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WATER FROM BEDROCK IN THE COLORADO PLATEAU OF UTAH

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WATER FROM BEDROCK IN THE COLORADO PLATEAU OF UTAH

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ABSTRACT

The bedrock aquifers in the Colorado Plateau of Utah supply water that ranges widely in chemical quality and yield. The range of dissolved solids in 649 samples collected from 534 wells, springs, and water-yielding mine tunnels was from less than 100 to more than 390,000 ppm (parts per million). The yield of wells ranged from less than 1 to 54,000 barrels of water per day (less than 1 to 1,600 gallons per minute); whereas the yield of springs ranged from less than 1 to 4,100,000 barrels of water per day (less than 1 to 121,000 gallons per minute).

The Colorado Plateau of Utah is divided into three sections—the Uinta Basin, Canyon Lands, and the High Plateaus. In the Uinta Basin, wells and springs have produced fresh to slightly saline water from the Madison Limestone, Morgan Formation, Weber Sandstone, Phosphoria and Park City Formations, Navajo and Entrada Sandstones, Frontier Sandstone Member of the Mancos Shale, Mesaverde Group, and the Wasatch, Green River, Uinta, and Duchesne River Formations. The major areas of recharge are the north flank of the basin, the Uinta Mountains on the north edge of the basin, and the high areas of the south flank. All the permeable formations that crop out along the north flank of the basin are potential freshwater aquifers. Few wells have been drilled, however, and the areal extent of the fresh water is unknown. In most of the central part of the basin, the thick sequence of rocks of Tertiary age and the underlying rocks of Cretaceous age contain water too saline for most uses.

The Canyon Lands section is divided into numerous hydrologic units by structural features such as the San Rafael Swell, Circle Cliffs and Monument Upwarps, the Abajo, Henry, and La Sal Mountains, and the faulted anticlines such as Salt, Spanish, and Lisbon Valleys. Most wells in the bedrock aquifers are restricted to a few areas, and few data are available for large parts of the section.

In the Canyon Lands section, fresh to slightly saline water is produced from wells and springs in the Hermosa Group, Rico and Cutler Formations, Cedar Mesa Sandstone Member, Organ Rock Tongue, and De Chelly Sandstone Member of the Cutler Formation, Chinle Formation, Shinarump Member of the Chinle Formation, Wingate Sandstone, Kayenta Formation, Navajo Sandstone, Carmel Formation, Entrada and Bluff Sandstones, Morrison and Burro Canyon Formations, and the Dakota Sandstone. The quality of water changes from area to area, however, and an aquifer containing fresh water in one area may contain saline water or brine in another. The area of greatest development of ground water in the Canyon Lands section is the Blanding Basin in southeastern San Juan County. In the western part of the basin, near Bluff, wells in the Glen Canyon Group yield water containing less than 500 ppm of dissolved solids. Toward the east near Aneth, however, the ground water contains more than 8,000 ppm of dissolved solids.

The High Plateaus section receives the greatest precipitation in the Colorado Plateau of Utah, and more than 16 inches a year falls on most of the section. This provides for abundant recharge by direct infiltration to bedrock aquifers and by infiltration from perennial streams that flow into the Canyon Lands section. Very little water is withdrawn by wells from the aquifers in the High Plateaus, however, in relation to the potential yield of the aquifers. The formations that are known to contain fresh water in the High Plateaus include limestones of Paleozoic age, the Wingate and Navajo Sandstones, Carmel Formation, Tropic Shale, Wahweap and Straight Cliffs Sandstones, Emery Sandstone Member of the Mancos Shale, Blackhawk, Price River, Kaiparowits, and North Horn Formations, Flagstaff Limestone, Wasatch, Brian Head, Green River, and Crazy Hollow Formations, and igneous rocks of Tertiary age.

INTRODUCTION

This report on the bedrock aquifers of the Colorado Plateau of Utah was prepared by the U.S. Geological Survey in cooperation with the Utah Oil and Gas Conservation Commission. The purpose of the study was to determine which bedrock formations are water bearing and to report on the quality of water in these formations and their yield of water to springs, water wells, and oil and gas wells. The information is needed by the Oil and Gas Conservation Commission and by other State and Federal authorities to determine usability of the water and to determine what protective measures may be needed to prevent water of poor quality from polluting usable ground and surface water.

The study covered the 1-year period from July 1964 to June 1965. This report is based on data compiled from published reports, which are listed in the section "Selected references," and from unpublished data in the files of the U.S. Geological Survey, the Utah Oil and Gas Conservation Commission, the Utah State Engineer, and the Utah State Department of Health. Stratigraphic nomenclature used in this report is from published sources, mainly from the Utah State Geologic Map (Stokes, 1964), and may not agree with that used by the U. S. Geological Survey. Many oil and gas companies provided upon request chemical analyses of water and other data from their files. The scope of the study did not permit a field check of existing wells. If this were done, undoubtedly data could be collected for many more wells.

A discussion of the hydrology of ground water in bedrock is beyond the scope of this report. R. E. Marsell (1964), however, describes the occurrence of ground water in bedrock, the bedrock ground-water provinces in Utah, and the effects of rock composition and geologic structure on ground water in bedrock.

Physiographic subdivisions of the Colorado Plateau

The Colorado Plateau of Utah comprises about half the area of the State and is divided into three sections (Hunt, 1956, p. 3)—the Uinta Basin, Canyon Lands, and High Plateaus (fig. 1). Small parts of two other sections also extend a few miles into the southern part of Utah, but in this report they are included with the Canyon Lands and High Plateaus sections.

The Uinta Basin section is at the north edge of the Colorado Plateau. The section is elongated east-west and is structurally the lowest part of the plateau. The upturned strata on the north flank of the Uinta Basin form hogbacks along the south edge of the Uinta Mountains, and the nearly horizontal strata of the south flank form the steep escarpments of the Roan and Book Cliffs. Altitudes in the basin range from about 4,650 feet above sea level near Ouray on the Green River to 10,000 feet along the Roan Cliffs.

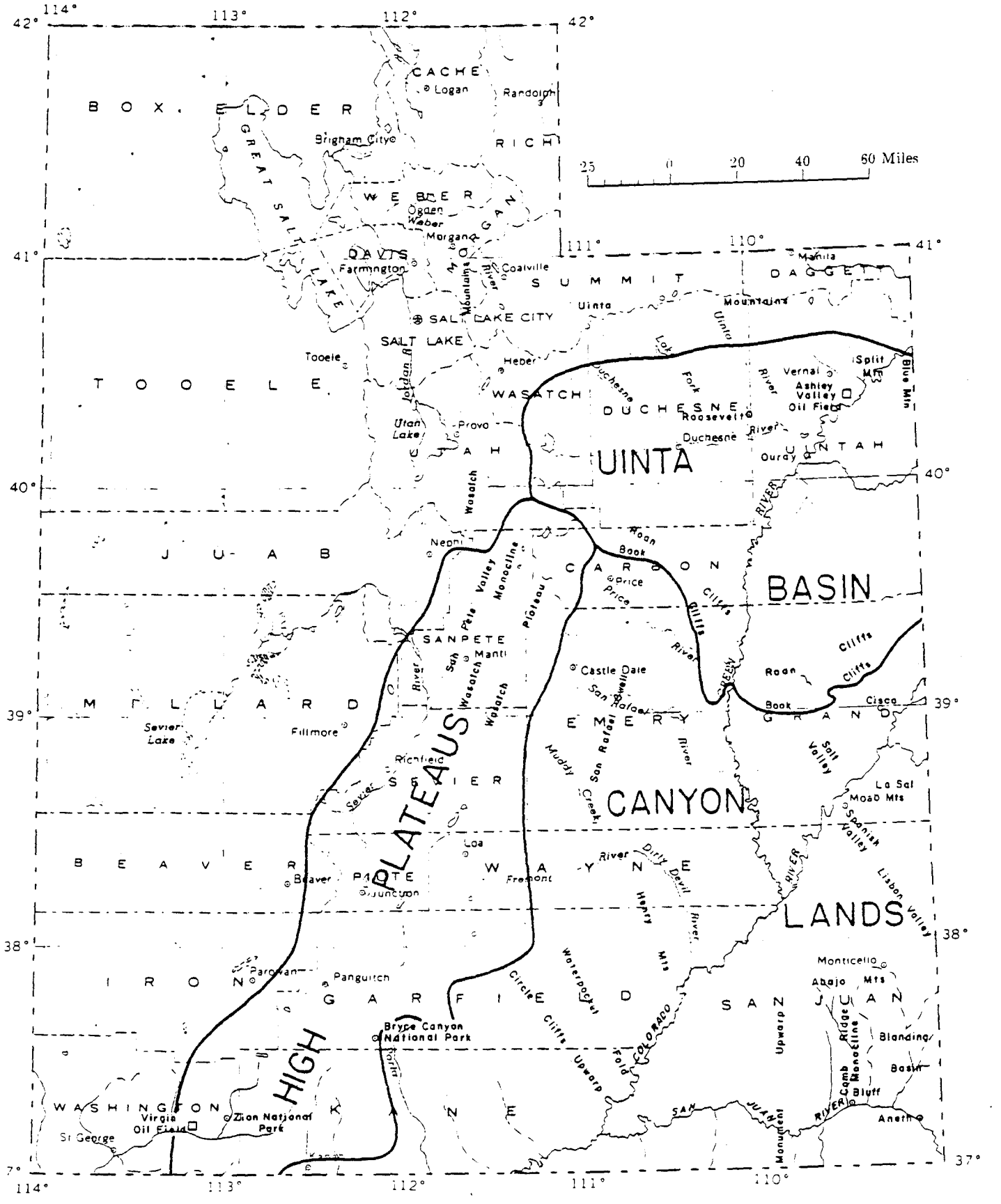

Figure 1. — Index map of the Colorado Plateau in Utah.

The Canyon Lands section is south of the Uinta Basin. The generally flat-lying rocks of this section are incised by streams that form the canyons, leaving intervening broad mesas and buttes. An intricate system of deep canyons along and across hogbacks and cuestas has resulted from faulting, upwarps (such as the San Rafael Swell), and distortion of rocks around mountains formed by intrusive rocks (such as the Henry Mountains). The Canyon Lands section generally ranges in altitude from 4,000 to 7,000 feet, with peaks of mountains ranging from about 8,000 to 12,700 feet.

The High Plateaus section consists of long, north-trending plateaus along the west edge of the Canyon Lands section. The topography of the section is mostly controlled by faults, although some of the escarpments were caused by differential erosion. Most of the plateaus are 9,000 feet high, but some are as high as 11,000 feet.

Distribution of precipitation on the Colorado Plateau

Precipitation is the source of the water in the bedrock aquifers in the Colorado Plateau. The normal annual precipitation on the plateau ranges from less than 6 to more than 40 inches, but on most of the plateau the precipitation is less than 12 inches (fig. 2).

The High Plateaus section has the greatest precipitation and more than 16 inches falls on most of the section. In addition to providing recharge to the aquifers, there is sufficient precipitation to maintain the flow of several perennial streams that are tributary to the Colorado River or that flow into the Great Basin.

In the Canyon Lands section, peaks in the Henry, La Sal, and Abajo Mountains receive more than 30 inches of percipitation. These areas are very small in comparison to the vast area of the Canyon Lands, however, and less than 10 inches falls on most of the section. Few perennial streams head in the section.

In the Uinta Basin section, high areas along the south flank and on the west end receive more than 30 inches of precipitation; but these areas are small in comparison to the size of the basin. Less than 12 inches falls on most of the basin. A large part of the Uinta Mountains north of the Uinta Basin receives more than 30 inches of precipitation. These mountains contribute a large amount of water to the bedrock aquifers along the north edge of the basin, and several perennial streams head in the mountains and flow into the basin.

Classification of natural water

The water from springs, water wells, oil and gas tests, bore holes, and mines in the Colorado Plateau varies greatly in chemical quality because of different geologic and hydrologic environments. In order to classify these waters as fresh, saline, or briny, the following classification based on concentration of dissolved solids or specific conductance (Robinove, Langford, and Brookhart, 1958, p. 3) is used:

Class	Dissolved solids (ppm)	Specific conductance (micromhos/cm at 25°C)
Fresh	0 to 1,000	0 to 1,400
Slightly saline	1,000 to 3,000	1,400 to 4,000
Moderately saline	3,000 to 10,000	4,000 to 14,000
Very saline	10,000 to 35,000	14,000 to 50,000
Briny	More than 35,000	More than 50,000

WATER FROM BEDROCK IN THE UINTA BASIN SECTION

The Uinta Basin is an asymmetric syncline with an axis that is concave southward and generally parallel to the eastward-trending Uinta Mountains that lie to the north. Beds that form the north flank of the basin dip steeply southward away from the Uinta Mountains. Beds that form the south flank dip up to 5° northward toward the axis of the syncline. Rocks of Precambrian, Cambrian, and Mississippian through Tertiary ages are exposed in and around the basin or have been identified in oil wells. Table 1, columns 2, 3, 4, and 5, show the stratigraphic section for the Uinta Basin.

Chemical analyses of water from springs, water wells, and oil and gas wells show that the following formations contain fresh water: Madison Limestone, Morgan Formation, Weber Sandstone, Phosphoria and Park City Formations, Navajo and Entrada Sandstones, Frontier Sandstone Member of the Mancos Shale, Mesaverde Group, and the Wasatch, Green River, Uinta, and Duchesne River Formations. The areal extent of the fresh water in each formation is not fully known because of the scarcity of points at which samples could be obtained.

The electrical logs of oil and gas wells used in constructing figure 3 indicate slightly saline water in the Navajo, Entrada, and Dakota Sandstones, and the Frontier Sandstone Member of the Mancos Shale. Electrical logs used in constructing figure 4 indicate fresh or slightly saline water in the Weber and Navajo Sandstones and the Green River and Duchesne River Formations.

Hydrologic data are not available for many of the formations in the basin, mainly because water wells have not been drilled to test the quantity or quality of water and because such data were not collected during oil and gas exploration. Data are least available in the northwestern part of the basin where oil and gas exploration has not been extensive and water wells have not been drilled deep enough to penetrate all potential aquifers.

Recharge to bedrock aquifers of the Uinta Basin occurs mostly along the north flank of the basin and to a lesser extent on the areas of highest elevations on the south flank of the basin. Along the north flank runoff from the Uinta Mountains, Split Mountain, and Blue Mountain Plateau percolates into the upturned outcrops of formations that dip steeply into the basin. Precipitation directly on these outcrops also is a source of recharge. Because numerous formations are exposed to recharge, fresh or slightly saline water should be expected in most permeable formations near the north edge of the basin. On the south flank of the basin, most recharge is in the areas of highest altitude where precipitation is greatest. However, because of the low dip of the south flank, few formations except the Green River Formation are exposed to recharge. Wells drilled below the formation that crops out seldom yield fresh or slightly saline water.

Table 2 contains selected hydrogeologic data from springs, water wells, and oil and gas wells in bedrock in the Uinta Basin section; locations of the sampling sites are shown in figures 5, 6, and 7. Following is a summary of the data by formation.

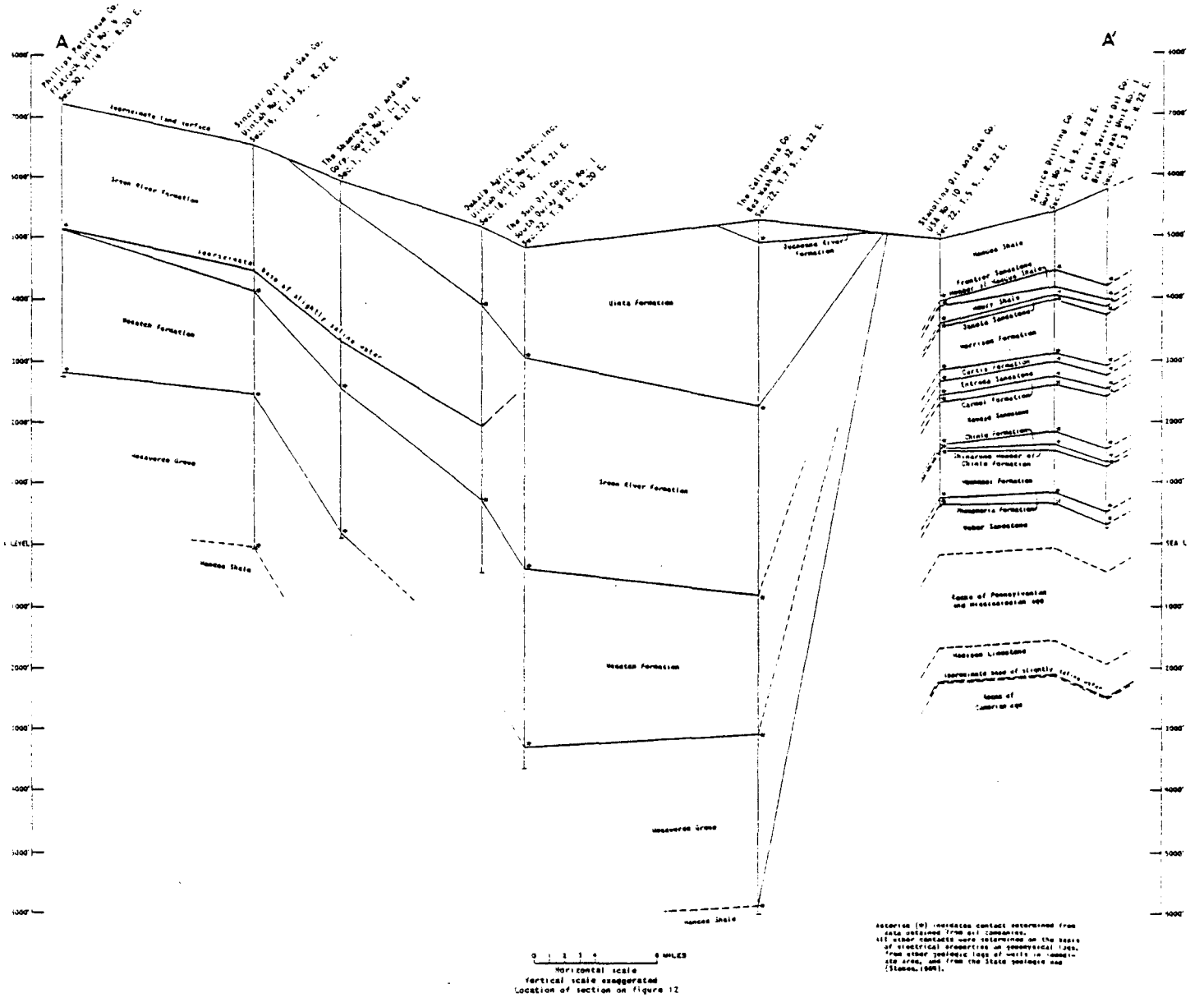

Figure 3. — Geologic section A-A′ of the Uinta Basin section near Vernal.

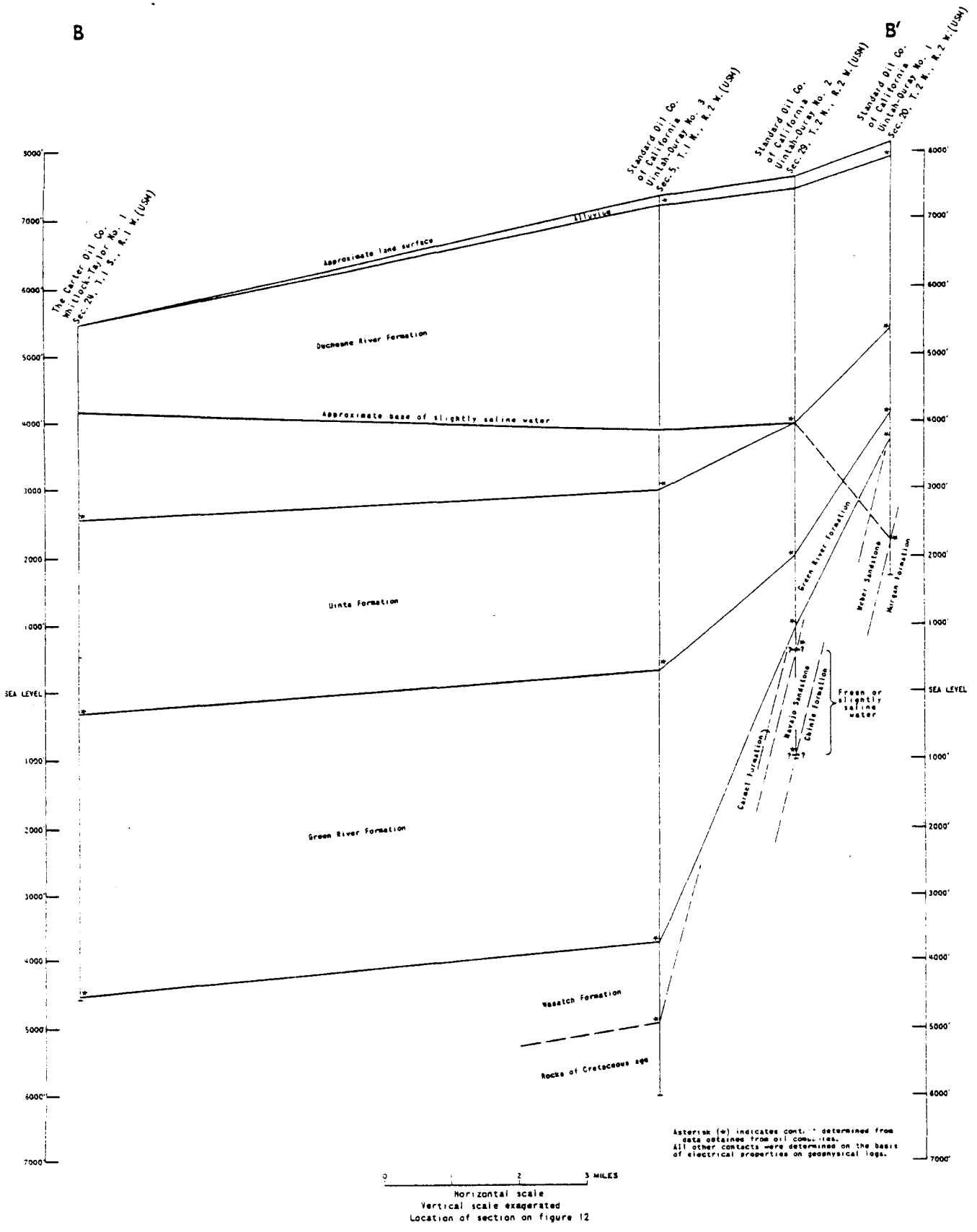

Figure 4. — Geologic section B-B′ of the Uinta Basin section near Roosevelt.

Madison Limestone and Morgan Formation

Water from warm springs issuing near the top of the Madison Limestone, or possibly at the base of the Morgan Formation in T. 4 S., R. 24 E., flows into the Green River about 2 miles above the mouth of the canyon at Split Mountain. The dissolved-sclids content of the water is 942 ppm (parts per million) (fig. 5 and table 2). In September, 1948, the discharge of the springs above river level was estimated to be 6 cfs (cubic feet per second) (2,700 gpm, gallons per minute, or 1,500 bwpd, barrels of water per day) and an equal amount or more was believed to discharge directly into the river (Thomas, 1952, p. 12). The source of water for the springs is probably from the south flank of the Uinta Mountains where the Madison and Morgan formations crop out. These formations could also be a partial source of the water produced in the Ashley Valley oil field. (See discussion of Weber Sandstone below.) The Morgan Formation, Madison Limestone, and other limestones of Mississippian age crop out over a wide area along the south flank of the Uinta Mountains, and they all should be considered potential fresh-water aquifers along the north edge of the basin.

Weber Sandstone

The water from oil wells, abandoned oil tests converted to water wells, and springs in the Weber Sandstone ranges from about 400 to 2,600 ppm of dissolved solids (fig. 5 and table 2). The source of the water in the Weber is from recharge to areas of outcrop in Split Mountain and along the south flank of the Uinta Mountains.

Oil wells in the Ashley Valley oil field produce water from the Weber Sandstone, but some of the water possibly comes from limestone of Pennsylvanian and Mississippian ages which underlies the Weber (Goode and Feltis, 1962, p. 12). Normal faults in the oil field, described by Peterson (1957, p. 191), could possibly form conduits between the underlying limestones and the Weber. Some of the wells in the Ashley Valley oil field are open to both the Weber and the overlying Phosphoria Formation, and the range in dissolved solids in water from these wells is about 500 to 2,600 ppm (fig. 5 and table 2). During 1964, the 28 oil wells in Ashley Valley oil field produced about 36.5 million barrels of water. Some of the high-volume pumps produce more than 9,000 bwpd (270 gpm) (Johnson, 1964, p. 187). Yields of individual wells at the time of sampling are listed in table 2.

The Weber Sandstone should be considered as a potential fresh-water aquifer all along the northern edge of the basin.

Phosphoria Formation

Water is produced with oil from wells developed in the Phosphoria Formation[1] in the Ashley Valley oil field; however, it is questionable whether or not the Phosphoria actually yields the water. V. E. Peterson (1957, p. 191) described the reservoir as follows: "Where porosity is present within the Phosphoria Formation, it is probable that this reservoir is common with that of the Weber Sandstone. Pronounced vertical fracturing in the Phosphoria in many of the wells probably connects the two reservoirs. * * * All of the wells are now producing material amounts of water with the oil and it is believed that water has invaded the oil reservoir through fractures." Therefore, most of the water in the Phosphoria probably comes from the Weber Sandstone or underlying formations.

[1]See discussion on nomenclature in the section on Park City Formation below.

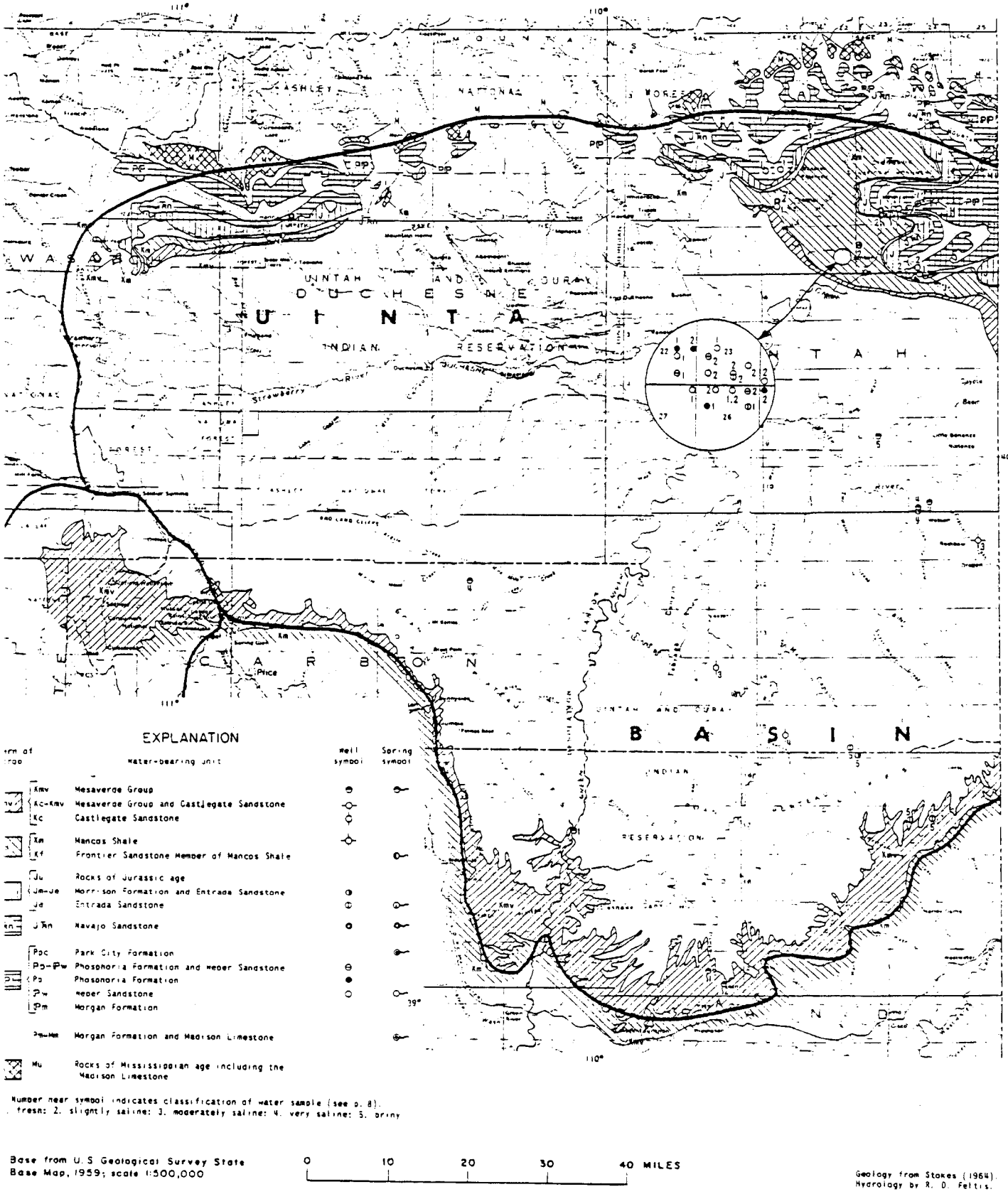

Figure 5. — Locations of wells and springs in rocks of Paleozoic and Mesozoic age in the Uinta Basin section.

Park City Formation

The Park City Formation is a potential aquifer along the north flank of the Uinta Basin, especially where the formation thickens toward the west. Although rocks of Permian age that crop out in the eastern Uinta Mountains are mapped as Park City (Kinney, 1955, pl. 1), for the subsurface, the term Phosphoria Formation has been used in most logs of oil tests. Consequently, water samples obtained from oil tests are considered to be from the Phosphoria. A spring in T. 2 S., R. 22 E., yields water from near the base of the Park City (fig. 5). The water contains 228 ppm of dissolved solids (table 2), and the spring was discharging at a rate of about 3 cfs (46,000 bwpd or 1,350 gpm) when visited in August 1950.

Navajo Sandstone

Few wells produce water from the Navajo Sandstone in the Uinta Basin, although it is an aquifer that probably contains fresh or slightly saline water along the north flank of the basin. Along the north flank of the basin, most oil tests that penetrate the Navajo are reported to obtain potable water or water suitable for irrigation. An oil well in sec. 12, T. 4 S., R. 20 E., in 1950 had an artesian flow of approximately 2,000 bwpd (60 gpm) of potable water from the Navajo; however, by 1958 the flow had declined to about 850 bwpd (25 gpm). Water from a well in the Navajo in T. 4 S., R. 21 E., contained 1,894 ppm of dissolved solids (fig. 5 and table 2); however, the sample was reportedly contaminated by drilling mud. No yield data are available. Two springs, in T. 1 N., R. 7 W. (USM, Uinta Special Meridian), and T. 4 S., R. 23 E., yield water containing 148 and 342 ppm of dissolved solids at estimated rates of 1,400 and 70 bwpd (40 and 2 gpm).

In the northwestern part of the Uinta Basin, the name Nugget Sandstone is generally used instead of Navajo Sandstone.

Entrada Sandstone

Chemical analyses are available for water from the Entrada Sandstone on the north flank of the Uinta Basin from a spring in T. 4 S., R. 23 E., and from two oil wells in T. 5 S., R. 22 E., and on the south flank from four gas tests in Tps. 15, 15½, and 17 S., Rs. 22, 23, and 24 E. (fig 5 and table 2). The spring water is fresh; and the two oil wells yielded water containing 479 and 1,165 ppm of dissolved solids at rates of 664 and 375 bwpd (19 and 11 gpm). Also on the north flank of the basin, electrical logs of oil wells used in constructing figure 3 indicate fresh or slightly saline water in the Entrada. On the south flank of the basin, water from the gas tests contained from 58,000 to 104,000 ppm of dissolved solids. Drilling reports of oil wells in the Cisco area, south of the Book Cliffs, also report "briny" or "salty" water from the Entrada.

Frontier Sandstone Member of Mancos Shale

Two springs in the Frontier Sandstone Member at T. 1 S., R. 8 W. (USM), and T. 4 S., R. 23 E., each yield about 1 gpm of water containing 736 and 2,620 ppm of dissolved solids (fig. 5 and table 2). The electrical logs of oil wells used in constructing figure 3 indicate fresh or slightly saline water in the Frontier.

Mancos Shale

The fine-grained materials and abundance of soluble salts in the Mancos Shale suggest that this formation does not contain fresh water. Water from an oil well in the shale in T. 11 S., R. 25 E., contained 5,800 ppm of dissolved solids (fig. 5).

Castlegate Sandstone

Chemical analyses of water from the Castlegate Sandstone at two oil wells in Tps. 14 and 15 S., Rs. 20 and 21 E., in southern Uintah County showed a dissolved-solids content of 4,711 and 33,253 ppm (fig. 5 and table 2). Another analysis of water from the Castlegate and the Mesaverde Group in T. 10 S., R. 24 E., showed a dissolved-solids content of 20,452 ppm. Fresher water may be present in the Castlegate along the southwest edge of the basin north and northwest of Price, where the area of outcrop is larger and recharge is greater.

Mesaverde Group

Six chemical analyses of water from four oil wells in the Mesaverde Group show a range of 12,511 to 62,502 ppm of dissolved solids (table 2). The wells were in T. 9 S., R. 23 E., T. 10 S., R. 24 E. (two wells), and T. 12 S., R. 14 E. (fig. 5); and the reported yield of water from one of the wells in T. 10 S., R. 24 E., was 38 bwpd (1 gpm). One spring in T. 17 S., R. 17 E., and two springs in T. 20 S., R. 20 E., all three in the Mesaverde, yield water containing 707, 660, and 1,090 ppm of dissolved solids, respectively.

Flagstaff Limestone

Water from an oil well in the Flagstaff Limestone in T. 14 S., R. 20 E., contained 8,245 ppm of dissolved solids (fig. 6 and table 2). The oil well is near the eastern extent of the formation and distant from possible recharge areas. The formation may contain fresh water in the southwestern part of the basin adjacent to the High Plateaus, in which area the formation does yield fresh water to water wells and springs. (See discussion of High Pleateaus section.)

Wasatch Formation

Chemical analyses of 11 water samples collected from the Wasatch Formation in 7 oil and gas wells indicate that 2 of the samples are slightly saline and the other 9 range from moderately saline to briny (fig. 6). One of the samples of slightly saline water was obtained from a well in T. 15 S., R. 21 E. The water contained 1,966 ppm of dissolved solids, and the aquifer probably is being recharged in the area of relatively high precipitation north of the Roan Cliffs. The other sample of slightly saline water was obtained from a well in T. 1 N., R. 1 E. (USM). The water contained 1,302 ppm of dissolved solids, and the aquifer probably is being recharged in the subsurface by interformational leakage along the south flank of the Uinta Mountains rather than by direct infiltration in the area of outcrop. Yield data are not available for the seven oil and gas wells. A spring in T. 16 S., R. 17 E., yielded fresh water having 596 ppm of dissolved solids while flowing at a rate of 7,650 bwpd (225 gpm) in September 1948. Additional smaller springs probably discharge from the Wasatch along the escarpment of the Roan Cliffs.

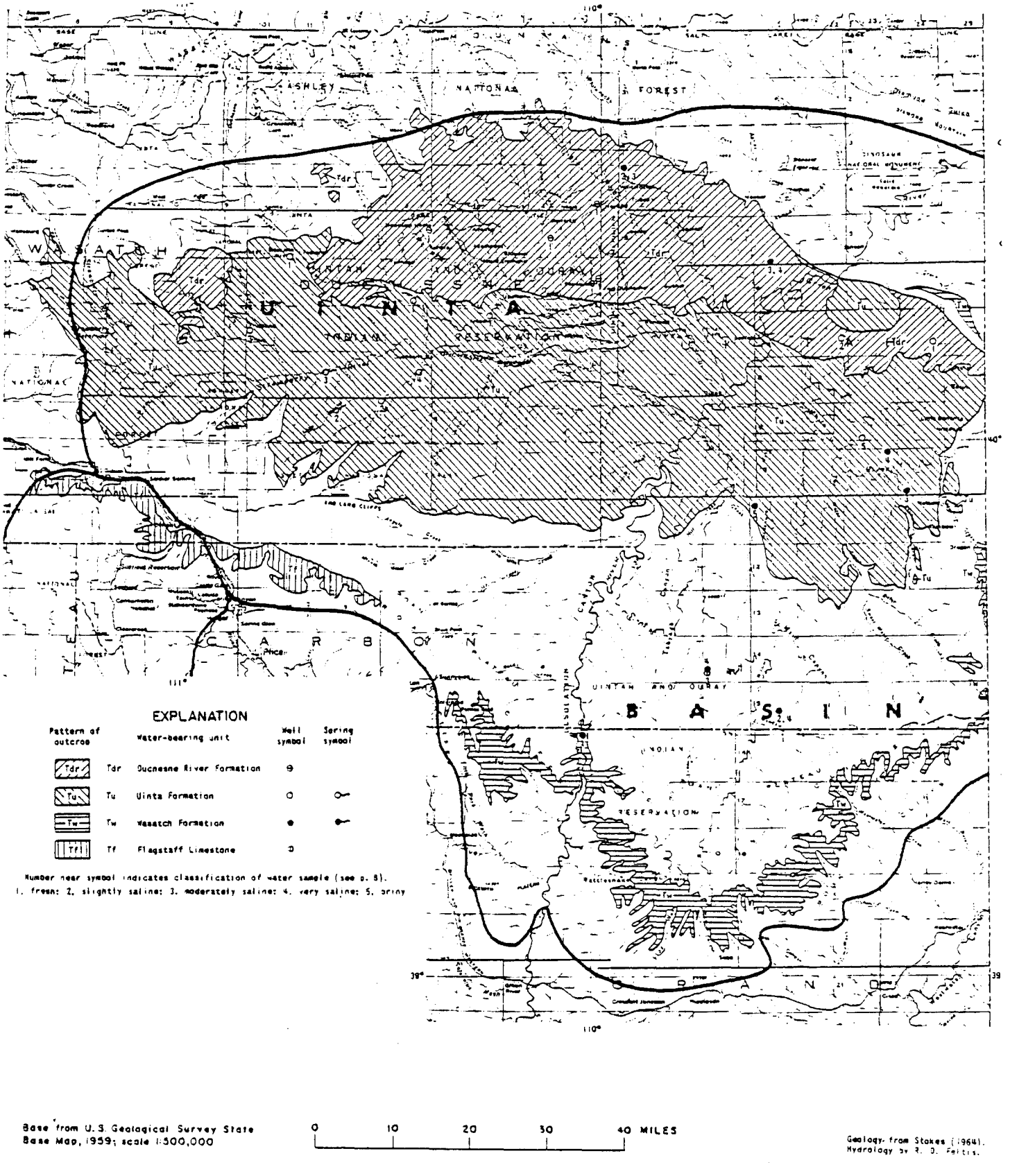

Figure 6. — Locations of wells and springs in the Flagstaff Limestone and Wasatch, Uinta, and Duchesne River Formations in the Uinta Basin section.

Green River Formation

The chemical quality of the water in the Green River Formation ranges from fresh to briny. Analyses of 73 water samples collected from 51 wells and 1 spring indicate that 4 were fresh, 18 were slightly saline, and the remaining 51 were moderately saline to briny (fig. 7). Three of the samples of fresh water came from two wells and a spring, and most of the slightly saline water came from wells on the scuthern flank of the Uinta Basin. The fresh water was obtained from a gas well in T. 11 S., R. 12 E., an oil well in T. 14 S., R. 20 E., and a spring in T. 15 S., R. 23 E.; and they contained 619, 818, and 381 ppm of dissolved solids, respectively. The occurrence of fresh and slightly saline water along the southern flank of the basin suggests that the aquifers are recharged in the area of high precipitation north of the Roan Cliffs (fig. 2). The fourth sample of fresh water was obtained from an oil well in T. 2 N., R. 2 W. (USM). The well yielded water containing only 348 ppm of dissolved solids from a depth of 4,115 feet. The Green River does not crop out in the central part of the north flank of the Uinta Basin; therefore, recharge to the aquifer in T. 2 N., R. 2 W. (USM), probably is by interformational leakage. The electrical logs used in constructing figures 3 and 4 show the occurrence of fresh and saline water in the Green River in the southeastern and northern parts of the Uinta Basin.

The yield of water from the Green River Formation, as indicated by tests at 17 oil and gas wells, ranges from 17 bwpd (0.5 gpm) to 7.200 bwpd (200 gpm). Two gas wells in sec. 35, T. 10 S., R. 20 E., and sec. 17, T. 10 S., R. 22 E., were converted to water wells; and in 1964 they flowed at rates of 2,700 bwpd (80 gpm) and 340 bwpd (10 gpm). The largest reported yield of water from the Green River is from an oil well in T. 9 S., R. 24 E., which produced 7,200 bwpd (220 gpm) from a depth of 1,932 feet.

On the south flank of the Uinta Basin the Green River Formation is a potential source of fresh or slightly saline water that could be used in the process of oil extraction from bituminous sand and oil shale.

Uinta Formation

The Uinta Formation yields water that ranges in chemical quality from fresh to briny (fig. 6). In T. 7 S., Rs. 22 and 24 E., two oil wells yielded water containing 2,365 and 898 ppm of dissolved solids (table 2), the latter at a rate of 3,600 bwpd (110 gpm). Two oil wells in T. 9 S., R. 23 E., and T. 4 S., R. 5 W. (USM), yielded water containing 81,200 and 22,915 ppm of dissolved solids, the latter at a rate of 1,000 bwpd (30 gpm). A spring in the Uinta in T. 1 S., R. 8 W. (USM), yielded water containing 237 ppm of dissolved solids at a rate of 1,700 bwpd (50 gpm). Three springs in T. 4 S., R. 7 W. (USM), and T. 5 S., Rs. 6 and 7 W. (USM), yielded water containing 7,320, 1,840, and 2,710 ppm of dissolved solids at rates of 680, 6,800, and 7,800 bwpd (20, 200, and 225 gpm).

Water from three water wells in T. 2 S., R. 5 W. (USM), and T. 3 S., Rs. 3 and 8 W., (USM), contained 439, 788, and 4,430 ppm of dissolved solids and the well in T. 3 S., R. 3 W., yielded 680 bwpd (20 gpm).

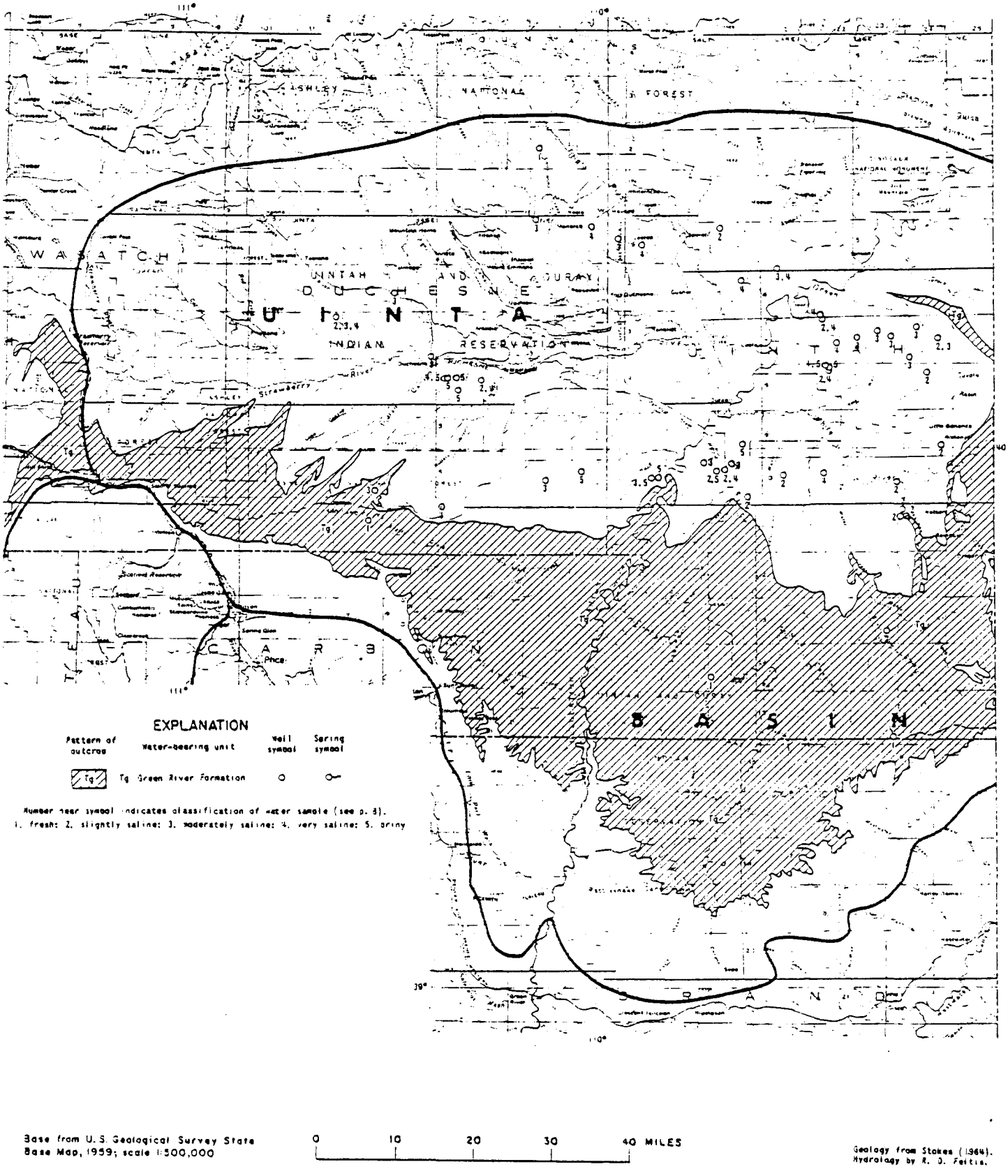

Figure 7. — Locations of wells and springs in the Green River Formation in the Uinta Basin section.

The chemical quality of water in the Uinta Formation is determined principally by the lithology of the formation and local recharge conditions. In the central part of the basin, the formation is composed predominantly of fine-grained lake deposits that contain large quantities of soluble salts; but it yields fresh and slightly saline water where local precipitation or runoff from the Uinta Mountains recharges the formation. In the eastern part of the basin, where there is little precipitation, wells may yield fresh or slightly saline water from coarse-grained fluvial deposits that contain few soluble salts (Picard, 1957, p. 128).

Duchesne River Formation

Sandstone beds in the Duchesne River Formation are a source of fresh water for the city of Roosevelt and for private domestic wells. Data from five water wells indicate a range in dissolved solids from 234 to 528 ppm (fig. 6 and table 2) and a range in yield from about 60 to 340 bwpd (2 to 10 gpm). The source of water in the formation is from recharge by surface streams that cross the area of outcrop and by precipitation directly on the area of outcrop along the north flank of the basin. The formation dips southward, and artesian conditions occur where water wells tap the aquifer in T. 2 S., R. 1 W. (USM). Water wells penetrate the Duchesne River to a maximum known depth of 810 feet; however, logs of oil wells show the formation to be as much as 4,000 feet thick. The electrical log of the well in sec. 5, T. 1 N., R. 2 W. (USM) in figure 4 indicates that the base of the slightly saline water in the Duchesne River may be as much as 3,460 feet deep.

WATER FROM BEDROCK IN THE CANYON LANDS SECTION

The Canyon Lands section is the most structurally complex part of the Colorado Plateau in Utah. Three upwarps—the San Rafael Swell and Circle Cliffs and Monument Upwarps—are the major structural elements in the section. The upwarps and adjacent basins are modified by numerous subsidiary folds and faults and by the intrusives that formed the Abajo and Henry Mountains. In the northeastern part of the Canyon Lands section is a northwest-trending belt of faulted anticlines, including Salt, Spanish, and Lisbon Valleys. Near the center of this area is the La Sal Mountains, also formed by an intrusive. Sedimentary rock of Cambrian and Devonian through Cretaceous age are exposed in the Canyon Lands section or have been identified in oil wells. Table 1, columns 6, 7, 8, and 9, show the stratigraphic section for the Canyon Lands.

Chemical analyses of water from water wells, oil and gas wells, and springs show that fresh water is in the Hermosa Group, the Rico and Cutler Formations, the Cedar Mesa Sandstone Member, Organ Rock Tongue, and De Chelly Sandstone Member of the Cutler Formation, Chinle Formation, Shinarump Member of the Chinle Formation, Wingate Sandstone, Kayenta Formation, Navajo Sandstone, Carmel Formation, Entrada and Bluff Sandstones, Morrison and Burro Canyon Formations, and the Dakota Sandstone. Many of the analyses are for water from scattered springs and stock wells that are the only source of ground water for hundreds of square miles.

The electrical logs of oil and gas tests used in constructing figure 8 indicate that water in bedrock in the Blanding Basin ranges from fresh to saline in chemical quality.

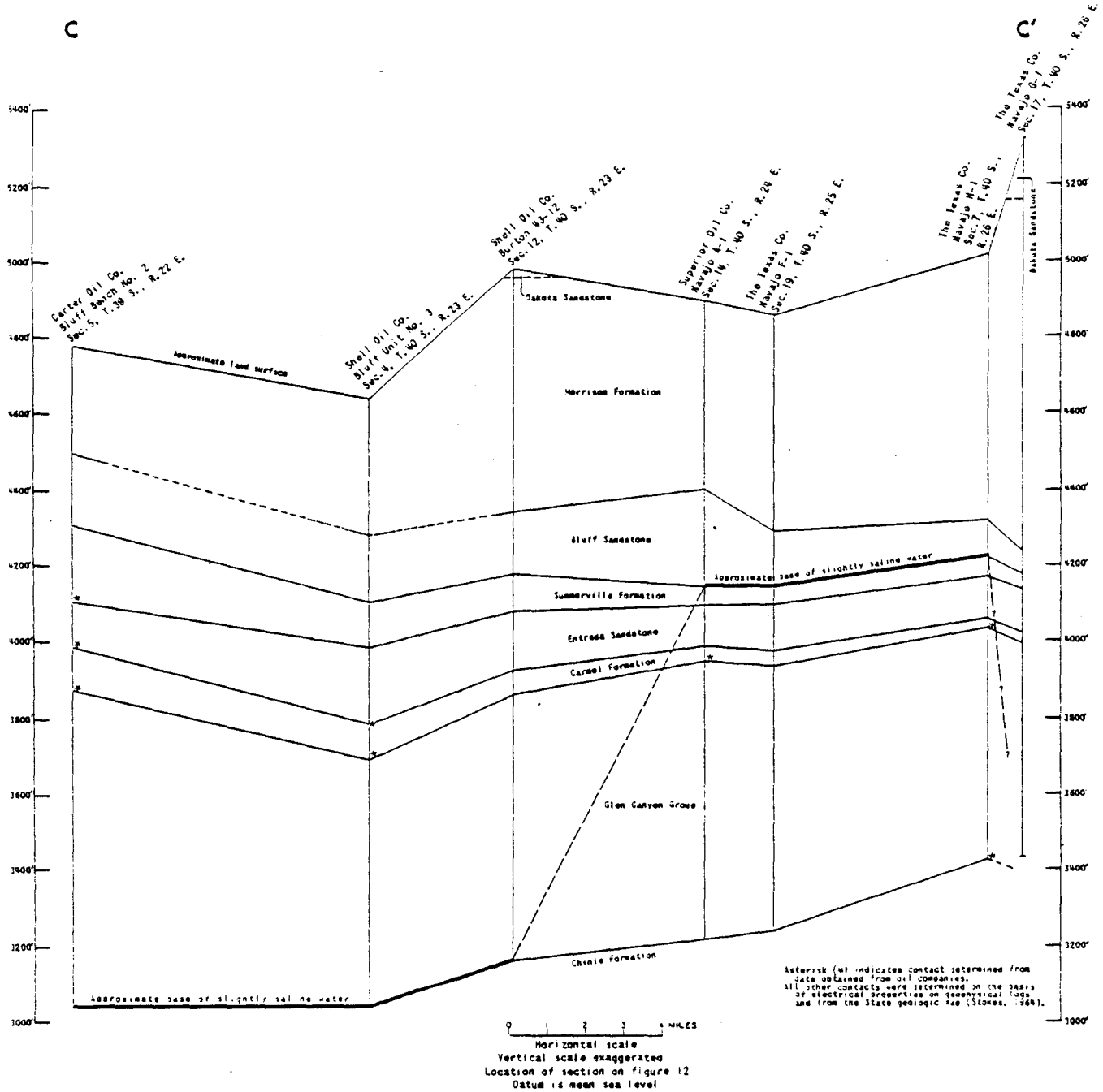

Figure 8. — Geologic section C-C′ of the Blanding Basin in the Canyon Lands section.

Ground-water data are not available for many areas in the Canyon Lands, mainly because water wells have not been drilled to test the quantity or quality of water and because such data were not collected during oil and gas exploration.

Recharge to bedrock aquifers in the Canyon Lands occurs where permeable formations crop out along the flanks of the Abajo, Henry, and La Sal Mountains, along the flanks of folds such as the Comb Ridge Monocline, San Rafael Swell, or Waterpocket Fold, and on the wide expanse of flat-lying aquifers that are exposed between the major structural elements. Except near the mountains, however, the amount of recharge is generally small because of the low normal annual precipitation (fig. 2).

The area of greatest development of ground water in the Canyon Lands section is the Blanding Basin, an artesian basin east of Comb Ridge in San Juan County. In T. 40 S., R. 21 E., wells in the Glen Canyon Group yield water having less than 500 ppm of dissolved solids. Eastward from Bluff, the Entrada and Bluff Sandstones and Morrison Formation also yield fresh and slightly saline water to wells. Near Aneth, however, the ground water has as much as 8,640 ppm of dissolved solids.

Artesian conditions have also been encountered in wells drilled in formations that crop out on the flanks of the Abajo, Henry, and La Sal Mountains. The relatively high precipitation on the mountains is a source of recharge to the formations, and in or near the area of outcrop the ground water is generally fresh or slightly saline. Few wells have been drilled near the mountains, however, and the areal extent of the fresh and slightly saline water is unknown.

Table 3 contains selected hydrogeologic data for bedrock formations in the Canyon Lands section, and the locations of the sampling sites are shown in figures 9, 10, 11, 12, 13, 14, and 15. Following is a summary of the data by formation.

Rocks of Cambrian and Devonian age

Water samples from oil wells have been collected from the Aneth and Elbert Formations, the McCracken Member of the Elbert Formation, and the Ouray Limestone of Devonian age, and from sedimentary rocks of Cambrian and Devonian age that are not differentiated.

Chemical analyses of 9 water samples collected from 8 wells in these formations indicate that 6 of the samples are briny and the other 3 are moderately or very saline (fig. 9 and table 3). The moderately saline samples were from the western part of the Canyon Lands section in T. 36 S., R. 10 E., and T. 26 S., R. 7 E. (Water samples from rocks of Devonian and Mississippian age are discussed in the next section.)

Rocks of Mississippian age

Water samples from oil wells have been collected from the Leadville, Madison, and Redwall Limestones of Mississippian age. These formations, however, generally have not been differentiated when the samples were collected. The individual formations, therefore, are stipulated where known, but otherwise they are considered as a unit called "rocks of Mississippian age."

Chemical analyses of water from three oil wells in the Leadville Limestone in T. 29 S., R. 10 E., T. 42 S., R. 23 E., and T. 43 S., R. 21 E., showed 8,470, 84,516, and 56,500 ppm of dissolved solids (fig. 9 and table 3). In T. 40 S., R. 26 E., and T. 42 S., R. 22 E., water from

the Leadville Limestone and the Ouray Limestone of Devonian age contained 31,583 and 71,948 ppm of dissolved solids.

The Madison Limestone yielded water containing 54,624 and 8,037 ppm of dissolved solids to oil wells in T. 16 S., R. 12 E., and T. 29 S., R. 10 E. (fig. 9 and table 3).

In T. 16 S., R. 9 E., and T. 36 S., R. 10 E., oil wells in the Redwall Limestone yielded water containing 73,653 and 4,669 ppm of dissolved solids and in T. 15 S., R. 12 E., an oil well in the Redwall Limestone and Elbert Formation of Devonian age yielded water containing 67,769 ppm of dissolved solids (fig. 9 and table 3).

Chemical analyses of 52 water samples from the undifferentiated rocks of Mississippian age showed a range of from 7,172 to 327,283 ppm of dissolved solids (fig. 9 and table 3). Six of the water samples were moderately saline, 16 samples were very saline, and 30 samples were brines.

In T. 40 S., R. 7 E., rocks of Mississippian and Devonian age yielded water containing 2,339 ppm of dissolved solids; and in T. 40 S., R. 26 E., and T. 41 S., R. 21 E., rocks of Mississippian age and the Ouray Limestone of Devonian age yielded water containing 39,869 and 83,940 ppm of dissolved solids (fig. 9 and table 3).

An oil well in rocks of Mississippian age and the overlying Molas Formation in T. 35 S., R. 3 E., yielded water containing 9,378 ppm of dissolved solids (fig. 9 and table 3) at a rate of 528 bwpd (16 gpm).

Hermosa Group

Most of the water samples from the Hermosa Group for which chemical analyses are available are from oil wells in the Paradox Formation. Analyses of 34 samples show a range of 5,342 to 397,061 ppm of dissolved solids (fig. 10 and table 3); and 25 of the samples were brines containing more than 35,000 ppm of dissolved solids. A spring in the Hermosa in T. 33 S., R. 16 E., yielded water at a rate of 15,300 bwpd (450 gpm) that contained 414 ppm of dissolved solids.

Molas Formation

A water sample from the Molas Formation in an oil well in T. 39 S., R. 13 E., contained 6,035 ppm of dissolved solids (fig. 10 and table 3).

Rico Formation

Chemical analyses of water from the Rico Formation are available for water from five springs and one water well. Three springs in T. 33 S., R. 15 E., yielded water with 1,220, 3,920, and 4,770 ppm of dissolved solids at rates of about 70, 510, and 850 bwpd (2, 15, and 25 gpm) (fig. 10 and table 3). Two springs in T. 40 S., R. 17 E., and T. 41 S., R. 19 E., yielded water containing 719 and 3,070 ppm of dissolved solids, each at a rate of about 170 bwpd (5 gpm). A water well in T. 35 S., R. 15 E., yielded water containing 318 ppm of dissolved solids at a rate of 350 bwpd (10 gpm).

Coconino Sandstone

Chemical analyses of water from three oil wells in the Coconino Sandstone in T. 16 S., R. 12 E., T. 18 S., R. 14 E., and T. 27 S., R. 15 E., showed 17,249, 49,902, and 3,378 ppm of dissolved solids (fig. 10 and table 3).

Toroweap Formation

Water from an oil well in the Toroweap Formation in T. 35 S., R. 3 E., contained 7,583 ppm of dissolved solids (fig. 10 and table 3).

Kaibab Limestone

Water from four oil wells in the Kaibab Limestone in T. 29 S., R. 10 E., T. 37 S., R. 2 E., T. 18 S., R. 14 E., and T. 20 S., R. 7 E., contained 3,720, 14,179, 35,985, and 72,000 ppm of dissolved solids (fig. 10 and table 3). A spring in T. 24 S., R. 10 E., yielded water having 2,150 ppm of dissolved solids at a rate of about 170 bwpd (5 gpm). (A water sample from the Kaibab Limestone and the Sinbad Limestone Member of the Moenkopi Formation is discussed in the section on the Sinbad Limestone Member.)

Cutler Formation

A water well in the Cutler Formation in T. 25 S., R. 23 E., yielded water having 931 ppm of dissolved solids at a rate of about 6,800 bwpd (200 gpm) (fig. 10 and table 3). The Cutler probably contains fresh or slightly saline water in other areas around the flanks of the La Sal Mountains. A spring in T. 33 S., R. 16 E., yielded water containing 770 ppm of dissolved solids at a rate of 12,200 bwpd (360 gpm). In T. 29 S., R. 26 E., and T. 28 S., R. 23 E., water from two oil wells in the Cutler contained 4,957 and 16,331 ppm of dissolved solids.

Cedar Mesa Sandstone Member of Cutler Formation

Two water wells in the Cedar Mesa Sandstone Member in T. 41 S., R. 16 E., and T. 43 S., R. 14 E., yielded water of 1,890 and 656 ppm of dissolved solids at rates of about 100 and 70 bwpd (3 and 2 gpm) (fig. 10 and table 3). Seven springs (in Tps. 36, 37, and 42 S., Rs. 16-18 E.) in the sandstone in San Juan County yielded water containing 298 to 596 ppm of dissolved solids at rates generally less than 170 bwpd (5 gpm).

Organ Rock Tongue of Cutler Formation

A water sample from an oil well in the Organ Rock Tongue in T. 29 S., R. 10 E., contained 4,487 ppm of dissolved solids (fig. 10 and table 3). Two springs, one in T. 43 S., R. 16 E., and another in T. 34 S., R. 14 E., yielded water containing 944 and 375 ppm of dissolved solids. The former yielded less than 3 bwpd (0.1 gpm), but the latter flowed at a rate of about 1,000 bwpd (30 gpm).

De Chelly Sandstone Member of Cutler Formation

In T. 41 S., Rs. 24 and 25 E., the De Chelly Sandstone Member yielded water containing 17,262 and 52,187 ppm of dissolved solids from two oil wells (fig. 10 and table 3). The yield of the well in T. 41 S., R. 24 E., was 270 bwpd (8 gpm). Three springs in the sandstone in T. 43 S., Rs. 14 and 19 E., yielded fresh water at rates generally less than 140 bwpd (4 gpm).

At Chinle, Ariz., about 90 miles south of Bluff, Utah, water wells in the De Chelly yielded water containing less than 400 ppm of dissolved solids. Electrical logs of oil wells in the Blanding Basin indicate that the De Chelly contains fresh or slightly saline water along the Comb Ridge Monocline, but the water becomes more saline toward the center of the basin.

White Rim Sandstone Member of Cutler Formation

The dissolved-solids content of water from six oil wells in the White Rim Sandstone Member in the west-central Canyon Lands section ranged from 2,045 to 6,045 ppm of dissolved solids (fig. 10 and table 3). Water from two springs in the White Rim in T. 40 S., R. 10 E., yielded water containing 2,470 and 4,060 ppm of dissolved solids at rates of about 70 and 5,100 bwpd (2 and 150 gpm).

Moenkopi Formation

In T. 24 S., R. 13 E., water sampled at two depths in an oil well in the Moenkopi Formation contained 12,472 and 15,999 ppm of dissolved solids. The latter sample was obtained with a reported yield of 94 bwpd (2.8 gpm). In T. 24 S., R. 14 E., however, another oil well yielded water from the formation that contained only 4,187 ppm of dissolved solids (fig. 11 and table 3). Two springs in T. 35 S., Rs. 13 and 14 E., yielded water containing 1,700 and 1,860 ppm of dissolved solids at rates of 15,300 bwpd (450 gpm) and 1,700 to 13,700 bwpd (50 to 400 gpm). Another spring in T. 31 S., R. 14 E., yielded water containing 2,355 ppm of dissolved solids; and a spring in T. 20 S., R. 11 E., yielded water containing 2,250 ppm of dissolved solids at a rate of 680 bwpd (20 gpm).

Sinbad Limestone Member of Moenkopi Formation

In T. 16 S., R. 12 E., oil wells in the Sinbad Limestone Member yielded very saline to briny water. In T. 24 S., R. 13 E., an oil well in the Sinbad yielded water containing 18,125 ppm of dissolved solids (fig. 11 and table 3). In oil wells in T. 29 S., Rs. 10 and 12 E., the Sinbad yielded water containing 4,437 and 9,130 ppm of dissolved solids, with the latter at the rate of 432 bwpd (13 gpm). A water sample collected from the Kaibab Limestone, the Sinbad Limestone Member, and undifferentiated beds in the Moenkopi Formation in an oil well in T. 29 S., R. 11 E., contained 6,167 ppm of dissolved solids.

Chinle Formation

Water from the Chinle Formation in oil tests in T. 22 S., R. 22 E., and T. 26 S., R. 7 E., contained 20,070 and 20,797 ppm of dissolved solids (fig. 11 and table 3), with the former at the rate of 34 bwpd (1 gpm). A spring in T. 39 S., R. 14 E., yielded water containing 747 ppm of dissolved solids. The water from this spring, however, may be discharging at the top of the Chinle after percolating downward through rocks of the overlying more permeable Glen Canyon Group.

Shinarump Member of Chinle Formation

Water has been produced in oil wells, water wells, springs, mines, and test holes from the Shinarump Member of the Chinle Formation (fig. 11). The dissolved-solids content of the water from the several sources were: oil well in T. 24 S., R. 13 E., 5,750 ppm; two water wells in T. 43 S., R. 4½ W., 646 and 710 ppm, with one well yielding 15,300 bwpd (450 gpm); springs in T. 31 S., R. 14 E., 1,613 ppm; and T. 41 S., R. 12 E., 840 ppm with the latter spring yielding 100 bwpd (3 gpm); mines in T. 35 S., R. 7 E., 8,510 ppm, and T. 37 S., R. 16 E., 5,840 ppm; and test holes in T. 41 S., R. 12 E., 1,670 and 3,340 ppm (table 3).

Moss Back Member of Chinle Formation

Water from the Moss Back Member in an oil test in T. 27 S., R. 14 E., yielded water containing 4,980 ppm of dissolved solids (fig. 11 and table 3).

Glen Canyon Group

The Glen Canyon Group consists of the Wingate Sandstone, the Kayenta Formation, and the Navajo Sandstone. This widespread sequence of predominantly sandstone is one of the most important aquifers in the Canyon Lands section because it generally yields fresh water to springs, and in many areas it yields water to wells that is at least suitable for livestock[1] (fig. 12).

In some wells, the subsurface data available are not detailed enough to identify the aquifer other than as the Glen Canyon Group. Five water wells in T. 40 S., Rs. 21-22 E., yielded water containing from 239 to 403 ppm of dissolved solids at rates of 750 to 3,400 bwpd (22 to 100 gpm) (table 3). A water well in T. 39 S., R. 25 E., yielded water containing 791 ppm of dissolved solids at a rate of 4,320 bwpd (130 gpm). In an oil well in T. 41 S., R. 25 E., the sandstones yield water containing 3,815 ppm of dissolved solids. An oil well in T. 16 S., R. 13 E., yielded very saline or briny water at a rate of 1,680 bwpd (50 gpm).

Wingate Sandstone

Four water wells in T. 23 S., R. 21 E., T. 30 S., R. 24 E., T. 31 S., R. 23 E., and T. 43 S., R. 24 E., yielded water from the Wingate Sandstone that contained from about 300 to 400 ppm of dissolved solids (fig. 12 and table 3). The yield of two of the wells was 70 and 140 bwpd (2 and 4 gpm). Sixteen springs in the Wingate yielded water containing from 133 to 914 ppm of dissolved solids at rates ranging from 17 to 3,840 bwpd (0.5 to 113 gpm). In T. 26 S., R. 7 E., water from an oil well in the Wingate contained 4,079 ppm of dissolved solids. Water produced from a well that taps the Wingate and also the Entrada and Navajo Sandstones is discussed in the section on the Entrada Sandstone. Recharge to the Wingate is restricted by the overlying relatively impermeable Kayenta Formation. Where fracturing and faulting extend through the Glen Canyon Group, however, water moves downward from the Navajo Sandstone through the Kayenta into the Wingate.

[1]According to the Western Australia Department of Agriculture (1950), beef cattle and adult sheep will tolerate water containing 10,000 and 12,000 ppm of dissolved solids, respectively.

Kayenta Formation

The Kayenta Formation generally acts as a barrier to the vertical movement of ground water rather than as an aquifer (M. E. Cooley, written commun., 1965). Many springs in the Glen Canyon Group issue at the base of the Navajo Sandstone or near the top of the Kayenta because the more impermeable rock of the Kayenta restricts or stops the downward flow of water. Three springs in the Kayenta in T. 31 S., R. 15 E., T. 39 S., R. 11 E., and T. 42 S., R. 12 E., yielded water containing 220, 115, and 144 ppm of dissolved solids at rates of 70 bwpd (2 gpm) or less (fig. 12 and table 3).

Navajo Sandstone

Most water wells in the Glen Canyon Group draw water from the Navajo Sandstone, probably because it is the shallowest and most permeable formation in the group. Twenty-one water wells in the Navajo yielded water containing from 171 to 7,250 ppm of dissolved solids at rates ranging from 70 to 45,400 bwpd (2 to 1,335 gpm) (fig. 12 and table 3). Five of the wells in Tps. 41 and 42 S., Rs. 21 to 23 E., are in the Blanding Basin, east of Comb Ridge. These five wells in the Navajo yielded water containing from about 170 to 500 ppm of dissolved solids at rates ranging from 70 to 1,200 bwpd (2 to 35 gpm). The chemical quality deteriorates toward the east, however, and two water wells in the Navajo in T. 41 S., R. 25 E., yielded water containing 7,080 and 7,250 ppm of dissolved solids at rates of 2,000 and 2,450 bwpd (60 and 72 gpm). The recharge area for the aquifer in the Blanding Basin is in the area of outcrop of the sandstone along the length of Comb Ridge Monocline. Ten wells drilled in the Navajo in Arizona and Utah to supply water at the Glen Canyon Dam construction facility in Arizona yielded water containing from 216 to 1,814 ppm of dissolved solids at rates ranging from 1,200 to 45,400 bwpd (35 to 1,335 gpm) (Goode, 1964, p. 45 and 60).

Chemical analyses of water from 14 springs in the Navajo Sandstone showed a range of dissolved solids from 129 to 354 ppm. The yield of the springs ranges from less than 34 bwpd (1 gpm) to 1,700 bwpd (50 gpm); but most of the springs yield 340 bwpd (10 gpm) or less.

Chemical analyses are available for four water samples from the Navajo Sandstone obtained from oil wells. Two wells in T. 41 S., R. 24 E., yielded water containing 3,410 and 3,890 ppm of dissolved solids, and wells in T. 15 S., R. 11 E., and T. 26 S., R. 7 E., yielded water containing 3,607 and 320 ppm of dissolved solids. Water produced from the Navajo in wells that also tap other formations is discussed in the section on the Entrada Sandstone.

Carmel Formation

The Carmel Formation has yielded water that ranges from fresh to moderately saline. The dissolved-solids content of water from three water wells in T. 25 S., R. 12 E., and T. 27 S., R. 11 E., ranged from 2,730 to 6,360 ppm (fig. 13 and table 3). The yields of two of the wells were 100 and 580 bwpd (3 and 17 gpm). Chemical analyses of water from three springs in T. 22 S., R. 8 E., T. 24 S., R. 13 E., and T. 28 S., R. 14 E., showed 7,450, 437, and 2,390 ppm of dissolved solids. The yield of the springs ranged from 34 to 170 bwpd (1 to 5 gpm). In most areas, however, the Carmel forms an aquiclude above the Navajo Sandstone. An example of this is the Blanding Basin, where the water in the Navajo is confined under artesian pressure by the overlying Carmel.

Entrada Sandstone

The Entrada Sandstone has yielded fresh water to water wells in some areas and saline water in others. The sandstone yielded water having 360 to 801 ppm of dissolved solids from six wells in eastern San Juan County; 380 to 3,500 ppm from seven wells in Emery, Kane, and Wayne Counties; and from 9,470 to 14,300 ppm from two wells in Grand County (fig 13 and table 3). Although the Entrada contained saline water in northeastern Grand County, in the Grand Junction area of Colorado water from the sandstone contained from 291 to 1,210 ppm of dissolved solids (Lohman, 1965, p. 115).

Data for eight wells indicate that yields from the Entrada Sandstone range from about 85 to 40,000 bwpd (2.5 to 1,200 gpm). Five of these wells are in San Juan County, and their yields average 4,860 bwpd (143 gpm).

Chemical analyses of water from nine springs, which issue from the Entrada Sandstone at rates ranging from 17 to 170 bwpd (0.5 to 5 gpm), indicate a range in dissolved solids from about 190 to 740 ppm (fig. 13).

Several wells in the Blanding Basin produce water from the Entrada Sandstone and one or more other formations, including the Bluff, Navajo, and Wingate Sandstones. In T. 39 S., R. 26 E., the Navajo and Entrada yielded water containing 1,070 ppm of dissolved solids at a rate of 990 bwpd (29 gpm); but in T. 41 S., R. 23 E., these formations yielded water containing 6,851 ppm at a rate of 1,070 bwpd (31.5 gpm). In T. 40 S., R. 24 E., and T. 41 S., R. 23 E., wells in the Navajo, Entrada, and Bluff Sandstones yielded water containing 4,526 and 1,735 ppm of dissolved solids; and in T. 41 S., R. 25 E., water from the Entrada, Navajo, and Wingate Sandstones contained 8,640 ppm. In T. 41 S., R. 25 E., a well in the Entrada and Bluff Sandstones yielded water containing 2,180 ppm of dissolved solids at a rate of 34 bwpd (1 gpm).

Bluff Sandstone

The Bluff Sandstone in Utah is found only in southern San Juan County. Two wells in T. 40 S., R. 23 E., yielded water containing 1,850 and 7,350 ppm of dissolved solids at rates of 440 to 850 bwpd (13 to 25 gpm) (fig. 13 and table 3). Two springs in the Bluff in T. 40 S., R. 22 E., and T. 41 S., R. 21 E., yield water containing 139 and 241 ppm of dissolved solids, and the latter discharges less than 34 bwpd (1 gpm). Water produced from the Bluff in wells that also tap other formations is discussed in the sections on the Entrada Sandstone and the Morrison Formation.

Morrison Formation[1]

In Grand County, water from five wells in the Morrison Formation in Tps. 19-22 S. contained from 2,090 to 25,700 ppm of dissolved solids (fig. 13 and table 3). A sixth well in T. 22 S., R. 22 E., yielded water containing only 517 ppm, and this probably indicates that recharge to the formation is at or near the well site. Yields from three of the wells were 70 bwpd (2 gpm) or less. In San Juan County, in T. 36 S., R. 21 E., and T. 40 S., R. 25 E., the Morrison yielded water containing 844 and 1,460 ppm of dissolved solids, the latter at a rate of 70 bwpd (2 gpm).

[1]In this discussion, data for wells and springs in all members of the Morrison Formation are treated as a unit. In figure 13 and table 3, however, the specific member is identified when possible.

Eight springs in the Morrison Formation in southeastern San Juan County yielded water containing from 216 to 712 ppm of dissolved solids. Seven of the springs yielded less than 10 bwpd (less than 1 gpm), and the other yielded 120 bwpd (3.5 gpm). A spring in Emery County in T. 19 S., R. 10 E., yielded water containing 768 ppm of dissolved solids at a rate of 34 bwpd (1 gpm).

In Grand and San Juan Counties, in T. 22 S., R. 22 E., T. 23 S., R. 22 E., and T. 37 S., R. 21 E., water from three mines in the Morrison Formation contained 1,430, 759, and 1,400 ppm of dissolved solids.

In T. 39 S., Rs. 24 and 25 E., and T. 40 S., Rs. 23 and 24 E., five water wells in the Bluff Sandstone and Morrison Formation yielded water containing 354, 450, 362, 438, and 2,035 ppm of dissolved solids at known rates of 1,000, 170, 5,100, 5,100, and 370 bwpd (30, 5, 150, 150, and 11 gpm). Two wells in the Morrison Formation, the Dakota Sandstone, and the Burro Canyon Formation in T. 33 S., R. 24 E., yielded water containing 292 and 414 ppm of dissolved solids at rates of 750 and 510 bwpd (22 and 15 gpm).

Dakota Sandstone

The Dakota Sandstone has yielded fresh to slightly saline water to springs and wells. Four springs in T. 34 S., R. 11 E., T. 39 S., R. 26 E. (two springs), and T. 41 S., R. 6 E., yielded water containing 199, 1,760, 1,220, and 186 ppm of dissolved solids (fig. 14 and table 3). The spring in T. 34 S., R. 11 E., flowed 510 bwpd (15 gpm), whereas the other three yielded 34 bwpd (1 gpm) or less.

Eight water wells east of Monticello penetrate the Dakota Sandstone and the Burro Canyon Formation, and two of the wells were drilled down into the Morrison Formation. For the six wells penetrating the Dakota and Burro Canyon, the dissolved-solids content of the water ranged from 290 to 453 ppm and the yields ranged from 750 to 4,250 bwpd (22 to 125 gpm). The two wells drilled to the Morrison produced water containing 292 and 414 ppm of dissolved solids at rates of 750 and 510 bwpd (22 and 15 gpm).

The Dakota Sandstone is not differentiated from the Cedar Mountain Formation in logs of oil wells along the north edge of the Canyon Lands section. The combined formational unit is reported to contain "salty" or "brackish" water.

Burro Canyon Formation

The Burro Canyon Formation has yielded fresh to slightly saline water to springs and wells. Six springs in San Juan and Garfield Counties yield water that ranges from 324 to 2,890 ppm of dissolved solids (fig. 14 and table 3) at known rates of 34 bwpd (1 gpm) or less.

Water produced from the Burro Canyon Formation in wells that also tap other formations is discussed in the section on the Dakota Sandstone.

Mancos Shale

The preponderance of fine-grained sediments and water soluble salts in the Mancos Shale suggests that this formation generally is not a fresh-water aquifer. Water wells in T. 15 S., R. 12 E., and T. 18 S., R. 14 E., yielded water containing 6,280 and 4,710 ppm of dissolved solids (fig. 14 and table 3).

Ferron Sandstone Member of Mancos Shale

Two water samples were collected while drilling an oil well with air through the Ferron Sandstone in T. 14 S., R. 9 E. (fig. 15). Chemical analyses of water showed a dissolved-solids content of 37,860 and 51,950 ppm (table 3). A gas well in T. 20 S., R. 7 E., yielded water containing 21,534 ppm of dissolved solids. The Ferron yielded water containing 3,454 ppm of dissolved solids in a coal mine in T. 22 S., R. 6 E.

Tununk Shale Member of Mancos Shale

Two water samples were collected while drilling an oil well with air through the Tununk Shale in T. 14 S., R. 9 E. (fig. 14). Chemical analyses of the water showed a dissolved-solids content of 11,117 and 12,093 ppm (table 3).

WATER FROM BEDROCK IN THE HIGH PLATEAUS SECTION

The High Plateaus section is divided into three longitudinal strips, each consisting of two to four plateaus that generally are separated by escarpments or valleys. The variations in relief generally are controlled by faults, but a few escarpments were formed solely by erosion. Except where distorted locally along faults, the rocks generally are horizontal or gently dipping, as indicated by the attitude of the tops of the individual plateaus. An exception is along the west edge of the Wasatch Plateau where for 50 miles strata of the Wasatch monocline plunge downward from the top of the plateau into Sanpete Valley.

Rocks exposed in the High Plateaus section range from Permian to Tertiary in age, and oil and gas wells have penetrated rocks of Cambrian, Devonian, Mississippian, and Pennsylvanian ages. The rocks include sedimentary and igneous types. Table 1, columns 10, 11, and 12, show the stratigraphic sections for the High Plateaus.

Chemical analyses of water from water wells, oil and gas wells, and springs show that fresh water is in limestones of Paleozoic age, Wingate and Navajo Sandstones, Carmel Formation, Tropic Shale, Wahweap and Straight Cliffs Sandstones, Emery Sandstone Member of the Mancos Shale, Blackhawk. Price River, Kaiparowits, and North Horn Formations, Flagstaff Limestone, Wasatch, Brian Head, Green River, and Crazy Hollow Formations, and igneous rocks of Tertiary age. The extent of fresh water in these formations is poorly known because few water wells penetrate bedrock, and oil and gas exploration has not been extensive in most of the section.

The electrical logs of oil and gas wells used in constructing figure 16 indicate that water in bedrock in the Wasatch Plateau ranges from fresh to saline in chemical quality.

Many communities in the High Plateaus section obtain their water supplies from springs that issue from bedrock. Sedimentary rocks of Tertiary age yield water to most of these springs in the northern part of the Plateaus, and igneous rocks of Tertiary age are the source of most springs in the central part of the High Plateaus. In the southern part of the High Plateaus, limestones of Tertiary age yield water to springs atop the plateaus, but along the escarpments sandstones of Mesozoic age are the principal aquifers. The numerous springs that yield large quantities of fresh water in the High Plateaus is a reflection of the great amount of precipitation on this area (fig. 2).

Table 4 contains selected hydrogeologic data from springs, water wells, and oil and gas wells in bedrock in the High Plateaus section; locations of the sampling sites are shown in figures 9, 10, 11, 12, 13, 14, 15, 17, and 18. Following is a summary of the data by formation.

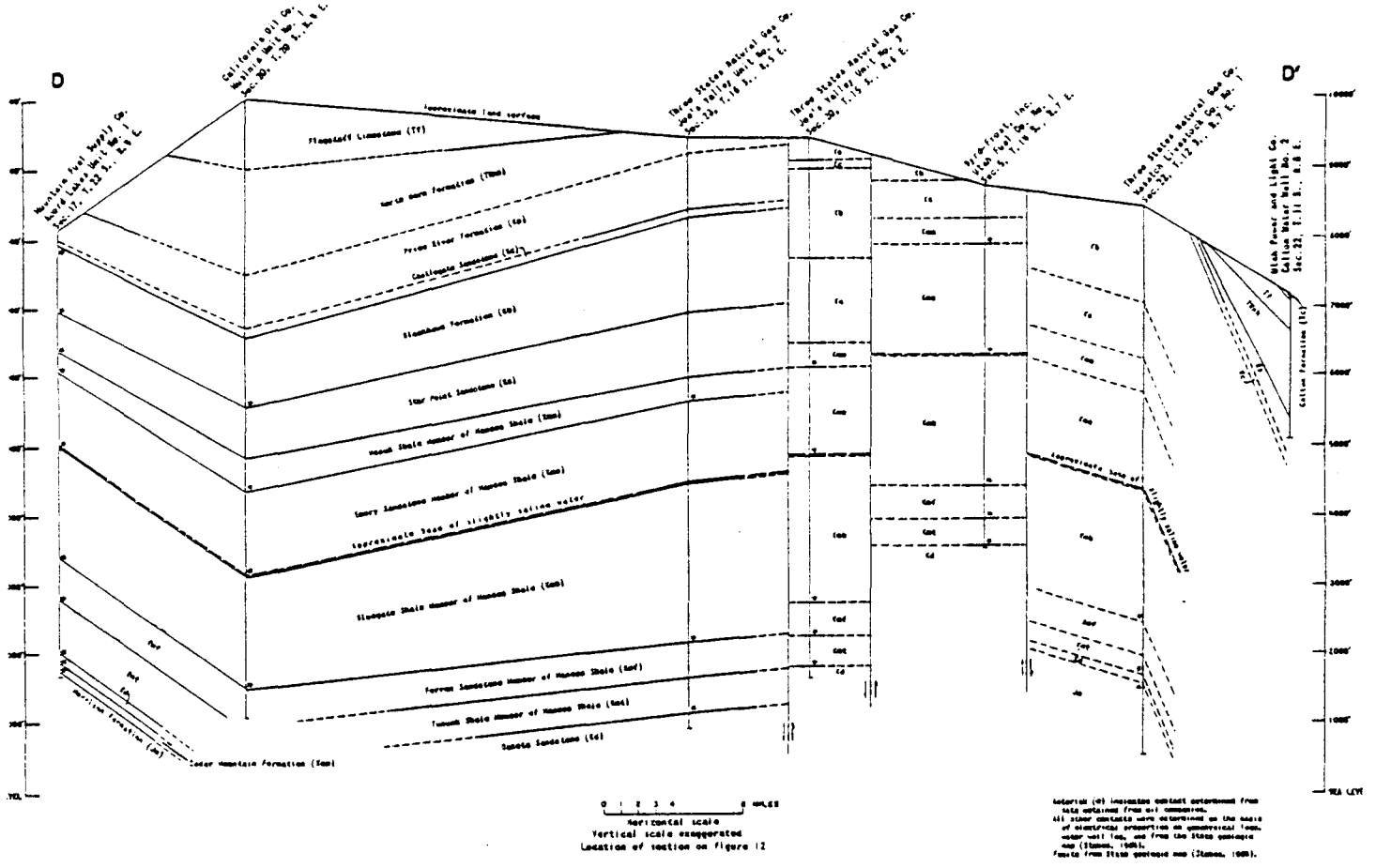

Figure 16. — Geologic section D-D′ of part of the High Plateaus section.

Limestones of Paleozoic age

In T. 40 S., R. 13 W., on the west edge of the High Plateaus section, an oil well produced water from an interval between 410 and 1,440 feet. The well yielded water containing 579 ppm of dissolved solids at a rate of 4,800 bwpd (140 gpm) from limestones of Paleozoic age (fig. 10 and table 4). While still in the limestones, the well reportedly encountered salt water at a depth of 5,000 feet.

Rocks of Mississippian age

An oil test in rocks of Mississippian age in T. 36 S., R. 1 E., produced water containing 10,494 ppm of dissolved solids at a rate of 34 bwpd (1 gpm) (fig. 9 and table 4).

Rocks of Mississippian age and Molas Formation

An oil well in rocks of Mississippian age and the overlying Molas Formation in T. 32 S., R. 3 E., yielded water containing 12,344 ppm of dissolved solids at a rate of 480 bwpd (14 gpm) (fig. 9 and table 4).

Toroweap Formation

Water from an oil well in the Toroweap Formation in T. 42 S., R. 7 W., contained 19,149 ppm of dissolved solids (fig. 10 and table 4).

Cedar Mesa Sandstone Member of Cutler Formation

An oil well in the Cedar Mesa Sandstone Member in T. 36 S., R. 1 E., yielded water containing 4,752 ppm of dissolved solids at a rate of 100 bwpd (3 gpm) (fig. 10 and table 4).

Coconino Sandstone

Two oil wells in the Coconino Sandstone in T. 36 S., R. 1 E., yielded water containing 10,630 and 9,869 ppm of dissolved solids, the latter at a rate of 100 bwpd (3 gpm) (fig. 10 and table 4).

Kaibab Limestone

Water from four oil wells in the Kaibab Limestone in T. 31 S., R. 2 W., T. 35 S., R. 2 W., and T. 36 S., R. 1 E. (two wells), contained 2,593, 3,992, 11,375, and 11,800 ppm of dissolved solids (fig. 10 and table 4). LaVerkin Hot Springs in T. 41 S., R. 13 W., yielded water containing 9,390 ppm of dissolved solids at a rate of 162,000 bwpd (about 4,760 gpm) in August 1960.

Shinarump Member of Chinle Formation

A spring in the Shinarump Member in T. 28 S., R. 5 E., yielded water containing 1,530 ppm of dissolved solids (fig. 11 and table 4) at a rate of less than 34 bwpd (1 gpm). An oil well in the Shinarump in T. 35 S., R. 2 W., yielded water containing 9,140 ppm of dissolved solids at a rate of 206 bwpd (6 gpm).

Moenkopi Formation

Water from an oil well in the Moenkopi Formation in the Virgin oil field, T. 41 S., R. 12 W., contained 84,714 ppm of dissolved solids (fig. 11 and table 4). Water of poor quality is to be expected from the Moenkopi in most areas because the formation contains interbedded evaporite deposits.

Wingate Sandstone

A spring in the Wingate Sandstone in T. 28 S., R. 4 E., yielded water containing 440 ppm of dissolved solids at a rate of 34 bwpd (1 gpm) (fig. 12 and table 4).

Wingate Sandstone and Kayenta Formation

Water from an oil well in the Navajo Sandstone and the Kayenta Formation in T. 14 S., R. 7 E., contained 41,716 ppm of dissolved solids (fig. 12 and table 4).

Navajo Sandstone

Many springs issue from the Navajo Sandstone in the southern High Plateaus. Analyses of water samples from five springs indicate that all of them contained less than 200 ppm of dissolved solids (table 4). In Zion National Park, in T. 41 S., R. 10 W. (fig. 12), water-supply systems obtain water from springs in the Navajo that yield as much as 3,000 bwpd (90 gpm). In Kanab Creek, in T. 42 S., R. 6 W., nine springs in the Navajo reportedly yielded from 340 to 13,600 bwpd (10 to 400 gpm) (Goode, 1964, p. 30).

Two water wells in the Navajo Sandstone in T. 41 S., R. 9 W., and T. 42 S., R. 7 W., yielded water containing 254 and 220 ppm of dissolved solids and the former yielded 290 bwpd (9 gpm). Four water wells in secs. 1, 23, 26, and 35, T. 42 S., R. 5 W., reportedly yielded 8,500, 1,200, 34,000, and 1,500 bwpd (250, 35, 1,000, and 45 gpm) (Goode, 1964, p. 45).

An oil well in the Navajo Sandstone in T. 22 S., R. 1 W., yielded water containing 50,163 ppm of dissolved solids.

Carmel Formation

Chemical analyses of water from springs issuing from the Carmel Formation in T. 39 S., R. 10 W., T. 40 S., R. 7 W., and T. 41 S., R. 7 W., showed dissolved solids of 145, 809, and 1,017 ppm (fig. 13 and table 4). The yields of the three springs were 1,300, 170, and 70 bwpd (38, 5, and 2 gpm).

Morrison and Cedar Mountain Formations

Water from an oil well in the Morrison and Cedar Mountain Formations in T. 22 S., R. 4 E., contained 53,361 ppm of dissolved solids (fig. 13 and table 4).

Winsor Formation and Dakota Sandstone

Water from the Winsor Formation and Dakota Sandstone in two oil wells in T. 37 S., Rs. 6 and 7 W., contained 1,231 and 1,634 ppm of dissolved solids (fig. 13 and table 4).

Dakota Sandstone

Water from two gas wells in the Dakota Sandstone in T. 16 S., Rs. 5 and 7 E., contained 3,669 and 5,474 ppm of dissolved solids, but in two gas wells in T. 15 S., R. 3 E., and T. 22 S., R. 4 E., the dissolved solids were 47,751 and 69,909 ppm (fig. 14 and table 4).

Tropic Shale

An oil well in the Tropic Shale in T. 37 S., R. 6 W., yielded water containing 1,530 ppm of dissolved solids (fig. 17 and table 4). In T. 40 S., Rs. 5 and 6 W., two springs in the Tropic yielded water containing 420 and 527 ppm of dissolved solids, both at a rate of about 100 bwpd (3 gpm).

Ferron Sandstone Member of Mancos Shale

Chemical analyses of water from 22 oil and gas wells in the Ferron Sandstone Member in the High Plateaus section show a range in dissolved solids from 63 to 25,931 ppm (fig. 15 and table 4). The extremely fresh water from several of the gas wells was water that condensed during gas production. In wells in which formation water was produced together with gas, the formation water was generally diluted by water of condensation. Undiluted formation water in the Ferron Sandstone in Tps. 13-16 S., Rs. 6-7 W., generally contains from 4,000 to 6,000 ppm of dissolved solids.

The water yield of the producing gas wells in the Wasatch Plateau was generally less than 1 gpm. East of the plateau, however, the gas well in T. 11 S., R. 7 E., yielded water at a rate of 2,000 bwpd (60 gpm), and wells in secs. 23 and 34, T. 22 S., R. 5 E., flowed water at rates of 710 and 2,600 bwpd (21 and 75 gpm).

Straight Cliffs and Wahweap Sandstones

A water well in T. 37 S., R. 4 W., in Bryce Canyon National Park yielded water containing 260, 315, and 870 ppm of dissolved solids from the Straight Cliffs and Wahweap Sandstones during three phases of perforating and developing the well (table 4 and fig. 17). Final completion of the well was in the Straight Cliffs, Wahweap, and the Wasatch Formation, and the well yielded 7,000 bwpd (200 gpm).

Springs in the sandstones in T. 36 S., R. 3 W., and T. 37 S., R. 4 W., yielded water containing 227 and 815 ppm of dissolved solids at rates of 580 and 1,630 bwpd (17 and 48 gpm). Many additional springs probably discharge from the sandstones elsewhere in the High Plateaus.

Wahweap Sandstone

Nine springs in the Wahweap Sandstone in Tps. 39 and 40 S., Rs. 5-7 W., yielded water containing from 145 to 690 ppm of dissolved solids at rates ranging from less than 34 to about 17,000 bwpd (less than 1 to about 500 gpm) (Goode, 1964, p. 48). Data for two of these springs in T. 39 S., R. 6 W., and T. 40 S., R. 7 W., are given in table 4 and their locations are shown in figure 17. Many additional springs probably discharge from the sandstone elsewhere in the High Plateaus.

Emery Sandstone Member of Mancos Shale

Fresh to slightly saline water has been produced from three gas wells in the Emery Sandstone Member (fig. 14). In T. 14 S., R. 5 E., one of the gas wells was converted to an irrigation well, and water containing 421 ppm of dissolved solids flowed at a rate of 20,000 bwpd (600 gpm) (table 4). In T. 16 S., R. 5 E., and T. 22 S., R. 4 E., other gas wells yielded water containing 1,304 and 1,793 ppm of dissolved solids. The latter well was open to the lower portion of the overlying Masuk Shale Member of Mancos Shale.

Although the Emery Sandstone Member does not crop out atop the Wasatch Plateau, water from precipitation and runoff on the plateau apparently reaches the formation through the system of faults that traverse the plateau (Spieker, 1949, p. 44, and Stokes, 1964).

Star Point Sandstone and Blackhawk Formation

In T. 22 S., R. 4 E., a gas well in the Star Point Sandstone and Blackhawk Formation yielded water containing 2,384 ppm of dissolved solids (fig. 17 and table 4). These formations may contain fresh to slightly saline water in other parts of the Wasatch Plateau, particularly in or just downdip from their areas of outcrop. (See section on Blackhawk Formation.)

Blackhawk Formation

A gas well in the Blackhawk Formation in T. 22 S., R. 2 E., yielded water containing 245 ppm of dissolved solids (fig. 17 and table 4). The gas well was converted to a water well that flowed water at a rate of 23,000 bwpd (675 gpm). A coal mine in the formation in T. 22 S., R. 3 E., yielded water containing 903 ppm of dissolved solids at a rate of 54,000 bwpd (1,600 gpm). The Blackhawk probably contains fresh or slightly saline water in other parts of the Wasatch and Sevier Plateaus. The most likely of such areas would be where outcroppings are recharged directly by precipitation or runoff, or where faults (Spieker, 1949, p. 44, and Stokes, 1964) permit movement of water to the formation where it does not crop out.

Price River Formation

The Price River Formation has yielded fresh water to many springs on the Wasatch Plateau. In Tps. 11 and 12 S., R. 7 E., Cordova (1963, p. 21) reports seven springs that yield water ranging in dissolved solids from 238 to 303 ppm at rates of 17 to 850 bwpd (0.5 to 25 gpm). Data for one of these springs in T. 11 S., R. 7 E., is given in table 4, and the location is shown in figure 17. A water well in sec. 22, T. 11 S., R. 8 E., was drilled 278 feet into the Price River at a total depth of 2,103 feet, but no aquifers were encountered in the Price River. The formation may contain fresh water in the Wasatch Plateau because the formation includes many sandstone beds that crop out where they could receive recharge from precipitation and streamflow.

Kaiparowits Formation

Chemical analyses of water from seven springs in the Kaiparowits Formation in Tps. 37-39 S., Rs. 4-7 W., in western Garfield and Kane Counties showed a range in dissolved solids from 223 to 462 ppm (fig. 17 and table 4). The yields from these springs ranged from 340 to 10,000 bwpd (10 to 300 gpm). Many springs probably issue from the formation elsewhere in the High Plateaus.

North Horn Formation

A water well in the North Horn Formation in T. 11 S., R. 8 E., yielded water containing 310 ppm of dissolved solids (figs. 17 and 18 and table 4). The well flowed at a rate of 9,200 bwpd (270 gpm) and was pumped at a rate of 54,000 bwpd (1,600 gpm) (Cordova, 1963, p. 15).

A water well in T. 14 S., R. 4 E., yielded water containing 344 ppm of dissolved solids at rates of 1,700 bwpd (50 gpm) flowing or 24,000 bwpd (700 gpm) pumped. The well is reportedly completed in sandstone in the North Horn Formation (Marsell, 1958, p. 30).

In T. 20 S., R. 2 W., an irrigation well drilled into sandstone in the North Horn Formation yielded water containing 238 ppm of dissolved solids. In February 1957 the well flowed at a rate of 48,000 bwpd (1,400 gpm), but in June 1963 the rate was 10,000 bwpd (290 gpm).

Five springs in T. 11 S., Rs. 7 and 8 E., and T. 12 S., R. 8 E., yielded water containing from 256 to 562 ppm of dissolved solids (Cordova, 1963, p. 21). Two of the springs yielded 100 and 680 bwpd (3 and 20 gpm). Data for one of the springs in T. 11 S., R. 7 E., is given in table 4.

Along the western edge of the Wasatch Plateau, two springs in T. 17 S., R. 4 E., and T. 18 S., R. 4 E., yielded water containing 225 and 363 ppm of dissolved solids, the former at a rate of 61,000 bwpd (1,800 gpm).

Flagstaff Limestone

The Flagstaff Limestone has yielded water to many springs in the Wasatch Plateau including the Colton Spring[1] in T. 11 S., R. 8 E., (fig. 18). This spring yielded water containing 209 ppm of dissolved solids and is part of a large spring area that has yielded as much as 690 million gallons per year (average rate of about 1,300 gpm, or 45,000 bwpd) (Cordova, 1963, p. 15). Eight other springs were also reported by Cordova (1963, p. 21) in Tps. 11 and 12 S., R. 8 E. They yielded water containing from 290 to 428 ppm of dissolved solids. Four of the springs yielded from 17 to 170 bwpd (0.5 to 5 gpm). Data for one of these springs in T. 12 S., R. 8 E., is given in table 4.

A water well in the NE¼SW¼NW¼ sec. 22, T. 11 S., R. 8 E., penetrated an aquifer in the middle of the Flagstaff Limestone; however, another well in the NW¼SW¼SE¼ sec. 22, T. 11 S., R. 8 E., did not encounter any water (Cordova, 1963, p. 13). This indicates that the water moves through solution channels that may not be connected. Although the water encountered in the first well was not sampled or tested, the quality of the water should be similar to that of Colton Spring.

In T. 18 S., R. 1 E., the Fayette Spring yields water containing 553 ppm of dissolved solids at a rate of 65,000 bwpd (1,900 gpm). The spring issues from solution channels in limestone.

[1]Although Colton Spring discharges from the Colton Formation, the water probably has risen to the surface along a regional fault from the underlying Flagstaff Limestone.

Wasatch Formation

The Wasatch Formation in the southern part of the High Plateaus section generally yields water to wells or springs from conglomerate or limestone units. Water collected from conglomerate while drilling a well through the formation in T. 37 S., R. 4 W., contained 252 ppm of dissolved solids (fig. 18 and table 4). Water from springs in the limestone generally issues from solution channels. Five springs in the eastern parts of Garfield and Kane Counties ranged in yield from less than 34 bwpd (less than 1 gpm) to as much as 4,110,000 bwpd (121,000 gpm), and the dissolved solids in the water ranged from 103 to 287 ppm.

Wasatch and Brian Head Formations

Two springs in the Wasatch and Brian Head Formations in T. 32 S., R. 2 W., yielded water containing 255 and 318 ppm of dissolved solids at rates of 15,300 and 55,800 bwpd (450 and 1,640 gpm) (fig. 18 and table 4).

Green River Formation

Along the western base of the Wasatch Plateau, wells and springs yield water from the Green River Formation. The water from two springs in T. 19 S., R. 2 E., contained 429 and 598 ppm of dissolved solids (fig. 18 and table 4), and the yield of one of the springs was 3,400 bwpd (100 gpm).

In Sanpete Valley, several wells have been drilled into the Green River Formation and in the SE¼SW¼SE¼ sec. 36, T. 17 S., R. 2 E., a well reportedly was pumped at 154,000 bwpd (4,500 gpm) (Marsell, 1958, p. 30). Another well in T. 17 S., R. 2 E. (fig. 18), yielded water containing 375 ppm of dissolved solids at a flow rate of 2,550 bwpd (75 gpm).

Crazy Hollow Formation

The Crazy Hollow Formation contains sandstone beds that are potential aquifers in the central and northern High Plateaus section. In T. 16 S., R. 3 E. (fig. 18), a well yields water from this formation (Marsell, 1958, p. 30) containing 894 ppm of dissolved solids at a rate of 30,900 bwpd (910 gpm) (table 4). A spring in the formation in T. 23 S., R. 3 W., yielded water having 310 ppm of dissolved solids at a rate of 47,600 bwpd (1,400 gpm).

Igneous rocks of Tertiary age

Many springs discharge from the igneous rocks that cover much of the central High Plateaus section, and the water is generally fresh (fig. 18). Records for 18 springs indicate a range in dissolved solids from 84 to 235 ppm and a range in yield from 340 to 153,000 bwpd (10 to 4,500 gpm) (table 4). Two hot springs in T. 25 S., Rs. 3 and 4 W., yielded water containing 2,700 and 5,150 ppm of dissolved solids at rates of 1,400 and 3,400 bwpd (40 and 100 gpm).

Two water wells in T. 27 S., R. 3 E., and T. 26 S., R. 4 W., yielded water containing 1,760 and 1,790 ppm of dissolved solids, the latter at a rate of 850 bwpd (25 gpm). A test hole in T. 31 S., R. 2 W., yielded fresh or slightly saline water, and it flowed at a rate of 1,400 bwpd (40 gpm). Two mine tunnels in T. 27 S., R. 5 W., yielded water containing 150 and 207 ppm of dissolved solids at rates of 3,400 and 13,600 bwpd (100 and 400 gpm).

CONCLUSIONS AND RECOMMENDATIONS

Water in the bedrock of the Colorado Plateau province in Utah ranges widely in quality and quantity because of many variations in the geology, physiography, and climate in the province. Development of ground water generally has been restricted to local stock, domestic, or municipal supplies; and a systematic effort has not been made to determine which formations contain fresh water and to delineate the extent of the water. Much of the available data only indicates what the ground-water conditions are in a specific locality, and care should be used when extrapolating such information to other areas.

The Colorado Plateau in Utah is divided into three sections—the Uinta Basin, Canyon Lands, and the High Plateaus. In the Uinta Basin, the area of greatest potential for development of fresh or slightly saline water is along the north flank where surface water from the Uinta Mountains and local precipitation is available to recharge bedrock aquifers. The Duchesne River Formation yields fresh water to wells for domestic and municipal supplies, and the Weber Sandstone yields water from oil wells that is suitable for irrigation. Other formations such as the Navajo, Entrada, and Dakota Sandstones and the Frontier Sandstone Member of the Mancos Shale probably contain fresh or slightly saline water along the north flank of the basin. Fresh water has been found at considerable depths in the Weber Sandstone and the Green River Formation on the north flank of the basin, and these formations may be recharged by interformational leakage.

On the south flank of the Uinta Basin, water for livestock is produced from oil and gas wells in the Green River Formation. This water source merits future study in light of water needs in oil extraction from oil shale and bituminous sand.

The Canyon Lands section is divided into numerous hydrologic units by structural elements such as the San Rafael Swell, Circle Cliffs and Monument Upwarps, the Abajo, Henry, and La Sal Mountains, and other subsidiary structures. The deeply incised drainage system in some areas drains the exposed bedrock and the aquifers are partially void of water. In several structural basins, northeast of the Henry Mountains and east of the Abajo Mountains and Comb Ridge, the aquifers contain water under artesian pressure and wells flow at the land surface.

In the Canyon Lands section, sandstones of the Glen Canyon Group are the most widely tapped fresh-water aquifers. They underlie much of the area, and in most places they can be relied upon to yield fresh water. Other formations that locally yield fresh water are in the Hermosa Group and the Rico, Cutler, Chinle, and Carmel Formations, Entrada and Bluff Sandstones, Morrison and Burro Canyon Formations, and Dakota Sandstone. However, these formations and the sandstones of the Glen Canyon Group contain saline water in some localities.

Many parts of the Canyon Lands section have not been adequately explored for water supplies because of the remoteness of the area and the cost of drilling. Fresh or slightly saline water probably occurs along the flanks of high areas such as the La Sal, Henry, and Abajo Mountains where runoff and precipitation recharges permeable formations.

The High Plateaus section receives the greatest precipitation in the Colorado Plateau of Utah and more than 16 inches a year falls on most of the section. This provides for abundant recharge by direct infiltration to bedrock aquifers and by infiltration from perennial streams that flow into the Canyon Lands section. However, very little water is withdrawn from the aquifers in the High Plateaus in relation to the amount of recharge and the potential yield

of the aquifers. The formations that are known to contain fresh water in the High Plateaus section include limestones of Paleozoic age, Wingate and Navajo Sandstones, Carmel Formation, Tropic Shale, Wahweap and Straight Cliffs Sandstones, Emery Sandstone Member of the Mancos Shale, Blackhawk, Price River, Kaiparowits, and North Horn Formations, Flagstaff Limestone, Wasatch, Brian Head, Green River, and Crazy Hollow Formations, and igneous rocks of Tertiary age.

Because of the scarcity of available data, this report includes only a general description of the occurrence of water in the bedrock formations of the Colorado Plateau. Chemical analyses of water from many formations are few or nonexistent; and water-yield information from most oil or gas wells is often nonexistent, and where existent it is generally an estimate. This is unfortunate, because many water data could have been obtained during routine drill-stem and production tests on oil and gas wells.

Every available source of information must be used in order to gain an understanding of the hydrology of an area as vast as the Colorado Plateau. It is recommended, therefore, that a program be established wherein all tests in oil and gas wells will be conducted so as to furnish a water sample and data on water yield, water pressure, and water levels.

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Table 1. — Correlation chart of bedro

(See fig. 12 fo

Geologic age (1)	Northwestern Uinta Basin (2)	Eastern and central Uinta Basin (3)	Book Cliffs at Green River, Utah (4)	Book Cliffs at Utah-Colorado State line (5)	Cane Creek and Big Flat (6)
Tertiary	Currant Creek Formation; Colton Formation; Flagstaff Limestone; North Horn Formation	Browns Park Formation; Duchesne River Formation; Uinta Formation; Green River Formation; Wasatch Formation	Green River Formation; Wasatch Formation	Green River Formation; Wasatch Formation	
Cretaceous	Mesaverde Group; Mancos Shale; Dakota Sandstone	Mesaverde Group; Mancos Shale; Frontier Sandstone Member; Mowry Shale; Dakota Sandstone	Mesaverde Group; Mancos Shale; Dakota Sandstone; Cedar Mountain Formation; Buckhorn Conglomerate	Mesaverde Group; Mancos Shale; Dakota Sandstone; Cedar Mountain Formation	
Jurassic	Morrison Formation; Curtis Formation; Entrada Sandstone; Twin Creek Formation; Nugget Sandstone	Morrison Formation; Curtis Formation; Entrada Sandstone; Carmel Formation; Navajo Sandstone	Morrison Formation; Summerville Formation; Curtis Formation; Entrada Sandstone; Carmel Formation; Glen Canyon Group: Navajo Sandstone, Kayenta Formation, Wingate Sandstone	Morrison Formation; Entrada Sandstone; Carmel Formation; Glen Canyon Group: Navajo Sandstone, Kayenta Formation, Wingate Sandstone	Glen Canyon Group: Navajo Sandstone, Kayenta Formation, Wingate Sandstone
Triassic(?)					
Triassic	Chinle Formation Shinarump Member; Ankareh Shale; Thaynes Limestone	Chinle Formation Shinarump Member; Moenkopi Formation	Chinle Formation Moss Back Member; Moenkopi Formation Sinbad Limestone Member	Chinle Formation	Chinle Formation Moss Back Member; Moenkopi Formation Sinbad Limestone Member
Permian	Park City Formation; Phosphoria Formation	Park City Formation; Phosphoria Formation	Coconino Sandstone; "Permian carbonate"		Cutler Formation White Rim Sandstone Memo.; Rico Formation
Pennsylvanian	Weber Sandstone; Morgan Formation; Round Valley Limestone; Manning Canyon Shale	Weber Sandstone; Morgan Formation; Round Valley Limestone; Manning Canyon Shale	Hermosa Group: Honaker Trail Formation, Paradox Formation; Molas Formation		Hermosa Group: Honaker Trail Formation, Paradox Formation, Ismay Zone, Desert Creek Zone, Akah Zone, Pinkerton Trail Limest; Molas Formation
Mississippian	Humbug Formation; Deseret Limestone; Madison Limestone	Humbug Formation; Deseret Limestone; Madison Limestone	Deseret Limestone; Leadville Limestone; Madison Limestone		Leadville Limestone; Madison Limestone
Devonian			Ouray Limestone; Elbert Formation		Ouray Limestone; Elbert Formation McCracken Member; Aneth Formation
Silurian					
Ordovician					
Cambrian	Ophir Formation; Tintic Quartzite	Lodore Formation	Lynch Dolomite; Maxfield Limestone; Tintic Quartzite		Lynch Dolomite
Precambrian	Uinta Mountain Group	Uinta Mountain Group		Granite	

ormations of the Colorado Plateau of Utah
cation of numbered areas.)

Henry Mountains (7)	Kaiparowits Plateau (8)	White Canyon to Aneth (9)	Western Kane and Washington Counties (10)	Aquarius Plateau (11)	Wasatch Plateau (12)
				Igneous rocks	
				Brian Head Formation	Crazy Hollow Formation
					Green River Formation
				Wasatch Formation	Colton Formation
					Flagstaff Limestone
					North Horn Formation
averde Group	Kaiparowits Formation		Kaiparowits Formation	Kaiparowits Formation	Price River Formation
	Wahweap Sandstone		Wahweap Sandstone	Wahweap Sandstone	Castlegate Sandstone
	Straight Cliffs Sandstone		Straight Cliffs Sandstone	Straight Cliffs Sandstone	Blackhawk Formation
					Star Point Sandstone
os Shale uk Shale Member ry Sandstone Member e Gate Shale Member ron Sandstone Member unk Shale Member	Tropic Shale	Mancos Shale	Tropic Shale	Tropic Shale	Mancos Shale Masuk Shale Member Emery Shale Member Blue Gate Shale Member Ferron Sandstone Member Tununk Shale Member
ta Sandstone	Dakota Sandstone	Dakota Sandstone	Dakota Sandstone	Dakota Sandstone	Dakota Sandstone
		Burro Canyon Formation			Cedar Mountain Formation
					Bucknorn Conglomerate
son Formation	Morrison Formation	Morrison Formation Brushy Basin Shale Member Westwater Canyon Sandstone Member Recapture Shale Member Salt Wash Sandstone Member	Winsor Formation	Winsor Formation	Morrison Formation
		Bluff Sandstone			
erville Formation	Summerville Formation	Summerville Formation		Summerville Formation	Summerville Formation
f Formation					Curtis Formation
ada Sandstone	Entrada Sandstone	Entrada Sandstone		Entrada Sandstone	Entrada Sandstone
el Formation	Carmel Formation	Carmel Formation	Carmel Formation	Carmel Formation	Carmel Formation
Navajo Sandstone	Glen Canyon Group: Navajo Sandstone	Glen Canyon Group: Navajo Sandstone	Navajo Sandstone	Glen Canyon Group: Navajo Sandstone	Glen Canyon Group: Navajo Sandstone
Kayenta Formation	Kayenta Formation	Kayenta Formation	Kayenta Formation	Kayenta Formation	Kayenta Formation
Wingate Sandstone	Wingate Sandstone	Wingate Sandstone	Shurtz Sandstone Tongue of Navajo Sandstone	Wingate Sandstone	Wingate Sandstone
			Moenave Formation		
le Formation narump Member	Chinle Formation Shinarump Member	Chinle Formation Moss Back Member Shinarump Member	Chinle Formation Shinarump Member	Chinle Formation Shinarump Member	Chinle Formation Shinarump Member
kopi Formation bad Limestone Member	Moenkopi Formation Timpoweap Member	Moenkopi Formation Hoskinnini Tongue	Moenkopi Formation Timpoweap Member	Moenkopi Formation	Moenkopi Formation Sinbad Limestone Member
Cutler Formation	Kaibab Limestone	Cutler Formation	Kaibab Limestone	Kaibab Limestone	Kaibab Limestone
White Rim Sandstone Member	Torowead Formation	White Rim Sandstone Member	Torowead Formation		
Organ Rock Tongue	Coconino Sandstone	De Chelly Sandstone Member	Coconino Sandstone	Coconino Sandstone	Coconino Sandstone
Cedar Mesa Sandstone Member	Hermit Shale	Organ Rock Tongue	Hermit Shale	Cutler Formation Organ Rock Tongue Cedar Mesa Sandstone Member	"Permian carbonate"
Halgaito Tongue		Cedar Mesa Sandstone Member Halgaito Tongue			
Rico Formation	Supai Formation	Rico Formation	Supai Formation	Rico Formation	
	Callville Limestone		Callville Limestone		
naker Trail Formation	Hermosa Group	Hermosa Group: Honaker Trail Formation		Sedimentary rocks	Hermosa Group
radox Formation		Paradox Formation Ismay Zone Desert Creek Zone Akah Zone			
nkerton Trail Limestone		Pinkerton Trail Limestone			
Formation	Molas Formation	Molas Formation			
					Manning Canyon Shale
entary rocks				Sedimentary rocks	Humbug Formation
	Redwall Limestone	Leadville Limestone	Redwall Limestone	Redwall Limestone	Deseret Limestone
					Madison Limestone
entary rocks	Ouray Limestone	Ouray Limestone	Sedimentary rocks	Sedimentary rocks	
	Elbert Formation	Elbert Formation McCracken Member			
		Aneth Formation			
entary rocks		Sedimentary rocks	Muav Limestone	Sedimentary rocks	Lynch Dolomite
			Bright Angel Shale		Maxfield Limestone
			Tapeats Sandstone		Ophir Formation
					Tintic Quartzite

Table 2. — Selected hydrogeologic data from springs, water well

Location: Salt Lake base and meridian.
Source: O, oil or gas well; S, spring; W, water well.
Operator or owner: Name of operator or owner at time water sample was collected for chemical analysis.
Producing formation: Fm., Formation; Gr., Group; Ls., Limestone; Mbr., Member; Sh., Shale; Ss., Sandstone. Many formation names were reported in records of oil and gas companies and State and Federal agencies do not necessarily agree with the identification.

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per					
														Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	NA + K	
T	R	Section																Sodium (Na)	Potassium (K)	Bicarbonate
1N	1E[1]	NE¼SW¼NE¼ 5	O	Carter Oil Co.	2	Wasatch Fm.	4,360	5,980	4,658-90	-	DST 1	5- -56	-	-	-	18	18	1,742		1,6
									4,957-76	-	DST 2	5- -56	-	-	-	9	15	511		
1N	1[2]	NW¼ 34	W	A. W. Brown	1	Duchesne River Fm.	-	-	-	See Remarks	Flow	7- 6-38	-	7.0	-	34	14	59		
1N	7[3]	31	S	-	-	Navajo Ss.	0	-	-	1,400/40(E)	do	7- 4-38	47	7.8	-	35	11	4.6		
1N	2[3]	C NW¼NW¼ 20	O	Standard Oil Co. of California	1	Green River Fm.	4,030	4,412	4,115-43	-	DST 1	8-31-56	-	-	-	63	25	14		
1S	1[2]	SE¼SW¼NE¼ 8	O	Carter Oil Co.	1	do	6,620	10,398	9,039-9,127	-	DST 2	11- 7-63	-	-	-	11	5	3,996		2,.
									10,134-10,453	-	DST 5	11-30-63	-	-	-	14	3	3,937		2,.
1S	1[2]	C SW¼SW¼ 13	O	do	1	do	6,040	10,190	9,825-10,190	-	Drain pipe into evaporation pond	5- 4-60	-	23	-	27	10	3,670	47	2,.
1S	2[2]	C SW¼NE¼ 5	O	do	1	do	7,895	12,082	10,209-10,257	-	DST 17	10- -50	-	-	-	-	-	3,312		1,
1S	2[3]	SW¼NW¼SW¼ 22	W	M. Mower	1	Duchesne River Fm.	0	-	60-810	61/1.3(M)	Flow	10- 6-64	54	8.5	-	47	18	13		
1S	5[3]	NE¼SE¼NE¼ 13	W	Town of Mountain Home	3	do	33	-	199-367	-	Storage tank	10-20-59	-	31	-	80	33	13		
1S	8[2]	NW¼ 12	S	DeFay	-	Frontier(?) Ss. Mbr. of Mancos Sh.	0	-	-	14/1(E)	-	7- 4-38	52	13	-	111	38	106		
1S	8[2]	SE¼ 36	S	Town of Tabiona	-	Uinta Fm.	0	-	-	1,700/30(E)	From pipeline half a mile from spring	10-20-54	56	8.6	5/0.02	50	23	6.0	2.2	
2S	1[2]	NE¼NE¼SE¼ 15	W	E. Warnock	1	Duchesne River Fm.	36	-	158-557	See Remarks	Flow	10- 6-64	56	7.5	2.3	2.4	1.5	206	.5	
2S	1[2]	NE¼NE¼NE¼ 21	W	City of Roosevelt	-	do	18	-	520-540	See Remarks	do	7- 6-38	58	11	-	3.2	1.0	172		
2S	5[2]	NE¼SW¼SE¼ 19	O	Standard Oil Co. of California	1	Green River Fm.	2,517	9,698	9,305-9,418	480(R)/14	DST 6	4- -60	-	-	-	19	-	2,570		3,
2S	5[3]	NE¼ 14	W	A. Strong	-	Uinta Fm.	-	-	See Remarks	-	-	7- 5-38	52	12	-	0	0	173		
3S	3[2]	SW¼SE¼NW¼ 3	W	H. Holgate	1	do	-	-	106-175	See Remarks	Flow	7- 5-38	54	7.6	-	2.4	1.0	326		
3S	5[2]	NE¼SE¼SW¼ 36	O	Carter Oil Co.	1	Green River Fm.	1,275	-	4,686-4,705	-	DST 8	10- -53	-	-	-	-	5	3,623		1.
3S	7[2]	SW¼NW¼SW¼ 1	O	California Oil Co.	1	do	2,490	9,050	4,075-89	-	DST 3	2- -62	-	-	-	4	1	886		1.
									4,810-45	-	DST 4	12- -61	-	-	-	11	2	10,978		1.
									5,133-61	-	DST 2	12- -61	-	-	-	9	7	13,157		4.
									5,442-52	-	DST 5	12- -61	-	-	-	3	3	5,739		3.
									5,542-52	-	DST 3	12- -61	-	-	-	12	5	10,080		5.
									8,524-70	510(E)/15	DST 7	2- -62	-	-	-	10	5	2,452		2
									8,737-59	2,400(E)/70	DST 9	2- -62	-	-	-	11	3	2,160		2
3S	8[2]	SW¼ 19	W	Fruitland Station	-	Uinta Fm.	0	-	-	-	-	7- 7-38	-	7.3	-	29	16	1,550		
4S	4[2]	C SE¼SE¼ 13	O	Carter Oil Co.	1	Green River Fm.	3,075	7,130	3,281-3,569	-	DST 12	2-23-52	-	-	-	-	-	1,117		1
									5,871-5,936	-	DST 16	4-11-52	-	-	-	16	7	4,287		1
4S	4[2]	NE¼SW¼NE¼ 16	O	Continental Oil Co.	3	do	2,462	-	2,770-3,350	-	Tracer sample	3- -62	-	-	-	8	3	72,920		51
4S	4[2]	NE¼SW¼NE¼ 17	O	do	6	do	2,426	-	2,438-3,382	-	Wash tank sample	6- 7-62	-	-	-	37	-	15,908		4
4S	4[2]	S½SW¼NW¼ 17	O	do	7	do	2,402	-	3,196-3,550	-	Swab test	5-31-62	-	-	-	(4)	-	13,976		-
									2,410-3,048	See Remarks	Separator water line	11-30-64	-	.0	-	.0	80	45,100		21
4S	4[2]	C NE¼NE¼ 18	O	do	28-1	do	-	-	Ac 2,750	-	-	11-10-59	-	-	7/23	124	38	99,500	340	
4S	5[2]	NE¼SW¼SE¼ 14	O	do	638-1	Uinta Fm.	0	1,374	Ac 915	1,000(R)/30	Circulation pic sample	4-19-62	-	-	-	10	(4)	9,868		
4S	7[2]	SW¼ 14	S	-	Stinking Spring	do	0	-	-	580/20(E)	Flow	5-15-60	58	34	-	.0	.0	1,110		1
5S	6[2]	NE¼ 1	S	-	Indian Canyon	do	0	-	-	6,300/200(E)	do	5-15-60	51	22	-	91	125	420		
5S	7[2]	SE¼ 12	S	-	Lake Canyon Upper Lake	do	0	-	-	7,700/225(E)	do	5-15-60	50	6.3	-	37	131	779		1

l oil and gas wells in bedrock in the Uinta Basin section

l: bwpd, barrels of water per day; gpm, gallons per minute; (E) estimated; (M), measured; (R), reported at time water sample was collected for chemical analysis.
(E), (M), or (R) is beside the given unit. The other unit is calculated on the basis of 1 gpm equals 34 bwpd and 1 bwpd equals 0.03 gpm.
od or point of collection: Flow, indicates collection at a spring or flowing well; DST, drill-stem test for oil or gas.
rks: DST, drill-stem test data reported by oil or gas company.

Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1/]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2/]	Remarks
million												
18	1,530	-	4,358	-	-	-	-	-	1.50	8.6	CGL	DST 1 recovered 40 feet of drilling mud and 3,300 feet of fresh water.
43	200	-	1,302	-	-	-	-	-	4.20	8.5	CGL	DST 2 recovered 90 feet of gas-cut mud and 3,200 feet of gas-cut fresh water.
72	13	0.6	306	142	0	48	2.2	523	-	7.6	GS	Well is 150 feet deep. Reported yield was less than 10 gpm (less than 340 bwpd).
4.1	2.5	1.8	148	134	0	7	.2	265	-	7.8	GS	
180	(4)	-	348	-	-	-	-	-	19.0	8.2	CGL	DST 1 recovered 3,435 feet of slightly muddy water. Total depth of hole at time of DST was 4,143 feet.
1,300	3,700	-	10,390	-	-	-	-	-	.68	8.5	CGL	DST 2 recovered 854 feet of slightly gas-cut muddy water. Sample from middle of formation water.
1,600	3,700	-	10,395	-	-	-	-	-	.73	7.8	CGL	DST 5 recovered 106 feet of high pour point oil, 2,592 feet of gassy oil-cut water, 4,416 feet of slightly oil-cut water, and 2,762 feet of very slightly oil-cut water.
17	4,100	5.4	9,210	110	0	98	152	14,600	-	8.5	GS	Analysis includes 29 ppm boron.
790	3,180	-	8,422	-	-	-	-	-	.86	8.3	CGL	DST 17 recovered 360 feet of slightly gas-cut mud and 4,290 feet of brackish water.
41	1.9	.1	234	192	18	12	.4	383	-	7.6	GS	Yield on 9-13-61 was reportedly 10 gpm (340 bwpd) by free flow and 200 gpm (6,800 bwpd) by air lift.
9.9	3.8	1.4	380	337	0	8	.3	632	-	7.3	GS	
304	24	.6	786	436	121	34	2.2	1,160	-	7.6	GS	
14	3.5	2.2	237	219	8	55	.2	424	-	7.8	GS	Analysis includes 0.1 ppm aluminum, 0.0 ppm fluoride, 0.00 ppm manganese, and 0.1 ppm phosphate.
77	79	.3	528	12	0	97	26	839	-	8.7	GS	Reported flow on 6-13-39 was 5 gpm (170 bwpd). Analysis includes 0.06 ppm boron and 1.1 ppm fluoride.
42	53	.5	443	12	-	-	-	739	-	8.6	GS	Reported flow on 12-1-46 was 2.5 gpm (85 bwpd).
34	1,360	-	6,194	-	-	-	-	-	1.22	8.7	CGL	DST 6 recovered gas to surface in 9 minutes; after 2 hours 40 minutes gauged 20,000 cubic feet of gas per day and 20 barrels of water per hour. Formation water resistivity 1.3 ohmmeters at 64°F.
72	5.5	.8	439	0	-	-	-	729	-	9.4	GS	Reported well depth, 180 feet.
48	5.0	1.0	779	10	0	99	45	1,210	-	8.6	GS	Reported well depth, 175 feet. Reported flow on 5-3-43 was 20 gpm (680 bwpd).
438	2,520	-	8,935	-	-	-	-	-	.85	9.4	(6)	DST 8 recovered 140 feet of oil and gas-cut mud and 540 feet of gas-cut fresh water.
(4)	30	-	2,070	-	-	-	-	-	3.70	9.0	GGL	DST 8 recovered 110 feet of mud and 3,165 feet of slightly gassy muddy water.
67	5,100	-	26,159	-	-	-	-	-	.36	10.0	CGL	DST 4 recovered 180 feet of slightly gas-cut muddy water with flecks of oil and 3,753 feet of slightly gas-cut water with flecks of oil.
13	7,000	-	31,468	-	-	-	-	-	.30	9.9	CGL	DST 2 recovered 4,398 feet of water, the top 70 feet being slightly mud cut.
28	3,320	-	13,772	-	-	-	-	-	.54	9.3	CGL	DST 5 recovered 846 feet of water, the top 40 feet being slightly mud cut with a few flecks of oil.
46	5,400	-	24,140	-	-	-	-	-	.37	9.6	CGL	DST 3 recovered 400 feet of slightly gas-cut muddy water with flecks of oil and 400 feet of slightly gas-cut water.
(4)	1,260	-	5,890	-	-	-	-	-	1.30	7.9	CGL	DST 7: shut in 1 hour, open 2 hours, shut in 1 hour; gas in 27 minutes, fluid in 1 hour 22 minutes; flowed mud to muddy water in first 3 minutes, slightly gassy water in last 35 minutes at estimated rate of 510-570 barrels per day; recovered 8,524 feet of slightly gassy water.
(4)	1,200	-	5,665	-	-	-	-	-	1.30	7.6	CGL	DST 6: shut in 1 hour, open 42 minutes, shut in 1 hour; gas immediately, gauged 43,000 cubic feet of gas per day; gassy mud in 23 minutes, flowed gassy muddy water for 15 minutes at estimated rate of 2,400 barrels per day; recovered 8,360 feet of gassy water.
1,470	1,130	2.7	4,430	135	0	96	58	6,610	-	8.2	GS	
164	380	-	2,695	-	-	-	-	-	2.70	9.0	(6)	DST 12 recovered 500 feet of drilling mud and 2,980 feet of fresh water, heavily gas cut and slightly oil cut.
79	5,300	-	10,792	-	-	-	-	-	.70	8.5	(6)	DST 16 recovered 1,320 feet of gas-cut drilling mud and slightly salty water.
347	66,000	-	178,213	-	-	-	-	-	.08	9.7	CGL	
228	12,600	-	38,796	-	-	-	-	-	.24	9.6	CGL	
152	8,900	-	33,653	-	-	-	-	-	.27	9.4	CGL	
683	31,700	20	109,400	330	0	100	1,080	93,500	-	9.6	GS	Yield was less than 1 gpm (less than 34 bwpd).
344	43,100	-	189,200	-	-	-	-	-	8/.07	9.7	CO	Analysis includes 11,450 ppm hydroxyl.
77	3,400	-	22,915	-	-	-	-	-	.40	10.2	CGL	Analysis includes 545 ppm hydroxide.
11	668	1.3	7,320	0	0	100	0	10,700	-	10.1	GS	Analysis includes 20 ppm boron.
682	41	.9	1,840	666	0	58	7.1	2,520	-	8.0	GS	Analysis includes 6.3 ppm boron.
887	124	4.1	2,710	632	0	73	13	3,690	-	8.8	GS	Analysis includes 6.6 ppm boron.

Table 2. — Continued

Location T	R	Section	Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (gpd/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	NA + K: Sodium (Na)	NA + K: Potassium (K)	Bicarbonate
4S	6W[1]	C SE¼NW¼ 35	O	Humble Oil and Refining Co.	1	Green River Fm.	0	4,160	3,190-3,250	-	DST 3	11- -61	-	-	-	32	8	3,979		5,
7S	4W[1]	N½NE¼NE¼ 7	O	Gulf Oil Corp.	2	do	0	4,679	4,223-4,345	-	DST 2	11- -59	-	-	-	327	242	10,683		
1S	1E[1]	C NW¼SW¼ 1	O	Carter Oil Co.	1	do	5,785	-	9,357-91	-	Treater sample	8-28-52	-	-	-	-	-	4,362		1,
2S	22E	NE¼ 31	S	Ratliff Ranch	-	Park City Fm.	0	-	-	26,000 / 1,350(E)	Flow	8- 8-50	-	8.3	0.02	48	23	2.3	1.3	
3S	21E	NE¼NW¼SE¼ 28	W	Bureau of Land Management	1	Weber Ss.	1,575	-	1,575-95	-	do	9-29-29	-	-	-	70	31	19		
									1,575-2,552	4,300 / 140(R)	do	5-25-34	-	-	-	76	14	19		
									1,575-2,552	-	do	12-11-51	-	11	-	38	26	9.2		
3S	21E	SW¼SE¼SE¼ 30	W	Uincan-Neal Dome Oil Co.	1	do	-	-	Ac 2,560	6,900(E) / 210	do	10- 8-58	62	10	-	95	28	9.0		
4S	21E	S½SW¼SW¼ 16	O	Continental Oil Co.	1	Navajo Ss.	5,844	6,920	5,852-6,600	-	DST 4	3- 3-53	-	10	7/10	35	-	675		
						Weber Ss.	7,860	-	7,367-7,960	-	DST 3	2-27-53	-	10	7/21	28	-	120		
4S	23E	NW¼ 25	S	National Park Service	Red Wash Spring	do	0	-	-	70 / 2(E)	Flow	11-18-58	-	11	-	140	53	15		
4S	23E	SE¼NW¼ 26	S	do	Quarry Spring	Entrada Ss.	0	-	-	See Remarks	do	7-12-58	63	11	-	63	32	22		
4S	23E	NW¼ 27	S	do	Orchard Draw Spring	Navajo Ss.	0	-	-	do	do	7-12-58	64	11	-	67	28	11		
4S	23E	SW¼ 27	S	do	-	Frontier Ss. Mbr. of Mancos Sh.	0	-	-	do	do	7-12-58	60	16	-	221	125	426		
4S	24E	SW¼NW¼ 20	S	-	Split Mountain Warm Spring	Madison Ls. and Morgan Fm.	0	-	-	do	do	9-19-48	36	18	-	97	32	193		
5S	20E	C NE¼SW¼ 5	O	Carter Oil Co.	1	Green River Fm.	4,480	10,110	6,475-95	-	DST 1	3- 8-51	-	-	-	21	(4)	975		1,
									6,394-6,915	-	DST 2	3-19-51	-	-	-	-	-	597		1,
5S	21E	C SE¼SW¼ 33	O	do	1	do	2,350	6,555	4,290-4,311	-	DST	1948	-	-	-	11.3	2.6	2,716		3,
									4,397-4,411	-	do	1948	-	-	-	13.[illegible]	6.8	3,330		6,
						Wasatch Fm.	6,555	-	6,717-31	-	do	1948	-	-	-	11.3	14	278		2,
									7,072-78	-	do	1948	-	-	-	123	49	6,719		
5S	22E	SE¼SW¼NE¼ 22	O	Pan American Petroleum Corp.	1	Phosphoria Fm.	4,126	4,277	4,266-73	3,700(R) / 110	Well bleeder pipe	11- 4-60	115	-	.34	103	28	38	20	
5S	22E	SE¼SE¼NE¼ 22	O	Equity Oil Co.	6	do	4,040	4,185	4,150-60	-	Well head	10- -59	-	-	-	129	28	552		
5S	22E	NE¼NW¼SE¼ 22	O	Pan American Petroleum Corp.	8	Weber Ss.	4,294	-	4,284-4,306	-	do	10- -59	-	-	-	102	33	103		
5S	22E	NE¼SW¼SE¼ 22	O	do	10	Phosphoria Fm.	4,210	4,328	4,323-30	1,320(R) / 55	Well bleeder pipe	11- 3-59	112	19	-	35	27	52		
						Weber Ss.	4,328	-												
5S	22E	SW¼SE¼NW¼ 23	O	Equity Oil Co.	7	Weber Ss.	4,152	-	4,152-4,230	-	Well head	11- 3-59	112	21	-	112	30	158		
5S	22E	NE¼NW¼SW¼ 23	O	do	1	Phosphoria Fm.	3,990	4,138	4,136-52	1,400(R) / 40	Pipe from well	11- 3-59	110	20	-	93	27	253		
						Weber Ss.	4,138	-												
5S	22E	NE¼SW¼SW¼ 23	O	Pan American Petroleum Corp.	1	Weber Ss.	4,094	-	4,097-4,195	3,050(R) / 90	Well head	11- 3-59	120	20	-	155	38	198		
5S	22E	SW¼NE¼SE¼ 23	O	California Oil Co.	1	do	4,207	-	4,207-35	-	-	7- -49	-	-	-	244	78	157		
5S	22E	NW¼SW¼SE¼ 23	O	Hollandsworth and Travis	1	Entrada Ss.	2,018	-	2,063-67	375(R) / 11	Flow	6-22-65	-	20	.51	9	3	410		
						Weber Ss.	4,076	-	4,076-4,124	140(R) / 4	Treater discharge	11- 3-59	-	27	-	109	31	547		
5S	22E	SW¼SW¼SW¼ 24	O	Robert Six	1	do	4,163	-	4,163-90	1,700(R) / 30	Bubbler pipe from treater	11- 3-59	-	23	-	338	74	163		
5S	22E	NW¼NW¼NW¼ 25	O	Pan American Petroleum Corp.	7	Phosphoria Fm.	4,022	4,168	4,141-43	-	Well head	10- -59	-	-	-	395	79	13		
5S	22E	NW¼NE¼NE¼ 26	O	do	5	Phosphoria Fm.	3,950	4,093	4,089-4,243	-	do	10- -59	-	-	-	289	60	174		
						Weber Ss.	4,093	-												
5S	22E	NW¼NW¼NE¼ 26	O	do	2	Weber Ss.	4,146	-	4,290-4,310	-	DST 4	3-22-49	-	-	-	107	34	94		
									4,096-4,251	1,390(R) / 57	Well head	11- 3-59	115	22	-	242	56	261		
5S	22E	NW¼SE¼NE¼ 26	O	Hollandsworth and Travis	1-A	Entrada Ss.	2,150	2,197	2,190-95	664(R) / 19	Flow	8-26-65	-	14	-	18	4	165		
5S	22E	NW¼NE¼NW¼ 26	O	Pan American Petroleum Corp.	3	Weber Ss.	4,146	-	4,148-4,287	6,670(R) / 200	Well bleeder pipe	11- 4-60	120	20	.05	192	43	171	27	
5S	22E	NE¼SW¼NW¼ 26	O	Hollandsworth and Travis	1	Phosphoria Fm.	4,265	4,393	4,372-93	-	DST 1	5-23-49	-	-	-	56	23	78		
5S	22E	NE¼NE¼NE¼ 27	O	Pan American Petroleum Corp.	9	Weber Ss.	4,268	-	4,268-90	-	Well head	10- -59	-	-	-	34	31	8		
5S	23E	SW¼SE¼NW¼ 18	O	California Oil Co.	1	Phosphoria Fm	4,272	4,408	4,366-4,414	-	DST 2	7- -49	-	-	-	158	35	434		
						Weber Ss.	4,408	-												
5S	24E	32	S	Morris Ranch	-	Weber Ss.	0	-	-	340 / 10(E)	-	9-13-58	63	13	-	360	95	107		

million														
(CO_3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2]	Remarks
175	58	2,400	-	9,674	-	-	-	-	-	0.80	8.8	CGL	DST 3 recovered 290 feet of oil and water-cut mud and 360 feet of gas-cut muddy water.
-	4,336	15,100	-	31,447	-	-	-	-	-	.26	7.2	CGL	DST 2 recovered 350 feet of mud-cut salt water and 100 feet of mud.
105	841	4,800	-	11,112	-	-	-	-	-	.64	8.6	CGL	Oil entering treater contains Tret-O-Lite chemical.
0	36	2.1	0.5	228	214	38	2	-	399	-	7.9	GS	Springs are located along the Green River in Split Mountain Canyon. Analysis includes 0.3 ppm fluoride and 0.01 ppm boron.
	149	(4)	-	382	302	113	12	0.5	-	-	-	GS	The well was drilled as an oil test in 1929 and later converted to a water well.
	152	-	-	386	-	-	-	-	-	-	-	GS	
	134	1.8	-	[3]/416	326	124	6	.2	-	-	-	DH	Analysis includes 0.8 ppm fluoride.
0	176	3.5	.1	432	352	168	5	.2	654	-	7.7	GS	Oil test converted to a water well.
61	705	71	-	1,894	-	-	-	-	-	[10]/2.05	11.7	CO	Sample contaminated by drilling mud.
26	213	28	-	714	-	-	-	-	-	[10]/11.4	8.6	CO	Sample slightly contaminated by drilling mud.
0	345	6	2.1	712	568	335	6	.3	1,000	-	7.5	GS	
0	76	14	.5	363	291	52	14	.6	603	-	7.7	GS	Yield on 10-22-57 was 1 gpm(E) (70 bwpd) Analysis includes 0.1 ppm fluoride
0	109	5.5	1.0	342	281	99	8	.3	547	-	7.5	GS	Yield on 10-1-58 was 2 gpm(E) (70 bwpd) Analysis includes 0.0 ppm fluoride.
0	1,700	20	2.5	2,620	1,060	875	47	5.7	3,100	-	6.5	GS	Yield was less than 1 gpm (less than 34 bwpd) Analysis includes 0.3 ppm fluoride.
0	211	291	1.2	942	374	212	53	-	1,370	-	-	GS	On 9-18-48 the estimated discharge was 6 cubic feet per second above the water level of the river and as much or more discharged directly into the river (Thomas, 1952, p. 12).
90	21	470	-	2,381	-	-	-	-	-	2.90	8.9	(6)	DST 1 recovered 1,740 feet of gas-cut water
41	140	180	-	1,687	-	-	-	-	-	4.20	8.9	CGL	DST 2 recovered 60 feet of drilling fluid and 720 feet of water.
45	18	1,746	-	8,261	-	-	-	-	-	-	-	CaO	DST recovered 70 feet of gas-cut water.
10	48	1,078	-	11,045	-	-	-	-	-	-	-	CaO	DST recovered 2,175 feet of gas-cut water
54	278	832	-	5,336	-	-	-	-	-	-	-	CaO	DST recovered 1,350 feet of gas-cut water.
	240	10,086	-	18,009	-	-	-	-	-	-	-	CaO	DST recovered 3,150 feet of slightly gas-cut water and 90 feet of oil.
0	244	104	3.2	731	372	55	17	.9	975	-	7.8	GS	Flowing oil well with water drive. Analysis includes 0.26 ppm boron.
	300	410	-	2,017	-	-	-	-	-	3.35	8.1	CGL	Flowing oil well with water drive
	204	60	--	692	-	-	-	-	-	12.0	8.2	CGL	Flowing oil well with water drive. Water contains a cloudy, yellow-colored organic filtrate
0	227	4.0	.5	532	324	129	26	1.3	829	-	8.1	GS	Flowing oil well with water drive
20	376	76	.6	925	404	158	46	3.4	1,330	-	8.5	GS	Do.
33	362	170	.5	1,090	344	68	62	5.9	1,590	-	8.6	GS	Do.
0	519	108	3.3	1,210	544	265	44	3.7	1,860	-	7.9	GS	Do.
24	633	100	-	1,502	-	-	-	-	-	-	7.7	CGL	Do.
0	93	17	1.2	1,165	35	-	-	-	1,630	-	8.1	DH	Flowing oil well with water drive. Analysis includes 0.95 ppm boron and 0.50 ppm fluoride.
0	615	372	.5	1,960	400	0	75	12	2,560	-	8.0	GS	Flowing oil well with water drive.
0	120	77	.3	1,930	1,150	920	24	2.1	2,340	-	7.7	GS	Do.
	932	60	-	1,687	-	-	-	-	-	5.00	8.1	CGL	Do
	924	110	-	1,595	-	-	-	-	-	4.50	8.0	CGL	Do.
0	37	46	-	940	-	-	-	-	-	[12]/8.0	8.0	SOG	DST 4 recovered 780 feet of sulfur water.
0	874	162	4.1	1,780	834	574	41	3.9	2,460	-	8.0	GS	Flowing oil well with water drive.
0	96	42	.5	479	55	0	87	9.7	771	-	7.8	GS	
0	968	116	.2	1,380	956	435	35	2.9	1,930	-	7.4	GS	Flowing oil well with water drive. Analysis includes 0.44 ppm boron.
0	33	21	-	564	-	-	-	-	-	[11]/13.0	6.4	SOG	DST 1 recovered 1,370 feet of sulfur water.
	111	16	-	380	-	-	-	-	-	15.2	8.0	CGL	Flowing oil well with water drive
	1,657	78	-	2,600	-	-	-	-	-	2.0	7.8		DST 2 recovered 180 feet of slightly gas-cut mud and 390 feet of fresh water.
0	1,220	80	2.7	1,960	1,290	-	-	1.3	2,410	-	7.1	GS	The pH of the water at the time of collection was 7.5.

Table 2. — Continued

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bwpd/gpm)	Method or point of collection	Date of collection	Temperature (°F)	Parts per					
														Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	NA + K	Bicarbonate (HCO_3)
																		Sodium (Na) / Potassium (K)	
T	R	Section																	
6S	20E	W½SW¼NE¼ 10	O	Caldwell and Covington Oil Co.	3	Green River Fm.	4,728	8,161	7,748-7,856 7,976-85	4(R)<1	Storage tank	9-10-57	-	-	-	104	68	6,080	1,12
6S	22E	C SW¼SE¼ 32	O	H. P. McLish	1	do	3,219	-	5,735-56	-	DST 5	11- -63	-	-	-	32	20	11,261	3,25
6S	23E	NE¼ Lot 3 1	W	Bureau of Land Management	1	Weber Ss.	2,447	-	2,527-2,650	34,000(R) 1,000	Well head	6-25-57	110	24	0.00	367	69	91 / 23	13.
6S	24E	5	S	Morris Ranch	-	do	0	-	-	340 10(E)	Flow	7-13-58	64	13	-	155	45	72	18
7S	22E	C NE¼NE¼ 5	O	Pan American Petroleum Corp.	1	Green River Fm.	3,212	6,475	5,332-37	-	DST 7	6-11-63	-	-	.0	42	(4)	1,015 / 90	8
									6,116-26	-	DST 2	6-11-63	-	-	.0	112	43	9,550 / 54	47
7S	22E	C SW¼NE¼ 32	O	California Oil Co.	32	do	3,002	6,155	See Remarks	81(R) 2.4	Storage tanks	9-10-57	-	-	-	0.0	1.0	5,980	2,96
7S	22E	C SW¼SW¼ 24	O	do	39	Uinta Fm.	-	3,040	2,624-51	-	DST 1	9-19-55	-	-	-	10	2	957	1,17
7S	23E	NW¼SW¼SE¼ 9	O	Pan American Petroleum Corp.	4	Green River Fm.	2,804	5,798	See Remarks	-	Treater drain	5-18-64	-	-	-	6.0	1.0	2,091	3,38
7S	23E	C NE¼SW¼ 14	O	California Oil Co.	23	do	2,906	-	5,489-5,808	138(R) 4.1	Pump bleeder	9-10-57	-	-	-	23	.0	2,490	6,35
7S	23E	C SW¼SW¼ 18	O	do	14	do	3,177	6,154	See Remarks	54(R) 1.5	Treater sample	9-10-57	-	-	-	2.0	1.0	2,000	4,24
7S	24E	C SW¼NE¼ 8	O	Humble Oil and Refining Co.	2	do	2,360	5,607	5,447-86	5(R) <1	do	9-10-57	-	-	-	3	2	2,660	5,77
7S	24E	C SW¼SW¼ 14	O	Sunray-Mid-Continent Oil	1	do	2,587	5,280	4,991-5,121	-	DST 1	4- 9-61	-	3.3	-	9.2	16	949	2,34
									5,155-5,216	-	DST 2	4-11-61	-	.5	-	18	12	1,520	4,00
7S	24E	C SW¼NE¼ 26	O	Chevron Oil Co.	203	Uinta Fm.	0	2,344	1,675-85	3,600(R) 110	See Remarks	5- 6-65	-	-	-	12	3	340 / 0	5
7S	24E	C SW¼NE¼ 31	O	California Co.	187	Green River Fm.	2,210	5,050	4,990-5,007	-	DST 1	4-17-63	-	-	-	17	3	2,668 / 8	1,5
8S	22E	NW¼SW¼NE¼ 4	O	do	8	do	2,612	-	5,959-77	-	DST 2	2-26-62	-	-	-	206	81	19,882	1,6
8S	22E	C NE¼NW¼ 4	O	Belco Petroleum Corp.	6	do	2,893	-	5,532-52	-	DST 5	10-31-61	-	-	-	241	92	10,974	8
									5,692-5,705	-	DST 1	10-30-61	-	-	-	155	49	17,383	1,9
8S	22E	SE¼SW¼SE¼ 4	O	do	31-4	do	2,480	5,389	4,469-82	-	DST 3	4-16-65	-	-	-	58	13	997 / 11	1,6
									4,499-4,515	-	DST 2	4-16-65	-	-	-	11	5	4,273 / 19	4,6
8S	24E	C NE¼NE¼ 9	O	Standard Oil Co. of California	41-9F	do	1,748	4,695	1,318-36	-	DST 1	5- -56	-	-	-	35	9	394	6
9S	20E	C NE¼NE¼ 27	O	DeKalb Agric. Assoc., Inc.	4	do	1,666	5,098	See Remarks	-	Flow	4- 2-64	-	-	-	-	-	-	-
9S	23E	SE¼SE¼SW¼ 16	O	Continental Oil Co.	1	Mesaverde Gr.	6,910	9,278	8,287-8,301	-	Separator	3- 8-53	-	26	2.43	350	-	23,000	
9S	23E	C NW¼SE¼ 29	O	do	4	Uinta Fm.	0	1,430	Ac 1,430	-	Casing head	5-21-58	-	-	-	25	352	22,000 / 45	42.
9S	24E	C NW¼SE¼ 27	O	Pacific Natural Gas Ex. Co.	3	Green River Fm.	1,240	2,720	Ac 1,932	7,200(R) 220	Flow	2- -63	-	-	-	-	-	-	
10S	16E	C SE¼ 15	O	Mountain Fuel Supply Co.	3	do	1,032	3,410	3,616-46	-	DST 4	4- -63	-	-	-	295	73	2,029 / 105	
10S	17E	SW¼SE¼NW¼ 3	O	do	2	do	380	4,690	3,618-85	-	DST 1	5-23-62	-	-	-	570	208	19,905	
									4,316-4,406	-	DST 3	5-27-62	-	-	-	398	285	24,265	
10S	18E	NW¼SE¼SW¼ 13	O	do	5	do	350	4,430	4,045-80	-	DST 2	11- 4-61	-	-	-	2,057	259	23,639	
10S	18E	SE¼NW¼NW¼ 14	O	do	2	do	467	4,865	2,162-2,282	-	DST 2	3-26-61	-	-	-	10	3	2,513	1,
									3,681-3,746	-	DST 3	4- 1-61	-	-	-	592	308	28,667	
									3,877-3,915	-	DST 4	4- 2-61	-	-	-	987	274	26,870	
									4,231-4,310	-	DST 5	4- 4-61	-	-	-	1,918	359	21,560	
10S	19E	SE¼NW¼SW¼ 1	O	do	7	do	1,430	4,465	2,350-73	See Remarks	See Remarks	10-15-63	-	-	0	11	10	3,449 / 28	2.
10S	20E	NW¼SW¼SW¼ 4	O	do	6	do	1,185	4,200	2,900-3,000	4,100 120(R)	Flow	7- -63	-	-	0	6	2	1,977 / 3	2
10S	20E	NW¼SE¼SW¼ 7	O	do	1	do	1,335	4,680	2,070-96	-	DST 3	10-16-60	-	-	-	11	8	39,367	9
									3,102-42	-	DST 5	10-21-60	-	-	-	11	1	912	1
10S	20E	C NE¼SW¼ 8	O	do	3	do	1,235	4,220	3,310-37	-	DST 1	7-10-62	-	-	-	6	-	928	1
									3,488-3,514	-	DST 2	7-12-64	-	-	-	272	92	10,506	1
10S	20E	SW¼NW¼NW¼ 35	W	Bureau of Land Management	2	do	750	4,255	See Remarks	4,300(E) 140	Flow	7-24-64	-	15	-	.0	7.3	359	1
10S	21E	SE¼SE¼NE¼ 16	O	DeKalb Agric. Assoc., Inc.	1	do	1,250	4,450	1,900-3,520	See Remarks	See Remarks	4- 2-64	-	13	-	.0	2.4	785	1

million													
Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1/]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2/]	Remarks
151	8,990	-	15,940	540	0	96	115	-	-	-	GS	
230	15,400	-	30,209	-	-	-	-	-	11/ 0.23	8.6	PA	DST 5 recovered 210 feet of slightly gas-cut drilling mud; 180 feet of mud-cut and slightly gas-cut water; and 1,226 feet of slightly gas-cut water.
1,150	78	1.1	1,870	1,200	1,090	14	1.1	2,200	-	7.6	GS	Oil test converted to water well. Analysis includes 0.30 ppm boron, 1.8 ppm fluoride, and 0.00 ppm manganese. Yield on 7-13-58 estimated at 200 gpm (6,800 bwpd)
485	51	.2	911	570	422	22	1.3	1,260	-	7.2	GS	The pH of the water at the time of collection was 7.0. Analysis includes 0.8 ppm fluoride.
290	1,350	-	2,926	-	-	-	-	-	2.25	10	CGL	DST 7, water and gas-cut mud to surface in 35 minutes after tool was opened. Analysis includes 1 ppm lithium.
1,450	13,700	-	25,207	-	-	-	-	-	.30	8.3	CGL	DST 2 recovered 823 feet of water with scum of oil on top. Analysis includes 3 ppm lithium.
188	7,230	-	14,970	4	0	100	1,300	-	-	-	GS	Perforated between 5,430-38, 5,562-95, and 5,719-42 feet.
-	820	-	2,365	-	-	-	-	-	2.80	8.0	CGL	DST 1 recovered 190 feet of mud-cut water and 2,000 feet of clear water.
0	1,050	-	6,714	-	-	-	-	-	1.19	8.7	PA	Perforated at 4,743, 4,751, 5,345, 5,366, and 5,386 feet.
1	191	-	5,830	58	0	99	143	-	-	-	GS	
8.0	421	-	4,690	9	0	100	290	-	-	-	GS	Perforated from 5,104-48 and 5,660-88 feet.
2	704	-	6,210	16	0	100	290	-	-	-	GS	
120	78	1.3	2,330	90	0	96	43	3,190	-	8.0	GS	DST 1 recovered 196 feet of mud-cut fresh water.
52	51	3.2	3,630	95	0	97	68	5,230	-	8.1	GS	DST 2 recovered 195 feet of muddy gas-cut water and 1,620 feet of clean gas-cut fresh water.
90	28	-	998	-	-	-	-	-	9.97	7.9	CGL	Water produced while drilling with gas. Water increased at 1,680 feet, but some water also came from other zones. Drilling at 2,310 feet when sampled.
74	3,100	-	7,528	-	-	-	-	-	1.00	8.2	CGL	DST 1 recovered 180 feet of heavily gas- and water-cut mud, 280 feet of heavily mud- and gas-cut water, and 2,651 feet of heavily gas-cut water.
1,750	29,000	-	51,748	-	-	-	-	-	.18	7.4	CGL	DST 2 recovered 105 feet of slightly oil- and gas-cut muddy water, 90 feet of water with a scum of oil, and 517 feet of water (sample taken at tool).
2,885	15,000	-	29,611	-	-	-	-	-	.26	7.7	CGL	DST 5 recovered 5 feet of oil and 225 feet of muddy water.
1,193	26,000	-	46,230	-	-	-	-	-	.18	7.5	CGL	DST 1 recovered 30 feet of oil, 270 feet of water-cut mud, and 1,900 feet of water. Sample from bottom of fluid column.
215	604	-	2,693	-	-	-	-	-	2.65	8.1	CGL	DST 3 recovered spray of drilling mud and water in 75 minutes, gas flow of 2,530 million cubic feet per day. At end of 85 minutes-still spray of water and gas flow of 2,630 million cubic feet per day. Temperature 102°F. Recovered 330 feet of gas-cut water.
88	3,800	-	10,574	-	-	-	-	-	.65	8.2	CGL	DST 2 recovered 90 feet of slightly water-cut mud, 600 feet of slightly gas-cut water. Water was a light orange color.
205	950	-	2,387	-	-	-	-	-	2.85	8.3	CGL	DST 1 recovered 362 feet of muddy water.
-	4,000	-	12/ 36,300	-	-	-	-	55,900	-	-	GS	Perforated from 2,726-80 and 3,970-4,005 feet
-	41,400	-	62,502	-	-	-	-	-	10/ 13	7.3	CO	
-	2,000	-	81,200	-	-	-	-	-	.15	9.1	CO	
-	126	-	12/ 1,360	-	-	-	-	2,090	-	-	GS	Water encountered while drilling with air.
5,100	120	-	8,068	-	-	-	-	-	1.20	7.3	CGL	DST 4 recovered 730 feet of slightly mud-cut water.
10,500	24,000	-	55,669	-	-	-	-	-	.16	7.6	CGL	DST 1 recovered 470 feet of water, 900 feet of black sulfur water with a show of heavy black oil.
470	39,000	-	65,344	-	-	-	-	-	.13	7.7	CGL	DST 3 recovered 60 feet of water-cut mud and 440 feet of mud-cut water.
3,380	38,000	-	67,754	-	-	-	-	-	.14	7.9	CGL	DST 2 recovered 600 feet of salt water.
26	2,349	-	6,462	-	-	-	-	-	1.05	8.6	CGL	DST 2 recovered 60 feet of water-cut mud and 1,170 feet of fresh water.
11,827	37,152	-	78,792	-	-	-	-	-	.12	8.4	CGL	DST 3 recovered 60 feet of water-cut mud and 1,610 feet of salty sulfur water.
2,998	41,280	-	72,551	-	-	-	-	-	.11	8.1	CGL	DST 4 recovered 60 feet of water, 180 feet of slightly gas-cut water, and a trace of dark green oil.
3,728	24,572	-	62,456	-	-	-	-	-	.13	8.1	CGL	DST 5 recovered 75 feet of gas-cut mud, 45 feet of gas-cut watery mud, and 360 feet of gas-cut salt water.
1,600	2,700	-	9,078	-	-	-	-	-	.84	8.4	CGL	Drilling with air; water was encountered between 2,850 and 2,875 feet and the well produced a 3-inch stream of formation water.
130	1,190	-	4,832	-	-	-	-	-	1.47	8.9	CGL	At drilling depth of 2,894 feet, water flow was encountered; at depth of 3,607 feet yield was approximately 120 gpm (4,100 bwpd).
525	45,000	-	97,937	-	-	-	-	-	.10	9.7	CGL	DST 3 recovered 720 feet of slightly salty sulfur water.
107	140	-	1,966	-	-	-	-	-	3.55	8.7	CGL	DST 5 recovered 1,050 feet of slightly gas-cut muddy brackish water.
54	296	-	2,221	-	-	-	-	-	3.30	8.8	CGL	DST 1 flowed brackish water to surface in 35 minutes.
3,870	13,100	-	28,489	-	-	-	-	-	.27	8.0	CGL	DST 2 recovered 860 feet of mud-cut water.
9.1	290	3	2,070	30	0	98	68	3,340	-	9.0	GS	Water from annulus behind 5½-inch casing from 168 to approximately 4,000 feet. Water sample collected before final conversion of abandoned gas well to water well. Water encountered while drilling from about 2,000 to 4,000 feet at rate of 200 to 250 barrels per hour (140 to 170 gpm). Completed water well production, 80 gpm (2,700 bwpd).
14	195	.7	1,870	10	0	99	108	3,080	-	8.8	GS	Reported flow on 9-29-59 was 125 gpm (4,300 bwpd). Water produced from annulus between 7 7/8-inch hole and 5½-inch casing.

Table 2. — Continued

Location T	R	Section	Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bbpd/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	NA + K: Sodium (Na)	NA + K: Potassium (K)	Bicarbonate (HCO_3)
10S	22E	C NE¼NE¼ 17	W	Bureau of Land Management	2	Green River Fm.	1,100	4,318	2,311-3,405	140 / 10(M)	Flow	11-30-64	-	3.4	-	0.0	97	4,070		2,27
10S	23E	NW¼SW¼NE¼ 2	O	Humble Oil and Refining Co.	1	Wasatch Fm.	4,252	-	4,392-4,614	-	DST 3	11- -61	-	-	-	702	126	10,305		41
10S	23E	NE¼NW¼NW¼ 24	O	Shell Oil Co.	7	Green River Fm.	375	3,115	3,066	-	Return line	10-15-61	-	-	-	2	1	572		1,07
10S	24E	SE¼SW¼SE¼ 28	O	ElPaso Natural Gas Co.	5	Mesaverde Gr.	4,360	-	5,295-5,305	-	Swab test	6-11-59	-	-	-	1,923	82	5,194		1
10S	24E	C NE¼SW¼ 32	O	Shell Oil Co.	8	Wasatch Fm.	3,306	4,938	4,390-4,497	-	DST 2	1-21-62	-	-	-	21	11	3,068		1,22
						Mesaverde Gr.	4,938	-	5,220-5,303	-	DST 3	1-28-62	-	-	-	304	63	10,580		1,24
						do	4,938	-	5,187-6,494	18(R) / 1	Production water	4-30-62	-	-	-	548	238	7,917		90
						Mesaverde Gr. Castlegate Ss.	4,938 6,830	-	5,370-6,947	-	Swab test	3-22-62	-	-	-	1,040	298	6,323		46
11S	12E	NE¼NE¼NW¼ 14	O	King Oil Co.	1	Green River Fm.	0	-	635-650	.17 / 0.3(E)	Flow	7-22-63	-	9.8	-	6.4	4.4	221		39
11S	21E	C SW¼NE¼ 7	O	Humble Oil and Refining Co.	2	Wasatch Fm.	1,392	6,901	4,715-36	-	DST 2	10- -61	-	-	-	804	211	12,457		32
									5,119-47	-	DST 3	10- -61	-	-	-	925	138	13,738		57
11S	24E	SW¼NW¼SE¼ 6	O	Shamrock Oil and Gas Corp.	5	Green River Fm.	-	2,677	223-2,207	-	Flow	8-26-63	-	12	-	3.2	.5	438		64
11S	24E	SW¼NE¼SW¼ 7	O	do	3	do	-	2,378	216-2,396	See Remarks	do	8-26-63	-	12	-	3.2	.5	418		59
11S	24E	NE¼NE¼SW¼ 8	O	do	1	do	0	2,518	At 1,275	-	do	9- 9-61	-	33	0.36	3.6	1.5	437	1.5	60
11S	25E	NE¼SE¼SW¼ 22	O	Continental Oil Co.	22-1	Mancos Sh.	4,632	-	At 6,225	-	See Remarks	8- 1-61	-	-	154	49	78	1,500	62	37
12S	14E	C SW¼NE¼ 13	O	Carter Oil Co.	1	Mesaverde Gr.	6,814	9,446	8,505-8,617	-	DST 22	6-27-52	-	-	-	350	64	8,198		1,01
									8,604-8,789	-	DST 25	7- 9-52	-	-	-	139	26	4,596		91
13S	23E	SE¼SW¼NE¼ 26	O	Skyline Oil Co.	1	Green River Fm.	0	2,170	2,000	-	-	9- -60	-	40.8	-	10.4	7.1	261		-
14S	20E	NW¼SE¼NE¼ 7	O	Phillips Petroleum Co.	1	Castlegate Ss.	7,033	7,285	7,080-7,180	-	DST 3	9-17-62	-	-	-	8	2	1,672		96
14S	20E	C SW¼NE¼ 30	O	do	2	Wasatch Fm.	2,390	4,320	3,790-3,820	See Remarks	See Remarks	7-13-65	-	23	-	614	91	11,900		53
						Flagstaff Ls.	4,320	4,635	4,530-60	48(R) / 1.4	Swab test	12-13-62	-	-	-	11	12	2,897		39
14S	20E	C NE¼NW¼ 30	O	do	4	Green River Fm.	0	2,100	1,383-1,910	360(R) / 11	do	7-22-63	-	-	-	10	7	274	13	36
13S	21E	C SW¼SE¼ 22	O	Atlantic Refining Co.	22-2	Wasatch Fm.	1,610	3,602	3,134-42	-	DST 1	9-25-63	-	-	-	20	36	664		14
									3,466-80	-	DST 2	9-28-63	-	-	-	30	36	2,766		15
						Castlegate Ss.	5,518	-	5,518-41	-	DST 4	10-12-63	-	-	-	600	109	11,643		10
15S	22E	W½NE¼SE¼ 16	O	Texaco, Inc.	1	Entrada Ss.	9,194	9,360	9,232-9,249	100(R) / 1	Swab test	4- -60		-	-	5,115	534	28,237		19
15S	23E	SE¼SE¼ 16	S	-	PR Spring	Green River Fm.	0	-	-	14 / 1(M)	Flow	9-17-64	47	17	-	93	36	17		10
15S	23E	NE¼SW¼SE¼ 33	O	Texaco, Inc.	3	Morrison Fm.	8,100	8,706	8,630-											
						Entrada Ss.	8,706	-	8,714	-	-	9- -61	-	-	-	8,739	434	34,077		20
16S	17E	SW¼ 31	S	-	Camel Rock Spring	Wasatch Fm.	3	-	-	1,200 / 225(R)	-	9-25-48	-	26	-	70	41	73		22
17S	17E	SW¼SW¼ 30	S	-	-	Mesaverde Gr.	0	-	-	-	-	9-25-48	-	18	-	10	5.7	250		43
17S	24E	NE¼SW¼SE¼ 9	O	Trend Oil Co.	6-A	Entrada Ss.	5,240	-	5,247-90	-	DST 1	11-21-60	-	-	-	3,370	-	30,200		24
17S	24E	NW¼SW¼SE¼ 12	O	do	3-A	do	5,070	-	At 5,160	-	See Remarks	11- 2-60	-	-	-	3,304	-	20,200		1
20S	20E	17	S	-	Thompson Spring	Mesaverde Gr.	0	-	-	-	-	10-20-11	-	-	.10	55	94	104		55
20S	20E	27	S	Chesterfield Coal Co.	Sego Spring	do	0	-	-	-	-	2-24-41	-	11	-	44	79	198		66

1/ Dissolved solids calculated from determined constituents except as noted.
2/ Analysis by: CaO, Carter Oil Co.
CGL, Chemical and Geological Laboratories, Casper, Wyo.
CL, Core Laboratories, Inc., Dallas, Tex.
CO, Continental Oil Co.
GS, U.S. Geological Survey
DH, Utah State Department of Health
PA, Pan American Petroleum Corp.
RME, Rocky Mountain Engineering Co., Grand Junction, Colo.
ShO, Shell Oil Co.
SOG, Stanolind Oil and Gas Co.
UC, Utah State Chemist
3/ Uinta Special Meridian.
4/ Trace.
5/ In solution at time of analysis.
6/ Analysis supplied by Carter Oil Co.
7/ Total iron.
8/ Resistivity at 72°F.
9/ Residue at 180°C.
10/ Resistivity at 75°F.
11/ Resistivity at 77°F.
12/ Calculated from specific conductance.
13/ Resistivity at 73°F.
14/ Resistivity at 74°F.
15/ Resistivity at 75°F.

(mg/l)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1/]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2/]	Remarks
million													
53	119	4,840	8.2	10,500	399	0	96	89	16,400	-	8.5	GS	Water from annulus behind 7-inch casing.
	5,103	13,500	-	29,941	-	-	-	-	-	0.29	7.7	CGL	DST 3 recovered 150 feet of mud and 1,553 feet of gas-cut brackish water.
48	145	99	-	1,941	8	-	-	-	-	17/4.2	8.9	SHO	
	480	11,250	-	19,536	-	-	-	-	-	.44	4.8	RME	Mud, water, and oil emulsion filtered to clear water.
72	620	3,550	-	8,562	96	-	-	-	-	16/.85	8.7	SHO	DST 2 recovered 374 feet of slightly gas-cut mud, 280 feet of heavily gas-cut and water-cut mud, 93 feet of very slightly gas-cut muddy water, and 93 feet of muddy water. Water sample collected at tool.
0	770	15,762	-	28,723	1,020	-	-	-	-	13/.27	7.8	SHO	DST 3 recovered 236 feet of gas-cut mud, 308 feet of highly gas-cut, oil-cut, and mud-cut water, and 186 feet of slightly oil-cut and slightly gas-cut muddy water.
0	308	13,312	-	23,326	2,600	-	-	-	-	15/.31	6.6	SHO	
0	470	11,857	-	20,452	3,825	-	-	-	-	10/.26	6.2	SHO	
0	179	3.1	.1	819	34	0	93	16	942	-	7.8	GS	
	4,827	17,500	-	35,961	-	-	-	-	-	.23	7.0	CGL	DST 2 recovered 300 feet of gas-cut muddy water and 554 feet of muddy, slightly salty water. Analysis from bottom sample.
	4,605	19,500	-	39,188	-	-	-	-	-	.21	6.0	CGL	DST 5 recovered 1,230 feet of muddy salt water. Water sample from 90 feet above tool.
0	334	60	1.6	1,170	10	0	99	60	1,800	-	8.2	GS	
0	310	21	1.4	1,110	10	0	99	58	1,720	-	8.2	GS	Report yield of 250 barrels of water per hour (175 gpm) while drilling at 1,159 feet.
2	422	4.0	.6	1,200	15	0	98	49	1,820	-	8.3	GS	Analysis includes 0.41 ppm boron, 1.8 ppm fluoride, and 0.00 ppm manganese. Sample collected when water flow was encountered while drilling well.
	2,900	180	-	5,300	-	-	-	-	-	1.7	7.6	CO	Sample collected from "bloole line" while drilling with air.
	2,523	11,000	-	26,636	-	-	-	-	-	.34	6.9	CGL	DST 22 recovered 375 feet of gas-cut slightly oil-cut mud and 2,440 feet of salt water.
10	1,638	5,600	-	12,511	-	-	-	-	-	.59	7.8	CGL	DST 25 recovered 600 feet of gas-cut and slightly oil-cut mud, 450 feet of water-cut mud, and 5,970 feet of slightly mud-cut water.
	423	17	-	1,086	-	-	-	-	-	-	7.6	UC	
4	2,150	140	-	4,711	-	-	-	-	-	2.65	9.3	CGL	DST 3 recovered 630 feet of water-cut mud (estimated to be 75 percent water).
0	1,490	18,300	25	32,700	1,910	1,470	93	119	48,900	-	7.3	GS	Water collected at discharge line to disposal pit after treatment to remove oil. Yield was 1 bwpd (less than 1 gpm).
0	4,850	320	-	8,245	-	-	-	-	-	1.02	9.4	CGL	
2	290	32	-	818	-	-	-	-	-	9.35	8.7	CGL	Fluid level 700 feet, unable to lower with swabbing rate of 15 barrels of water per hour.
2	2	1,065	-	1,900	-	-	-	-	-	1.97	8.4	CL	DST 1 recovered 1,482 feet of gas-cut water.
1	179	353	-	11,986	-	-	-	-	-	66	8.6	CL	DST 3 recovered 525 feet of brackish water with sulfur water.
2	5,213	14,981	-	33,253	-	-	-	-	-	23	7.3	CL	DST 4 recovered 150 feet of slightly gas-cut muddy water and 950 feet of slightly gas-cut brackish water.
	72	54,000	-	88,052	-	-	-	-	-	.10	7.3	CGL	Swabbed 4½ barrels of water per hour from 8,800 feet with fluid level standing at 8,000 feet.
1	94	2.8	.5	381	312	64	11	4	606	-	7.7	GS	
	19	64,000	-	104,438	-	-	-	-	-	.09	6.3	CGL	Report of analysis lists the Entrada Sandstone as the water-bearing formation.
1	220	7	.7	596	343	80	32	1.7	842	-	-	GS	
1	176	5	.1	707	48	0	92	10	1,060	-	-	GS	
	2,112	51,500	-	86,626	-	-	-	-	-	.08	6.8	RME	DST 1 recovered 40 feet of drilling mud and 1,460 feet of slightly gas-cut salt water.
	2,352	33,500	-	58,369	-	-	-	-	-	.14	6.0	RME	Drilled with air from 930 to 5,161 feet; encountered water at 5,100 feet and the water rose 300 feet.
	156	8.0	1.2	660	400	-	-	-	-	-	-	GS	
	323	26	.0	9/1,990	432	-	-	-	-	-	7.5	DH	Analysis includes 0.1 ppm fluoride

Table 3. — Selected hydrogeologic data from springs, water wel

Location: Salt Lake base and meridian.
Source: M, mine tunnel; O, oil or gas well; S, spring; T, test hole; W, water well.
Operator or owner: Name of operator or owner at time water sample was collected for chemical analysis.
Producing formation: Fm., Formation; Gr., Group; Ls., Limestone; Mbr., Member; sed., sedimentary; Sh, Shale; Ss., Sandstone. Many formation names were reported in records of oil and gas companies and State and Federal agencies do not necessarily agree with the identification.

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bbpd/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per					
																		NA + K		Bicarbonate
T	R	Section												Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	
43S	4W	SE¼SE¼SE¼ 31	W	F. Hamblin	1	Shinarump Mbr. of Chinle Fm.	217	269	217-269	See Remarks	Flow	8-13-57	-	3.4	0.24	14	1.0	215		
43S	4W	NW¼NW¼NE¼ 33	W	Richard Von Hake	1	do	-	-	28-79	-	Pumped	8-13-57	-	23	.24	119	21	28		
14S	9E	S½NW¼NE¼ 29	O	Amerada Petroleum Co.	1	Ferron Ss. Mbr. of Mancos Sh.	2,664	3,023	At 2,756	-	Flowline	12- -62	-	-	0	320	24	19,978		
									At 2,306	-	do	12- -62	-	-	0	290	24	14,975		3,
						Tununk Sh. Mbr. of Mancos Sh.	3,023	3,416	At 3,054	-	do	12- -62	-	-	0	120	24	6,537		1,
									At 3,125	-	do	12- -62	-	-	0	30	24	7,549		1,
15S	10E	C NE¼NE¼ 26	O	Shell Oil Co.	1	Mississippian sed. rocks	8,950	10,763	10,058-10,163	-	DST 3	5-13-58	-	-	-	1,330	396	6,583		
15S	11E	NE¼SE¼SW¼ 12	O	Carbon Dioxide and Chemical Co.	2	Navajo Ss.	3,095	3,114	3,095-3,114	-	See Remarks	1-21-39	-	-	(5)	874	91	422		3,
15S	12E	SW¼SW¼SW¼ 7	O	Pan American Petroleum Corp.	1	Mississippian sed. rocks	7,942	8,154	7,431-7,986	-	DST 1	4- -63	-	-	(5)	1,144	311	10,356		2,
15S	12E	SE¼SW¼SW¼ 8	O	Shell Oil Co.	1-A	Redwall Ls.	7,970	9,130	8,123-9,174	-	DST 1-A	8-18-59	-	-	-	3,496	716	21,583		2,
						Elbert Fm.	9,130	-												
15S	12E	15	W	-	-	Mancos Sh.	0	-	0-30	-	-	8- 8-58	-	11	-	481	302	743		
16S	9E	W½NE¼NW¼ 12	O	Pure Oil Co.	1-A	Redwall Ls.	9,800	11,125	10,117-10,259	-	DST 2	3- 9-62	-	-	-	3,913	3,980	462	22,050	3,
16S	12E	C NE¼NW¼ 1	O	Cities Service Oil Co.	1	Sinbad Ls. Mbr. of Moenkopi Fm.	4,014	-	4,014-63	-	DST 3	1- -63	-	-	-	-	-	-		
						Mississippian sed. rocks	6,172	-	7,831-7,930	-	DST 5	5- -63	-	-	-	-	-	-		
16S	12E	C NE¼NW¼ 4	O	Equity Oil Co.	2	Sinbad Ls. Mbr. of Moenkopi Fm.	4,141	-	4,138-75	-	-	1- -63	-	-	-	-	-	-		
									4,138-75	-	-	1- -63	-	-	-	-	-	-		
									4,185-4,207	-	-	1- -63	-	-	-	-	-	-		
16S	12E	C NW¼NE¼ 27	O	Carter Oil Co.	1	Coconino Ss.	3,975	4,330	4,242-58	-	DST 2	1-14-57	-	-	-	1,355	377	4,749		2,
						Madison Ls.	6,585	-	6,998-7,133	-	DST 5	2- -57	-	-	-	1,936	454	18,537		4,
16S	13E	E½SW¼SW¼ 21	O	Reserve Oil and Gas Co.	1	Glen Canyon Gr.	1,777	2,644	At 2,400	1,580(R)/50	See Remarks	5- -63	-	-	-	480	-	-		
						Moenkopi Fm.	2,312	3,396	3,494-											
						Sinbad Ls. Mbr. of Moenkopi Fm.	3,516	3,574	3,550	-	DST 1	5-17-63	-	-	-	-	-	-		
18S	14E	SE¼SW¼SE¼ 9	W	-	Roadside Geyser	Mancos Sh.	0	-	-	-	-	3-14-47	82	-	-	908	288	360		2
18S	14E	NW¼SW¼SW¼ 30	O	Humble Oil and Refining Co.	2	Kaibab Ls.	3,606	3,710	3,906-73	-	DST 1	10-25-62	-	-	-	2,400	486	9,672		4,
						Coconino Ss.	3,710	4,159	3,717-3,868	-	DST 2	10-29-62	-	-	-	2,400	486	12,070		3
						Mississippian sed. rocks	6,872	-	6,963-7,083	-	DST 7	12-20-62	-	-	368	2,400	486	16,174		3
19S	10E	6	S	-	Red Seep	Brushy Basin Sh. Mbr. of Morrison Fm.	0	-	-	34/1(E)	Flow	10-31-58	57	7.3	-	7.2	.0	287		
19S	13E	SE¼SE¼SE¼ 12	O	Humble Oil and Refining Co.	1	Paradox Fm.	5,317	5,407	5,318-5,908	-	DST 11	8-11-62	-	-	0	960	1,021	8,450		2
						Mississippian sed. rocks	6,407	7,242	6,716-9,915	-	DST 12	8-13-62	-	-	0	2,940	365	16,169		1
19S	24E	SW¼NW¼SE¼ 35	O	Promontory Oil Co.	3	Brushy Basin Sh. Mbr. of Morrison Fm.	1,370	-	1,484-1,508	See Remarks	Flow	10-27-64	-	7.2	-	983	96	9,210		
19S	25E	SE¼NW¼NE¼ 10	W	E. Elizondo	1	Morrison Fm.	-	-	595-602	1(E)/<1	Bailed	6-23-65	-	1.7	-	56	92	2,690		
						Entrada Ss.	875	-	875-905	35/2.3(R)	do	6-23-65	-	5.3	-	94	34	3,620		1
20S	7E	NE¼SE¼NE¼ 21	O	Pan American Petroleum Corp.	3	Kaibab Ls.	7,150	7,200	7,170-7,220	See Remarks	Separator valve	11- 6-64	-	35	-	1,320	528	25,700		2
20S	7E	SW¼NE¼SW¼ 27	O	English Oil Co.	33-27	Ferron Ss. Mbr. of Mancos Sh.	790	951	804-806	-	-	4- -62	-	-	-	49	23	3,484		2
20S	11E	1	S	-	Buckhorn Wash	Moenkopi(?) Fm.	0	-	-	680/20(E)	Flow	10-31-58	-	12	-	329	124	194		
20S	22E	C SE¼NW¼ 30	O	Cabeen Exploration Corp.	T-1	Morrison Fm.	2,064	-	2,388-2,456	-	DST 2	9- -57	-	-	-	531	251	7,904		1
20S	24E	NE¼SE¼SW¼ 29	O	G. Hartzka	2	do	300	-	384-400	-	Bailed	11- -63	-	1.1	-	820	17	2,050	105	
									762-772	-	do	11- -63	-	2.4	-	365	9.7	1,650	83	
									872-888	-	do	11- -63	-	1.5	-	9.6	0	794	30	
21S	15E	NW¼SW¼SW¼ 24	O	Superior Oil Co.	14-24	Mississippian sed. rocks	9,533	10,205	9,533-9,632	-	DST 7	4- -61	-	-	101	4,370	1,904	120,957		1
									9,705-52	-	DST 8	4- -61	-	-	3.4	10,120	1,410	86,325		
21S	16E	NE¼SE¼SE¼ 34	W	G. Ruby	Crystal Geyser	Entrada Ss.	59	487	59-97	40,000(R)/1,200	Flow	3-22-48	64	13	-	1,300	225	4,070		4
21S	19E	SE¼SE¼SW¼ 33	O	Potash Co. of America	2	do	1,736	-	1,736-58	-	See Remarks	7-20-43	-	-	-	244	107	3,654		
22S	6E	NW¼ 33	M	Browning Coal Mine	-	Ferron Ss. Mbr. of Mancos Sh.	-	-	-	-	do	1-23-53	-	-	-	253	196	3,876		
22S	8E	23	S	O. H. Barton	Jensen Spring	Carmel Fm.	0	-	-	170/5(E)	Flow	4-23-59	-	15	-	477	226	1,670		
22S	14E	SE¼ 29	W	F. J. Mac	1	Entrada(?) Ss.	190	-	190-200	-	-	10-28-58	61	10	-	321	246	551		

d oil and gas wells in bedrock in the Canyon Lands section

eld: bwpd, barrels of water per day; gpm, gallons per minute; (E), estimated; (M), measured; (R), reported at time water sample was collected for chemical analysis.
ne (E), (M), or (R) is beside the given unit. The other unit is calculated on the basis of 1 gpm equals 34 bwpd and 1 bwpd equals 0.03 gpm.
thod or point of collection: Flow, indicates collection at a spring or flowing well; DST, drill-stem test for oil or gas.
marks: DST, drill-stem test data reported by oil or gas company.

(CO$_3$)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2]	Remarks
	million												
0	272	26	0.1	646	38	0	92	15	1,020	-	6.9	GS	Reported yield on 7-17-56 was 450 gpm (15,300 bwpd). Analysis includes 0.8 ppm fluoride.
0	490	22	.4	710	384	384	14	.6	962	-	3.9	GS	Analysis includes 0.5 ppm fluoride.
44	40	30,956	-	51,950	-	-	-	-	-	3/ 0.14	7.0	CL	Sample collected while drilling with air.
40	40	21,300	-	37,860	-	-	-	-	-	3/ .18	8.0	CL	Do.
36	40	2,840	-	11,117	-	-	-	-	-	3/ .62	8.0	CL	Do.
96	40	2,840	-	12,093	-	-	-	-	-	3/ .54	8.0	CL	Do.
0	2,825	11,600	-	23,568	-	-	-	-	-	3/ .30	7.1	ShO	
	568	172	-	3,607	-	-	-	-	-	-	-	GS	Carbon dioxide well. Water sample bailed from hole at 2,320 feet under pressure by using temperature observation machine.
	8,400	13,100	-	35,778	-	-	-	-	-	.26	7.3	CGL	DST 1 recovered very cloudy water, dark brown organic filtrate.
	2,346	38,371	-	67,769	-	-	-	-	-	.12	7.2	CGL	DST 1-A recovered 6,750 feet of slightly gassy, slightly muddy salt water with trace of oil and sulfurous odor.
0	3,530	305	466	6,280	3,260	2,870	39	5.7	6,580	-	7.5	GS	Dug well, 30 feet deep. Analysis includes 0.2 ppm fluoride.
0	1,640	42,600	-	73,653	-	-	-	-	-	4/ .14	6.5	CL	DST 2 recovered 450 feet of heavy gas-cut mud (carbon dioxide) and 360 feet of salt water.
	-	9,700	-	-	-	-	-	-	-	-	-	(7)	DST 3 recovered 80 feet of slightly sulfur gas-cut mud, 90 feet of sulfur water-cut mud, and 450 feet of sulfur water.
	-	44,000	-	-	-	-	-	-	-	-	-	(7)	DST 5 recovered 270 feet of gas (carbon dioxide) and salt water-cut mud and 1,910 feet of gas-cut (carbon dioxide) salt water from Deseret(?) Formation
	6,400	78,000	-	-	-	29,200	-	-	-	-	6.5	PL	Analysis includes 2,410 ppm magnesium as magnesium carbonate and 180 ppm free carbon dioxide.
	72,000	75,200	-	-	-	38,400	-	-	-	-	6.7	PL	Analysis includes 2,680 ppm magnesium as magnesium carbonate and 210 ppm free carbon dioxide.
	10,400	88,000	-	-	-	51,320	-	-	-	-	6.4	PL	Analysis includes 3,620 ppm magnesium as magnesium carbonate and 430 ppm free carbon dioxide.
	642	8,900	-	17,249	-	-	-	-	-	.40	7.9	CGL	DST 2 recovered 30 feet of water-cut mud and 360 feet of water.
	2,712	29,000	-	54,624	-	-	-	-	-	.16	6.8	CGL	DST 5 recovered 140 feet of mud and 340 feet of salt water.
	-	-	-	-	-	-	-	-	-	-	-	(8)	While drilling with air an estimated flow of 70 barrels of water per hour (50 gpm) was produced from the Navajo Ss. below 1,784 feet. The analysis includes 10,000 ppm sodium chloride.
	-	18,000	-	-	-	-	-	-	-	-	-	(8)	DST 1 recovered 60 feet of rat-hole fluid and 403 feet of emulsified mud and black sulfur water slightly gas cut.
0	1,340	215	.0	4,710	3,456	1,120	19	-	5,640	-	-	GS	Reported well depth 180 feet. Analysis includes 0.4 ppm boron.
0	60	18,815	-	35,985	-	-	-	-	-	9/ .20	6.0	CL	DST 1 recovered 1,620 feet of heavy gas-cut dark sulfur water, 721 feet of mud-cut and heavy gas-cut sulfur water, 180 feet of slightly gas and water-cut mud, and 120 feet of mud.
0	200	22,720	-	49,902	-	-	-	-	-	9/ .19	6.0	CL	DST 2 recovered 160 feet of mud, 450 feet of slightly salty water, 270 feet of gas-cut and slightly mud-cut water.
0	30	29,110	-	51,888	-	-	-	-	-	9/ .13	6.0	CL	DST 7 recovered 90 feet of mud and 3,366 feet of salt water.
0	181	94	.7	768	18	0	97	29	1,240	-	8.8	GS	Analysis includes 1.9 ppm fluoride.
0	320	16,188	-	29,125	-	-	-	-	-	10/ .20	7.3	CL	DST 11 recovered 180 feet of mud and 5,120 feet of slightly salty water.
-	300	25,968	-	50,345	-	-	-	-	-	11/ .11	7.0	CL	DST 12 recovered 300 feet of mud and 5,160 feet of mud-cut salt water.
	49	15,600	9.4	25,700	2,100	2,030	91	87	38,800	-	6.8	GS	Estimated yield less than 1 gpm (less than 34 bwpd).
	1,120	1,750	.7	7,350	520	-	92	51	61,000	-	12.3	GS	Analysis includes 875 ppm hydroxide.
	270	4,840	.0	9,470	300	0	96	91	51,300	-	7.8	GS	
-	4,210	38,800	12	72,000	5,470	3,170	91	152	84,600	-	7.3	GS	Estimated yield less than 1 gpm (less than 34 bwpd).
-	24	11,500	-	21,534	-	-	-	-	-	.34	8.5	(12)	
1	1,430	36	.3	2,250	1,330	1,140	-	2.3	3,550	-	8.4	GS	Analysis includes 1.7 ppm fluoride.
	527	12,900	-	22,584	-	-	-	-	-	.33	7.4	CGL	DST 2 recovered 65 feet of slightly gas-cut mud and 480 feet of brackish water.
	146	2,800	44	6,880	2,120	2,120	66	19	17,700	-	12.4	GS	Analysis includes 0.11 ppm boron, 0.6 ppm fluoride, and 790 ppm hydroxide.
	299	2,240	51	5,510	1,450	1,450	70	19	13,400	-	12.3	GS	Analysis includes 0.14 ppm boron, 0.1 ppm fluoride, and 527 ppm hydroxide.
	607	512	3.2	2,090	24	0	97	70	3,500	-	10.3	GS	Analysis includes 2.0 ppm boron, 4.7 ppm fluoride, and 31 ppm hydroxide.
	2,400	196,400	-	327,283	-	-	-	-	-	9/ .04	5.5	CL	DST 7 recovered 173 feet of mud, 81 feet of water-cut mud, and 118 feet of muddy water.
	300	155,300	-	254,525	-	-	-	-	-	9/ .04	5.0	CL	DST 8 recovered 600 feet of water-cut mud and 5,700 feet of salt water.
	2,410	4,370	-	14,300	1,420	0	72	30	19,400	-	-	GS	The geyser is an open abandoned oil test with a carbon dioxide drive.
	946	5,390	-	10,341	-	-	-	-	-	-	-	GS	Water sample from drill pipe above well packer.
	2,212	46	-	3,454	-	-	-	-	-	-	-	GS	Water from "I" bed in coal series in upper part of Ferron Sandstone Member.
	3,800	1,200	5.8	7,450	2,120	2,020	63	16	8,990	-	7.4	GS	Analysis includes 1.5 ppm boron and 0.8 ppm fluoride.
	1,120	132	.1	3,370	1,810	154	40	5.6	4,340	-	7.1	GS	Analysis includes 0.0 ppm fluoride.

ble 3. — Continued

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (gpm/fpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per					
																	NA + K		
R	Section													Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO3)
16E	SE¼NW¼SW¼	2	O	Amerada Petroleum Co.	1	Paradox Fm.	5,100	-	Ac 5,250	-	Flow	10- -48	-	16	-	68,459	9,090	35,950		-
16E	NE¼SW¼SW¼	2	O	do	2	do	5,054	-	5,792-5,396	See Remarks	do	7- -49	-	10	-	76,176	9,484	38,301		9
17E	E½SE¼NW¼	34	O	Superior Oil Co.	22-34	Mississippian sed. rocks	10,020	-	10,053-10,173	-	DST 3	8- -58	-	-	-	9,757	1,441	66,729		2
19E	NW¼NW¼NE¼	16	O	Potash Co. of America	1	Morrison Fm.	703	1,363	1,118-55	-	Bailed	8-12-43	-	-	(5)	329	175	4,913		5
22E	NW¼NE¼	33	M	-	Cactus Rat Mine	Salt Wash Ss. Mbr. of Morrison Fm.	0	-	-	17 / 0.3(E)	-	9-29-50	56	10	0.03	101	15	343	3.4	2
22E	SE¼NW¼NW¼	33	O	Utah Southern Oil Co.	1	Morrison Fm.	0	-	298-319	70 / 2(E)	Pumped	12-29-35	-	-	-	-	-	205		3
						Chinle Fm.	1,100	-	1,109-40	14 / 1(E)	Bailed	11-18-35	-	-	-	474	137	6,993		4
10E		8	S	-	Cliff Dweller Spring	Wingate Ss.	0	-	-	14 / 1(E)	Flow	10-31-58	-	7.5	-	127	112	19		9
15E	C NE¼NW¼	21	O	Shell Oil Co.	1	Mississippian sed. rocks	7,452	-	7,500-7,702	-	DST 1	8-31-59	-	-	-	1,444	208	7,283		7
16E	NE¼SW¼NW¼	3	O	Mobil Oil Co.	12-3	do	8,355	9,042	8,530-9,715	-	DST 1	8- -61	-	-	-	9,388	1,265	55,921		3
16E	NE¼SW¼SE¼	15	O	do	34-15	White Rim Ss. Mbr. of Cutler Fm.	2,540	2,860	See Remarks	See Remarks	Flow	9- -61	-	-	-	474	56	681		7
						Mississippian sed. rocks	3,028	-	3,210-3,440	-	DST 1	10- -61	-	-	-	5,092	2,916	65,021		4
17E	C NW¼SW¼	13	O	Pan American Petroleum Corp.	1	do	8,422	8,988	8,678-8,768	-	DST 3	3- -61	-	-	-	3,469	752	44,936		7
17E	C SE¼NE¼	17	O	Texaco, Inc.	1	do	8,458	-	8,732-38	-	-	12- -62	-	-	-	5,302	1,002	56,175		3
17E	C NW¼SE¼	17	O	do	2	do	8,447	-	8,709-16	-	Swab test	12- -62	-	-	-	5,781	1,453	56,954		2
21E	SE¼SW¼NW¼	27	M	National Park Service	1	Wingate Ss.	765	-	790-900	140 / 4(E)	Well head	10-31-62	61	5.0	-	28	18	54		1
22E	NW¼	6	M	-	Telluride No. 18	Salt Wash Ss. Mbr. of Morrison Fm.	0	-	-	See Remarks	Pumped	9-29-50	50	11	14/20	89	30	129	6.1	2
23E		8	S	-	Squaw Park Spring	Entrada Ss.	0	-	-	14 / 1(E)	Flow	6- 5-59	-	33	-	51	4.9	9.1		
24E	NW¼NW¼SW¼	8	S	-	Dewey Bridge Spring	do	0	-	-	-	do	4-24-59	56	10	-	13	2.4	147		
10E	SE¼NE¼	4	S	-	Tan Seep	Kaibab Ls.	0	-	-	See Remarks	do	10-30-58	44	11	-	257	224	38		
13E	NW¼NE¼SW¼	2	O	Superior Oil Co.	23-2	Shinarump Mbr. of Chinle Fm.	1,327	1,362	1,527-47	-	DST 1	8- -58	-	-	-	76	39	275		4
						Moenkopi Fm.	1,362	2,200	1,842-62	-	DST 2	9- -58	-	-	-	294	3.6	4,239		
						do	1,562	2,200	1,800-65	34(R) / 2.8	Pumped	11- 9-58	-	-	-	358	36	5,149		4
						Sinbad Ls. Mbr. of Moenkopi Fm.	2,038	-	2,041-65	-	DST 3	9- -58	-	-	-	239	3.6	5,910		5
13E	NW¼	29	S	-	Red Rock Spring	Carmel Fm.	0	-	-	70 / 2(E)	Flow	10-28-58	62	9.8	-	54	30	35		
14E	NE¼NE¼SE¼	21	O	Carter Oil Co.	1	Moenkopi Fm.	1,688	2,375	2,114-2,240	-	DST 2	10- -58	-	-	.0	400	97	729		1
15E	C SE¼NW¼	19	O	Shell Oil Co.	1	Mississippian sed. rocks	7,570	8,263	7,968-8,067	-	DST 2	11-12-58	-	-	-	1,957	384	14,697		
20E	SW¼NE¼NE¼	20	S	-	Courthouse Spring	Navajo Ss.	0	-	-	-	-	10-16-58	-	-	.42	44	35	12		
22E		9	S	-	Turnbow Cabin Spring	Entrada Ss.	0	-	-	170 / 5(E)	-	8- 1-62	-	-	14/100	-	-	-		
24E	and	22 23	S	-	Onion Creek Spring	Paradox Fm.	0	-	-	-	-	9- -27	-	-	-	965	132	4,490		
12E	SW¼	14	W	J. Marsing	Temple Junction	Carmel Fm.	-	-	-	-	-	10-30-58	62	13	-	481	642	339		
12E	SE¼SW¼SW¼	34	W	Bureau of Land Management	Gilson Butte	Entrada Ss.	0	298	See Remarks	See Remarks	-	10-30-58	58	9.6	-	240	272	105		
13E	C NW¼NE¼	13	O	Superior Oil Co.	31-13	Hermosa Gr. Ismay Zone of Paradox Fm.	4,018 4,340	5,196 5,070	4,319-55	-	DST 1	7- -61	-	-	.0	9,680	5,637	58,749		
15E	C SW¼NE¼	22	O	Continental Oil Co.	2	Hermosa Gr.	3,283	5,916	4,345-67	-	DST 6	6- -58	-	-	-	301	460	7,192		
						Paradox Fm.	4,955	5,916	4,950-5,062	-	DST 2	6- -58	-	-	-	476	444	7,183		
						Mississippian sed. rocks	5,916	-	6,085-6,220	-	DST 5	7- -58	-	-	-	1,382	234	9,689		
15E	NW¼NE¼SW¼	12	W	Standard Oil Co. of California	1	Navajo Ss.	250	-	680-720	-	Pumped	7-11-56	-	-	-	125	86	28		
16E	C NE¼NW¼	10	O	Shell Oil Co.	2	Mississippian sed. rocks	6,707	7,065	6,398-7,092	-	DST 1	3- 1-59	-	-	-	2,227	750	4,251		
16E	C SE¼SW¼	29	O	Standard Oil Co. of California	1	do	6,359	-	6,480-6,594	-	DST 3	10-21-57	-	-	-	1,923	41	13,742		
17½E	NW¼NE¼SE¼	20	O	Superior Oil Co.	43-20	do	6,050	6,664	6,361-86	-	DST 5	1-25-61	-	-	-	560	1,069	9,955		
18E	C NW¼SW¼	29	O	Promontory Oil Co.	1	White Rim Ss. Mbr. of Cutler Fm.	1,445	1,715	1,445-1,715	-	-	9-17-63	-	16	-	174	52	1,050	79	

(CO3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2]	Remarks
	137	231,200	-	367,475	208,406	-	-	-	-	-	-	CTL	Analysis includes 1,891 ppm borate, 73 ppm hydroxide, and 76 ppm iron and aluminum oxide.
	49	249,600	-	397,601	229,301	-	-	-	-	-	-	CTL	Analysis includes 2,362 ppm borate and 160 ppm iron and aluminum oxide. Flowed salt water at 1,000 to 5,000 bwpd (30 to 150 gpm) from July 3 to 17, 1949, from a depth of 5,792 to 5,896 feet.
0	670	123,703	-	202,907	30,284	-	-	-	-	13/ 0.10	6.5	SO	DST 3 recovered 300 feet of muddy salt water and 2,670 feet of salt water. Analysis includes 0.0 ppm sulfide and 348 ppm iron and aluminum oxide.
	457	8,036	-	13,910	-	-	-	-	-	-	-	GS	
	806	47	5.8	1,430	314	140	70	8.5	2,030	-	7.9	GS	Analysis includes 0.02 ppm boron, 0.3 ppm fluoride, and 0.00 ppm manganese.
	17	54	-	517	-	-	-	-	-	-	-	GS	
	1,830	10,442	-	20,070	-	-	-	-	-	-	-	GS	
	285	24	.2	914	778	247	10	.6	1,380	-	8.1	GS	Analysis includes 0.2 ppm fluoride.
	3,090	11,670	-	24,074	-	-	-	-	-	31	6.9	CGL	DST 1 recovered 3,240 feet (34 barrels) of salt water.
	951	106,000	-	173,905	-	-	-	-	-	06	6.4	CGL	DST 1 recovered 1,150 feet of mud-cut salt water and 7,000 feet of salt water
	1,778	410	-	3,784	-	-	-	-	-	2.60	7.1	CGL	Estimated water flow of 200 gallons per hour (3 gpm or 100 bwpd) encountered while drilling between 2,530 and 2,570 feet.
	2,086	116,000	-	191,344	-	-	-	-	-	.05	6.9	CGL	DST 1 recovered 651 feet of mud and 6,929 feet of salt water.
	[illegible]	136,224	-	228,517	-	-	-	-	-	.05	7.7	CGL	DST 3 recovered 668 feet of heavy gas-cut mud, 704 feet of amber colored gas-cut emulsion, 1,858 feet of oil, and 610 feet of salt water.
	1,240	99,300	-	164,478	-	-	-	-	-	.06	6.5	CGL	
	1,275	101,000	-	166,549	-	-	-	-	-	.06	6.5	CGL	Cloudy yellow water with iron oxide precipitate.
	36	52	.3	283	142	8	45	2.0	530	-	7.3	GS	
	388	13	2.6	759	304	138	47	-	1,100	-	7.9	GS	Water pumped from mine sump at rate of 300 gallons per day (0.2 gpm or 76 bwpd). Analysis includes 0.04 ppm boron, 0.4 ppm fluoride, and 0.00 ppm manganese.
	8.2	3.0	4.6	204	148	0	12	.3	316	-	8.4	GS	Analysis includes 0.10 ppm boron and 0.4 ppm fluoride.
	44	64	.5	417	42	0	88	9.9	693	-	7.6	GS	
	1,380	42	.7	2,150	1,360	1,310	11	1.0	2,500	-	8.4	GS	Yield on 10-27-44 was estimated at 5 gpm (170 bwpd). Analysis includes 1.3 ppm fluoride.
0	270	526	-	5,750	556	-	-	-	-	13/ .62	7.8	SO	DST 1 recovered 110 feet of 8.9 pound water-cut mud. Analysis includes 0.0 ppm sulfide and 90 ppm iron and aluminum oxide.
0	2,025	5,374	-	12,472	748	-	-	-	-	13/ 1.58	7.4	SO	DST 4 recovered 280 feet of mud and 1,342 feet of black sulfur water. Analysis includes 0.0 ppm sulfide and 14 ppm iron and aluminum oxide.
0	324	6,079	-	12,999	1,041	-	-	-	-	13/ .48	7.0	SO	Well pumped at rate of 56 3/4 barrels of water in 14¼ hours. Analysis includes 5.0 ppm sulfide and 13 ppm iron and aluminum oxide.
0	325	6,137	-	18,125	611	-	-	-	-	13/ .59	15/ 7.2	SO	DST 5 recovered 85 feet of mud and 1,225 feet of black sulfur water. Analysis includes a trace of sulfide and 63 ppm iron and aluminum oxide.
	94	14	2.1	437	340	43	18	.8	700	-	8.5	GS	pH at point of collection was 7.5. Analysis includes 0.2 ppm fluoride.
0	1,620	341	-	4,187	-	-	-	-	-	.92	7.0	CL	DST 2 recovered 180 feet of mud, 630 feet of mud-cut water, and 740 feet of brackish water
	5,131	85,000	-	147,313	-	-	-	-	-	.07	7.1	CGL	DST 2 recovered 6,900 feet (95.3 barrels) of salt water with hydrogen sulfide odor.
	68	17	1.9	288	254	-	-	-	-	-	-	GS	
	-	2.0	.5	-	156	18	-	-	271	-	7.7	GS	Spring is series of seeps in stream bed. Analysis includes 0.3 ppm fluoride.
	2,350	6,990	-	15,170	2,950	-	77	36	-	-	-	GS	
	3,900	105	41	8,360	3,840	3,510	16	2.4	3,640	-	7.6	GS	pH of water at point of collection was 7.0. Analysis includes 0.2 ppm fluoride.
	1,980	36	42	3,500	2,130	-	-	1.0	3,160	-	7.8	GS	Depth of well is 290 feet with casing perforated from 230 to 290 feet. Reported yield in March 1953 was 360 bwpd (11 gpm). pH of water at point of collection was 7.0. Analysis includes 1.4 ppm fluoride.
0	120	124,960	-	209,682	-	-	-	-	-	16/ .05	7.0	CL	DST 1 recovered 290 feet of water.
	7,843	7,300	-	24,318	-	-	-	-	-	.36	7.6	CGL	DST 6 recovered 3,570 feet of mud-cut salt water and salt water.
	5,884	9,400	-	23,943	-	-	-	-	-	.33	8.7	CGL	DST 2 recovered 60 feet of mud-cut sulfur water and 750 feet of slightly gas-cut sulfur water. Sample was clear reddish-brown water from lower part of column.
	3,911	15,000	-	30,232	-	-	-	-	-	.26	7.6	CGL	DST 5 recovered 5,460 feet of mud-cut sulfur water and sulfur water. Sample was clear water.
	394	26	-	827	-	-	-	-	-	6.90	7.5	CGL	Well is 720 feet deep and perforated from 680 to 720 feet. Reported depth to water was 650 feet in 1956.
	4,251	54,000	-	94,667	-	-	-	-	-	.88	6.9	CGL	DST 1 recovered 1,470 feet of muddy salt water and 4,395 feet of salt water.
	4,024	21,000	-	40,617	-	-	-	-	-	.20	7.6	CGL	DST 3 recovered 180 feet of watery mud, 900 feet of muddy water, and 4,550 feet of black sulfur water.
	5,000	15,052	-	31,775	-	-	-	-	-	.23	5.5	CL	DST 5 recovered 50 feet of mud, 450 feet of muddy water, and 5,130 feet of salt water.
	2,250	200	.0	4,040	650	295	75	18	5,080	-	7.9	GS	Analysis includes 2.9 ppm boron and 1.4 ppm fluoride.

Table 3. — Continued

Location T	R	Section	Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bwpd/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	NA + K: Sodium (Na)	NA + K: Potassium (K)	Bicarbonate
25S	19E	C NW¼SE¼ 27	O	Pure Oil Co.	5	Mississippian sed. rocks	7,190	-	7,602-30	-	DST 4	7- 7-62	-	-	0.0	640	413	3,052		1,1
25S	20E	4	S	-	Seeping Spring	Wingate Ss.	0	-	-	-	Flow	10-21-33	-	-	18/.61	52	69	111		4
25S	21E	SE¼SE¼NE¼ 20	W	National Park Service	2	Navajo Ss.	0	-	Ac 124	270 / 3(M)	Pumped	12-11-58	67	12	-	55	21	75		2
25S	21E	SE¼NW¼ 26	S	-	Moab Bridge Spring	Wingate Ss	0	-	-	170 / 5(R)	Flow	10-3-58	62	11	-	33	10	18		1
25S	21E	NE¼NE¼NE¼ 35	S	D. Parriot	-	do	0	-	-	-	do	10-24-33	-	-	.20	32	16	5.7		1
25S	21E	SW¼SW¼SE¼ 16	S	M. R. Fish	-	do	0	-	-	50 / 1.5(R)	do	10-27-33	-	-	.15	36	19	10		1
25S	23E	NE¼NE¼NW¼ 3	W	A. Sarten	-	Cutler Fm.	90	-	285-90	5,300 / 200(E)	do	2-26-55	-	17	.05	135	30	97	2.6	1
26S	7E	C NW¼NW¼ 19	O	Shell Oil Co.	1	Mississippian sed. rocks	5,002	5,906	5,420-5,530	-	DST 3	11-15-60	-	-	-	424	101	1,672		1,9
						Devonian sed. rocks	6,220	6,672												
						Cambrian sed. rocks	6,672		6,100-6,704	-	DST 2	11-14-60	-	-	-	916	158	1,038		1,3
26S	7E	C NE¼SE¼ 20	O	Shumway Uranium Mining Corp.	1	Navajo Ss.	62	776	605-50	-	Bailed	6- -57	-	-	1.36	-	-	-		-
						Wingate Ss.	1,173	1,375	Ac 1,450	-	do	6- -57	-	-	.24	-	-	-		-
						Chinle Fm.	1,375	1,783	1,655-60	-	do	7- -57	-	-	1.56	-	-	-		-
26S	13E	NW¼SE¼SW¼ 19	W	-	Jeffery Well	Encrada(?) Ss.	-	-	-	-	-	10-30-58	59	9.3	-	224	227	69		3
26S	14E	C NW¼NW¼ 7	O	Odessa Natural Gas Co.	1	Mississippian sed. rocks	5,617	-	5,619-5,750	-	DST 2	11- -59	-	-	-	1,089	277	3,117		4
26S	14E	C SW¼SW¼ 30	O	Humble Oil and Refining Co.	7	do	5,812	-	5,860-6,207	-	DST 3	12-27-61	-	-	-	160	923	1,166		3
26S	17E	SW¼SW¼SW¼ 5	O	Superior Oil Co.	14-5	do	6,001	-	6,150-6,410	-	See Remarks	1-12-62	-	-	-	160	1,792	9,860		1,1
									6,150-6,410	-	DST 3	1-12-62	-	-	4.3	160	2,381	4,338		
									6,410-66	-	See Remarks	1- -62	-	-	0	480	1,944	21,788		1,
									6,410-66	-	DST 5	1- -62	-	-	0	320	1,021	3,922		1,
26S	18E	SW¼NE¼SE¼ 7	O	Pure Oil Co.	1	do	5,305	-	6,978-7,086	-	DST 3	10-16-58	-	-	0	1,480	316	251		
26S	20E	SE¼SE¼NW¼ 9	O	Southern Natural Gas Co.	1	See Remarks	7,023	7,214	7,050-75	-	Production Water	11- 2-64	-	-	74	74,100	8,450	22,300		
26S	22E	NW¼NW¼SW¼ 13	S	J. Westwood	-	Navajo Ss.	0	-	-	14 / 1(E)	Flow	9- 7-53	-	11	.01	16	13	8.8	1.3	
27S	11E	NE¼SW¼SE¼ 14	W	Civil Aeronautics Administration	1	Carmel Fm.	350	-	418-38	See Remarks	do	9-28-52	-	13	2.2	130	5.3	1,160		-
27S	11E	NW¼SE¼SE¼ 34	W	do	1	do	-	-	498-502	100 / 3(R)	do	9-28-52	-	14	3.0	101	7.1	369		
27S	12E	SW¼NE¼NE¼ 9	O	Carter Oil Co.	1	Mississippian sed. rocks	5,990	-	6,210-6,430	-	DST 3	2- -59	-	-	-	1,138	337	1,630		1,
27S	13E	NE¼NE¼ 4	W	Bureau of Land Management	31	Encrada Ss.	-	-	See Remarks	-	Pumped	11- 1-44	-	-	-	92	46	17		
27S	13E	C NW¼NE¼ 30	O	Superior Oil Co.	31-30	Mississippian sed. rocks	6,390	7,105	6,549-6,965	-	DST 2	1- -62	-	-	0	400	535	3,071		
27S	13E	C SE¼SW¼ 36	O	Continental Oil Co.	1	do	6,643	-	6,712-6,820	-	DST	12-20-58	-	-	13/1	1,200	512	4,000	130	
27S	14E	NE¼NE¼NW¼ 5	W	G. H. Franz	Franz Well	Navajo Ss.	380	-	580-610	-	-	10-30-58	59	8.2	-	204	143	41		
27S	14E	NE¼SW¼NW¼ 5	O	Carter Oil Co.	1	Moenkopi Mbr. of Chinle Fm.	2,165	2,235	See Remarks	-	DST 1	12- 5-55	-	-	-	34	27	1,380		1
27S	14E	C SW¼SW¼ 17	O	Amerada Petroleum Corp.	5	White Rim Ss. Mbr. of Cutler Fm.	2,695	-	2,731-2,826	-	DST 2	10-12-59	-	-	.0	496	272	901		1
27S	15E	C SE¼NE¼ 32	O	Texaco, Inc.	6	Coconino Ss.	1,352	1,390	See Remarks	-	DST 2	10- 8-60	-	-	-	-	760	108		
						Mississippian sed. rocks	5,845	6,376	5,900-90	-	DST 4	12-23-60	-	-	-	1,200	1,762	7,380		
27S	15E	C SW¼NW¼ 35	O	Carter Oil Co.	2	do	5,170	-	5,170-5,410	-	DST 3	10-18-56	-	-	-	1,920	0	3,130		
27S	16E	NW¼SW¼NW¼ 33	O	Superior Oil Co.	32-33	do	5,779	6,435	5,394-5,994	-	DST 3	11- -61	-	-	0	1,200	438	9,108		
27S	18E	NE¼NE¼SW¼ 25	O	Husky Oil Co.	1	do	6,277	-	See Remarks	-	DST 3	3-30-63	-	-	-	2,202	329	86,704	400	
27S	21E	SW¼SE¼SW¼ 3	O	Humble Oil and Refining Co.	3	do	6,125	-	6,150-6,274	-	DST 5	1- -63	-	-	-	2,000	243	36,133		
27S	22E	NW¼SE¼SE¼ 17	O	do	1	do	6,960	7,345	7,025-83	-	DST 2	12-10-60	-	-	0	360	1,360	47,975		
28S	11E	SE¼NE¼SW¼ 5	O	Tenneco Oil Co.	1	do	7,078	-	7,100-7,301	-	DST 2	3- -61	-	-	72	600	416	1,173		
28S	11E	NE¼SW¼NE¼ 16	W	-	Old CCC Well	Encrada Ss.	0	-	290-320	-	Flow	3-16-47	61	-	-	15	14	115		

(CO3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2]	Remarks
	million												
0.0	240	6,106	-	11,751	-	-	-	-	-	[17] 0.44	7.5	CL	DST 4 recovered 3,240 feet of slightly salty black sulfur water.
0	97	112	0.1	680	413	-	-	-	-	-	-	GS	
0	133	49	1.6	454	224	45	42	2.2	762	-	7.4	GS	
0	36	12	.8	186	124	16	24	.7	298	-	8.1	GS	
0	35	12	.8	164	146	-	-	-	-	-	-	GS	
	51	21	.5	202	168	-	-	-	-	-	-	GS	Spring was developed by a tunnel that was driven 116 feet into sandstone.
	419	114	2.6	931	542	386	28	1.8	1,400	-	7.3	GS	Analysis includes 0.06 ppm boron, 0.2 ppm fluoride, and 0.00 ppm manganese.
0	2,925	518	-	7,279	1,480	-	-	-	-	[19] 1.56	7.4	ShO	Analysis includes 2.0 ppm ammonium and 2 ppm boron. DST 3 recovered 3,890 feet (54 barrels) of water-cut mud, mud-cut sulfurous water, and sulfurous water with salinity of 1,160 ppm sodium chloride.
	2,350	638	-	6,142	2,200	-	-	-	-	[20] 1.63	7.3	ShO	Analysis includes 1 ppm ammonium and 1 ppm boron. DST 2 recovered 4,540 feet (60 barrels) of mud-cut water with a salinity of 1,320 ppm sodium chloride.
	92	26	-	[21] 320	-	-	-	-	-	-	8.4	UC	Analysis includes 235 ppm of alkalinity as calcium carbonate.
	279	2,150	-	[21] 5,079	-	-	-	-	-	-	12.1	UC	Analysis includes 1,875 ppm of alkalinity as calcium carbonate.
	1,665	10,450	-	[21] 20,797	-	-	-	-	-	-	7.5	UC	Analysis includes 410 ppm of alkalinity as calcium carbonate.
	1,390	12	6.4	2,250	1,500	1,320	9	.8	2,330	-	8.3	GS	Analysis includes 0.9 ppm fluoride.
	3,004	5,040	-	12,767	-	-	-	-	-	.62	7.5	CGL	DST 2 recovered 180 feet of mud-cut sulfur water and 2,595 feet of sulfur water.
	122	4,260	-	7,361	-	-	-	-	-	[9] .74	6.0	CL	DST 3 recovered 3,625 feet of slightly mud-cut water.
	200	19,880	-	33,063	-	-	-	-	-	[9] .19	6.0	CL	DST 3: good blow of gas immediately increasing to strong in 2 minutes, fluid to surface in 7 minutes--90 percent water, 10 percent mud and asphaltic residue. Flowed by heads, changed to small spray of sulfur water.
	480	13,561	-	21,364	-	-	-	-	-	[9] .26	6.0	CL	DST 3 recovered 450 feet of water.
	400	38,908	-	66,082	-	-	-	-	-	[9] .11	7.0	CL	DST 5: good blow of gas immediately increasing through test. Fluid to surface in 35 minutes
	680	8,094	-	15,745	-	-	-	-	-	[9] .38	7.5	CL	DST 5 recovered 2,340 feet of sulfur water; sample from bottom of fluid column. Samples from top and middle of fluid column contained 39,876 and 22,242 ppm of dissolved solids, respectively.
	2,380	1,135	-	7,172	-	-	-	-	-	1.7	7.0	CL	DST 3 recovered 300 feet of muddy water and 5,600 feet of slightly salty sulfur water.
	140	190,000	2.7	295,000	220,000	220,000	18	21	160,000	-	4.4	Gb	Producing formation reported to be "Cane Creek Member" of Paradox Formation.
	48	4.2	1.1	187	143	38	12	-	316	-	7.9	GS	Analysis includes 0.07 ppm boron and 0.1 ppm fluoride.
	236	1,730	-	3,391	346	-	-	-	-	-	7.3	DH	Reported flow on 8-18-48 was .7 gpm (580 bwpd).
	291	1,220	-	2,730	282	-	-	-	-	-	8.0	DH	
	1,938	2,940	-	9,212	-	-	-	-	-	.89	7.0	CGL	DST 3 recovered 540 feet of water-cut mud and 4,920 feet of slightly brackish water.
	53	9.0	1.0	350	344	44	-	.4	673	-	-	GS	Well drilled in 1935 to depth of 795 feet, cased to 456 feet; depth of water in November 1935 was 720 feet.
	320	6,455	-	11,361	-	-	-	-	-	[22] .44	-	CL	DST 2 recovered 550 feet of mud and water-cut water and 5,000 feet of brackish water.
	1,100	7,100	-	17,400	-	-	-	-	-	[23] .47	7.8	CO	DST recovered 5,510 feet of salty sulfur water.
	1,210	12	8.6	1,530	1,100	988	7	5	1,770	-	7.0	GS	Analysis includes 0.5 ppm fluoride.
	993	620	-	4,980	-	-	-	-	-	1.5	8.6	CGL	Sample collected with bottom of drill hole at 2,356 feet in the Moenkopi Formation and a packer at 2,142 feet in Chinle Formation; however, Mossback Member of Chinle Formation is reported producing formation. DST 1 recovered 510 feet of mud-cut fresh water.
0	2,899	199	-	6,011	-	-	-	-	-	.26	6.0	CL	DST 2 recovered 1,365 feet of muddy fresh water.
	1,780	600	-	3,378	-	-	-	-	-	2.56	10.5	RME	Interval tested was from 2,330 feet in Moenkopi Formation to 2,366 feet in Coconino Sandstone; however, the latter formation was the reported producing formation. DST 2 recovered 650 feet of muddy fresh water.
	3,840	15,500	-	30,279	-	-	-	-	-	.51	7.3	RME	DST 4 recovered 4,500 feet of water and 100 feet of mud.
	3,240	3,510	-	14,427	-	-	-	-	-	.77	5.0	CL	DST 9 recovered 732 feet of drilling fluid and 3,085 feet of brackish water with sulfur odor in the last 290 feet.
	2,200	15,330	-	29,129	-	-	-	-	-	[9] .23	7.0	CL	DST 3 recovered 580 feet of brackish muddy water and 3,653 feet of brackish water. Samples from top and middle of recovery column contained 203,592 and 72,949 ppm of dissolved solids, respectively.
	3,200	135,000	-	230,042	-	-	-	-	-	.05	7.5	CGL	Interval tested was from 6,260 feet in Pennsylvanian rock to 6,400 feet in Mississippian rock, however, the latter rock was the reported producing formation. DST 3 recovered 2,127 feet of black salty sulfur water.
	120	59,640	-	98,526	-	-	-	-	-	[24] .08	6.0	CL	DST 5 recovered 360 feet of slightly gas-cut drilling mud, 270 feet of highly water-cut drilling mud, and 4,980 feet of salt water with sulfur odor; sampled just above tool.
	2,600	77,390	-	130,964	-	-	-	-	-	[9] .08	6.0	CL	DST 2 recovered 4,741 feet of black salty sulfur water; sample collected 1,500 feet from bottom.
	1,200	2,130	-	7,343	-	-	-	-	-	1.05	7.0	CL	DST 2 recovered 5,200 feet of fresh water in 4.5-inch drill pipe.
	130	8	.1	400	95	0	72	5.1	617	-	-	GS	Analysis includes 0.7 ppm fluoride.

Table 3. — Continued

Location T	R	Section	Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bpd/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	NA + K: Sodium (Na)	NA + K: Potassium (K)	Bicarbonate (HCO_3)
29S	11E	NW¼SE¼SE¼ 16	W	E. E. Stone	1	Entrada Ss.	0	-	305-340	See Remarks	Flow	9- 5-59	64	14	-	17	9.1	137		12
29S	14E	SE¼NE¼SW¼ 22	S	A. Ekker	Roobers Roost Spring	Carmel Fm.	0	-	-	34/1(R)	do	5-20-57	52	14	0.01	547	102	20	4.4	10
29S	15E	NW¼NW¼SE¼ 21	S	do	Blue John Spring	Entrada Ss.	0	-	-	34/1(R)	do	5-21-57	54	18	.01	96	47	83	5.2	27
29S	15E	SE¼SE¼SE¼ 29	S	-	Granary Spring	do	0	-	-	-	do	11- 1-44	-	-	-	79	30	33		20
29S	18E	NW¼NE¼NW¼ 12	O	Pan American Petroleum Corp.	1	Mississippian sed. rocks	5,497	6,092	5,507-90 5,552- 5,825	-	DST 5 DST 6	5-25-60 5-28-60	-	-	-	1,234 1,963	348 198	7,078 11,044		69 42
						Elbert Fm.	6,234	6,420	6,391- 6,509											
						McCracken Mbr. of Elbert Fm.	6,420	6,462												
						Cambrian sed. rocks	6,462	6,509	See Remarks	-	DST 10	6-12-62	-	-	-	2,564	97	49,623		37
29S	19E	SW¼SE¼ 18	O	Shell Oil Co.	1	Mississippian sed. rocks	6,220	6,782	6,338- 6,467	-	DST 2	8-19-61	-	-	-	1,840	243	14,051		87
28S	21E	SW¼NE¼SW¼ 22	O	Richfield Oil Corp.	1	do	7,655	8,160	7,726-86	-	DST 3	12- -61	-	-	-	1,946	622	19,972		51
29S	22E	NE¼SW¼ 1	S	-	Kane Spring	Entrada Ss.	0	-	-	680/20(R)	-	10-28-33	-	-	-	54	36	31		18
28S	22E	NW¼SE¼SE¼ 10	O	Pure Oil Co.	1	Mississippian sed. rocks	7,030	7,447	7,098- 7,209	-	DST 1	1-12-64	-	-	-	2,087	445	11,913	640	39
28S	23E	SW¼NW¼ 21	O	California Oil Co.	1	Cutler Fm.	3,172	7,392	6,475- 6,575	-	Flow line	7- -61	-	-	-	479	1,556	2,386		78
						Hermosa Gr.	7,392	10,202	7,394- 8,012	-	DST 1	8- 7-61	-	-	-	10,398	2,223	44,451		11
						Mississippian sed. rocks	10,226	10,516	10,255- 10,427	-	DST 2	9- -61	-	-	-	1,501	289	84,397		44
28S	23E	NE¼NW¼SE¼ 16	S	-	Trough Spring	Burro Canyon Fm.	0	-	-	-	-	10-25-33	-	-	.18	109	30	23		2
28S	26E	SE¼SE¼SE¼ 30	S	Roy Turner	-	Entrada(?) Ss.	0	-	-	170/5(R)	Flow	10- 5-60	59	10	.01	40	18	1.7	1.9	1
29S	10E	N½SW¼SW¼ 8	O	Amerada Petroleum Corp.	1	Sinbad Ls. Mbr. of Moenkopi Fm.	4,746	4,823	4,750-90	-	DST 1	7-16-58	-	-	-	50	19	1,511		5
						Kaibab Ls.	4,823	4,863	4,840-65	-	DST 2	7-18-58	-	-	-	550	154	467		6
						Organ Rock Tongue of Cutler Fm.	5,107	5,351	5,107-59	-	DST 3	7-22-58	-	-	-	726	90	669		1,1
						Halgaito Tongue of Cutler Fm.	5,810	6,105	6,035-60	-	DST 4	7-29-58	-	-	-	456	139	895		1,1
						Paradox Fm.	6,742	7,586	7,170- 7,240	-	DST 6	8-21-58	-	-	-	361	24	3,523		1,0
									7,390- 7,470	-	DST 7	8-28-58	-	-	-	375	108	1,263		4
						Leadville Ls.	7,792	3,014	7,920-53	-	DST 8	9- 8-58	-	-	-	1,043	242	1,584		1,4
						Madison Ls.	8,014	-	8,150-74	-	DST 9	9-13-58	-	-	-	881	463	1,352		1,1
29S	11E	C NE¼NE¼ 2	O	do	1	Moenkopi Fm.	2,304	2,706												
						Sinbad Ls. Mbr. of Moenkopi Fm.	2,706	2,751												
									2,695-											
						Kaibab Ls.	2,751	2,795	2,783	-	DST 4	12-22-58	-	-	-	99	31	2,131		1,6
						White Rim Ss. Mbr. of Cutler Fm.	2,795	-	2,787- 2,347	-	DST 5	12-23-58	-	-	-	102	38	2,061		1,5
29S	12E	C SW¼NE¼ 33	O	Tenneco Oil Co.	1	Sinbad Ls. Mbr. of Moenkopi Fm.	1,916	2,290	2,162-78	432(R)/13	Swab test	2- 9-59	-	-	-	1,390	367	1,280		1,4
29S	15E	NW¼NW¼SE¼ 14	S	A. Ekker	Trail Spring	Navajo Ss.	0	-	-	17/0.5(R)	Flow	5-22-57	48	8.6	.01	28	22	4.8	2.1	
29S	15E	S½SE¼NE¼ 20	O	Continental Oil Co.	1	Mississippian sed. rocks	6,603	-	6,585- 6,346	-	DST 4	10- 4-58	-	-	18/17	2,100	471	30,000	218	
29S	20E	NE¼NW¼SW¼ 4	O	Humble Oil and Refining Co.	1	do	4,206	4,565	4,334-44	-	DST 2	12-18-59	-	-	0	1,560	399	25,134		
29S	21E	NW¼SW¼ 18	O	Pure Oil Co.	1	do	6,196	6,910	6,420- 6,340	-	DST 2	10- 5-61	-	-	-	2,865	632	75,900		1,
29S	23E	NE¼NW¼SW¼ 4	W	Graves Oil Co.	1	Navajo Ss.	-	-	682-828	-	See Remarks	1-15-64	-	11	18/.01	66	39	35	4.4	
29S	26E	NW¼SE¼SE¼ 5	O	Superior Oil Co.	1-5	Cutler Fm.	2,822	3,612	3,126-94	See Remarks	Flow	11- -63	-	-	-	705	137	652	9	
						Mississippian sed. rocks	11,340	11,543	11,406- 11,557	-	DST 3	2-20-64	-	-	-	2,360	646	42,343	2,100	
30S	16E	NW¼NE¼NE¼ 1	S	-	French Spring	Navajo Ss.	0	-	-	34/1(R)	Flow	3-22-57	49	8.3	14/.00	43	13	11	1.5	
30S	24E	SE¼ 21	W	"	"	Wingate Ss.	-	-	-	-	-	5- 4-39	-	12	-	11	11	93		
31S	11E	SE¼SE¼SE¼ 27	O	California Oil Co.	1-K	Mississippian sed. rocks	6,508	-	6,600-83	-	DST 1	11-27-61	-	-	-	1,179	227	2,254		
31S	13E	9	S	-	-	Wingate Ss.	0	-	-	100/3(R)	Flow	6-20-57	64	9.1	.01	25	28	46	3.5	
31S	14E	NE¼SE¼ 23	S	-	Lower North Hatch Spring	Moenkopi Fm.	0	-	-	-	do	12- -58	-	-	-	26	66	642		
31S	14E	SW¼NW¼ 36	S	-	Tonco Mill Site Spring	Shinarump Mbr. of Chinle Fm.	0	-	-	-	do	8- 4-58	-	-	-	36	52	378		
31S	15E	9	S	-	Two-Pipe Spring	Kayenta Fm.	0	-	-	17/0.5(E)	do	9- -56	-	-	-	36	15	26	4	
31S	13E	NW¼SE¼NW¼ 19	O	Superior Oil Co.	22-19	Paradox Fm.	2,750	3,780	2,339-64	-	DST 1	12- -58	-	-	-	1,076	477	14,810		

million												
Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1/]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2/]	Remarks
144	4.5	1.8	448	67	0	82	7.3	688	-	8.6	GS	Reported flow on 5-29-62 was 13 gpm (440 bwpd). Analysis includes 0.22 ppm boron and 0.3 ppm fluoride.
1,580	19	.2	2,390	1,780	1,620	2	.2	2,470	-	6.8	GS	Analysis includes 0.12 ppm boron and 0.3 ppm fluoride.
240	103	14	742	434	209	29	1.7	1,160	-	6.9	GS	Analysis includes 0.07 ppm boron and 0.3 ppm fluoride.
147	52	.2	441	320	154	-	.8	740	-	-	GS	
3,429	11,170	-	23,954	-	-	-	-	-	[9/] 0.28	7.7	PA	DST 5 recovered 3,150 feet of salty sulfur water.
3,735	48,935	-	86,202	-	-	-	-	-	[9/] .09	7.7	PA	DST 6 recovered 3,600 feet of black sulfur water.
5,090	77,302	-	135,060	-	-	-	-	-	[9/] .06	7.5	PA	DST 10 recovered 219 feet of water and mud and 2,000 feet of salty black water. Analysis report lists McCracken Member of Elbert Formation as scratum yielding water.
4,300	21,655	-	42,967	-	-	-	-	-	[20/] .17	7.2	SHO	DST 2 recovered 380 feet (2.8 barrels) of water-cut mud and 3,220 feet (23.5 barrels) of black sulfur water with trace of tarry residue; sample taken at tool.
3,550	64,000	-	110,342	-	-	-	-	-	.08	6.9	CGL	DST 3 recovered 200 feet of drilling mud, 3,076 feet of muddy salt water, and 2,250 feet of black sulfur water; sample from 60th stand.
112	37	.4	379	283	-	-	-	-	-	-	GS	Analysis includes 0.00 ppm boron.
4,300	52,000	-	91,785	-	-	-	-	-	.09	6.2	CGL	DST 1 recovered 460 feet of drilling fluid and 5,550 feet of black salt water.
11,115	410	-	16,331	-	-	-	-	-	.72	7.6	CGL	
547	94,000	-	152,279	-	-	-	-	-	.06	6.6	CGL	Bottom sample.
3,707	131,000	-	221,192	-	-	-	-	-	.05	7.7	CGL	Sample taken from drill collars.
191	17	1.2	[25/] 504	396	-	-	-	-	-	-	GS	
16	3.0	.1	190	172	10	-	.1	315	-	8.3	GS	Analysis includes 0.1 ppm aluminum, 0.03 ppm boron, and 0.1 ppm fluoride.
1,770	630	-	4,437	-	-	-	-	-	1.75	8.5	CGL	DST 1 recovered 1,100 feet of sulfur water, slightly muddy at top.
1,799	240	-	3,720	-	-	-	-	-	1.25	7.5	CGL	DST 2 recovered 465 feet of sulfur water.
1,989	460	-	4,487	-	-	-	-	-	2.28	7.3	CGL	DST 3 recovered 828 feet of water-cut mud, 1,380 feet of slightly mud-cut fresh water, and 2,128 feet of fresh water.
1,976	440	-	4,495	-	-	-	-	-	2.08	7.3	CGL	DST 4 recovered 450 feet of slightly mud-cut fresh water.
6,197	660	-	11,690	-	-	-	-	-	90	7.5	CGL	DST 6 recovered 2,300 feet of rotary mud heavily cut with water (50 percent mud and 50 percent water).
1,691	200	-	3,342	-	-	-	-	-	1.61	7.5	CGL	DST 7 recovered 6,310 feet of slightly muddy fresh water.
1,940	2,940	-	8,470	-	-	-	-	-	.95	7.9	CGL	DST 8 recovered 90 feet of drilling mud and 6,808 feet of brackish water.
1,756	2,960	-	8,037	-	-	-	-	-	.98	7.2	CGL	DST 9 recovered an estimated 6,000 feet of brackish water.
1,309	1,180	-	6,167	-	-	-	-	-	1.50	7.5	CGL	DST 4 recovered 540 feet of water-cut mud and 1,871 feet of sulfur water.
1,955	1,120	-	6,045	-	-	-	-	-	1.50	7.7	CGL	DST 5 recovered 300 feet of water-cut mud and 2,071 feet of sulfur water.
1,330	5,620	-	9,130	-	-	-	-	-	-	-	GS	
15	10	2.6	179	159	16	6	.2	318	-	7.3	GS	Analysis includes 0.01 ppm boron and 0.1 ppm fluoride.
5,900	46,500	-	96,300	-	-	-	-	-	[22/] .09	7.7	CO	DST 4 recovered 900 feet of muddy water and 680 feet of black sulfur water
5,145	39,902	-	73,396	-	-	-	-	-	.12	6.5	CL	DST 2 recovered 3,730 feet of black sulfur water with traces of hydrogen sulfide.
3,840	120,000	-	205,067	-	-	-	-	-	.09	6.0	RME	DST 2 recovered 60 feet of drilling mud and 4,000 feet of black salt water.
152	35	27	505	325	-	-	-	760	-	7.5	DH	Water collected from kitchen tap in American Cafe, La Sal Junction, San Juan County. Analysis includes 0.10 ppm boron and 0.38 ppm fluoride.
1,100	240	-	4,957	-	-	-	-	-	2.1	6.8	CGL	Four-inch water flow from 5,165-5,194 feet; then increased to 8-inch flow at 5,194 feet. Flow washed hole clean and clear water was observed at surface.
1,650	71,000	-	121,399	-	-	-	-	-	08	6.3	CGL	DST 3 recovered 1,170 feet of muddy water. Sample was cloudy orange water with precipitated iron oxide. Analysis includes 5 ppm lithium.
22	18	1.5	205	161	26	13	.4	362	-	7.1	GS	Analysis includes 0.01 ppm boron and 0.1 ppm fluoride.
18	20	1.0	303	74	0	73	4.7	500	-	7.8	GS	Analysis includes 0.01 ppm boron and 0.2 ppm fluoride.
2,243	4,260	-	10,426	-	-	-	-	-	.76	7.8	CGL	DST 1 recovered 2,430 feet of slightly brackish water.
44	12	3.7	312	176	0	35	1.5	528	-	7.4	GS	Analysis includes 0.06 ppm boron and 0.3 ppm fluoride.
592	307	-	2,355	336	-	-	-	-	[23/] 2.22	6.0	SO	Analysis includes 33 ppm iron and alum.
650	94	-	1,613	302	-	-	-	-	[23/] 5.5	6.8	SO	
25	21	-	220	152	0	27	.9	374	-	8.2	GS	Spring is on south side of ridge above North Hatch Canyon.
2,984	23,003	-	43,770	4,650	-	-	-	-	[13/] .19	6.8	SO	DST 1 recovered 270 feet of slightly mud-cut water.

Table 3. — Continued

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bbl/day)	Method of point of collection	Date of collection	Temperature (°F)	Parts per					
														Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Na + K	
T	R	Section																Sodium (Na)	Potassium (K)	Bicarbonate
31S	23E	NW¼ 7	W	R. Bailey	-	Wingate Ss.	-	-	-	-	-	10-25-33	-	-	0.18	63	33	-		1
32S	23E	SW¼SW¼SW¼ 24	S	-	Peters Spring	Burro Canyon Fm.	0	-	-	-	Flow	10-28-33	-	-	-	62	20	28		2
33S	13E	4	S	-	-	Wingate Ss.	0	-	-	340 / 20(E)	do	6- 9-63	58	10	-	14	11	46		2
33S	15E	19	S	-	GJ-172	Halgaico Tongue of Cutler Fm.	0	-	-	680 / 30(E)	do	4-23-59	-	17	-	838	202	1,180		1,1
33S	15E	28	S	-	GJ-166	Rico Fm.	0	-	-	70 / 2(E)	do	4-23-59	-	12	-	220	65	79		2
33S	15E	29	S	-	GJ-171	do	0	-	-	530 / 25(E)	do	4-23-59	-	15	-	317	137	659		7
33S	15E	32	S	-	GJ-170	do	0	-	-	350 / 25(E)	do	4-23-59	-	22	.04	540	161	768	56	8
33S	16E	19	S	-	-	Cutler Fm.	0	-	-	12,200 / 360(R)	do	9-25-47	-	-	-	135	64	16		1
33S	16E	19	S	-	-	Hermosa Gr.	0	-	-	15,200 / 430(R)	do	10- 3-48	61	8.6	-	84	28	12		1
33S	23E	NE¼NE¼SE¼ 36	W	Atomic Energy Commission	3	Dakota Ss. and Burro Canyon Fm.	30	230	97-230	1,050 / 31(M)	Pumped	5-11-55	51	10	.05	56	13	64	3.1	2
33S	24E	SE¼NE¼SE¼ 19	W	do	Hall 1	do	81	257	130-257	1,200 / 35(R)	do	12-10-55	-	15	-	12	13	58		1
						Entrada Ss.	1,085	1,256	1,085-1,256	1,400 / 40(R)	do	11-30-55	90	21	-	6.2	2.6	301	5.1	
						Navajo Ss.	1,305	1,685	1,313-1,673	1,700 / 50(R)	do	11-22-55	68	28	-	19	19	54		1
33S	24E	NW¼NE¼SE¼ 30	W	do	Dalton 2	Dakota Ss. and Burro Canyon Fm.	195	319	203-319	750 / 22(M)	do	7-11-55	-	9.1	-	39	13	72	3.6	
33S	24E	SW¼SE¼SE¼ 30	W	do	Dalton 1	do	159	325	208-325	4,250 / 125(M)	do	10-16-53	56	3.5	8.1	55	20	56	2.3	
33S	24E	NW¼NW¼NE¼ 31	W	do	Perkin 1	Dakota Ss. and Burro Canyon Fm.	202	320	202-353	510 / 15(M)	do	6-16-55	-	10	.02	57	17	64	3.3	
						Morrison Fm.	320	-												
33S	24E	NW¼SW¼NE¼ 31	W	do	Jensen 1	Dakota Ss. and Burro Canyon Fm.	226	353	253-355	1,700 / 50(M)	do	5-16-55	56	11	.19	15	5.0	85	2.5	
33S	24E	SW¼SW¼NW¼ 31	W	do	Jensen 4	Dakota Ss. and Burro Canyon Fm.	225	317	228-343	750 / 22(M)	do	8- 5-55	-	12	-	15	4.1	83	2.1	
						Morrison Fm.	317	-												
33S	24E	NW¼SE¼NW¼ 31	W	do	Jensen 3	Dakota Ss. and Burro Canyon Fm.	214	370	217-370	1,400 / 40(M)	do	8- 5-55	60	12	-	13	3.8	83	2.1	
34S	9E	SE¼SW¼SW¼ 2	O	Superior Oil Co.	14-2	White Rim Ss. Mbr. of Cutler Fm.	5,832	6,255	5,858-5,991	-	DST 2	5- -61	-	-	8.4	580	316	48		
						Mississippian sed. rocks	9,240	-	9,555-9,582	-	DST 4	5- -61	-	-	16	497	170	1,485		1,
34S	11E	14	S	-	Star Ranch Spring	Dakota Ss.	0	-	-	510 / 15(R)	Flow	4-27-59	53	19	-	49	9.6	9.8		
34S	14E	19	S	-	-	Organ Rock Tongue of Cutler Fm.	0	-	-	1,200 / 30(E)	do	4-27-59	-	11	-	48	48	25		
35S	3E	C NE¼NE¼ 29	O	Tenneco Oil Co.	1	Torowean Fm.	4,956	5,030	4,985-5,015	-	DST 3	9- -63	-	-	0	300	194	1,288		2,
35S	3E	W½NE¼NE¼ 29	O	do	2	Molas Fm.	6,830	7,009	6,912-7,223	528(R) / lo	Swab test	10- -63	-	-	0	736	758	1,288		3.
						Mississippian sed. rocks	7,009	-												
35S	7E	25	M	-	Rainy Day Mine	Shinarump Mbr. of Chinle Fm.	-	-	-	-	-	4-26-59	54	3.8	-	70	48	2,350		1.
35S	9E	26	S	Bureau of Land Management	Clay Spring	Burro Canyon Fm.	0	-	-	34 / 1(E)	Flow	4-26-59	58	16	-	26	10	103		
35S	10E	18	S	-	Eggnog Spring	do	0	-	-	34 / 1(E)	do	4-26-59	59	12	-	57	16	70		
35S	13E	35	S	-	-	Moenkopi Fm.	0	-	-	15,300 / 450(E)	do	9- 8-57	-	16	-	125	87	327		
35S	14E	30	S	-	Warm Spring	do	0	-	-	1,700 / 50(E)	do	8- 9-63	78	11	-	130	37	342		
35S	15E	SW¼SW¼ 4	W	Happy Jack Mine	-	Rico Fm.	-	-	-	340 / 10(R)	Pumped	8- 9-63	-	7.6	14/ 91	38	46	19		
35S	22E	NW¼SE¼ 33	O	Standard Oil Co. of California	1	Paradox Fm.	6,057	-	6,098-6,109	-	DST 2	9- -57	-	-	-	13,570	5,012	46,727		
36S	9E	10	S	-	Bears Spring	Burro Canyon Fm.	0	-	-	17 / 0.5(E)	Flow	4-26-59	54	14	-	79	41	66		
36S	10E	E½SE¼SE¼ 18	O	California Oil Co.	1	White Rim Ss. Mbr. of Cutler Fm.	3,930	4,243	3,924-46	-	DST 3	4- 6-52	-	-	-	146	87	393		
									3,964-62	-	DST 5	4- 7-52	-	-	-	163	87	492		
						Redwall Ls.	7,201	7,305	7,316-49	-	DST 3	3- -52	-	-	-	852	192	456		1
						Devonian sed. rocks	7,305	8,316	8,279-8,314	-	DST 4	3-27-52	-	-	-	932	160	1,476		1
36S	13E	21	S	-	GJ-115	Wingate Ss.	0	-	-	170 / 5(E)	Flow	4-23-59	-	16	-	23	13	33		

million												
Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2]	Remarks
65	17	14	-	293	-	-	-	-	-	-	GS	
86	12	.4	324	237	-	-	0.8	-	-	-	GS	Analysis includes 0.0 ppm fluoride.
33	9.0	.5	332	210	0	32	1.4	562	-	7.5	GS	
1,920	1,800	1.7	6,530	2,920	1,970	47	9.5	8,800	-	6.7	GS	Analysis includes 2.2 ppm boron and 1.9 ppm fluoride.
816	98	.7	1,220	816	609	17	1.2	1,690	-	7.6	GS	Analysis includes 0.16 ppm boron and 0.7 ppm fluoride.
1,250	970	2.7	3,920	1,860	1,240	44	6.7	5,430	-	7.2	GS	Analysis includes 1.0 ppm boron and 0.6 ppm fluoride.
1,430	1,270	1.7	4,770	2,260	1,560	42	-	7,010	-	6.8	GS	Spring has hydrogen sulfide odor. Sulfur deposits at spring. Analysis includes 1.5 ppm boron and 1.8 ppm fluoride.
456	20	.0	770	600	-	-	.3	-	-	-	CS	
183	8.0	1.0	414	324	-	-	.3	621	-	-	GS	
109	5.0	.1	390	193	0	41	2.0	612	-	7.4	GS	Sample collected after 25 hours of pumping. Analysis includes 0.0 ppm fluoride.
81	8.0	.0	305	132	0	-	-	496	-	8.4	GS	
130	7.5	.5	801	26	0	95	26	1,260	-	8.8	GS	Analysis includes 1.5 ppm fluoride.
46	5.5	.3	284	128	0	-	-	451	-	8.4	GS	
140	10	.2	436	209	0	42	2.2	694	-	7.4	GS	Sample collected after 30 minutes of pumping.
179	8.0	.6	453	220	47	39	1.9	685	-	7.1	GS	Analysis includes 0.01 ppm boron, 0.2 ppm fluoride, and 1.1 ppm manganese. Measured yield on 7-17-55 was 200 gpm (6,800 bwpd); water contained 416 ppm of dissolved solids.
135	7.5	.2	414	212	13	39	1.9	644	-	7.1	GS	Sample collected after 7.5 hours of pumping. Analysis includes 0.10 ppm boron and 0.2 ppm fluoride.
62	5.0	.1	291	58	0	75	4.9	462	-	7.5	GS	Sample collected after 20 hours of pumping. Analysis includes 0.3 ppm fluoride.
64	4.0	.5	292	55	0	76	4.9	474	-	7.5	GS	Sample collected after 1 hour of pumping.
63	4.0	.2	290	54	0	76	5.0	460	-	7.5	GS	Sample collected after 7 hours of pumping.
2,900	40	-	4,627	-	-	-	-	-	[3]/1.77	6.5	CL	DST 2 recovered 4,679 feet of fresh water.
3,200	525	-	7,259	-	-	-	-	-	[3]/1.12	7.0	CL	DST 4 recovered 2,400 feet of muddy water.
32	2.5	.3	199	149	16	13	.3	313	-	7.8	GS	Analysis includes 0.07 ppm boron and 0.2 ppm fluoride.
49	13	.9	375	318	17	14	.6	647	-	8.0	GS	Analysis includes 0.08 ppm boron and 0.2 ppm fluoride.
800	1,617	-	7,583	-	-	-	-	-	[4]/.93	7.3	CL	DST 3 recovered 1,000 feet of sulfur water
900	2,927	-	9,378	-	-	-	-	-	.80	7.0	CL	4½-inch liner set to 6,912 feet, swabbed 3 hours (open hole), recovered 22 barrels of water per hour.
3,300	1,040	21	8,510	372	0	94	64	10,900	-	8.2	GS	Water from mine sump. Analysis includes 0.31 ppm boron and 1.1 ppm fluoride.
72	11	.2	383	107	0	68	4.3	608	-	8.0	GS	Analysis includes 0.06 ppm boron and 0.4 ppm fluoride.
175	16	2.3	441	208	55	42	2.1	674	-	7.5	GS	Analysis includes 0.08 ppm boron and 0.2 ppm fluoride.
706	325	3.3	1,700	670	-	-	5.5	2,510	-	7.0	GS	
770	356	3.2	1,860	775	563	49	5.3	2,710	-	7.5	GS	Principal flow from large joint, with some gas issuing from bottom of wash. Estimated yield on 5-13-60 was 400 gpm (13,800 bwpd).
26	9.0	.3	318	284	0	12	.5	571	-	7.4	GS	
864	110,000	-	176,227	-	-	-	-	-	.07	6.7	CGL	DST 2 recovered 80 feet of gas, oil, and water-cut mud, 180 feet of gas and oil-cut salt water, and 150 feet of salt water with a skim of oil.
246	22	.5	601	365	144	28	1.5	855	-	7.7	GS	Analysis includes 0.12 ppm boron and 0.4 ppm fluoride.
972	86	-	2,236	-	-	-	-	-	4.0	7.8	CGL	DST 5 recovered 20 feet of rat-hole mud and 1,010 feet of black sulfur water with strong sulfide odor.
831	58	-	2,045	-	-	-	-	-	4.2	7.9	CGL	DST 6 recovered 30 feet of muddy water and 1,170 feet of black sulfur water with a strong sulfide odor
2,061	320	-	4,969	-	-	-	-	-	2.3	6.8	CGL	DST 1 recovered 105 feet of rat-hole mud, 95 feet of mud and water, and 1,000 feet of water.
3,399	500	-	8,891	-	-	-	-	-	1.5	7.6	CGL	DST 4 recovered 300 feet of muddy water and 550 feet of black sulfur water with a strong sulfide odor.
15	7.8	3.5	181	112	0	31	1.0	296	-	8.0	GS	Analysis includes 0.00 ppm boron and 0.1 ppm fluoride.

Table 3. — Continued

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (gpm/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per					
																	NA + K		
T	R	Section												Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)
36S	16E	34	S	-	Fry Spring	Cedar Mesa Ss. Mbr. of Cutler Fm.	0	-	-	-	Flow	11-19-58	-	13	0.01	42	30	145		48
36S	18E	NW¼NW¼NW¼ 29	S	-	J. Wiley Spring	do	0	-	-	-	do	11-19-58	51	9.8	.00	51	31	33		31
36S	21E	N½SE¼NW¼ 22	O	Pan American Petroleum Corp.	1	Paradox Fm.	5,286	-	5,325-94	-	DST 1	1-14-59	-	-	-	15,511	2,476	51,479		20
36S	21E	SW¼NW¼ 26	W	Atomic Energy Commission	1	Morrison Fm.	-	-	See Remarks	-	Pumped	6-24-60	-	13	.02	77	53	128	6.4	37
37S	2E	NW¼NW¼NW¼ 3	O	California Oil Co.	2	Kaibab Ls.	6,782	-	7,040-81	-	DST 7	10-27-52	-	-	-	664	131	4,366		3,06
37S	12E	9	S	-	-	Navajo Ss.	0	-	-	680/20(E)	Flow	9- 9-57	-	20	-	46	29	41		30
37S	15E	1	S	Radium King Mining Co.	-	Wingate Ss.	0	-	-	170/3(E)	do	4-28-59	-	13	-	30	17	15		18
37S	16E	6	M	Cog Minerals	-	Shinarump Mbr. of Chinle Fm.	-	-	-	-	-	4-28-59	-	9.5	-	202	71	1,600		40
37S	17E	11	S	National Park Service	Headquarters Spring	Cedar Mesa Ss. Mbr. of Cutler Fm.	0	-	-	34/1(R)	Flow	11-20-58	-	8.9	.00	48	32	35		28
37S	18E	35	S	-	Kane Gulch Spring	do	0	-	-	170/3(E)	do	9-10-58	-	12	-	79	47	46		34
37S	21E	NE¼NW¼ 10	M	Blanding Mines	-	Morrison Fm.	-	-	-	-	-	6-24-60	-	13	.25	116	114	179	10	48
37S	24E	NW¼NW¼SW¼ 24	W	M. Dalton	1	Entrada Ss.	-	-	-	See Remarks	Flow	8-10-54	-	-	-	19	7.6	103	21	27
37S	25E	NW¼NE¼SW¼ 17	W	do	1	do	-	-	-	-	do	8-10-54	-	-	-	15	4.8	161	15	25
38S	16E	NW¼NE¼NE¼ 22	O	Sinclair Oil and Gas Co.	1	Hermosa Fm.	1,334	2,317	2,297-2,312	-	Swab test	10- -57	-	-	-	4,248	430	1,779		91
38S	25E	SE¼SW¼NW¼ 7	W	H. C. Perkins	1	Entrada Ss.	-	-	265-320	See Remarks	Flow	6-16-54	-	-	-	5.8	3.4	122	3.9	37
38S	25E	SE¼SW¼SW¼ 7	W	do	1	do	-	-	120-515	See Remarks	do	6-16-54	-	-	-	6.6	2.7	124	3.9	3
39S	4E	NW¼SW¼NE¼ 16	O	Great Western Drilling Co.	2	Pennsylvanian sed. rocks	8,526	-	8,600-9,016	-	DST 3	3-25-55	-	-	-	588	164	1,321		1,6
39S	11E	9	S	-	GJ-191	Kayenta Fm.	0	-	-	70/2(E)	do	4-22-59	-	14	.04	21	9.7	3.4	1.4	1
39S	11E	20	S	-	GJ-91	Navajo Ss.	0	-	-	170/5(E)	do	4-22-59	-	11	-	35	13	4.3		1
39S	13E	E½SE¼SE¼ 24	O	Pan American Petroleum Corp.	1	Molas Fm.	4,886	-	5,011-5,231	-	DST 1	11- -58	-	-	-	554	311	1,209		1,2
39S	14E	1	S	-	-	Chinle Fm.	0	-	-	-	Flow	4-28-59	-	12	-	5.4	2.2	296		6
39S	14E	2	S	-	Irish Green Spring	Wingate Ss.	0	-	-	70/2(E)	do	5-12-60	-	14	-	28	14	14	1.2	1
39S	14E	10	S	-	Green Water Spring	do	-	-	-	17/0.5(E)	do	4-28-59	-	17	-	25	16	12		1
39S	18E	C NE¼NW¼ 15	O	Carter Oil Co.	1	Ouray Ls.	3,610	3,875	3,617-43	-	do	11- -54	-	-	-	420	445	4,513		1,3
39S	24E	NW¼SE¼SE¼ 18	W	S. L. Macon	1	Morrison Fm. Bluff Ss.	49 495	495 -	458-566	1,300/30(R)	do	8- 3-60	-	12	18/40	40	15	55	24	-
39S	25E	NE¼SW¼NE¼ 5	W	Bureau of Indian Affairs	1	Entrada Ss.	252	530	-	7,400/230(E)	do	7-19-52	-	9.0	.05	22	12	138	21	3
39S	25E	NE¼SW¼NE¼ 5	W	do	2	Glen Canyon Gr.	553	1,120	-	See Remarks	do	7-19-52	-	9.3	.09	28	10	264	17	6
39S	25E	NW¼NW¼NE¼ 13	W	J. Redd	1	Morrison Fm. Bluff Ss.	0 -	- -	90-444	170/5(R)	-	6-16-54	-	-	-	4.6	2.6	139	3.5	4
39S	25E	SW¼NW¼NW¼ 30	W	Bureau of Indian Affairs	12T-326	Morrison Fm. Bluff Ss.	32 519	519 680	403-480	5,100/150(R)	Flow	5-10-56	-	13	-	30	20	80		3
39S	26E	SW¼NE¼NE¼ 20	S	National Park Service	-	Dakota Ss.	0	-	-	34/1(E)	do	5- 1-59	-	8.1	-	98	134	122		
39S	26E	NW¼SE¼NW¼ 21	W	do	1	Entrada Ss. Navajo Ss.	1,080 1,225	1,200	See Remarks	See Remarks	Pumped	3-10-64	70	9.7	-	13	7.5	186		
39S	26E	33	S	Bureau of Indian Affairs	12R-163	Dakota Ss.	0	-	-	See Remarks	Flow	9- 8-54	73	15	-	25	41	556		
40S	7E	C SE¼NW¼ 2	O	Shell Oil Co.	1	Mississippian sed. rocks Devonian sed. rocks	6,121 6,725	6,725 -	6,142-7,155	-	DST 1	1-14-60	-	-	-	257	51	467		
40S	10E	NW¼ 10	S	-	GJ-201	White Rim Ss. Mbr. of Cutler Fm.	0	-	-	70/2(E)	Flow	4-18-59	-	12	-	341	131	265		
40S	10E	SW¼ 10	S	-	GJ-200	do	0	-	-	5,100/150(E)	do	4-18-59	-	8.3	-	407	140	779		
40S	10E	12	S	-	GJ-94	Wingate Ss.	0	-	-	170/3(E)	do	4-21-59	-	11	-	5.2	1.7	56		
40S	17E	NW¼SE¼NE¼ 25	S	-	-	Rico Fm.	0	-	-	170/3(E)	do	4-30-59	-	12	-	128	42	46		
40S	20E	NW¼SW¼SW¼ 36	S	-	Navajo Spring	Wingate Ss.	0	-	-	-	do	3- 1-44	-	-	-	18	13	74		
40S	21E	NW¼NE¼NE¼ 25	W	City of Bluff	1	Glen Canyon Gr.	200	1,200	See Remarks	1,700/50(E)	do	9-10-58	-	10	-	4.3	1.0	98		
40S	22E	SE¼SE¼SE¼ 30	S	St. Christopher Mission	Mission Spring	Bluff Ss.	0	-	-	-	do	4-26-47	-	-	-	27	9.2	13		
40S	22E	NE¼NE¼NE¼ 29	W	do	1	Glen Canyon Gr.	200	1,200	-	-	do	5-21-58	-	12	18/10	4.4	.6	34	1.5	

million												
Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1/]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2/]	Remarks
93	32	0.7	596	228	0	58	4.1	947	-	7.8	GS	
50	10	1.4	341	255	0	22	.9	584	-	7.6	GS	
766	113,295	-	183,734	-	-	-	-	-	[9/]0.05	7.5	PA	DST 1 recovered 75 feet of mud-cut salt water and 1,800 feet of salt water.
353	27	.2	844	410	100	40	2.8	1,250	-	7.7	GS	Reported well depth, 100 feet. Analysis includes 0.00 ppm boron and 0.2 ppm fluoride.
3,786	3,720	-	14,179	-	-	-	-	-	.61	6.7	CGL	DST 7 recovered 1,450 feet of gas-cut muddy water with sulfur odor and 90 feet of water and gas-cut mud.
51	16	1.5	354	234	-	-	1.2	500	-	7.6	GS	
11	10	1.0	187	145	0	18	.5	321	-	7.7	GS	Analysis includes 0.02 ppm boron and 0.3 ppm fluoride.
3,700	50	6.1	5,840	795	462	81	25	6,920	-	7.9	GS	Water from mine sump. Analysis includes 0.37 ppm boron and 1.1 ppm fluoride.
62	18	.1	346	250	14	23	1.0	578	-	8.1	GS	
176	20	1.2	548	390	111	20	1.0	857	-	7.9	GS	
631	91	1.9	1,400	758	364	34	2.9	1,990	-	7.4	GS	Water from mine sump that was 75 feet deep. Analysis includes 0.00 ppm boron and 0.4 ppm fluoride.
51	15	-	[27/]360	-	-	68	-	620	-	-	SU	Well deepened in March 1955 to 520 feet, with reported flow of 150 gpm (5,100 bwpd).
30	26	-	[27/]510	-	-	82	-	780	-	-	SU	
9[illegible]	13,600	-	23,142	-	-	-	-	-	.40	6.[illegible]	CGL	
58	13	-	[27/]380	-	-	89	-	648	-	-	SU	Reported water flow of 2 gpm (70 bwpd) from 330 feet, 60 gpm (2,000 bwpd) from 388 feet, and 250 gpm (8,500 bwpd) from 490 feet. Flow after well was open 30 days was 145 gpm (4,900 bwpd).
53	13	-	[27/]400	-	-	89	-	665	-	-	SU	While drilling well at 340 feet, water rose to land surface; at depth of 386 feet water flowed from well. Reported flow upon well completion, 150 gpm (5,100 bwpd).
1,701	1,390	-	7,464	-	-	-	-	-	1.25	7.7	CGL	DST 3 recovered 4,230 feet of fluid, of which 3,420 feet was fresh water.
7.4	2.0	4.1	115	92	5	7	.2	196	-	8.0	GS	Analysis includes 0.02 ppm boron and 0.1 ppm fluoride.
1.6	3.0	.4	155	140	0	6	.2	270	-	7.8	GS	Analysis includes 0.02 ppm boron and 0.2 ppm fluoride.
1,226	2,110	-	6,035	-	-	-	-	-	1.30	6.9	CGL	DST 1 recovered 270 feet of water-cut muc and 3,630 feet of fresh water.
74	20	2.0	747	22	-	-	27	1,180	-	8.0	GS	Analysis includes 1.4 ppm fluoride.
11	10	1.5	171	127	0	19	.5	294	-	7.8	GS	Analysis includes 0.05 ppm boron.
12	7.8	3.2	171	130	0	17	.5	290	-	8.2	GS	Analysis includes 0.00 ppm boron and 0.2 ppm fluoride
4,350	5,000	-	15,400	-	-	-	-	-	.54	7.7	CGL	Water flowed from the well when it was being drilled; sample was slightly cloudy with traces of oil and other organic material.
39	7.0	65	354	162	-	-	-	598	-	7.9	DH	Analysis includes 0.24 ppm boron and 0.31 ppm fluoride.
55	16	.1	482	104	0	70	-	743	-	8.0	GS	Analysis includes 0.29 ppm boron and 0.5 ppm fluoride.
99	45	.1	791	111	0	81	-	1,290	-	8.2	GS	Reported flow on 7-31-52 was 4,320 bwpd (130 gpm). Analysis includes 0.03 ppm boron and 1.7 ppm fluoride.
38	14	-	[27/]430	-	-	93	-	770	-	-	SU	
48	4	.3	362	157	0	53	2.8	616	-	7.5	GS	Analysis includes 1.2 ppm fluoride.
572	20	2.6	1,220	794	360	25	1.9	1,650	-	8.1	GS	Analysis includes 0.08 ppm boron and 0.3 ppm fluoride.
299	28	.2	1,070	64	0	93	21	1,630	-	8.4	GS	Casing perforated from 1,150 to 1,200 and 1,275 to 1,425 feet. On 9-7-63 the well was pumped at rate of 29 gpm (990 bwpd) with 140 feet of drawdown.
673	44	1.1	1,760	231	0	84	16	2,500	-	-	GS	Yield on 9-8-54 was less than 0.1 gpm (less than 1 bwpd). Analysis includes 1.1 ppm fluoride.
1,152	70	-	2,339	-	-	-	-	-	3.7	7.3	CGL	DST 1 recovered 4,900 feet (67 barrels) of muddy fresh water. Maximum salinity was 2,500 ppm of sodium chloride, mud salinity before test was 1,000 ppm of sodium chloride.
1,400	100	.4	2,470	1,390	1,030	29	3.1	3,020	-	7.8	GS	Analysis includes 1.1 ppm boron and 2.2 ppm fluoride.
1,790	490	2.8	4,060	1,590	867	52	8.5	5,170	-	7.3	GS	Analysis includes 2.7 ppm boron and 1.2 ppm fluoride.
4.7	3.5	3.1	162	20	0	86	5.4	250	-	7.9	GS	Analysis includes 0.00 ppm boron and 0.2 ppm fluoride.
349	16	.7	719	494	286	17	.9	1,020	-	7.9	GS	Analysis includes 0.05 ppm boron and 0.1 ppm fluoride.
42	8.0	1.5	279	98	0	62	.3	491	-	-	GS	
44	4.0	.8	267	16	0	93	11	418	-	8.4	GS	Well drilled in 1910, reported depth was 800 feet. Depths to top and bottom of the formation are author's estimates. Analysis includes 0.8 ppm fluoride.
20	4.0	2.5	139	106	0	21	.6	225	-	-	GS	Analysis includes 0.1 ppm fluoride.
48	1.8	1.1	239	14	0	92	9.9	378	-	8.1	GS	Reported well depth, 599 feet. Depths to top and bottom of the formation are author's estimates. Analysis includes 0.06 ppm boron and 0.1 ppm fluoride.

Table 3. — Continued

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bbl/d/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per					
														Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	NA + K	Bicarbonate (HCO_3)
T	R	Section																Sodium (Na) / Potassium (K)	
40S	22E	SW¼NE¼NE¼ 30	W	F. A. Nielson	1	Glen Canyon Gr.	200	1,200	-	1,400 / 100(E)	Flow	10-21-59	65	11	-	4.0	1.5	87	1
40S	22E	NW¼NW¼NW¼ 30	W	Bluff Irrigation Co.	1	do	200	1,200	-	750 / 22(R)	do	10- 9-64	68	11	-	3.2	1.5	148	3
40S	22E	SW¼NW¼NW¼ 30	W	R. A. Musselman	1	do	200	1,200	-	1,400 / 100(E)	do	9-10-58	-	10	-	40	23	74	2
40S	23E	SW¼NW¼NW¼ 4	W	Shell Oil Co.	1	Morrison Fm. and Bluff Ss.	0 / 220	220 / 430	See Remarks	170 / 11(R)	do	5- -56	-	-	-	71	43	591	3
40S	23E	NE¼NW¼NW¼ 4	O	do	3	Mississippian sed. rocks	6,900	-	6,940-7,057	-	DST 6	7-16-56	-	-	-	2,079	558	26,384	1,7
40S	23E	NE¼SE¼NE¼ 12	O	do	42-12	Ismay Zone of Paradox Fm.	6,118	6,164	6,134-31	240(R) / 70	Pumped	9- 4-62	-	-	-	24,000	11,664	38,058	3
40S	23E	NW¼NE¼NE¼ 23	W	do	1	Bluff(?) Ss.	-	-	452-548	440 / 13(R)	do	4-29-59	-	11	-	26	9.2	992	9
40S	23E	NW¼NW¼NE¼ 36	W	A. B. Smith	1	Bluff Ss.	-	-	390-415	350 / 25(R)	Flow	4-29-59	-	11	-	224	136	2,210	6
40S	24E	C SE¼SW¼ 3	O	Standard Oil Co. of California	177-1	Desert Creek Zone of Paradox Fm.	5,538	5,670	5,612-22	90(E) / 2.7	DST 5	5- -57	-	-	-	24,200	5,073	80,872	2
40S	24E	SE¼NW¼NE¼ 11	W	Bureau of Indian Affairs	12T-327	Morrison Fm. Bluff Ss.	30 / 370	370 / 520	355-520	1,100 / 150(R)	Flow	3- 2-56	63	13	-	33	18	115	4
40S	24E	SE¼NE¼ 14	W	Superior Oil Co.	1	Bluff Ss. Entrada Ss. Navajo Ss.	- / - / 950	- / - / -	365-1,070	-	-	2- -57	-	-	-	89	48	1,285	1,2
40S	24E	SE¼NW¼SE¼ 17	W	Texaco, Inc.	1 Navajo G	Navajo Ss.	-	-	Ac 920	-	Flow	5- -56	-	-	0	8	32	1,062	1,1
40S	24E	NE¼NE¼SW¼ 20	O	do	D-30	Anech Fm.	7,455	7,870	7,480-7,520 / 7,700-7,885	322(R) / 9.6 -	Swab test DST 8	5- -62 5- -61	-	-	224 111	4,141 1,092	754 137	26,548 31,543	1,2 5
40S	24E	20	S	Bureau of Indian Affairs	12R-171	Recapture Sh. Mbr. of Morrison Fm.	0	-	-	120 / 3.5(R)	Flow	9- 8-54	60	11	-	24	11	174	4
40S	25E	SW¼SW¼NW¼ 1	W	do	12T-312	Navajo Ss.	1,222	-	1,222-1,402	70 / 2(R)	do	8- 7-52	71	16	-	54	20	1,350	2,1
40S	25E	NW¼NW¼NW¼ 5	S	do	12R-173	Burro Canyon Fm.	0	-	-	3 / 0.1(R)	do	9- 8-54	68	13	-	27	12	927	-
40S	25E	C SE¼SW¼ 5	O	Mountain Fuel Supply Co.	2	Desert Creek Zone of Paradox Fm.	6,066	-	6,066-6,190	-	DST 3	7- 3-62	-	-	-	25,200	3,400	64,528	
40S	25E	SE¼SW¼SW¼ 14	O	Shell Oil Co.	1	Ismay Zone of Paradox Fm.	-	-	5,738-5,843	-	DST 1	11-12-56	-	-	-	7,359	2,788	43,506	
						Mississippian sed. rocks	7,230	7,515	7,230-7,449	-	DST 4	12-10-56	-	-	-	921	246	17,396	3,
40S	25E	SE¼NE¼SE¼ 19	W	Bureau of Indian Affairs	12X-315	Salt Wash Ss. Mbr. of Morrison Fm.	300	410	350-390	70 / 2(E)	Pumped See Remarks	12- 3-53	-	10	-	5.2	1.7	567 6.6	
40S	26E	NW¼SW¼SE¼ 3	O	Shell Oil Co.	1	Leadville Ls. Ouray Ls.	7,360 / 7,520	7,520 / 7,643	7,460-7,530	-	DST 2	1-19-56	-	-	-	1,208	160	10,834	4,
40S	26E	C SE¼SE¼ 7	O	Texaco, Inc.	H-1	Mississippian sed. rocks Ouray Ls.	7,165 / 7,385	7,385 / 7,585	7,284-7,405	-	DST 5	7- -56	-	-	-	185	295	14,375	2,
41S	6E	23	S	-	-	Dakota Ss.	0	-	-	See Remarks	Flow	5-28-59	-	10	-	44	9.7	7.5 2.3	
41S	9E	1	S	-	Hole-in-the-Rock	Navajo Ss.	0	-	-	510 / 15(E)	do	4-18-59	-	13	-	43	14	4.0	
41S	9E	32	S	-	GJ-156	do	0	-	-	170 / 5(E)	do	4-18-59	-	10	-	29	11	2.5	
41S	12E	NE¼SE¼NE¼ 22	T	-	GJ-77	Shinarump Mbr. of Chinle Fm.	-	-	174-191	-	-	12-12-57	-	21	-	229	136	585	
41S	12E	SE¼SW¼NE¼ 27	T	-	GJ-9	do	-	-	64-169	-	-	11-24-57	-	13	-	156	93	275	
41S	12E	NW¼NW¼NW¼ 35	S	-	GJ-5	do	0	-	-	100 / 3(E)	Flow	11-23-57	-	18	-	89	19	175	
41S	19E	32	W	Bureau of Indian Affairs	BK-422	Cedar Mesa Ss. Mbr. of Cutler Fm.	23	418	185-418	100 / 3(E)	Bailed	10-11-53	58	20	-	289	113	133	
41S	17E	6	S	-	-	Halgaito Tongue of Cutler Fm.	0	-	-	-	Flow	4-30-59	-	14	-	411	157	376	
41S	19E	10	S	-	-	do	0	-	-	See Remarks	do	9-10-58	-	24	-	381	128	164	
41S	19E	29	S	-	Goodrich Sulphur Spring	Rico Fm.	0	-	-	170 / 5(E)	do	4-30-59	-	22	-	585	112	204	
41S	21E	22	W	Bureau of Indian Affairs	9T-220	Navajo Ss.	130	-	130-275	100 / 3(E)	Pumped	1- 6-54	62	17	-	17	4.6	64	
41S	21E	W½SW¼SW¼ 35	O	Shell Oil Co.	1	Mississippian sed. rocks Ouray Ls.	6,114 / 6,314	6,314 / 6,340	6,265-6,340	-	DST 6	6- 2-57	-	-	-	5,764	1,202	24,319	1
41S	22E	36	S	Bureau of Indian Affairs	9Y-25	Bluff Ss.	0	-	-	27 / 0.8(R)	Flow	11-3-54	62	16	-	29	3.3	58	
41S	22E	2	S	do	9Y-62	Recapture Sh. Mbr. of Morrison Fm.	0	-	-	3 / 0.1(R)	do	10-27-54	58	18	-	36	8.3	27	

(CO$_3$)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2]	Remarks
	47	2.0	0.2	245	16	0	92	9.5	382	-	8.7	GS	Reported well depth, 640 feet. Depths to top and bottom of the formation are author's estimates.
	53	10	.3	387	14	0	96	17	591	-	8.0	GS	Well drilled in 1910, reported depth was 825 feet. Depths to top and bottom of the formation are author's estimates.
	108	13	.5	403	195	0	45	2.3	637	-	8.4	GS	Reported well depth, 600 feet. Depths to top and bottom of the formation are author's estimates. Analysis includes 0.3 ppm fluoride.
	769	374	-	2,035	-	-	-	-	-	-	-	CGL	Casing is perforated from 170 to 190 and 343 to 363 feet, and the well is an open hole from 364 to 388 feet. Depths to top and bottom of the formations are author's estimates.
	2,588	43,400	-	76,063	-	-	-	-	-	0.17	8.3	CGL	DST 6 recovered 210 feet (3 barrels) of gassy, slightly oil and water-cut mud, and 1,176 feet (11.9 barrels) of gassy mud-cut water.
	80	134,900	-	209,019	-	-	-	-	-	.05	4.0	CL	Pumped well at rate of 240 bwpd (7 gpm). Operating fluid level was 2,435 feet.
	208	445	.8	1,850	102	0	94	30	3,050	-	7.6	GS	Analysis includes 1.1 ppm boron and 2.3 ppm fluoride.
	2,330	2,110	18	7,350	1,120	606	81	29	10,400	-	7.6	GS	Reported well depth, 415 feet. Analysis includes 0.45 ppm boron and 0.3 ppm fluoride.
	286	182,000	-	292,557	-	-	-	-	-	.04	5.4	CGL	DST 5: fluid to surface after 1 hour and 43 minutes, consisting of gas and oil-cut mud for 20 minutes and salt water with a skim of oil for duration of test. Flow during last 5 minutes at estimated rate of 4 barrels per hour, 95 percent salt water and 5 percent oil.
	41	9.5	.2	438	156	0	61	4.9	728	-	7.6	GS	Analysis includes 0.8 ppm fluoride.
	948	823	-	4,526	417	-	-	-	-	[13]/ 2.21	7.1	SO	Well drilled March 1957, 10,070 feet deep, 9 5/8-inch casing cemented at 365 feet. Water sands logged from 445 to 535 feet and 918 to 1,040 feet. Producing formations listed are author's interpretation. Depth to top of the Navajo Sandstone is author's estimate.
	[illegible]	710	-	2,389	-	-	-	-	-	2.75	7.5	CL	Oil test drilled to 1,890 feet. Water flow encountered at 865 feet. Completed as water well with plug from 925 to 968 feet.
	963	48,657	-	[28]/ 82,200	-	-	-	-	-	[9]/ .08	6.6	Dow	Swabbed 121 barrels of salt water in 9 hours.
	4,511	47,324	-	[28]/ 85,000	-	-	-	-	-	[9]/ .08	7.5	Dow	DST 8 recovered 5,266 feet of salt water with no show of oil or gas.
	59	14	1.2	534	105	0	78	7.4	967	-	-	GS	Analysis includes 1.0 ppm fluoride.
	286	685	4.1	3,550	216	0	93	40	5,390	-	-	GS	Analysis includes 0.4 ppm fluoride.
	1,670	54	1.5	2,890	117	0	95	37	3,930	-	-	GS	Analysis includes 1.7 ppm fluoride.
	1,170	153,000	-	247,448	-	-	-	-	-	.05	6.9	CGL	DST 3 recovered 450 feet of salt water-cut mud and 540 feet of mud-cut salt water.
	[illegible]	88,000	-	143,667	-	-	-	-	-	.07	6.9	ShO	DST 1 recovered 90 feet of watery gas-cut mud and 3,094 feet of slightly mud and gas-cut salt water, very slight trace of oil.
	670	26,800	-	49,235	-	-	-	-	-	.15	7.0	CGL	DST 4 recovered 4,860 feet (66.1 barrels) of slightly mud-cut, heavily gas-cut water.
	296	35	.2	1,460	20	0	98	55	2,230	-	-	GS	Water sample from storage tank at well. Analysis includes 1.8 ppm fluoride.
	1,852	15,200	-	31,583	-	-	-	-	-	.25	7.0	CGL	DST 2 recovered 900 feet (12.8 barrels) of slightly muddy carbon dioxide(?) gas-cut salt water and 3,600 feet (37.8 barrels) of carbon dioxide(?) gas-cut salt water.
	1,064	19,867	-	39,369	-	-	-	-	-	.19	7.5	CL	DST 3 recovered 140 feet of carbon dioxide gas-cut drilling mud and 4,225 feet of carbon dioxide gas-cut salt water.
	22	7.0	3.9	186	150	17	10	.3	318	-	7.8	GS	Yield of spring less than 1 gpm (less than 34 bwpd). Analysis includes 0.02 ppm boron.
	4.7	2.5	.6	183	170	1	5	.1	322	-	7.9	GS	Analysis includes 0.15 ppm boron and 0.4 ppm fluoride.
	7.2	2.0	.9	129	116	0	4	.1	224	-	7.9	GS	Analysis includes 0.02 ppm boron and 0.2 ppm fluoride.
	1,960	63	16	3,340	1,340	-	49	-	3,970	-	-	GS	Uranium exploration borehole, 191 feet deep. Depth to water was 174 feet on 12-12-57. Analysis includes 0.4 ppm fluoride.
	933	18	1.1	1,670	772	-	44	-	2,200	-	-	GS	Uranium exploration borehole, 169 feet deep. Depth to water was 64 feet on 11-24-57. Analysis includes 1.1 ppm fluoride.
	344	11	.6	840	300	-	56	-	1,220	-	-	GS	Analysis includes 0.6 ppm fluoride.
	1,190	24	.4	1,890	1,190	986	20	1.7	2,320	-	-	GS	Do.
	2,210	56	1.1	3,290	1,670	1,570	33	4.0	3,640	-	7.4	GS	Analysis includes 0.35 ppm boron and 1.3 ppm fluoride.
	1,320	55	1.8	2,550	1,480	1,310	20	1.9	2,640	-	8.0	GS	Reported yield, less than 10 gpm (less than 340 bwpd). Analysis includes 0.7 ppm fluoride.
	1,910	72	.7	3,070	1,920	1,950	19	2.0	3,280	-	7.0	GS	Analysis includes 0.25 ppm boron and 0.7 ppm fluoride.
	31	6	.1	235	62	0	69	3.5	364	-	-	GS	Analysis includes 0.2 ppm fluoride.
	1,259	50,000	-	83,940	-	-	-	-	-	.10	6.0	CGL	DST 6 recovered 450 feet of water-cut mud, 450 feet of slightly muddy water, and 1,300 feet of water with salinity of 78,400 ppm of sodium chloride. Mud before test contained 1,320 ppm of sodium chloride.
	17	7	.8	241	86	0	59	2.7	388	-	-	GS	Analysis includes 0.8 ppm fluoride.
	43	10	21	226	124	20	32	1.0	359	-	-	GS	Analysis includes 0.7 ppm fluoride.

Table 3. — Continued

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bwpd/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per					
														Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	NA + K	Bicarbonate (HCO$_3$)
T	R	Section																Sodium (Na) / Potassium (K)	
41S	22E	13	S	Bureau of Indian Affairs	9Y-61	Recapcure Sh. Mbr. of Morrison Fm.	0	-	-	7 / 0.2(R)	Flow	10-27-54	66	17	-	46	17	37	2
41S	22E	33	W	do	9K-209	Navajo Ss.	418	-	432-775	100 / 3(R)	Pumped	10-27-54	64	11	-	7.1	3.3	67	1
41S	23E	SE¼NW¼SW¼ 12	W	Shell Oil Co.	1	Entrada Ss.	437	-	See Remarks	1,270 / 31.5(R)	Flow	12- -56	55	-	0	80	56	2,140	6
						Navajo Ss.	574	-											
41S	23E	24	S	Bureau of Indian Affairs	9Y-60	Recapcure Sh. Mbr. of Morrison Fm.	0	-	-	7 / 0.2(R)	do	10-21-54	62	15	-	34	7.6	113	2
41S	23E	25	S	do	9Y-43A	do	0	-	-	7 / 0.2(R)	do	10-21-54	58	16	-	43	9.7	34	1
41S	23E	NE¼NE¼NW¼ 27	W	ElPaso Natural Gas Co.	1	Bluff Ss.	-	-	183-672	-	-	7-15-60	-	9.2	18/78	28	6.4	630 / 20	8
						Entrada Ss.	-	-											
						Navajo Ss.	-	-											
41S	23E	C SE¼SE¼ 35	O	Shell Oil Co.	2	Ouray Ls.	6,396	6,510	6,400-6,506	-	DST 5	10- -54	-	-	-	4,795	254	31,440	3,1
						Devonian sed. rocks	6,863	7,179	6,889-7,020	-	DST 6	10- -54	-	-	-	980	975	28,867	3
41S	24E	C SE¼NW¼ 1	O	Texaco, Inc.	J"R"	Navajo Ss.	-	-	At 300	-	Flow	7-21-58	-	13	-	35	16	1,200	9
41S	24E	18	S	Bureau of Indian Affairs	9Y-42	Recapcure Sh. Mbr. of Morrison Fm.	0	-	-	7 / 0.2(R)	do	10-21-54	63	14	-	9.5	10	58	1
41S	24E	C SW¼NE¼ 19	O	Phillips Petroleum Co.	19-32	De Chelly Ss. Mbr. of Cutler Fm.	2,630	2,310	See Remarks	270(R) / 3	DST 1	12-16-58	-	-	-	191	54	6,395	1
41S	24E	SE¼SW¼NE¼ 20	W	do	1	Navajo Ss.	556	-	556-604	See Remarks	-	5- 7-58	-	-	-	7	5	596	3
41S	24E	SW¼NE¼SW¼ 27	O	Continental Oil Co.	2-A	do	-	-	At 600	-	Flow	5- -57	-	-	1	23	20	1,250	5
41S	24E	31	S	Bureau of Indian Affairs	9Y-41	Recapcure Sh. Mbr. of Morrison Fm.	0	-	-	7 / 0.2(R)	do	10-21-54	63	15	-	70	22	134	1
41S	25E	SW¼SE¼NE¼ 5	W	Superior Oil Co.	1	Glen Canyon Gr.	600	1,200	At 1,122	-	do	4- 9-58	-	-	-	30	5.8	1,163	1,2
41S	25E	NW¼SW¼SW¼ 16	W	Bureau of Indian Affairs	12K-308A	Bluff Ss.	-	-	235-300	34 / 1(R)	do	8-25-49	-	11	-	8.5	1.3	786	9
						Entrada Ss.	-	-											
41S	25E	SW¼SW¼SW¼ 16	W	do	12K-308	Entrada Ss.	257	-	328-338	2,350 / 75(R)	do	3-10-55	65	10	18/13	105	74	2,940 / 28	9
						Navajo Ss. and Kayenta Fm.	509	1,148	1,163										
						Wingate Ss.	1,148	-											
41S	25E	SE¼NW¼SW¼ 17	W	Superior Oil Co.	26-M	Navajo Ss.	432	717	452-717	1,200 / 40(R)	do	10-12-54	-	10	-	35	41	2,310	3
41S	25E	NE¼SE¼SW¼ 17	W	do	0-24	do	453	710	500-600	1,430 / 72(R)	do	10-12-54	-	9.7	-	112	41	2,550	3
41S	25E	SW¼SE¼SE¼ 17	O	Carter Oil Co.	114-19	De Chelly Ss. Mbr. of Cutler Fm.	2,331	2,510	2,333-2,502	See Remarks	DST 1	5- -58	-	-	-	1,346	324	17,541	
41S	25E	23	S	Bureau of Indian Affairs	12R-184A	Wescwater Canyon Ss. Mbr. of Morrison Fm.	0	-	-	- / 0.2(E)	Flow	9- 9-54	67	17	-	64	13	77	1
41S	25E	C NE¼NE¼ 26	O	Shell Oil Co.	2	Ismay Zone of Paradox Fm.	-	-	5,503-449	-	DST 1	3-17-59	-	-	-	5,418	1,547	30,437	1
41S	26E	NW¼NW¼NW¼ 27	O	British American Oil Prod. Corp.	C-1	do	5,556	5,785	5,748-84	-	DST 1	10-28-64	-	-	21	7,600	1,552	40,350	2
42S	9E	33	S	Bureau of Indian Affairs	2A-104	Navajo Ss.	0	-	-	360 / 10.5(R)	Flow	9-11-53	70	29	-	92	17	6.4	1
42S	10E	26	S	do	2GS-14-2	Wingate Ss.	0	-	-	1,340 / 113(R)	do	9- 2-53	60	17	-	47	18	6.9	2
42S	10E	32	S	do	2A-101	Navajo Ss.	0	-	-	35 / 2.3(R)	do	9-10-53	65	24	-	84	22	6.9	3
42S	12E	NE¼SW¼NE¼ 19	S	do	2A-28	Kayenta Fm.	0	-	-	See Remarks	do	7-29-54	63	14	-	30	9.5	6.4	1
42S	16E	19	S	do	3A-293	Cedar Mesa Ss. Mbr. of Cutler Fm.	0	-	-	7 / 0.2(E)	do	9-18-54	77	16	-	34	13	58	
42S	16E	30	S	do	4A-294	do	0	-	-	7 / 0.2(E)	do	9-18-54	67	15	-	64	9.0	26	
42S	17E	4	S	do	3A-193	do	0	-	-	7 / 0.2(E)	do	9-17-54	66	23	-	69	16	23	
42S	17E	14	S	do	9A-281	Halgaito Tongue of Cutler Fm.	0	-	-	7 / 0.2(E)	do	9-17-54	74	19	-	421	147	119	
42S	20E	SW¼SW¼ 34	O	Shell Oil Co.	1	Paradox Fm.	4,680	5,520	4,832-53	70 / 2(E)	DST 2	1-18-61	-	-	-	520	238	2,928	1,
42S	21E	1	S	Bureau of Indian Affairs	9Y-27	Entrada Ss.	0	-	-	34 / 1(E)	Flow	11- 1-58	64	18	-	40	11	44	
42S	21E	13	W	do	9K-221	Navajo Ss.	60	-	60-209	110 / 9(R)	Pumped	11- 1-54	58	19	-	19	7.6	30	
42S	21E	SW¼NE¼SW¼ 33	O	Marathon Oil Co.	1-33	Paradox Fm.	4,830	-	4,978-98	-	Swab test	1- -59	-	-	-	4,214	1,291	21,684	1
42S	22E	C SW¼NE¼ 1	O	Anadarko Production Co.	A-1	do	5,416	-	5,538-78	-	DST 2	5- -61	-	-	0	16,400	972	53,952	

million														
(CO_3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2]	Remarks
	21	12	25	298	185	0	30	1.2	506	-	-	GS	Analysis includes 0.5 ppm fluoride.
	38	9	1.6	210	31	0	82	5.2	329	-	-	GS	Do.
	2,550	1,378	-	6,851	-	-	-	-	-	1.5	6.0	(29)	Casing set at 437 feet.
	86	33	11	429	116	0	68	4.6	679	-	-	GS	Analysis includes 1.2 ppm fluoride.
	54	13	2.4	236	148	26	26	.9	384	-	-	GS	Analysis includes 0.8 ppm fluoride.
.3	214	415	.26	1,735	97	-	-	-	3,115	-	7.8	DH	Analysis includes 1.1 ppm aluminum, 0.05 ppm arsenic, 1.4 ppm boron, 1.2 ppm fluoride, 0.01 ppm hydroxide, and 1.4 ppm phosphate.
	1,750	54,600	-	96,390	-	-	-	-	-	.10	6.3	CGL	DST 5 recovered 5,150 feet of muddy water.
	5,086	37,400	-	68,512	-	-	-	-	-	.13	5.8	CCL	DST 6 recovered 1,018 feet of gassy, muddy water and 990 feet of salt water.
	1,030	650	1.6	3,410	155	0	94	42	5,140	-	8.1	GS	
	16	6	6.5	216	84	0	66	3.1	354	-	-	GS	Analysis includes 0.4 ppm fluoride.
	849	9,646	-	17,262	-	-	-	-	-	.37	-	(30)	The interval tested was from 2,598 to 2,799 feet in the De Chelly Sandstone and overlying Cutler Formation; however, the DeChelly was the reported producing formation. DST 1: flowed at rate of 11.2 barrels of slightly salty water per hour on 5/8 inch bottom choke and 1 inch top choke. Recovered 2,560 feet of slightly salty water.
	559	301	-	2,159	-	-	-	-	-	-	8.6	(30)	Yield on 5-27-58 was 1,000 bwpd (30 gpm) by bailer test.
	1,580	726	-	3,890	-	-	-	-	-	-	-	CO	
	361	11	.6	712	265	102	52	3.6	1,030	-	-	GS	Analysis includes 0.5 ppm fluoride.
	675	581	-	3,815	99	-	-	-	-	2.28	7.8	(31)	Seven-inch casing set at 1,106 feet, depth of well is 1,122 feet, perforated below 822 feet. Depths to top and bottom of the formation are author's estimates.
	841	78	1.2	2,180	36	0	98	57	3,180	-	-	GS	Depth of well is 300 feet, cased to 235 feet. Analysis includes 3.9 ppm fluoride.
	1,640	3,490	2.5	8,640	566	10	90	54	12,000	-	7.9	GS	Depth of well is 1,163 feet, cased to 328 feet. Analysis includes 0.1 ppm fluoride.
	1,360	2,810	.2	7,080	379	0	93	56	11,100	-	7.9	GS	Pumped yield on 6-15-64 was 157 gpm (5,340 bwpd), with 318 feet of drawdown. Analysis includes 0.3 ppm fluoride.
	1,280	2,960	.2	7,250	449	0	93	52	11,300	-	7.8	GS	Pumped yield on 3-9-64 was 125 gpm (4,250 bwpd), with 318 feet of drawdown. Analysis includes 0.4 ppm fluoride.
	440	31,700	-	52,187	-	-	-	-	-	.14	7.9	CGL	DST 1 flowed a 1-inch stream of slightly salty water in 55 minutes.
	186	19	3.1	473	213	58	44	2.3	721	-	-	GS	Analysis includes 0.6 ppm fluoride.
	1,661	60,000	-	99,259	-	-	-	-	-	.08	8.0	CGL	DST 1 recovered 180 feet of salt water-cut mud, 180 feet of muo-cut salt water, and 450 feet of salt water.
	280	80,940	-	131,864	-	-	-	-	-	22/.65	5.5	CL	DST 1 recovered 160 feet of oil and gas-cut mud and 315 feet of gas-cut salt water.
	15	8	.9	264	224	14	6	.2	433	-	-	GS	Analysis includes 0.2 ppm fluoride.
	12	9	.9	219	192	11	7	.2	373	-	-	GS	Do.
	5.4	6	.8	329	300	0	5	.2	329	-	-	GS	Do.
	11	5	4.2	144	114	9	11	.3	240	-	-	GS	Yield on 7-29-54 was less than 0.1 gpm (less than 3 bwpd). Analysis includes 0.4 ppm fluoride.
	126	42	3.1	460	263	68	32	1.5	712	-	-	GS	Analysis includes 0.4 ppm fluoride.
	73	15	4.2	298	196	48	22	.8	450	-	-	GS	Do.
	47	19	6.2	328	238	32	18	.7	538	-	-	GS	Do.
	1,670	20	2.5	2,490	1,660	1,310	13	1.3	2,760	-	-	GS	Analysis includes 0.7 ppm fluoride
	2,475	3,195	-	11,260	2,280	-	-	-	-	22/.78	7.4	ShO	DST 2 recovered 470 feet (4 barrels) of sulfurous water. Analysis includes 3 ppm ammonium, 10 ppm boron, and 12 ppm sulfide.
	65	19	4.3	287	145	4	40	1.0	467	-	-	GS	Analysis includes 0.7 ppm fluoride.
	30	8	.3	172	76	0	46	1.5	273	-	-	GS	Analysis includes 0.6 ppm fluoride.
	2,675	42,000	-	72,419	-	-	-	-	-	.12	7.1	CGL	
	600	114,310	-	186,353	-	-	-	-	-	11/.05	5.5	CL	DST 2 recovered 15 feet of heavily gas-cut mud, 90 feet of heavily oil and gas-cut mud, 100 feet of oil-cut mud, and 710 feet of salt water.

Table 3. — Continued

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bwpd/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per					
																	NA + K		
T	R	Section												Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate
42S	22E	14	W	Bureau of Indian Affairs	9T-214	Navajo Ss.	460	-	497-590	70 / 2(R)	Pumped	12- 3-53	61	14	-	2.0	0.5	129	1.9	1
42S	22E	C SE¼NW¼ 16	O	Shell Oil Co.	2	Paradox Fm.	5,066	5,666	5,550-5,648	-	DST 1	2- 3-60	-	-	-	5,000	1,340	21,545		2
42S	22E	29	S	Bureau of Indian Affairs	9Y-29	Navajo Ss.	0	-	-	100 / 3(E)	Flow	10-27-54	58	15	-	33	13	28		1
42S	22E	C SW¼NE¼ 33	O	Shell Oil Co.	1	Paradox Fm.	4,597	5,547	See Remarks	-	Treacer samole	9- -59	-	-	-	650	1,594	13,297		1.1
						Leadville Ls.	5,675	5,320	5,307-	-	DST 8	3- 5-55	-	-	-	5,084	1,490	19,210		1.3
						Ouray Ls.	5,320	-	5,930											
42S	23E	NW¼SE¼NW¼ 2	W	do	1	Navajo Ss.	385	-	385-460	1,200 / 35(R)	Flow	3-11-53	62	14	18/ 0.11	1.3	.7	195	8	3
42S	23E	SW¼SE¼NW¼ 2	O	do	1	Leadville Ls.	5,655	6,045	5,855-5,390	-	DST 5	6- -54	-	-	-	5,031	1,043	26,091		2.0
42S	26E	NW¼SW¼NE¼ 32	O	Phillips Petroleum Co.	1K	Ismay Zone of Paradox Fm.	5,650	5,798	5,764-66	-	See Remarks	4- -64	-	-	-	5,901	2,720	35,718	300	3
43S	2E	SW¼NW¼SW¼ 11	W	Glen Canyon, Inc.	1	Navajo Ss.	-	-	320-610	-	Pumped	8-13-57	-	12	.06	53	53	95		1
43S	2E	SW¼NW¼SW¼ 11	W	do	2	do	-	-	40-675	-	do	8-13-57	-	12	.05	31	55	95		3
43S	2E	SE¼ 24	W	-	-	do	-	-	-	-	do	12- 4-58	54	12	-	83	47	103		2
43S	3E	SW¼SW¼SE¼ 32	W	Leslie Taylor	2	do	-	-	-	650 / 25(M)	do	10- 9-63	66	9.3	1.4	15	15	71		1
43S	4E	SE¼NE¼ 4	W	Bureau of Reclamation	DH-2	Encrada Ss.	0	-	See Remarks	34 / 17(E)	Flow	5- 1-65	-	-	-	32	9.8	331	10	1
43S	4E	SW¼SW¼SW¼ 34	S	-	Castle Rock Spring	do	0	-	-	See Remarks	do	12- 5-58	52	14	-	27	8.1	43		1
43S	5E	24	S	-	GJ-249	Navajo Ss.	0	-	-	1,200 / 50(E)	do	4-21-59	-	14	-	47	14	56		1
43S	9E	7	S	Bureau of Indian Affairs	2A-111	do	0	-	-	190 / 5.5(R)	do	8-11-53	72	17	-	43	23	13		2
43S	14E	11	S	do	8A-213	De Chelly Ss. Mbr. of Cutler Fm.	0	-	-	See Remarks	do	9-30-54	65	11	-	16	13	-		1
43S	14E	13	S	do	8K-550	do	0	-	-	7 / 0.2(E)	do	9-30-54	64	11	-	16	14	-		1
43S	14E	SE¼SW¼SE¼ 16	W	do	8K-432	Cedar Mesa Ss. Mbr. of Cutler Fm.	230	-	276-451	70 / 2(E)	Pumped	5-21-55	64	11	-	44	27	151		2
43S	16E	23	S	do	8A-229	Organ Rock Tongue of Cutler Fm.	0	-	-	See Remarks	Flow	9- 9-54	70	17	-	20	14	313		-
43S	19E	29	S	do	8A-260	De Chelly Ss. Mbr. of Cutler Fm.	0	-	-	140 / 4(E)	do	9- 9-54	72	14	-	33	13	166		3
43S	20E	23	S	do	9Y-21	Navajo Ss.	0	-	-	340 / 10(E)	do	11- 4-54	61	17	-	24	4.1	19		1
43S	21E	C NE¼NW¼ 19	O	Texaco, Inc.	1 AE	Leadville Ls.	5,810	6,292	5,810-20	-	Production water	5- -62	-	-	136	5,682	862	14,306		1
43S	22E	9	S	Bureau of Indian Affairs	9Y-45	Wingate Ss.	0	-	-	17 / 0.5(E)	Flow	10-29-54	56	14	-	21	9.7	12		
43S	23E	16	W	do	9K-219	Navajo Ss.	210	-	418-508	100 / 3(R)	Pumped	1-11-55	59	19	-	8.7	7.2	43		
43S	23E	C SE¼SW¼ 25	O	Shell Oil Co.	1	Hermosa Gr.	5,310	5,630	5,380-5,498	-	DST 5	4-27-56	-	-	-	8,374	2,448	27,316		-
43S	23E	32	S	Bureau of Indian Affairs	9Y-57	Wingate Ss.	0	-	-	17 / 0.5(E)	Flow	10-20-54	58	-	-	-	-	-		
43S	24E	C SW¼NE¼ 5	O	Zeller and Dannenberg Oil Co.	32-1	Akan Zone of Paradox Fm.	5,222	6,614	5,460-6,580	-	DST 2	12- 3-62	-	-	-	8,380	2,163	29,277		1.
43S	24E	C SE¼SE¼ 6	O	Shell Oil Co.	1	Paradox Fm.	5,451	6,308	6,255-6,390	-	DST 5	6- -55	-	-	-	18,300	3,340	34,642		
						Ouray Ls.	6,726	6,903	5,305-	-	DST 6	6- -55	-	-	-	7,475	1,370	24,389		1.
						Elbert Fm.	6,903	-	6,925											
43S	24E	9	W	Bureau of Indian Affairs	9Y-32	Wingate Ss.	370	-	570-735	70 / 2(R)	Pumped	8-30-49	66	17	-	2.0	1.3	161		
43S	24E	C NE¼NE¼ 25	O	Chamolin Petroleum Co.	1-112	Desert Creek Zone of Paradox Fm.	5,042	-	5,053-76	-	DST 1	8-23-63	-	-	-	1,440	753	29,168		1.
43S	25E	C SW¼SW¼ 16	O	do	1-130	Ismay Zone of Paradox Fm.	5,464	5,679	5,389-5,503	-	DST 1	10-22-63	-	-	0	3,200	534	32,554		
43S	25E	C SW¼NW¼ 21	O	do	2-130	do	5,392	5,612	5,504-25	-	DST 1	11-30-63	-	-	0	2,400	1,992	36,393		
44S	4E	SW¼SW¼NW¼ 8	W	Merritt-Chapman and Scott Corp.	9	Navajo Ss.	-	-	408-600	45,200 / 1,335(R)	Pumped	3- 2-61	-	17	0	113	39	149		

Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohm-meter at 68°F)	pH	Analysis by[2]	Remarks
	million												
19	50	26	0.4	341	7	0	97	21	565	-	-	GS	Analysis includes 0.8 ppm fluoride.
0	3,800	43,310	-	75,666	18,100	-	-	-	-	[33] 0.10	7.6	ShO	DST 1 recovered 180 feet (2 barrels) of watery mud and 1,527 feet (14.5 barrels) of slightly muddy, slightly gassy salt water.
0	48	13	18	236	136	24	31	1.0	384	-	-	GS	Analysis includes 0.5 ppm fluoride.
-	4,790	22,100	-	43,002	-	-	-	-	-	.18	8.0	CGL	Perforated 4,688-4,750, 5,108-5,282, and 5,374-5,480 feet.
-	2,243	42,000	-	71,948	-	-	-	-	-	.12	7.1	CGL	DST 8 recovered 350 feet of gassy watery mud, 270 feet of gassy muddy water, and 600 feet of black sulfur water.
45	52	21	.5	500	6	0	97	35	846	-	9.0	GS	Analysis includes 0.8 ppm fluoride.
-	1,324	50,000	-	84,516	-	-	-	-	-	.10	6.9	CGL	DST 5 had a flow of inflammable gas and recovered 4,085 feet of water.
-	763	73,000	-	118,567	-	-	-	-	-	.08	7.1	CGL	Water sample obtained from oil well stock tank; sample was light brown and contained a clear filtrate.
0	208	110	.5	644	348	162	37	2.2	1,060	-	7.6	GS	Reported well depth 610 feet, perforated 320-412 feet, open hole 412-610 feet. Analysis includes 0.5 ppm fluoride.
0	217	118	.9	727	428	181	33	2.0	1,180	-	7.3	GS	Reported well depth 675 feet, open hole 40-675 feet. Analysis includes 0.3 ppm fluoride.
16	238	100	1.1	724	400	166	36	2.2	1,130	-	8.5	GS	Reported well depth, 600 feet. Analysis includes 0.2 ppm fluoride.
0	71	16	.3	292	98	0	61	3.1	477	-	7.4	GS	
11	[34] 625	40	-	[27] 1,130	-	-	96	13.8	1,690	-	8.3	BR	Reported well depth, 598 feet, open hole 5-598 feet.
2	51	15	3.1	232	101	0	48	1.9	375	-	8.1	GS	Spring flow varies from 0.5 to 10 gpm (17 to 340 bwpd). Analysis includes 0.4 ppm fluoride
-	79	42	.0	346	175	-	-	1.9	566	-	7.7	GS	Analysis includes 0.5 ppm fluoride.
0	22	11	.4	244	202	12	12	.4	418	-	-	GS	Analysis includes 0.2 ppm fluoride.
0	-	6.0	3.2	-	94	0	-	-	213	-	-	GS	Yield on 9-30-54 was less than 0.1 gpm (less than 3 bwpd).
0	-	10	3.4	-	98	0	-	-	315	-	-	GS	
0	228	37	7.4	656	221	0	60	4.4	1,030	-	7.6	GS	Analysis includes 1.0 ppm fluoride.
2	230	110	10	944	108	0	86	13	1,470	-	-	GS	Yield on 9-9-54 was less than 0.1 gpm (less than 3 bwpd). Analysis includes 1.2 ppm fluoride.
3	111	36	2.8	597	136	0	73	6.2	941	-	-	GS	Analysis includes 0.6 ppm fluoride.
0	12	10	3.5	143	78	0	35	.9	220	-	-	GS	Do.
0	1,486	33,657	-	[28] 56,500	-	-	-	-	-	[9] .12	6.6	Dow	
0	9	5.0	1.7	133	92	0	21	.5	206	-	-	GS	Analysis includes 0.2 ppm fluoride.
3	12	5.0	1.4	171	51	0	83	2.6	274	-	7.3	GS	Analysis includes 0.6 ppm fluoride.
-	1,267	64,000	-	104,297	-	-	-	-	-	.08	7.6	CGL	DST 3 recovered 90 feet of water-cut mud, 510 feet of slightly muddy water, 300 feet of slightly oil-cut muddy sulfurous water, and 540 feet of slightly muddy black sulfurous water.
0	-	5.5	3.0	-	105	6	-	-	228	-	-	GS	
0	2,060	64,965	-	108,687	31,100	-	-	-	-	.08	7.2	ShO	DST 2 recovered 1,200 feet of sulfur water.
-	3,876	95,000	-	156,534	-	-	-	-	-	.07	7.9	CGL	DST 5 recovered 1,710 feet of slightly muddy sulfur salt water. Sample taken at test tool, clear water, hydrogen sulfide present.
-	1,183	5,500	-	90,623	-	-	-	-	-	.11	7.1	CGL	DST 6 recovered 4,185 feet of muddy water with slight sulfur odor. Clear water sample with precipitated iron oxide.
32	9.5	5.0	4.9	404	10	0	97	22	662	-	-	GS	Analysis includes 1.0 ppm fluoride.
0	100	52,540	-	87,099	-	-	-	-	-	[35] .09	7.0	CL	DST 1 recovered 129 feet of water-cut mud, very slightly oil and gas cut; and 598 feet of salt water with sulfur odor.
120	250	56,800	-	93,946	-	-	-	-	-	[36] .12	8.0	CL	DST 1 recovered 5,094 feet of oil slugged with gas, 309 feet of salt water and gas-cut oil, and 186 feet of salt water.
0	1,000	60,030	-	108,964	-	-	-	-	-	[37] .10	6.5	CL	DST 1 recovered 465 feet of muddy, slightly salty water with sulfur odor and 2,704 feet of slightly salty water with sulfur odor.
-	180	138	-	376	450	290	-	-	-	-	7.1	(38)	Well is 800 feet deep.

1/ Dissolved solids calculated from determined constituents except as noted.
2/ Analysis by: BR, U.S. Bureau of Reclamation
CGL, Chemical and geological Laboratories, Casper, Wyo.
CL, Core Laboratories, Inc., Dallas, Tex.
CO, Continental Oil Co.
CTL, California Testing Laboratories, Inc., Los Angeles, Calif.
Dow, Dowell Division of the Dow Chemical Co.
DH, Utah State Department of Health
GS, U.S. Geological Survey
PA, Pan American Petroleum Corp.
PL, Peterson Laboratories, Salt Lake City, Utah
RME, Rocky Mountain Engineering Co., Grand Junction, Colo.
ShO, Shell Oil Co.
SO, Superior Oil Co.
SU, Utah State University
UC, Utah State Chemist
3/ Resistivity measured at 67°F.
4/ Resistivity measured at 80°F.
5/ Iron present but amount not determined.
6/ Resistivity measured at 64°F.
7/ Analysis supplied by Cities Service Oil Co.
8/ Analysis supplied by Reserve Oil and Gas Co.
9/ Resistivity measured at 77°F.
10/ Resistivity measured at 89°F.
11/ Resistivity measured at 88°F.
12/ Analysis supplied by Pacific Natural Gas Exploration Co.
13/ Resistivity measured at 70°F.
14/ Iron in solution at time of analysis.
15/ pH determined at 22°C.
16/ Resistivity measured at 92°F.
17/ Resistivity measured at 86°F.
18/ Total iron.
19/ Resistivity measured at 74.5°F.
20/ Resistivity measured at 75°F.
21/ Dissolved solids determined after ignition.
22/ Resistivity measured at 95°F.
23/ Resistivity measured at 71°F.
24/ Resistivity measured at 69°F.
25/ Sum is calculated without silica.
26/ Resistivity measured at 83°F.
27/ Dissolved solids determined from the residue on evaporation.
28/ Dissolved solids calculated by author.
29/ Analysis supplied by Shell Oil Co.
30/ Analysis supplied by Phillips Petroleum Co.
31/ Analysis supplied by Superior Oil Co.
32/ Resistivity measured at 74°F.
33/ Resistivity measured at 72°F.
34/ Calculated.
35/ Resistivity measured at 76°F.
36/ Resistivity measured at 62°F.
37/ Resistivity measured at 54°F.
38/ Analysis supplied by Merritt-Chapman and Scott Corp.

Table 4. — Selected hydrogeologic data from springs, water well

Location: Salt Lake base and meridian.
Source: M, mine tunnel; O, oil or gas well; S, spring; T, test hole; W, water well.
Operator or owner: Name of operator or owner at time water sample was collected for chemical analysis.
Producing formation: Fm., Formation; Ls., Limestone; Mbr., Member; sed., sedimentary; Sh., Shale; Ss., Sandstone. Many formation names were reported in records of oil and gas companies and State and Federal agencies do not necessarily agree with one identification.

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bwpd/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	NA + K: Sodium (Na)	NA + K: Potassium (K)	Bicarbonate (HCO_3)
T	R	Section																		
20S	2W	NE¼NE¼NW¼ 34	W	Scipio Irrigation Co.	1	North Horn Fm.	460	-	460-700	30,000/600(E)	Flow	8-26-57	54	11	0.00	43	31	3.5	1.1	27
22S	1W	SW¼NE¼SE¼ 32	O	Standard Oil Co. of California	1	Navajo Ss.	8,397	-	9,309-9,477	-	DST 2	4- -57	-	-	-	7,320	1,335	8,384		53
23S	2W	SE¼NW¼SW¼ 36	S	Town of Glenwood and Utah State Fish Hatchery	Glenwood Spring	Tertiary igneous rocks	0	-	-	153,000/4,300(R)	Flow	7-15-57	59	41	1/00	26	6.4	10	1.9	11
23S	3W	NE¼SW¼NE¼ 26	S	City of Richfield	Richfield Spring	Crazy Hollow Fm.	0	-	-	47,500/1,400(R)	do	7-30-57	68	14	1/04	43	38	12	4.0	29
24S	4W	NW¼NW¼NE¼ 32	S	Town of Joseph	Gooseberry Spring	Tertiary igneous rocks	0	-	-	3,200/90(R)	do	7-30-57	52	40	1/04	48	9.6	10	5.8	179
25S	1W	SW¼NW¼ 26	S	Town of Burrville	Burr Spring	do	0	-	-	49,000/1,440(R)	do	7- 6-62	50	33	1/02	23	3.9	4.9	1.2	9
25S	3W	NE¼SE¼SE¼ 10	S	-	Monroe Hot Spring	do	0	-	-	1,400/40(E)	do	7-23-57	112	54	1/07	282	34	562	63	354
25S	3W	NE¼SW¼SE¼ 25	S	City of Monroe	Cold Spring	do	0	-	-	-	do	7-23-57	47	26	1/05	33	4.6	4.9	1.1	78
25S	4W	SW¼NE¼NE¼ 23	S	South Bend Irrigation Co.	Joseph Hot Spring	do	0	-	-	3,400/100(E)	do	7-23-57	-	85	1/56	282	36	1,440	68	424
26S	4W	NE¼NW¼NW¼ 29	W	Ben Derringer	1	do	95	-	At 100	850/25(R)	Pumped	7-22-57	53	23	1/00	327	112	30	5.8	38
27S	3W	NE¼NE¼SW¼ 2	M	Annie Laurie Consolidated Gold Mines	-	do	0	-	-	3,400/100(E)	Flow	10-15-59	47	14	-	39	4.6	8.6		152
27S	3W	SW¼SE¼SW¼ 2	M	do	-	do	0	-	-	13,900/400(E)	do	10-15-59	47	10	-	65	4.1	6.7		216
29S	2W	NW¼SE¼SW¼ 15	S	Gerald Allen	Pole Canyon Spring	do	0	-	-	9,200/270(M)	do	7- 6-62	55	42	1/01	32	8.0	11		140
29S	4W	SW¼SW¼NE¼ 21	S	Town of Junction	Sawmill Spring	do	0	-	-	-	do	7-29-57	55	39	1/02	23	4.5	5.0	2.8	107
30S	3W	NW¼NE¼NE¼ 24	S	Town of Kingston	Kingston Spring	do	0	-	-	510/15(M)	do	7-21-57	55	41	1/04	35	1.4	20	2.1	122
30S	4W	NW¼NE¼ 16	S	Town of Circleville	Circleville Spring	do	0	-	-	2,900/50(M)	do	12- 3-62	44	35	-	9.6	2.7	6.0		52
31S	2W	NE¼NE¼ 16	O	California Oil Co.	1	Kaibab Ls.	2,385	-	2,996-3,144	-	DST 1	11-13-64	-	-	0	156	37	656	35	659
31S	2W	NW¼NW¼ 19	S	Town of Antimony	Antimony Spring	Tertiary igneous rocks	0	-	-	7,500/220(R)	Flow	7- 5-62	53	43	4/00	43	4.4	15	1.5	174
31S	2W	SW¼SE¼ 27	T	California Oil Co.	1	do	0	1,074	At 1,025	1,400/40(E)	do	6- -64	-	-	-	3	-	-		-
32S	2W	SE¼SW¼NE¼ 2	S	Various water users	-	Wasatch and Arapien Head Fm.	0	-	-	15,300/450(E)	do	6- 7-62	50	34	4/01	51	15	13		234
32S	2W	NW¼SE¼NE¼ 23	S	do	Deer Creek Spring	do	0	-	-	53,900/1,540(M)	do	6-26-62	30	25	4/00	74	18	14	1.3	318
33S	6W	NW¼SW¼SW¼ 5	S	do	Bear Creek Spring	Tertiary igneous rocks	0	-	-	340/10(E)	do	6-28-62	64	31	-	17	3.6	27	1.8	116
34S	3W	SW¼SE¼SE¼ 27	S	do	Tom Best Spring	Wasatch Fm.	0	-	-	17,200/500(E)	do	7-31-62	50	30	-	53	14	18		246
34S	6W	SW¼ 18	S	City of Panguitch	Panguitch Spring	Tertiary igneous rocks	0	-	-	31,000/900(E)	do	5-14-62	51	28	4/28	24	4.6	7.4	.4	107
35S	2W	NW¼SW¼NE¼ 22	O	California Oil Co.	2	Kaibab Ls.	7,320	-	7,320-70	-	DST 1	5- 2-52	-	-	-	243	53	1,154		1,670
35S	2W	C NE¼NE¼ 27	O	Tidewater Oil Co.	41-27	Shinarump Mbr. of Chinle Fm.	6,307	6,386	6,312-25	206(R)/-	Swab test	9- 9-65	-	16	-	158	42	3,310		724
36S	3W	33	S	National Park Service	Campbell Canyon Spring	Wahweap and Straight Cliffs Ss.	0	-	-	330/17(M)	Flow	5-18-57	57	10	-	49	22	3.9		249
36S	7W	SW¼NE¼SE¼ 31	S	Various water users	Mammoth Spring	Wasatch Fm.	0	-	-	See Remarks	do	8- 6-54	40	20	-	20	4.7	6.4		92
37S	4W	SE¼SE¼SE¼ 11	W	National Park Service	1	do	0	500	270-300	-	Bailer	9- -59	-	1.7	-	40	16	9.4		310
						Wahweap and Straight Cliffs Ss.	600	-	See Remarks	-	do	7-25-60	-	7.0	-	42	16	34		340
						do	600	-	do	-	do	7-27-60	-	7.7	-	57	29	12		234
						do	600	-	do	-	do	8- 5-60	-	8.2	-	163	32	15		470
37S	4W	NE¼NW¼NW¼ 17	S	Various water users	Cold Spring	Kaiparowits Fm.	0	-	-	340/10(M)	Flow	6-26-62	44	6.4	-	39	31	3.3	16	271
37S	4W	23	S	National Park Service	Sheep Creek Spring	Wahweap and Straight Cliffs Ss.	0	-	-	1,630/48(M)	do	5-20-57	-	15	-	137	30	2.3		402
37S	6W	C NE¼SE¼ 16	O	Phillips Petroleum Co.	1A	Tropic Sh.	3,243	4,826	4,632-35	-	WLT 1	9- -63	-	-	0	3	1	583	17	988
						Dakota Ss.	4,326	4,893	4,826-	-	DST 1	9- -63	-	-	0	6	3	472	17	769
						Winsor Fm.	4,893	-	4,917											
37S	6W	SW¼NW¼ 33	S	Various water users	Lower Asay Spring	Wasatch Fm.	0	-	-	442,000/13,000(M)	Flow	8- 3-54	50	11	-	41	13	8.0		193
37S	7W	NE¼SE¼SE¼ 2	O	Phillips Petroleum Co.	13	Dakota Ss.	4,872	4,963	4,872-	-	DST 3	10- -63	-	-	0	17	3	626	10	732
						Winsor Fm.	4,943	-	4,971											
37S	9W	SW¼SE¼NW¼ 11	S	National Park Service	2	Wasatch Fm.	0	-	-	25/0.75(M)	Flow	9-24-60	38	9.7	.00	42	18	1.0	.3	218

nd oil and gas wells in bedrock in the High Plateaus section

ield: bwpd, barrels of water per day; gpm, gallons per minute; (E), estimated; (M), measured; (R), reported at time water sample was collected for chemical analysis. The (E), (M), or (R) is beside the given unit. The other unit is calculated on the basis of 1 gpm equals 34 bwpd and 1 bwpd equals 0.03 gpm.
ethod or point of collection: Flow, indicates collection at a spring or flowing well; DST, drill-stem test for oil or gas; WLT, wire-line test for oil or gas.
emarks: DST, drill-stem test data, and WLT, wire-line test data reported by oil or gas company.

Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1/]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-absorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2/]	Remarks
million													
	4.4	7.5	2.0	238	235	12	-	0.1	436	-	7.7	GS	Reported yield on 2-12-57 was 1,400 gpm (48,000 bwpd) and on 6-25-63 was 290 gpm (10,000 bwpd). Analysis includes 0.1 ppm fluoride.
	1,761	30,000	-	50,163	-	-	-	-	-	0.15	6.8	CGL	DST 2 recovered 7,522 feet of salt water. Cloudy water with a high organic content, unable to correlate at this time but believed to be formation water.
	3.2	13	.7	159	91	0	18	.5	232	-	6.0	GS	Analysis includes 0.0 ppm aluminum, 0.00 ppm copper, 0.1 ppm fluoride, 0.3 ppm lithium, 0.00 ppm manganese, 0.1 ppm phosphate, and 0.00 ppm zinc.
)	27	20	.8	310	269	25	6	.3	348	-	7.9	GS	Analysis includes 0.1 ppm aluminum, 0.00 ppm copper, 0.2 ppm fluoride, 0.5 ppm lithium, 0.01 ppm manganese, 0.4 ppm phosphate, and 0.00 ppm zinc.
)	9.2	19	3.2	235	159	13	11	.3	371	-	7.9	GS	Analysis includes 0.0 ppm aluminum, 0.00 ppm copper, 0.2 ppm fluoride, 0.6 ppm lithium, 0.01 ppm manganese, 0.9 ppm phosphate, and 0.00 ppm zinc.
)	2.5	5.0	.1	119	74	0	12	.2	158	-	7.5	GS	Analysis includes 0.02 ppm boron and 0.3 ppm fluoride.
)	898	630	.0	2,700	864	554	56	9.4	4,100	-	7.6	GS	Analysis includes 0.2 ppm aluminum, 0.00 ppm copper, 2.6 ppm fluoride, 4.8 ppm lithium, 0.02 ppm manganese, 0.3 ppm phosphate, and 0.02 ppm zinc.
)	17	3.5	.2	119	76	12	1	.2	178	-	7.5	GS	Analysis includes 0.1 ppm aluminum, 0.00 ppm copper, 0.1 ppm fluoride, 0.2 ppm lithium, 0.13 ppm manganese, 0.2 ppm phosphate, and 0.00 ppm zinc.
)	1,270	1,750	.0	5,150	852	502	76	22	7,790	-	6.9	GS	Analysis includes 0.1 ppm aluminum, 0.00 ppm copper, 0.7 ppm fluoride, 8.0 ppm lithium, 0.41 ppm manganese, 0.4 ppm phosphate, and 0.00 ppm zinc. Temperature is greater than 130°F.
)	1,240	17	.1	1,790	1,280	1,250	.5	.9	2,050	-	9.7	GS	Analysis includes 0.1 ppm aluminum, 0.00 ppm copper, 3.9 ppm fluoride, 1.0 ppm lithium, 6.5 ppm manganese, 0.0 ppm phosphate, and 0.00 ppm zinc.
)	6.2	2.5	.3	150	116	0	14	.3	256	-	7.8	GS	Mine tunnel caved and abandoned.
-	--	2.0	.0	207	174	2	5	.2	358	-	-	GS	Do.
)	3.4	9.0	.1	146	12	0	17	.4	254	-	7.4	GS	Analysis [illegible] 0.3 ppm fluoride.
)	1.8	2.0	.7	134	76	0	-	.3	176	-	7.7	GS	Analysis includes 0.1 ppm fluoride, 0.4 ppm lithium, and 0.00 ppm manganese
)	4.6	7.9	.6	168	68	0	35	1.1	230	-	7.4	GS	Analysis includes 3.2 ppm fluoride, 1.0 ppm lithium, and 0.02 ppm manganese.
)	1.9	2.5	.0	84	33	0	27	.4	85	-	7.2	GS	
-	1,275	108	-	2,593	-	-	-	-	-	4.6	7.4	CGL	DST 1 recovered 300 feet of mud, 400 feet of water-cut mud, 300 feet of muddy water, and 1,053 feet of slightly muddy water. Sample from bottom.
)	7.0	8.0	.6	209	126	0	20	.6	294	-	7.3	GS	Analysis includes 0.08 ppm boron and 0.3 ppm fluoride.
-	0	300	-	-	-	-	-	-	-	-	-	(E)	A flow of water was encountered during drilling at depth of 1,025 feet.
)		11	2.3	255	194	2	13	.4	420	-	7.6	GS	The spring is in a basalt flow probably in the Brian Head Formation. Analysis includes 0.05 ppm boron and 0.1 ppm fluoride.
)	16	10	2.6	318	258	0	10	.4	519	-	7.5	GS	The spring is in a basalt flow probably in the Brian Head Formation. Analysis includes 0.06 ppm boron and 0.2 ppm fluoride.
)	4.8	11	.5	154	57	0	50	1.6	221	-	7.8	GS	Analysis includes 0.02 ppm boron and 0.2 ppm fluoride.
)	17	6.0	.9	260	191	0	17	.6	408	-	7.8	GS	Analysis includes 0.04 ppm boron and 0.2 ppm fluoride.
)	4.3	4.0	.1	126	80	0	17	.4	180	-	7.3	GS	Analysis includes 0.02 ppm boron and 0.1 ppm fluoride.
-	1,151	560	-	3,992	-	-	-	-	-	2.1	7.3	CGL	DST 2 recovered 1,730 feet of water with a few specks of heavy dead crude oil. Salinity of water ranged from 300 to 500 ppm chloride.
)	1,870	1,990	2.0	9,140	368	0	92	55	11,700	-	6.9	GS	
)	.7	2.0	.1	227	214	10	5	.1	401	-	9.1	GS	
)	3.6	2.5	.0	103	70	0	17	.3	152	-	7.9	GS	Spring discharge measurements: April 1957, 900 gpm (30,600 bwpd); June 1957, 121,000 gpm (4,110,000 bwpd).
0	6.6	5.5	.5	252	249	0	5	.1	404	-	7.9	GS	Water sample collected while drilling well, casing at 270 feet.
0	37	5.5	.4	260	170	0	30	1.1	435	-	7.8	GS	Well cased to 2,000 feet, perforated from 1,873 to 1,920 and 1,962 to 1,974 feet.
0	91	3.0	.4	315	264	72	9	.3	510	-	7.9	GS	Well cased to 2,000 feet, perforated from 1,268 to 1,282, 1,873 to 1,920, and 1,962 to 1,974 feet.
0	365	6.0	.4	870	742	337	4	.2	1,210	-	7.6	GS	Well cased to 2,000 feet, perforated from 860 to 890, 1,268 to 1,282, 1,873 to 1,920, and 1,962 to 1,974 feet.
0	5.6	4.0	.1	223	225	3	3	.1	413	-	6.1	GS	Analysis includes 0.02 ppm boron and 0.1 ppm fluoride.
0	364	8.0	.1	915	714	384	-	-	1,160	-	7.7	GS	
0	350	90	-	1,530	-	-	-	-	-	4.6	7.7	CGL	WLT 1 recovered 20,250 cc (cubic centimeters) (5.4 gallons) of water and 250 cc (less than 1 cubic foot) of sand. Water sample was from a sand in the lower part of the Tropic Shale, which was logged from 4,433 to 4,826 feet. Analysis includes 0.0 ppm lithium.
8	176	130	-	1,231	-	-	-	-	-	6.0	8.7	CGL	DST 1 recovered 1,250 feet of slightly mud-cut brackish water. Analysis includes 0.0 ppm lithium.
0	11	2.5	.7	182	156	0	10	.3	294	-	7.7	GS	
0	265	100	-	1,634	-	-	-	-	-	4.4	9.3	CGL	DST 3 recovered 682 feet of mud-cut water. Analysis includes 1 ppm lithium.
0	2.1	1.5	1.4	193	179	0	1	.0	182	-	8.1	GS	Analysis includes 0.01 ppm boron and 0.2 ppm fluoride.

Table 4. — Continued

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bwpd/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per					
																	NA + K		
T	R	Section												Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)
38S	5W	SE¼SW¼ 23	S	-	-	Kaiparowits Fm.	0	-	-	8,500 250(R)	Flow	7- 1-63	45	0.8	0.04	58	30	0.3		3/31
39S	5W	NE¼SE¼ 3	S	-	-	do	0	-	-	1,700 50(R)	do	8-29-63	45	1.6	.09	35	40	20		5/401
39S	5W	SW¼NE¼ 15	S	-	-	do	0	-	-	950 28(R)	do	7- 9-63	44	7.8	0	68	33	15		5/378
39S	6W	NW¼SW¼NW¼ 7	S	-	-	do	0	-	-	5,400 160(R)	do	7-27-63	54	1.2	0	46	34	7.4		2/305
39S	6W	SE¼NW¼SE¼ 17	S	-	-	Wasatch Fm.	0	-	-	5,100 150(E)	do	8-14-63	50	2.8	0	56	34	6.5		2/331
39S	7W	NE¼SW¼SW¼ 15	S	-	-	Kaiparowits Fm.	0	-	-	10,000 300(E)	do	8-28-63	48	5.3	0	46	40	39		2/457
39S	7W	SW¼SE¼SW¼ 25	S	-	-	do	0	-	-	340 10(E)	do	7-26-63	52	3.9	0	65	34	11		5/347
39S	7W	NW¼SW¼NE¼ 36	S	-	-	Wahweap Ss.	0	-	-	27 0.3(R)	do	7-20-63	57	5.6	.06	30	12	6.1		5/152
39S	10W	SE¼Loc 22 30	S	-	-	Carmel Fm.	0	-	-	1,300 38(R)	do	11- 8-63	44	19	1/.05	29	10	4.2	1.0	125
40S	5W	SE¼SW¼NW¼ 5	S	Preston Swapp	-	Tropic Sh.	0	-	-	100 3(R)	do	8-21-63	50	3.1	.04	70	37	23		3/396
40S	6W	NW¼NE¼SE¼ 7	S	-	-	Tropic(?) Sh.	0	-	-	100 3(E)	do	7-22-63	57	11.5	0	86	39	22		3/329
40S	7W	SW¼SE¼NE¼ 28	S	-	-	Wahweap Ss.	0	-	-	100 3(E)	do	8-12-63	52	6.0	0	117	57	27		5/451
40S	7W	NW¼SE¼NE¼ 25	S	-	-	Carmel Fm.	0	-	-	170 5(E)	do	7-31-63	58	12	0	119	59	22		3/347
40S	10W	NE¼ 33	S	National Park Service	-	Navajo Ss.	0	-	-	-	do	3- 7-63	-	9.8	.01	36	11	2.0	1.6	165
40S	13W	NE¼NW¼NE¼ 23	O	McCulloch Oil Corp.	1	Paleozoic lime-stone	400	-	410-1,440	4,300 140(E)	See Remarks	1- 9-64	-	-	(3)	110	45	-		90
41S	7W	SE¼NE¼NW¼ 11	S	-	-	Carmel Fm.	0	-	-	70 2(E)	Flow	7-31-63	58	20	0	143	61	66		3/305
41S	9W	NW¼SE¼NW¼ 20	W	National Park Service	1	Navajo Ss.	0	-	865-924	310 9(M)	Bailed	7-31-62	68	11	.00	63	9.3	13		186
41S	10W	21	S	do	-	do	0	-	-	See Remarks	Flow	3- 7-63	-	9.1	.02	32	13	10	1.4	144
41S	10W	4	S	do	-	do	0	-	-	do	do	3- 7-63	-	8.5	.01	19	8.8	1.5	1.3	96
41S	10W	17 and 20	S	do	-	do	0	-	-	do	do	3- 6-63	-	8.4	.07	45	14	4.0	2.0	199
41S	12W	SW¼NE¼NW¼ 13	O	Utah Parks Petroleum Corp.	3	Moenkopi Fm.	0	-	632-636	-	Bailed	8- -30	-	-	-	1,305	1,402	27,380		150
41S	13W	SW¼ 24	S	-	LaVerkin Hot Springs	Kaibab Ls.	0	-	-	162,000 4,760(R)	Flow	8-31-60	100	28	.00	590	148	2,400	177	583
42S	6W	SW¼NE¼SE¼ 17	S	-	-	Navajo Ss.	0	-	-	350 25(E)	do	8-26-63	57	6.7	0	32	15	14		170
42S	7W	C SW¼NE¼ 16	O	Superior Oil Co.	32-16	Toroweap Fm.	4,207	4,628	4,590-4,604	-	DST 2	10-30-62	-	-	0	160	194	5,405		4,758
42S	7W	SE¼SE¼NW¼ 19	W	Bureau of Land Management	1	Navajo Ss.	0	-	550-600	-	-	7- -62	-	18	-	-	-	-		-
11S	7E	C NE¼NW¼ 11	O	E. W. Paulev	1	Ferron Ss. Mbr. of Mancos Sh.	7,242	7,797	7,400-7,705	2,200(R) 90	Swab test	9-28-58	-	-	-	9	3	456		1,301
11S	7E	SW¼SE¼SE¼ 13	S	G. Jackson	-	North Horn Fm.	0	-	-	100 3(M)	Flow	8-24-62	44	6.5	1/.00	67	27	2.5		316
11S	7E	NW¼SE¼NW¼ 36	S	N. Johnson	-	Price River Fm.	0	-	-	680 20(E)	do	7-11-62	-	6.3	-	67	23	3.9		307
11S	9E	NE¼SW¼NW¼ 22	W	Utah Power and Light Co.	Colton Well No. 2	North Horn Fm.	560	1,825	See Remarks	See Remarks	-	2- 9-54	-	11	7.3	35	26	11		301
11S	8E	SE¼NE¼SE¼ 27	S	City of Price	Colton Spring	Flagstaff Ls.	See Remarks	-	-	do	Flow	7-11-61	48	7.3	.00	27	31	7.6		214
12S	8E	NE¼NW¼NE¼ 3	S	P. Nelson	-	do	0	-	-	-	do	8- 9-62	44	8.0	-	32	29	6.0		172
13S	7E	C SE¼SW¼ 15	O	Standlind Oil and Gas Co.	1	Ferron Ss. Mbr. of Mancos Sh.	6,129	-	6,195-97	-	Ac flare line	12- -54	-	-	-	14	(8)	1,344		1,960
									6,472-6,502	-	DST 3	12- -54	-	-	-	14	(8)	1,437		2,050
13S	7E	SW¼SE¼SW¼ 17	O	Mountain Fuel Supply Co.	7	do	3,835	4,250	3,865-4,250	-	Production water	4-30-63	-	-	(11)	10	3	109	3	122
13S	7E	NW¼NE¼NW¼ 19	O	do	8	do	4,204	-	4,227-4,390	-	do	4-30-63	-	-	-	17	3	1,976	10	2,135
13S	7E	SE¼SW¼NW¼ 29	O	do	1	do	4,334	-	4,342-4,812	-	do	5-21-63	-	-	-	15	4	439	3	256
13S	7E	NW¼SW¼SW¼ 32	O	do	2	do	4,483	-	4,508-4,910	-	do	4-30-63	-	-	(11)	2	(8)	25		91
												3-21-64	-	-	-	14	10	1,770	10	2,722
13S	7E	SE¼NW¼SE¼ 32	O	do	3	do	4,067	4,564	4,070-4,402	-	do	4-30-63	-	-	(11)	13	10	169	3	403
										See Remarks	do	11- 5-64	-	1.6	-	6.4	5.8	239		274
14S	4E	SW¼NW¼NE¼ 1	W	City of Fairview	1	North Horn Fm.	-	-	174-383	do	Flow	7-25-52	-	19	.05	62	29	25		352

million													
(CO_3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2]	Remarks
	10	6	0	[1]277	271	-	-	-	-	-	-	UC	
	74	8	0	[1]462	376	-	-	-	-	-	-	UC	
	19	9	0	[1]332	304	-	-	-	-	-	-	UC	
	4.7	8	0	[1]283	256	-	-	-	-	-	-	UC	
	5.3	10	0	[1]287	278	-	-	-	-	-	-	UC	
	20	10	0	[1]416	274	-	-	-	-	-	-	UC	
	30	8	0	[1]347	301	-	-	-	-	-	-	UC	
	6.1	8	0	[1]145	124	-	-	-	-	-	-	UC	
	15	3.5	1.6	145	115	12	7	0.2	240	-	7.2	GS	Analysis includes 0.02 ppm boron, 0.2 ppm fluoride, and 0.0 ppm manganese.
	34	14	0	[1]420	328	-	-	-	-	-	-	UC	
	132	10	0	[1]527	373	-	-	-	-	-	-	UC	
	196	9	0	[1]690	527	-	-	-	-	-	-	UC	
	258	15	1.5	[1]809	540	-	-	-	-	-	-	UC	
	4.9	4.5	.5	151	138	3	3	.1	263	-	7.6	GS	Spring supplies Temple of Sinawava water system. Analysis includes 0.04 ppm boron, 0.1 ppm fluoride, and 0.00 ppm manganese.
	232	102	-	579	-	-	-	-	-	-	7.7	HC	Oil test drilled by air-rotary method. Water was encountered at -10 feet, with estimated yield of 2 gpm (70 bwpd) at 920 feet, 25 gpm (850 bwpd) at 1,200 feet, 140 gpm (4,800 bwpd) at 1,470 feet, and 300 gpm (10,200 bwpd) at 1,600 feet. Salt water at 5,000 feet.
	458	19	8.4	[1]1,017	610	-	-	-	-	-	-	UC	
	56	10	.3	254	197	44	13	.4	421	-	7.5	GS	Analysis includes 0.3 ppm fluoride.
	16	16	.7	169	134	16	14	.4	296	-	7.6	GS	Spring supplies water to Grotto water system. Reported yield in July 1960 was 70 gpm (2,400 bwpd). Analysis includes 0.05 ppm boron, 0.1 ppm fluoride, and 0.00 ppm manganese.
	2.1	3.0	.1	91	84	5	4	.1	152	-	7.5	GS	Springs of Birch Creek water system. Reported yield in July 1960 was 90 gpm (3,000 bwpd). Analysis includes 0.03 ppm boron, 0.1 ppm fluoride, and 0.00 ppm manganese.
	7.0	5.5	1.5	186	170	7	5	.1	332	-	7.6	GS	Springs of Oak Creek water system. Reported yield in July 1960 was 55 gpm (1,900 bwpd). Analysis includes 0.04 ppm boron, 0.1 ppm fluoride, and 0.00 ppm manganese.
-	2,648	50,000	-	84,714	-	-	-	-	-	-	-	GS	Sample may be contaminated by surface water.
	2,050	3,610	3.2	9,390	2,080	1,600	70	24	13,500	-	7.4	GS	Sampled flow of entire spring area at old highway bridge. Analysis includes 5.0 ppm boron and 2.1 ppm fluoride.
-	18	9	2.0	182	[1]139	-	-	-	-	-	-	UC	
	8,000	532	-	19,149	-	-	-	-	-	[3]0.49	8.0	CL	DST 2 recovered 196 feet of sulfur water.
-	-	-	-	220	164	-	-	-	-	-	8.1	(10)	
	11	70	-	1,095	-	-	-	-	-	-	-	GS	A DST from 7,400 to 7,761 feet recovered 3,783 feet of very heavily gas-cut water.
	14	5.5	2.7	280	278	19	2	.1	495	-	7.7	GS	
	7.4	5.0	2.8	267	260	8	3	.1	484	-	7.7	GS	
	53	15	7.2	[1]310	246	22	9	-	-	-	7.6	DH	Although the well is perforated from 1,290 to 1,948 feet, opposite the Price River Formation, only the North Horn Formation reportedly yielded water. Reported yields in 1962: flowed 270 gpm (9,200 bwpd) and pumped 1,600 gpm (54,000 bwpd).
	24	7.0	.4	209	194	19	8	.2	369	-	8.1	GS	The Colton Spring is possibly a fault spring that issues from the Colton Formation, which overlies the water-bearing Flagstaff Limestone. Yield from Colton Spring locale, in millions of gallons: 394 (9.4 million barrels) in 1961 and 691 (16.4 million barrels) in 1957 (see Cordova, 1963, p. 16).
	16	10	1.8	336	324	19	4	.1	603	-	7.6	GS	
	16	859	-	3,272	-	-	-	-	-	2.30	8.2	CGL	
	24	733	-	3,335	-	-	-	-	-	2.30	8.3	CGL	DST 3 recovered 2,350 feet of very slightly gas-cut water.
-	0	126	-	311	-	-	-	-	-	19.5	6.3	CGL	The water was cloudy orange, with precipitat ' iron oxide, and it is believed to be mainly condensed water.
-	0	1,700	-	4,657	-	-	-	-	-	1.5	7.6	CGL	
-	(8)	570	-	1,157	-	-	-	-	-	5.25	6.9	CGL	Water is similar in chemical composition to water from the Ferron Sandstone Member except that it is much more dilute. The water is believed to be a mixture of condensed and formation water.
-	0	6	-	63	-	-	-	-	-	95.0	5.9	CGL	The water was cloudy orange, with precipitated iron oxide, and it is believed to be condensed water.
-	(8)	1,150	-	4,254	-	-	-	-	-	1.62	7.3	CGL	Water was clear and soapy.
-	0	392	-	987	-	-	-	-	-	6.40	6.4	CGL	Water was cloudy yellow, with precipitated iron oxide, and it is believed to be an equal mixture of condensed water and formation water.
0	11	230	.1	629	40	0	93	16	1,120	-	6.5	GS	Producing gas well, yield was less than 1 gpm (less than 34 bwpd).
-	16	7.9	11	344	273	-	-	-	-	-	-	DH	Reported yield in 1952: flow, 50 gpm (1,700 bwpd); pumped, 700 gpm (24,000 bwpd). Analysis includes 0.4 ppm fluoride.

Table 4. — Continued

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bwpd/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per						
														Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	NA + K		Bicarbonate (HCO_3)
T	R	Section																Sodium (Na)	Potassium (K)	
14S	5E	SE¼SE¼NW¼ 16	W	Birch Creek Irrigation Co.	1	Emery Ss. Mbr. of Mancos Sh.	-	5,818	-	30,000/900(E)	Flow	5-18-59	133	35	-	27	6.1	129		440
14S	7E	SW¼NW¼NE¼ 5	O	Mountain Fuel Supply Co.	10	Ferron Ss. Mbr. of Mancos Sh.	4,622	-	4,678-5,063	-	Production water	4-30-63	-	-	(11)	6	1	510	2	388
14S	7E	E½SE¼SW¼ 5	O	do	1	do	4,335	-	4,361-4,645	See Remarks	do	11- 5-64	-	17	-	20	9.7	1,770		2,070
14S	7E	NW¼SE¼SW¼ 19	O	do	1-X	do	4,075	-	4,091-4,439	-	do	4-30-63	-	-	-	9	3	1,262	2	1,330
14S	7E	C SE¼NE¼ 24	O	Pacific Western Oil Corp.	1	Kayenta Fm. Wingate Ss.	9,365 9,500	9,500 9,940	9,470-9,535	-	DST 1	3-21-47	-	-	-	379	167	15,416		1,250
14S	7E	SE¼SE¼SW¼ 30	O	Mountain Fuel Supply Co.	A-3	Ferron Ss. Mbr. of Mancos Sh.	3,706	-	3,719-4,049	-	Production water	4-30-63	-	-	-	25	6	1,151	6	1,337
14S	7E	SE¼NW¼SW¼ 32	O	Three States Natural Gas Co.	1-A	do	4,495	4,871	4,516-71	-	DST 1	4- 4-56	-	-	-	18	12	117		305
15S	3E	N½SE¼NE¼ 16	O	Tenneco Oil Co.	1	do	8,202	9,150	8,709-50	-	DST 4	1957	-	-	-	24	-	1,011		1,305
									8,969-84	-	DST 7	1957	-	-	-	15	-	1,337		1,425
						Dakota Ss.	9,741	9,357	9,776-9,852	-	DST 10	1957	-	-	-	1,923	233	16,534		440
15S	5E	NW¼SW¼NW¼ 17	O	Three States Natural Gas Co.	1-X	Ferron Ss. Mbr. of Mancos Sh.	7,090	-	-	-	Production water	4-12-56	-	-	-	7	2	187		434
15S	6E	SW¼SE¼SW¼ 20	O	Tenneco Oil Co.	3	do	6,695	-	6,720-6,848	See Remarks	See Remarks	11- 5-64	-	21	-	60	12	1,360		1,350
16S	3E	NE¼SE¼SW¼ 13	W	T. Agaard	1	Crazy Hollow Fm.	-	-	87-200	30,900/910(M)	Pumped	6- 4-65	53	25	-	103	32	35	-	473
16S	3E	SW¼NW¼SW¼ 23	O	Three States Natural Gas Co.	2	Emery Ss. Mbr. of Mancos Sh.	3,810	-	3,868-79	-	DST 1	8-18-54	-	-	-	13	6	529		1,110
						Dakota Ss.	8,305	-	8,205-12	-	DST 9	11-13-54	-	-	-	28	11	1,448		2,540
16S	6E	SE¼SW¼SW¼ 23	O	do	3	Ferron Ss. Mbr. of Mancos Sh.	6,600	7,150	See Remarks	-	-	3- -54	-	-	-	122	52	2,089		1,755
16S	7E	SW¼NE¼SE¼ 9	O	do	4	do	4,490	4,880	See Remarks	-	-	5- -54	-	-	-	4	4	1,315		1,350
						Dakota Ss.	5,290	5,430	5,308-18	-	DST 2	3-29-54	-	-	-	17	14	2,180		2,125
17S	2E	NE¼SE¼NE¼ 35	W	Kjar Brothers	1	Green River Fm.	150	-	See Remarks	1,550/75(M)	Flow	7-27-60	53	17	0.14	44	41	32	.9	304
17S	4E	SW¼SE¼ 13	S	City of Spanish	-	North Horn Fm.	0	-	-	61,000/1,300(E)	do	8-28-57	45	5.1	1/10	45	21	9.8	2.2	262
17S	7E	SW¼SE¼SE¼ 25	O	Utah Southern Oil Co.	1	Ferron Ss. Mbr. of Mancos Sh.	3,380	3,880	-	-	-	3- -54	-	-	-	32	24	9,048		9,750
18S	1E	NW¼NE¼SE¼ 19	S	Town of Fayette	Fayette Spring	Flagstaff Ls.	0	-	-	65,000/1,300(M)	Flow	8-27-57	64	13	1/00	49	43	39	1.9	305
18S	4E	NW¼NW¼ 20	S	City of Manti	-	North Horn Fm.	0	-	-	-	do	8-28-57	41	6.5	1/09	62	36	9.1	1.0	218
19S	3E	NE¼NE¼SE¼ 4	S	City of Gunnison	Peacock Spring	Green River Fm.	0	-	-	-	do	8-27-58	67	13	2/05	38	19	94	3.8	310
19S	2E	SE¼SE¼SE¼ 20	S	Town of Centerfield	Spannard Spring	do	0	-	-	1,200/100(E)	do	8-28-57	55	19	.09	74	66	49	1.7	450
20S	4E	SW¼NW¼NE¼ 20	O	California Oil Co.	1	Ferron Ss. Mbr. of Mancos Sh.	3,581	-	3,830-90	-	DST 4	10- -61	-	-	-	16	19	3,938		1,120
22S	2E	SW¼NE¼NE¼ 15	W	Salina Irrigation Co.	1	Blackhawk Fm.	-	350	Ac 425 and 600	33,000/975(E)	Flow	8-27-57	66	11	1/29	26	10	47	5.1	196
22S	3E	NW¼SE¼ 20	M	-	-	do	-	-	Ac 167	54,000/1,900(R)	Pumped	7-11-61	53	9.2	2/01	96	30	219		492
22S	4E	SE¼NW¼SW¼ 17	O	Mountain Fuel Supply Co.	1	Blackhawk Fm.	270	1,175	1,156-96	-	DST 1	11-28-55	-	-	-	32	19	781		1,290
						Star Point Ss.	1,175	1,754												
						Masuk Sh. and Emery Ss. Mbr. of Mancos Sh.	1,754 2,090	2,080 2,963	2,045-2,107	-	DST 2	12- 3-55	-	-	-	49	13	603		980
						Ferron Ss. Mbr. of Mancos Sh.	4,727	5,340	4,732-57	-	DST 5	1-23-56	-	-	-	471	126	6,202		1,035
									4,782-98	-	DST 6	1-24-56	-	-	-	308	190	7,981		360
									4,910-20	-	DST 8	1-27-56	-	-	-	153	41	1,793		1,360
									5,226-42	-	DST 11	2-10-56	-	-	-	314	134	3,960		910
						Dakota Ss.	6,132	6,280	6,196-6,212	-	DST 13	2-24-56	-	-	-	1,498	1,042	21,010		943
						Cedar Mountain Fm. and Morrison Fm.	6,280 6,392	6,392 -	6,370-6,434	-	DST 15	3- 1-56	-	-	-	2,993	970	16,999		280
22S	5E	NE¼SW¼NE¼ 23	O	K. O. Owen	1	Ferron Ss. Mbr. of Mancos Sh.	1,242	1,775	1,305-19	-	Flow	1-19-53	-	-	-	109	32	2,317		395
									1,395-1,408	710/21(R)	DST 2	1-22-53	-	-	-	221	48	3,397		452
									1,423-36	-	DST 3	1-24-53	-	-	-	209	40	2,492		437
									1,520-30	-	DST 5	1-28-53	-	-	-	222	92	3,077		855
22S	5E	C SW¼SE¼ 34	O	Skelly Oil Co.	1	do	1,170	1,730	1,174-1,205	2,400/75(R)	Flow	2- 3-62	-	15	2/02	488	24	2,900		370
24S	1E	SE¼SW¼NW¼ 13	S	City of Salina	Little Last Creek Spring	Tertiary igneous rocks	0	-	-	37,000/1,100(R)	do	9-26-57	53	44	1/04	21	3.8	9.0	3.0	91
26S	1E	NW¼NE¼ 30	S	Town of Koosharem	Brown Spring	do	0	-	-	9,300/300(E)	do	8-22-62	55	29	2/02	16	1.5	7.5		67
26S	3E	13	S	-	-	do	0	-	-	10,000/300(E)	do	4-24-59	-	37	-	28	9.2	8.3		119
27S	2E	25	S	Utah Fish and Game Dept.	Loa Fish Hatchery Spring	do	0	-	-	153,000/4,500(E)	do	4-24-59	-	40	-	33	9.2	14		136

Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2]	Remarks
	million												
0	0.0	8.0	0.2	421	92	0	75	5.8	645	-	7.5	GS	Abandoned gas test converted to a water well.
-	0	228	-	1,233	-	-	-	-	-	5.5	7.3	CGL	Water was cloudy orange, with precipitated iron oxide, and it is believed to be a mixture of approximately 25-50 percent formation water with the remaining being condensed water.
0	4.1	1,580	22	4,440	90	0	98	81	7,110	-	8.0	GS	Producing gas well that yielded less than 1 gpm (less than 34 bwpd).
(8)	0	1,200	-	3,131	-	-	-	-	-	2.12	8.2	CGL	
-	1,439	23,500	-	41,716	-	-	-	-	-	.16	6.5	CGL	
0	0	950	-	2,895	-	-	-	-	-	2.2	7.9	CGL	
-	69	20	-	386	-	-	-	-	-	18.7	6.8	CGL	Drilled sampled interval with natural gas. DST 1 recovered 20 feet of fresh water.
(8)	1,008	100	-	2,786	-	-	-	-	-	5.2	8.0	CGL	DST 4 recovered 8,700 feet of fresh water.
84	597	720	-	3,455	-	-	-	-	-	2.5	8.4	CGL	DST 7 recovered 500 feet of mud-cut fresh water.
-	344	28,700	-	47,751	-	-	-	-	-	.16	6.2	CGL	DST 10 recovered 210 feet of mud, 300 feet of salt water very slightly gas-cut with a faint trace of dead oil on top, and 352 feet of mud.
-	8	48	-	466	-	-	-	-	-	15.2	7.2	CGL	Water is believed to be condensed water. Well deepened to Dakota Sandstone in 1958.
0	24	2,060	7.4	5,050	200	0	96	60	8,150	-	7.8	GS	Water was pumped from tubing inside well as gas was produced from well casing during well production test. Yield was less than 1 gpm (less than 34 bwpd).
0	231	108	26	894	616	228	21	1.5	1,420	-	7.8	GS	Reported yield on 10-27-55 was 1,160 gpm (39,400 bwpd).
91	58	60	-	1,304	-	-	-	-	-	6.0	9.3	CGL	Sample contained red sediment.
144	457	330	-	3,669	-	-	-	-	-	2.4	9.5	CGL	DST 9 recovered 380 feet of mud, 920 feet of gas-cut mud, and 80 feet of water. Sample contained quebracho mud.
146	212	2,240	-	5,725	-	-	-	-	-	1.2	9.2	CGL	Sampled interval was not reported; however, the Ferron Sandstone was the producing formation.
172	239	650	-	3,247	-	-	-	-	-	1.2	9.0	CGL	While drilling the gas well, a water zone was reported from 4,718 to 4,768 feet.
-	66	2,150	-	5,474	-	-	-	-	-	1.3	7.8	CGL	DST 2 recovered 240 feet of gas-cut mud and 4,008 feet of gas-cut water.
0	68	22	.2	375	278	29	20	.8	640	-	8.0	GS	Well is 350 feet deep and is perforated from 127 to 140 feet in alluvium; however, the water enters the well mostly from the Green River Formation from the perforated zone at 215-280 feet and through the well bottom at 350 feet. Analysis includes 0.09 ppm boron and 0.4 ppm fluoride.
0	8.8	1.8	2.0	225	199	0	-	-	376	-	8.1	GS	Analysis includes 0.1 ppm fluoride and 0.00 ppm manganese.
635	-	2,600	-	14,341	-	-	-	-	-	.58	8.5	CGL	
0	43	132	1.2	553	300	50	-	2.5	1,020	-	7.6	GS	Analysis includes 0.3 ppm fluoride and 0.00 ppm manganese.
0	138	1.8	2.0	363	298	120	-	-	594	-	7.9	GS	Analysis includes 0.2 ppm fluoride and 0.00 ppm manganese.
2	71	34	.1	429	173	0	-	3.0	711	-	8.3	GS	Spring is in a fault zone at the base of the Wasatch Monocline, and the water contains hydrogen sulfide. Analysis includes 1.1 ppm fluoride and 0.02 ppm manganese.
0	107	37	23	398	456	87	-	1.0	978	-	7.5	GS	Analysis includes 0.3 ppm fluoride and 0.00 ppm manganese.
291	4,424	1,900	-	11,140	-	-	-	-	-	80	8.7	CGL	DST 4 recovered 730 feet of slightly muddy water and 709 feet of black brackish water.
0	43	8.0	.1	245	106	0	-	2.0	409	-	8.0	GS	While drilling a gas test in 1952, an artesian flow was encountered with an estimated yield of 2,000 gpm (68,000 bwpd). The gas test was later converted to a water well. Analysis includes 0.4 ppm fluoride and 0.00 ppm manganese.
0	394	26	1.1	903	256	0	92	5.0	1,300	-	7.8	GS	Water sample was from abandoned coal mine shaft, 10 feet square and 16 feet deep.
-	907	60	-	2,384	-	-	-	-	-	3.30	7.2	CGL	DST 1 recovered 60 feet of drilling mud and 250 feet of muddy fresh water. Organic matter present in water sample
-	597	44	-	1,793	-	-	-	-	-	4.60	7.7	CGL	DST 2 recovered 60 feet of mud and 1,080 feet of fresh water.
-	10,176	2,960	-	20,145	-	-	-	-	-	.50	7.0	CGL	DST 3 recovered 800 feet of salt water and 40 feet of mud. Organic matter present in water sample.
-	10,418	3,960	-	25,931	-	-	-	-	-	.40	6.8	CGL	DST 6 recovered 180 feet of muddy salt water.
-	2,263	580	-	5,598	-	-	-	-	-	1.50	7.5	CGL	DST 8 recovered 70 feet of salt water and mud. Organic matter present in water sample.
-	5,473	400	-	13,501	-	-	-	-	-	.80	7.2	CGL	DST 11 recovered 3,400 feet of brackish sulfur water and 30 feet of mud.
-	41	43,000	-	69,909	-	-	-	-	-	.13	6.5	CGL	DST 13 recovered 60 feet of mud and 660 feet of salt water. Clear water sample.
-	861	32,000	-	53,361	-	-	-	-	-	.18	6.5	CGL	DST 15 recovered 120 feet of mud and 240 feet of salt water. Organic matter present in water sample.
-	4,143	573	-	7,370	-	-	-	-	-	-	-	GS	Artesian flow encountered while drilling gas test.
-	4,424	703	-	8,015	-	-	-	-	-	-	-	GS	DST 2 flowed 1,240 gallons of water per hour (710 bwpd or 21 gpm) through a 5/8-inch opening.
-	4,373	702	-	8,233	-	-	-	-	-	-	-	GS	DST 3 recovered 750 feet of fresh muddy water.
-	3,463	707	-	6,954	-	-	-	-	-	-	-	GS	DST 5 recovered 1,260 feet of fresh water, muddy on top.
0	5,630	367	.3	9,510	1,320	1,010	31	31	10,700	-	7.2	GS	Artesian flow encountered while drilling gas test. Analysis includes 1.9 ppm boron.
0	3.0	9.3	1.2	140	98	0	21	.5	184	-	7.8	GS	Analysis includes 0.0 ppm aluminum, 0.00 ppm copper, 0.2 ppm fluoride, 0.2 ppm lithium, 0.2 ppm phosphate, 0.00 ppm manganese, and 0.00 ppm zinc.
0	2.3	4.0	.1	94	47	0	26	.5	116	-	7.6	GS	Analysis includes 0.1 ppm fluoride.
0	2.3	9.0	.5	160	106	0	14	.3	231	-	7.7	GS	Analysis includes 0.04 ppm boron and 0.2 ppm fluoride.
0	24	8.5	2.7	199	121	9	20	.5	287	-	7.3	GS	Analysis includes 0.03 ppm boron and 0.2 ppm fluoride.

Table 4. — Continued

Location			Source	Operator or owner	Name or number	Producing formation	Depth to top of formation (feet)	Depth to bottom of formation (feet)	Interval sampled (feet)	Yield (bwpd/gpm)	Method of point of collection	Date of collection	Temperature (°F)	Parts per					
														Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	NA + K	Bicarbonate (HCO_3)
																		Sodium (Na) / Potassium (K)	
T	R	Section																	
27S	2E	33	S	-	-	Tertiary limestone rocks	0	-	-	15,300 +50(E)	Flow	10-20-54	63	38	0.00	22	5.1	13 / 3.6	115
27S	3E	NE¼NE¼NE¼ 19	W	C. Albrecht	1	do	50	200	-	-	do	4-24-59	50	32	-	173	75	49	177
28S	4E	30	S	Forest Service	-	Wingate Ss.	0	-	-	14 1(E)	do	4-24-59	64	22	-	34	35	10	231
29S	5E	SW¼NW¼ 36	S	do	-	Shinarump Mbr. of Chinle Fm.	0	-	-	See Remarks	do	4-25-59	-	10	-	22	27	532	1,050
32S	3E	NE¼SE¼SW¼ 29	O	Phillips Petroleum Co.	2	Molas Fm. and Mississippian sed. rocks	4,343 / 4,887	4,887 / 5,932	See Remarks	480(R) 14	See Remarks	8-25-61	-	-	-	974	232	2,925	1,560
36S	1E	SE¼SE¼NE¼ 11	O	Tenneco Oil Co.	1	Kaibab Ls.	6,035	6,923	6,060-70	-	Production test	8-15-63	-	-	0	1,680	170	1,973	2,342
						Coconino Ss.	6,923	-	6,990-7,011	100(R) 3	do	8- 8-62	-	-	0	1,040	146	2,049	2,782
36S	1E	NE¼SW¼NW¼ 13	O	do	2	Kaibab Ls.	6,620	6,954	6,660-83	See Remarks	Production water	6-10-65	-	38	-	551	223	1,460	2,100
						Coconino Ss. See Remarks	7,315	7,345	See Remarks	-	See Remarks	12-12-63	-	-	0	940	24	2,515	1,220
						Cedar Mesa Ss. Mbr. of Cutler Fm.	7,500	8,550	7,505-90	100 3(R)	Swab test	1-20-64	-	-	0	736	228	262	1,376
		—				Mississippian sed. rocks	9,278	-	At 9,424	See Remarks	See Remarks	2-12-64	-	-	0	112	93	3,705	342

1/ Dissolved solids calculated from determined constituents except as noted.
2/ Analysis by: CGL, Chemical and Geological Laboratories, Casper, Wyo.
CL, Core Laboratories, Dallas, Tex.
OH, Utah State Department of Health
GS, U.S. Geological Survey
HC, Halliburton Co., Oklahoma City, Okla.
UC, Utah State Chemist
3/ Total iron.
4/ Iron in solution at time of analysis.
5/ Analysis supplied by California Oil Co.
6/ Calculated by author from parts per million of alkalinity (as calcium carbonate).
7/ Residue on evaporation.
8/ Trace.
9/ Resistivity measured at 77°F.
10/ Analysis supplied by Nevada Power Co.
11/ Iron present but amount not determined.
12/ Resistivity measured at 77°F.
13/ Analysis supplied by Phillips Petroleum Co.
14/ Resistivity measured at 72°F.
15/ Resistivity measured at 90°F.
16/ Resistivity measured at 61°F.

Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	Resistivity (ohmmeter at 68°F)	pH	Analysis by[2]	Remarks
	million												
0	3.1	5.5	2.1	150	76	0	26	0.6	212	-	7.8	GS	Analysis includes 0.2 ppm fluoride.
-	1,110	30	5.2	1,760	1,240	-	-	.6	1,990	-	7.9	GS	Well depth, 285 feet. Analysis includes 0.1 ppm fluoride.
0	167	7.5	.5	440	353	164	6	.2	665	-	7.9	GS	Sunset Park at Durfee Canyon. Analysis includes 0.05 ppm boron and 0.2 ppm fluoride.
-	387	36	.6	1,530	166	0	87	18	2,270	-	8.2	GS	Yield was less than 1 gpm (less than 34 bwpd). Analysis includes 0.76 ppm boron and 3.0 ppm fluoride.
0	2,475	4,178	-	12,344	-	-	-	-	-	[12] 0.59	-	(13)	Water production after encountering drilling breaks at 4,843-87 feet; yield increased from 0 to 10 barrels of water per hour while drilling with 3,450 cubic feet of air per hour. After drilling breaks at 4,987-95 feet, water production increased to an estimated 20 barrels of water per hour. Sample taken with compressor shutdown and well blowing mist and heads of water.
0	240	4,970	-	11,375	-	-	-	-	-	[14] 57	7.5	CL	
0	160	3,692	-	9,869	-	-	-	-	-	[14] 64	7.5	CL	Swabbed 80.8 barrels of fluid in 19 hours; no show of oil or gas.
0	2,970	3,540	1.1	11,800	2,290	569	77	31	16,500	-	7.0	GS	Well production in April 1965 was 82 barrels of water in 24 days, with 4,002 barrels of oil.
0	4,000	1,931	-	10,630	-	-	-	-	-	[12] 73	6.5	CL	Water sample collected while drilling with air between 6,565 (bottom of casing) and 7,370 feet. Formations exposed in open hole include Timpoweap Member of Moenkopi Formation, Kaibab Limestone, Toroweap Formation, Coconino Sandstone, and Organ Rock Tongue of Cutler Formation.
0	1,400	248	-	4,752	-	-	-	-	-	[15] 1.1	6.0	CL	
0	1,140	5,112	-	10,494	-	-	-	-	-	[16] 68	6.2	CL	Drilling with air and blowed well at 9,424 feet, well making 1 to 1.5 barrels of water per hour. Open hole from 9,267 to 9,424 feet.

PUBLICATIONS OF THE UTAH STATE ENGINEER'S OFFICE

(*) — Out of Print

TECHNICAL PUBLICATIONS

No. 1. Underground leakage from artesian wells in the Flowell area, near Fillmore, Utah, by Penn Livingston and G. B. Maxey, U.S. Geological Survey, 1944.

No. 2. The Ogden Valley artesian reservoir, Weber County, Utah, by H. E. Thomas, U.S. Geological Survey, 1945.

*No. 3. Ground water in Pavant Valley, Millard County, Utah, by P. E. Dennis, G. B. Maxey, and H. E. Thomas, U.S. Geological Survey, 1946.

*No. 4. Ground water in Tooele Valley, Tooele County, Utah, by H. E. Thomas, U.S. Geological Survey, in Utah State Eng. 25th Bienn. Rept., p. 91-238, pls. 1-6, 1946.

*No. 5. Ground water in the East Shore area, Utah: Part I. Bountiful District, Davis County, Utah, by H. E. Thomas and W. B. Nelson, U.S. Geological Survey, in Utah State Eng. 26th Bienn. Rept., p. 53-206, pls. 1-2, 1948.

*No. 6. Ground water in the Escalante Valley, Beaver, Iron, and Washington Counties, Utah, by P. F. Fix, W. B. Nelson, B. E. Lofgren, and R. G. Butler, U.S. Geological Survey, in Utah State Eng. 27th Bienn. Rept., p. 107-210, pls. 1-10, 1950.

No. 7. Status of development of selected ground-water basins in Utah, by H. E. Thomas, W. B. Nelson, B. E. Lofgren, and R. G. Butler, U.S. Geological Survey, 1952.

*No. 8. Consumptive use of water and irrigation requirements of crops in Utah, by C. O. Roskelly and Wayne D. Criddle, 1952.

No. 8. (Revised) Consumptive use and water requirements for Utah, by W. D. Criddle, K. Harris, and L. S. Willardson, 1962.

No. 9. Progress report on selected ground water basins in Utah, by H. A. Waite, W. B. Nelson, and others, U.S. Geological Survey, 1954.

No. 10. A compilation of chemical quality data for ground and surface waters in Utah, by J. G. Connor, C. G. Mitchell, and others, U.S. Geological Survey, 1958.

No. 11. Ground water in northern Utah Valley, Utah: A progress report for the period 1948-1963, by R. M. Cordova and Seymour Subitzky, U.S. Geological Survey, 1965.

No. 12. Reevaluation of the ground-water resources of Tooele Valley, Utah, by Joseph S. Gates, U.S. Geological Survey, 1965.

No. 13. Ground-water resources of selected basins in southwestern Utah, by G. W. Sandberg, U.S. Geological Survey, 1966.

No. 14. Water-resources appraisal of the Snake Valley area, Utah and Nevada, by J. W. Hood and F. E. Rush, U.S. Geological Survey, 1966.

WATER CIRCULAR

No. 1. Ground water in the Jordan Valley, Salt Lake County, Utah, by Ted Arnow, U. S. Geological Survey, 1965.

BASIC-DATA REPORTS

No. 1. Records and water-level measurements of selected wells and chemical analyses of ground water, East Shore area, Davis, Weber, and Box Elder Counties, Utah, by R. E. Smith, U.S. Geological Survey, 1961.

No. 2. Records of selected wells and springs, selected drillers' logs of wells, and chemical analyses of ground and surface waters, northern Utah Valley, Utah County, Utah, by Seymour Subitzky, U. S. Geological Survey, 1962.

No. 3. Ground-water data, central Sevier Valley, parts of Sanpete, Sevier, and Piute Counties, Utah, by C. H. Carpenter and R. A. Young, U. S. Geological Survey, 1963.

No. 4. Selected hydrologic data, Jordan Valley, Salt Lake County, Utah, by I. W. Marine and Don Price, U.S. Geological Survey, 1963.

No. 5. Selected hydrologic data, Pavant Valley, Millard County, Utah, by R. W. Mower, U.S. Geological Survey, 1963.

No. 6. Ground-water data, parts of Washington, Iron, Beaver, and Millard Counties, Utah, by G. W. Sandberg, U.S. Geological Survey, 1963.

No. 7. Selected hydrologic data, Tooele Valley, Tooele County, Utah, by J. S. Gates, U.S. Geological Survey, 1963.

No. 8. Selected hydrologic data, upper Sevier River basin, Utah, by C. H. Carpenter, G. B. Robinson, Jr., and L. J. Bjorklund, U.S. Geological Survey, 1964.

No. 9. Ground-water data, Sevier Desert, Utah, by R. W. Mower and R. D. Feltis, U.S. Geological Survey, 1964.

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No. 11. Hydrologic and climatologic data, collected through 1964, Salt Lake County, Utah, by W. V. Iorns, R. W. Mower, and C. A. Horr, U.S. Geological Survey, 1966.

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*No. 1. Plan of work for the Sevier River Basin (Sec. 6, P.L. 566), United States Department of Agriculture, 1960.

No. 2. Water production from oil wells in Utah, by Jerry Tuttle, Utah State Engineer's Office, 1960.

No. 3. Ground water areas and well logs, central Sevier Valley, Utah, by R. A. Young, United States Geological Survey, 1960.

No. 4. Ground water investigations in Utah in 1960 and reports published by the United States Geological Survey or the Utah State Engineer prior to 1960, by H. D. Goode, United States Geological Survey, 1960.

No. 5. Developing ground water in the central Sevier Valley, Utah, by R. A. Young and C. H. Carpenter, United States Geological Survey, 1961.

*No. 6. Work outline and report outline for Sevier River basin survey, (Sec. 6, P.L. 566), United States Department of Agriculture, 1961.

No. 7. Relation of the deep and shallow artesian aquifers near Lynndyl, Utah, by R. W. Mower, United States Geological Survey, 1961.

No. 8. Projected 1975 municipal water use requirements, Davis County, Utah, by Utah State Engineer's Office, 1962.

No. 9. Projected 1975 municipal water use requirements, Weber County, Utah, by Utah State Engineer's Office, 1962.

No. 10. Effects on the shallow artesian aquifer of withdrawing water from the deep artesian aquifer near Sugarville, Millard County, Utah, by R. W. Mower, United States Geological Survey, 1963.

No. 11. Amendments to plan of work and work outline for the Sevier River basin (Sec. 6, P.L. 566), United States Department of Agriculture, 1964.

No. 12. Test drilling in the upper Sevier River drainage basin, Garfield and Piute Counties, Utah, by R. D. Feltis and G. B. Robinson, Jr., United States Geological Survey, 1963.

No. 13. Water requirements of lower Jordan River, Utah, by Karl Harris, Irrigation Engineer, Agricultural Research Service, Phoenix, Arizona, prepared under informal cooperation approved by Mr. William W. Donnan, Chief, Southwest Branch (Riverside, California) Soil and Water Conservation Research Division, Agricultural Research Service, U.S.D.A. and by Wayne D. Criddle, State Engineer, State of Utah, Salt Lake City, Utah, 1964.

No. 14. Consumptive use of water by native vegetation and irrigated crops in the Virgin River area of Utah, by Wayne D. Criddle, Jay M. Bagley, R. Keith Higginson, and David W. Hendricks, through cooperation of Utah Agricultural Experiment Station, Agricultural Research Service, Soil and Water Conservation Branch, Western Soil and Water Management Section, Utah Water and Power Board, and Utah State Engineer, Salt Lake City, Utah, 1964.

No. 15. Ground-water conditions and related water administration problems in Cedar City Valley, Iron County, Utah, February, 1966, by Jack A. Barnett and Francis T. Mayo, Utah State Engineer's Office.

No. 16. Summary of water well drilling activities in Utah, 1960 through 1965, compiled by Utah State Engineer's Office, 1966.

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UNITED STATES DEPARTMENT OF THE INTERIOR
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STATE OF UTAH
STATE ENGINEER

TECHNICAL PUBLICATION NO. 15
FIGURE 2 1966

Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

Isohyetal analysis prepared by the Water Supply Forecast Unit and Office of the State Climatologist, U.S. Weather Bureau, Salt Lake City, Utah, using adjusted climatological data (1931-60) and values derived by correlation with physiographic factors.

ISOHYETAL MAP OF THE COLORADO PLATEAU IN UTAH

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TECHNICAL PUBLICATION NO. 15
FIGURE 9 1966

EXPLANATION

Water-bearing unit	Well symbol
Molas Formation and rocks of Mississippian age	
Rocks of Mississippian age	
Leadville Limestone	
Redwall Limestone	
Madison Limestone	
Rocks of Mississippian and Devonian age	
Rocks of Mississippian age and Ouray Limestone	
Leadville and Ouray Limestones	
Redwall Limestone and Elbert Formation	
Rocks of Devonian age	
Ouray Limestone	
Aneth Formation	
Ouray Limestone and Elbert Formation	
Elbert Formation, McCracken Member of Elbert Formation, and rocks of Cambrian age	
Rocks of Devonian and Cambrian age	

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5, briny

Base from U.S. Geological Survey State
Base Map, 1959; scale 1:500,000

0 10 20 30 40 MILES

Hydrology by R. D. Feltis.

MAP SHOWING LOCATIONS OF WELLS IN ROCKS OF CAMBRIAN, DEVONIAN, AND MISSISSIPPIAN AGE IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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TECHNICAL PUBLICATION NO. 15
FIGURE 10 1966

EXPLANATION

Pattern of outcrop	Water-bearing unit	Well symbol	Spring symbol
	Trm-Trms-Pk Moenkopi Formation, Sinbad Limestone Member of Moenkopi Formation, and Kaibab Limestone		
	Pk Kaibab Limestone		
	Pt Toroweap Formation		
	Pco Coconino Sandstone		
	Pc Cutler Formation		
P	Pcw White Rim Sandstone Member of Cutler Formation		
P	Pcd De Chelly Sandstone Member of Cutler Formation		
	Pcor Organ Rock Tongue of Cutler Formation		
	Pcc Cedar Mesa Sandstone Member of Cutler Formation		
	Pch Halgaito Tongue of Cutler Formation		
PP	PPr Rico Formation		
	PPu Rocks of Pennsylvanian age		
	PPh Hermosa Group		
	PPp Paradox Formation		
P	PPpi Ismay Zone of Paradox Formation		
P	PPh-PPpi Hermosa Group and Ismay Zone of Paradox Formation		
	PPpd Desert Creek Zone of Paradox Formation		
	PPpa Akah Zone of Paradox Formation		
	PPm Molas Formation		
	PPm-Mu Molas Formation and rocks of Mississippian age		
	Pz Limestone of Paleozoic age		

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5, briny

Base from U.S. Geological Survey State
Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis.

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN ROCKS OF PENNSYLVANIAN AND PERMIAN AGE IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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TECHNICAL PUBLICATION NO. 15
FIGURE 11 1966

EXPLANATION

Pattern of outcrop	Water-bearing unit	Well symbol	Test-hole symbol	Mine symbol	Spring symbol
	Trcm Moss Back Member of Chinle Formation	⊕			
	Trcs Shinarump Member of Chinle Formation	○	⊹	⊣	○
TR	Trc Chinle Formation	●			●
	Trms Sinbad Limestone Member of Moenkopi Formation	⊖			
	Trm Moenkopi Formation	◉			◉
	Trm-Trms Moenkopi Formation and Sinbad Limestone Member of Moenkopi Formation	⊸			
	Trm-Trms-Pk Moenkopi Formation, Sinbad Limestone Member of Moenkopi Formation, and Kaibab Limestone	⊹			

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5, briny

Base from U.S. Geological Survey State
Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis.

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS, SPRINGS, TEST HOLES, AND WATER-YIELDING MINE TUNNELS IN THE MOENKOPI AND CHINLE FORMATIONS IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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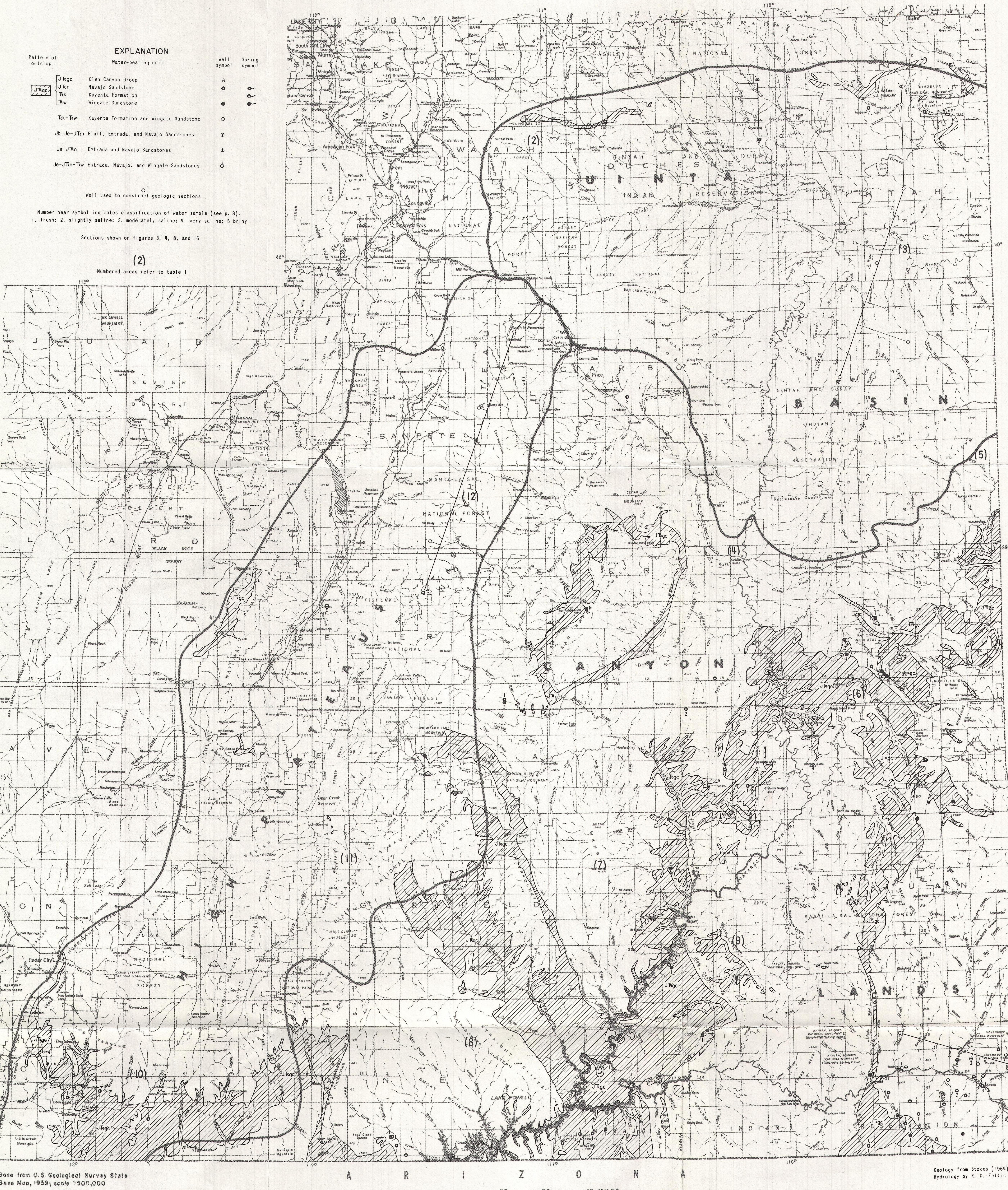
FIGURE 12 1966



MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN THE GLEN CANYON GROUP IN THE COLORADO PLATEAU IN UTAH

UNITED STATES DEPARTMENT OF THE INTERIOR
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TECHNICAL PUBLICATION NO. 15
FIGURE 13 1966

EXPLANATION

Pattern of outcrop	Water-bearing unit	Well symbol	Mine symbol	Spring symbol
Kd-Jw	Dakota Sandstone and Winsor Formation			
Kdbc-Jm	Dakota Sandstone and Burro Canyon and Morrison Formations			
Kcm-Jm	Cedar Mountain and Morrison Formations			
	Jm Morrison Formation			
	Jmb Brushy Basin Shale Member of Morrison Formation			
	Jmw Westwater Canyon Sandstone Member of Morrison Formation			
	Jmr Recapture Shale Member of Morrison Formation			
J	Jms Salt Wash Sandstone Member of Morrison Formation			
	Jw Winsor Formation			
	Jb Bluff Sandstone			
	Je Entrada Sandstone			
	Jc Carmel Formation			
Jm-Jb	Morrison Formation and Bluff Sandstone			
Jb-Je	Bluff Sandstone and Entrada Sandstone			
Jb-Je-JTrn	Bluff, Entrada, and Navajo Sandstones			
Je-JTrn	Entrada and Navajo Sandstones			
Je-JTrn-Trw	Entrada, Navajo, and Wingate Sandstones			

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5, briny

Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis.

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS, SPRINGS, AND WATER-YIELDING MINE TUNNELS IN THE CARMEL FORMATION, ENTRADA AND BLUFF SANDSTONES, AND MORRISON AND WINSOR FORMATIONS IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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TECHNICAL PUBLICATION NO. 15
FIGURE 14 1966

EXPLANATION

Pattern of outcrop		Water-bearing unit	Well symbol	Spring symbol
Km	Kms	Mancos Shale	◎	
	Kme	Emery Sandstone Member of Mancos Shale	◎	
	Kmm-Kme	Masuk Shale Member and Emery Sandstone Member of Mancos Shale	◎	
	Kmt	Tununk Shale Member of Mancos Shale	◎	
Ktd	Ktd	Tropic Shale and Dakota Sandstone	◎	
Kdc	Kd	Dakota Sandstone	○	
	Kdbc	Dakota Sandstone and Burro Canyon Formation	●	
	Kbc	Burro Canyon Formation	◉	
	Kcm	Cedar Mountain Formation	◉	
	Kd-Jw	Dakota Sandstone and Winsor Formation	◎	
	Kdbc-Jm	Dakota Sandstone and Burro Canyon and Morrison Formations	◎	
	Kcm-Jm	Cedar Mountain and Morrison Formations	◎	

Number near symbol indicates classification of water sample (see p. 8).
1. fresh; 2. slightly saline; 3. moderately saline; 4. very saline; 5. briny

Base from U.S. Geological Survey State
Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN THE CEDAR MOUNTAIN AND BURRO CANYON FORMATIONS, DAKOTA SANDSTONE, AND MANCOS SHALE (EXCEPT FERRON SANDSTONE MEMBER) IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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FIGURE 15 1966

EXPLANATION

Pattern of outcrop	Water-bearing unit	Well symbol	Mine symbol
Kf	Kf Ferron Sandstone Member of Mancos Shale	●	⊣

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5, briny

Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS AND A WATER-YIELDING MINE TUNNEL IN THE FERRON SANDSTONE MEMBER OF THE MANCOS SHALE IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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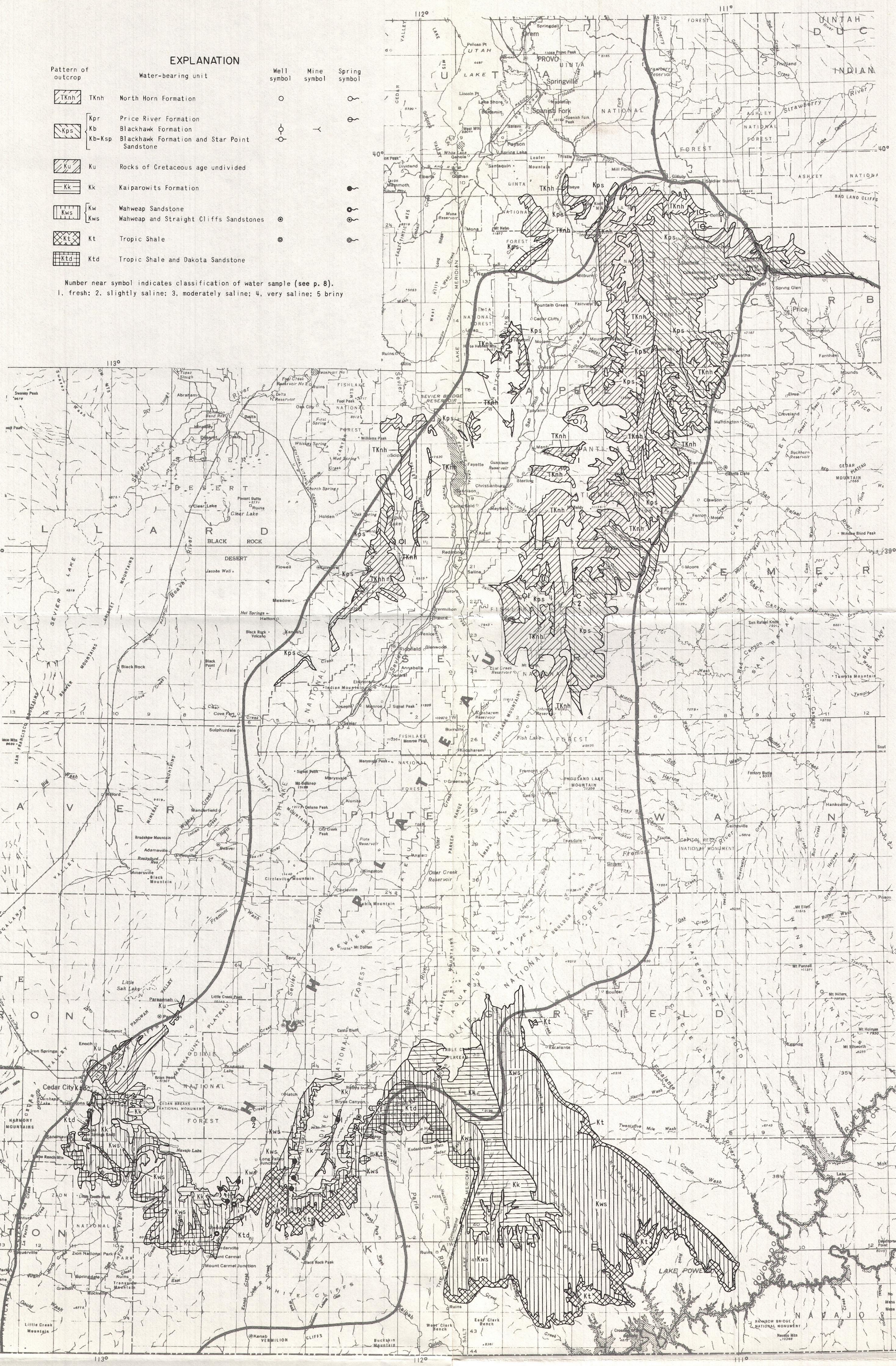
FIGURE 17 1966

EXPLANATION

Pattern of outcrop		Water-bearing unit	Well symbol	Mine symbol	Spring symbol
TKnh	TKnh	North Horn Formation	○		○~
Kps	Kpr	Price River Formation			○~
	Kb	Blackhawk Formation	◇	⊣	
	Kb-Ksp	Blackhawk Formation and Star Point Sandstone	◇-		
Ku	Ku	Rocks of Cretaceous age undivided			
Kk	Kk	Kaiparowits Formation			●~
Kws	Kw	Wahweap Sandstone			●~
	Kws	Wahweap and Straight Cliffs Sandstones	◉		◉~
Kt	Kt	Tropic Shale	◎		◎~
Ktd	Ktd	Tropic Shale and Dakota Sandstone			

Number near symbol indicates classification of water sample (see p. 8).
1. fresh; 2. slightly saline; 3. moderately saline; 4. very saline; 5 briny



Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis.

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN ROCKS OF LATE CRETACEOUS AGE (EXCEPT DAKOTA SANDSTONE AND MANCOS SHALE) IN THE HIGH PLATEAUS SECTION, COLORADO PLATEAU, UTAH

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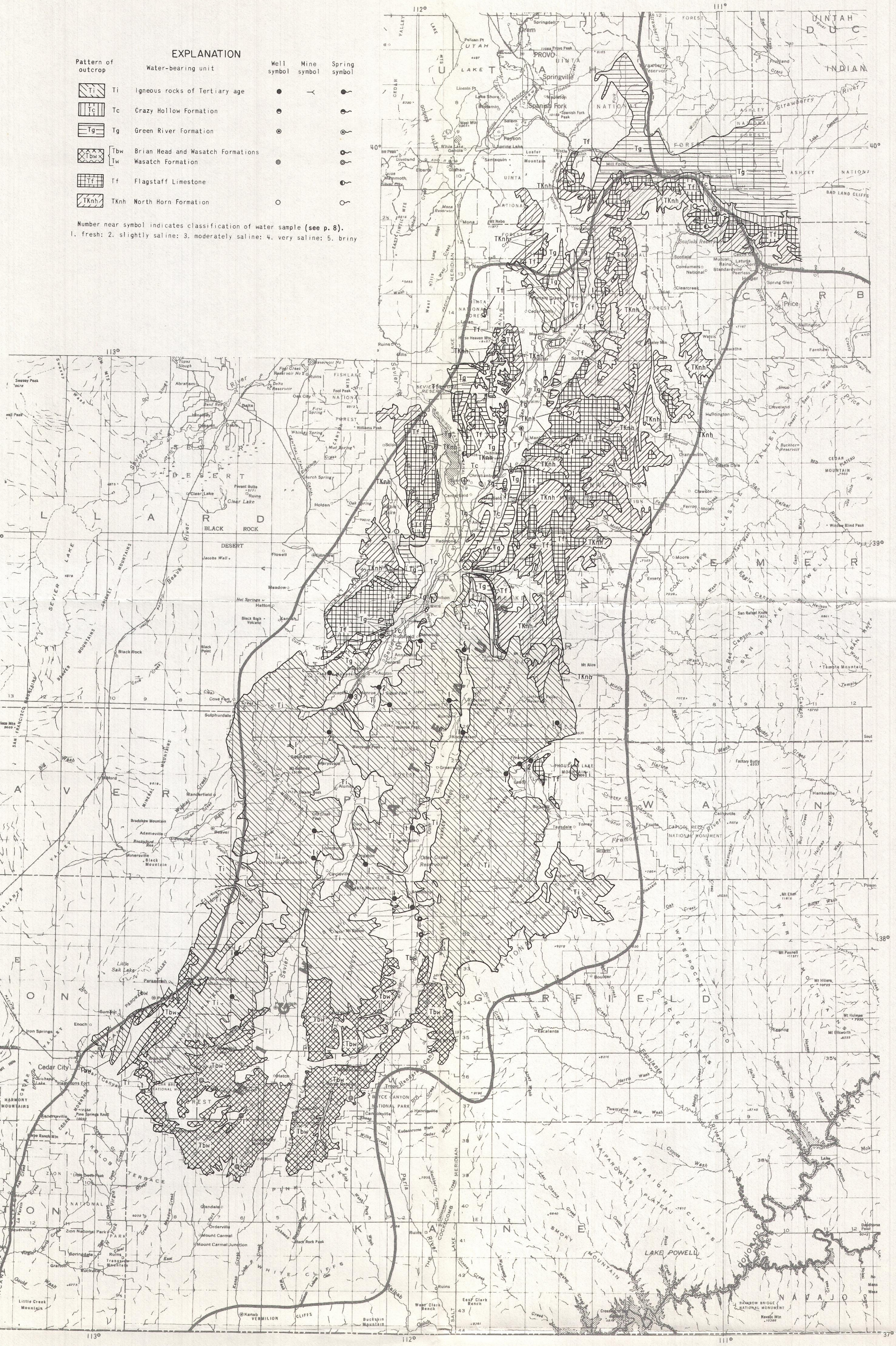
FIGURE 18 1966

EXPLANATION

Pattern of outcrop		Water-bearing unit	Well symbol	Mine symbol	Spring symbol
Ti	Ti	Igneous rocks of Tertiary age	●	⊣	●~
Tc	Tc	Crazy Hollow Formation	◓		◓~
Tg	Tg	Green River Formation	⊙		⊙~
Tbw	Tbw	Brian Head and Wasatch Formations			◎~
	Tw	Wasatch Formation	◎		◎~
Tf	Tf	Flagstaff Limestone			◐~
TKnh	TKnh	North Horn Formation	○		○~

Number near symbol indicates classification of water sample (see p. 8).
1. fresh; 2. slightly saline; 3. moderately saline; 4. very saline; 5. briny



MAP SHOWING LOCATIONS OF WELLS, SPRINGS, AND WATER-YIELDING MINE TUNNELS IN ROCKS OF TERTIARY AGE IN THE HIGH PLATEAUS SECTION, COLORADO PLATEAU, UTAH

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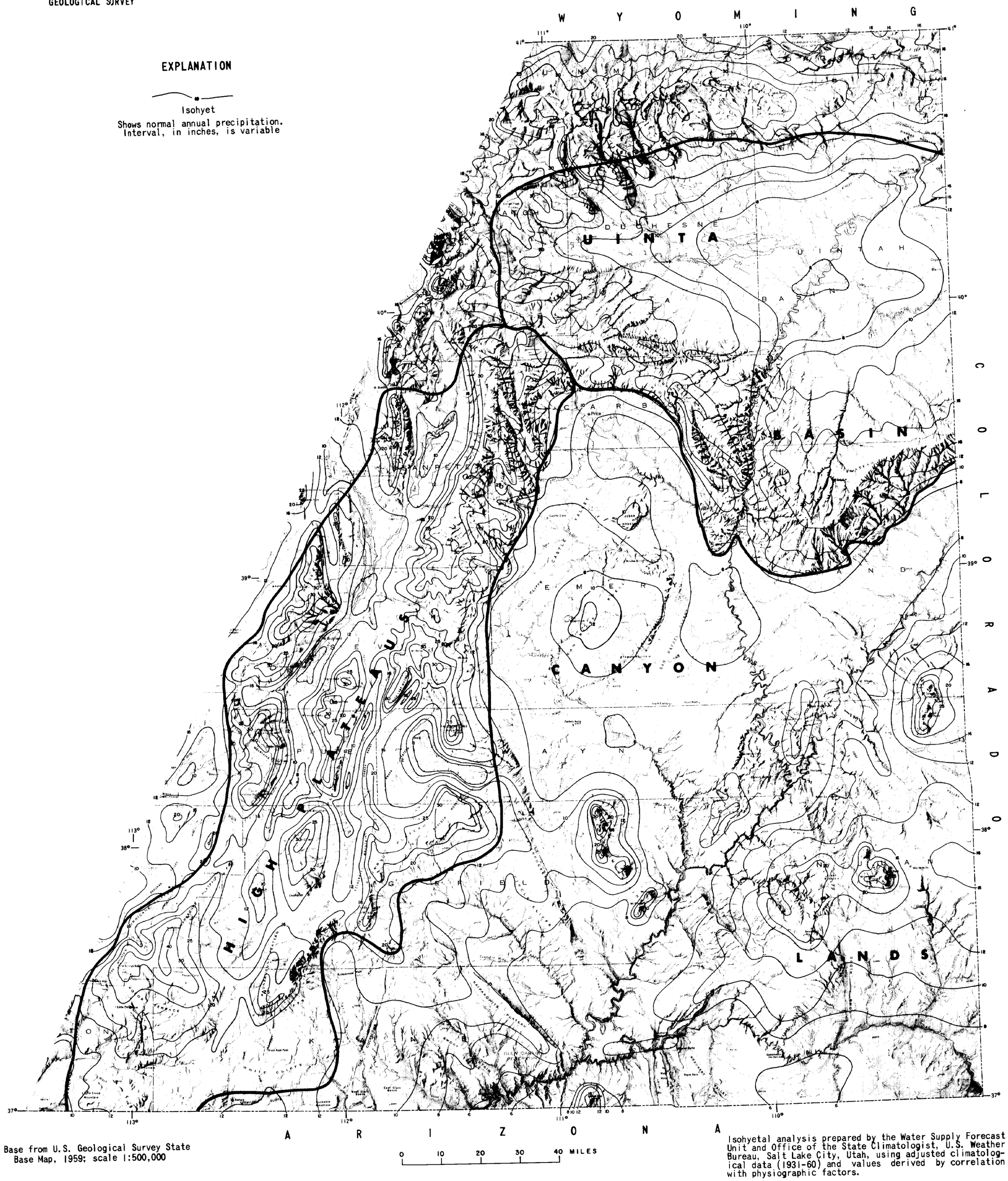
FIGURE 2 1966

EXPLANATION

Isohyet

Shows normal annual precipitation. Interval, in inches, is variable



Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

Isohyetal analysis prepared by the Water Supply Forecast Unit and Office of the State Climatologist, U.S. Weather Bureau, Salt Lake City, Utah, using adjusted climatological data (1931-60) and values derived by correlation with physiographic factors.

ISOHYETAL MAP OF THE COLORADO PLATEAU IN UTAH

UNITED STATES DEPARTMENT OF THE INTERIOR
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TECHNICAL PUBLICATION NO. 15
FIGURE 2 1966

EXPLANATION

Isohyet

Shows normal annual precipitation.
Interval, in inches, is variable

Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

Isohyetal analysis prepared by the Water Supply Forecast Unit and Office of the State Climatologist, U.S. Weather Bureau, Salt Lake City, Utah, using adjusted climatological data (1931-60) and values derived by correlation with physiographic factors.

ISOHYETAL MAP OF THE COLORADO PLATEAU IN UTAH

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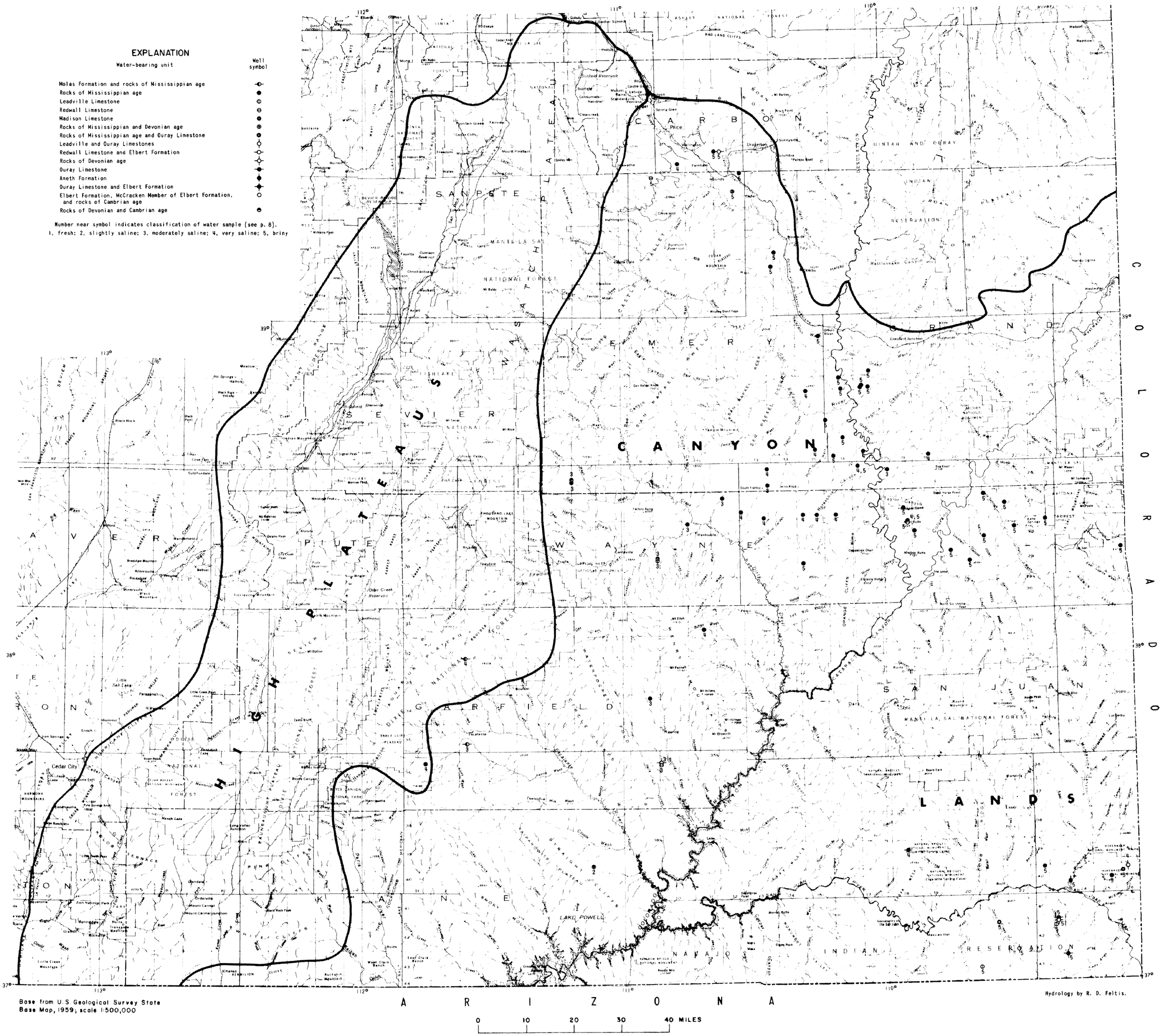
TECHNICAL PUBLICATION NO. 15
FIGURE 9 1966

EXPLANATION

Water-bearing unit	Well symbol
Molas Formation and rocks of Mississippian age	
Rocks of Mississippian age	
Leadville Limestone	
Redwall Limestone	
Madison Limestone	
Rocks of Mississippian and Devonian age	
Rocks of Mississippian age and Ouray Limestone	
Leadville and Ouray Limestones	
Redwall Limestone and Elbert Formation	
Rocks of Devonian age	
Ouray Limestone	
Aneth Formation	
Ouray Limestone and Elbert Formation	
Elbert Formation, McCracken Member of Elbert Formation, and rocks of Cambrian age	
Rocks of Devonian and Cambrian age	

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5, briny



Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

Hydrology by R. D. Feltis.

MAP SHOWING LOCATIONS OF WELLS IN ROCKS OF CAMBRIAN, DEVONIAN, AND MISSISSIPPIAN AGE IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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FIGURE 9 1966

EXPLANATION

Water-bearing unit	Well symbol
Molas Formation and rocks of Mississippian age	
Rocks of Mississippian age	
Leadville Limestone	
Redwall Limestone	
Madison Limestone	
Rocks of Mississippian and Devonian age	
Rocks of Mississippian age and Ouray Limestone	
Leadville and Ouray Limestones	
Redwall Limestone and Elbert Formation	
Rocks of Devonian age	
Ouray Limestone	
Aneth Formation	
Ouray Limestone and Elbert Formation	
Elbert Formation, McCracken Member of Elbert Formation, and rocks of Cambrian age	
Rocks of Devonian and Cambrian age	

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5, briny

MAP SHOWING LOCATIONS OF WELLS IN ROCKS OF CAMBRIAN, DEVONIAN, AND MISSISSIPPIAN AGE IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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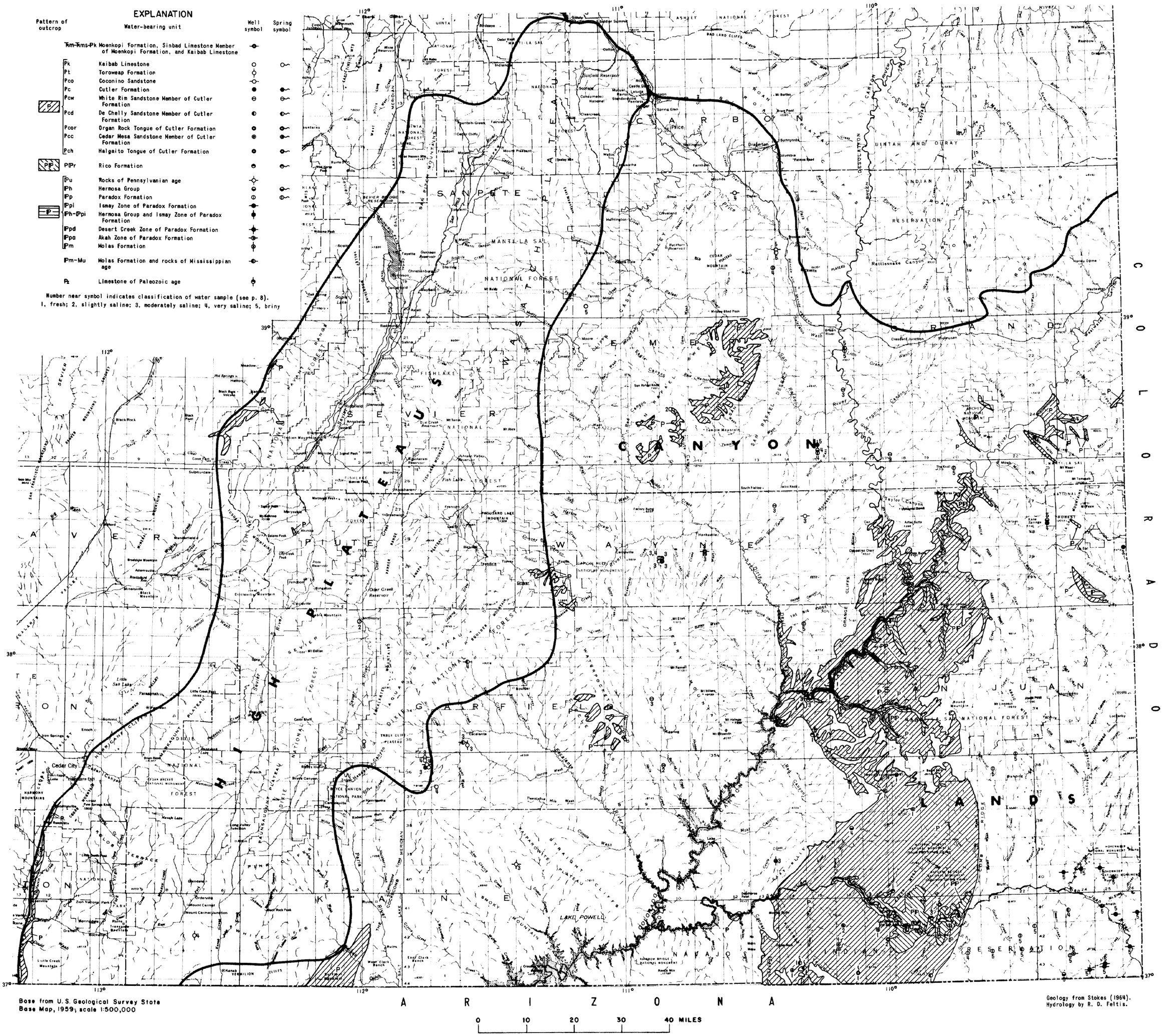
TECHNICAL PUBLICATION NO. 15
FIGURE 10 1966



MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN ROCKS OF PENNSYLVANIAN AND PERMIAN AGE IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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TECHNICAL PUBLICATION NO. 15
FIGURE 10 1966

EXPLANATION

Pattern of outcrop		Water-bearing unit	Well symbol	Spring symbol
	TRm-TRms-Pk	Moenkopi Formation, Sinbad Limestone Member of Moenkopi Formation, and Kaibab Limestone		
	Pk	Kaibab Limestone		
	Pt	Toroweap Formation		
	Pco	Coconino Sandstone		
	Pc	Cutler Formation		
P	Pcw	White Rim Sandstone Member of Cutler Formation		
P	Pcd	De Chelly Sandstone Member of Cutler Formation		
	Pcor	Organ Rock Tongue of Cutler Formation		
	Pcc	Cedar Mesa Sandstone Member of Cutler Formation		
	Pch	Halgaito Tongue of Cutler Formation		
PPr	PPr	Rico Formation		
	Pu	Rocks of Pennsylvanian age		
	Ph	Hermosa Group		
	Pp	Paradox Formation		
	Ppi	Ismay Zone of Paradox Formation		
P	Ph-Ppi	Hermosa Group and Ismay Zone of Paradox Formation		
	Ppd	Desert Creek Zone of Paradox Formation		
	Ppa	Akah Zone of Paradox Formation		
	Pm	Molas Formation		
	Pm-Mu	Molas Formation and rocks of Mississippian age		
	Pz	Limestone of Paleozoic age		

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5, briny

Base from U.S Geological Survey State
Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis.

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN ROCKS OF PENNSYLVANIAN AND PERMIAN AGE IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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STATE OF UTAH
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TECHNICAL PUBLICATION NO. 15
FIGURE 11 1966

EXPLANATION

Pattern of outcrop	Water-bearing unit	Well symbol	Test-hole symbol	Mine symbol	Spring symbol
	Trcm Moss Back Member of Chinle Formation	⊕			
	Trcs Shinarump Member of Chinle Formation	○	✧	⊀	⊱
	Trc Chinle Formation	●			●
	Trms Sinbad Limestone Member of Moenkopi Formation	⊖			
	Trm Moenkopi Formation	●			●
	Trm-Trms Moenkopi Formation and Sinbad Limestone Member of Moenkopi Formation	⊹			
	Trm-Trms-Pk Moenkopi Formation, Sinbad Limestone Member of Moenkopi Formation, and Kaibab Limestone	⊹			

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5, briny

Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis.

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS, SPRINGS, TEST HOLES, AND WATER-YIELDING MINE TUNNELS IN THE MOENKOPI AND CHINLE FORMATIONS IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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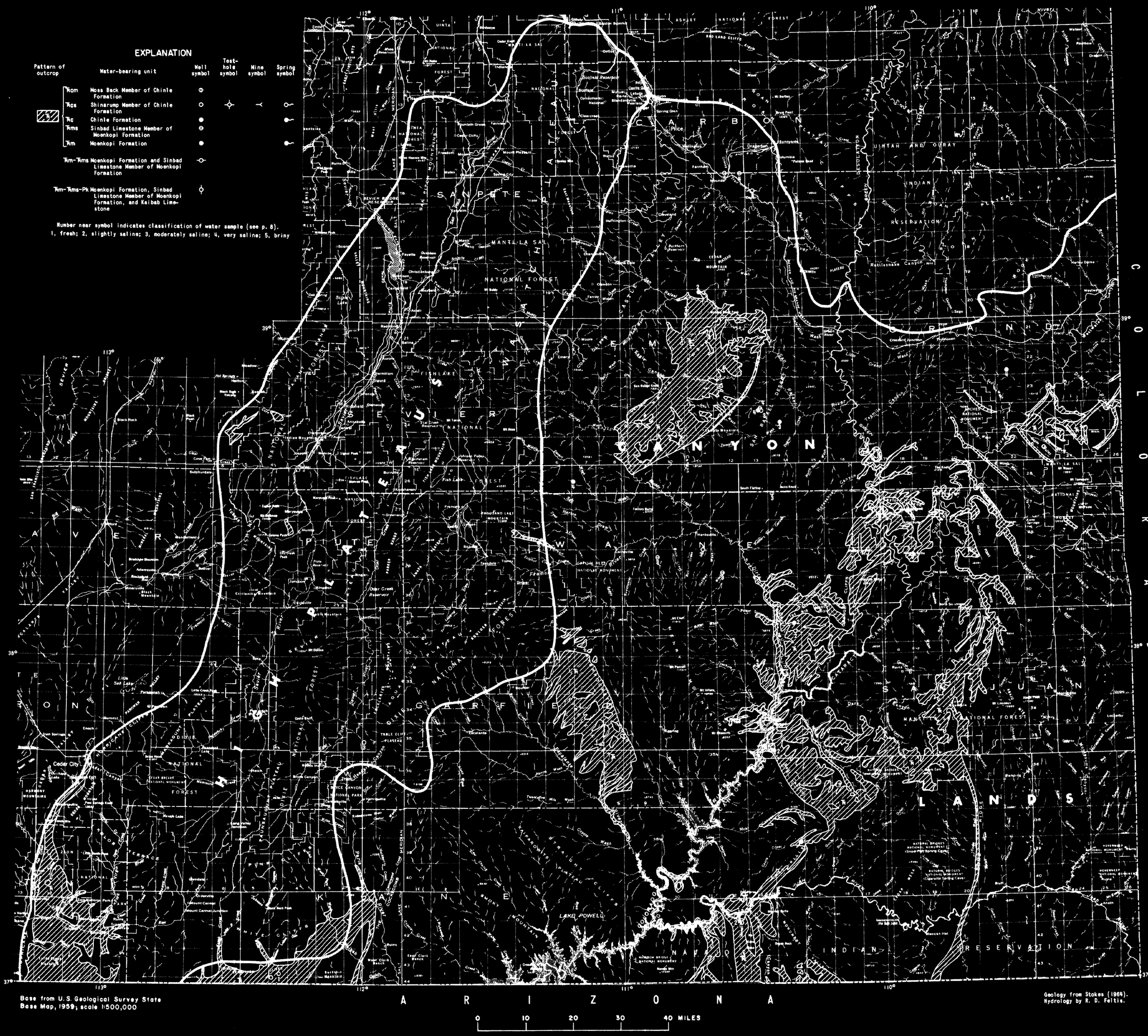
STATE ENGINEER

TECHNICAL PUBLICATION NO. 15
FIGURE 11 1966

EXPLANATION

Pattern of outcrop	Water-bearing unit	Well symbol	Test-hole symbol	Mine symbol	Spring symbol
	Trcm Moss Back Member of Chinle Formation	⊕			
	Trcs Shinarump Member of Chinle Formation	○	⊹	⊀	⊰
57	Trc Chinle Formation	●			⊰
	Trms Sinbad Limestone Member of Moenkopi Formation	⊖			
	Trm Moenkopi Formation	●			⊰
	Trm-Trms Moenkopi Formation and Sinbad Limestone Member of Moenkopi Formation	⊸			
	Trm-Trms-Pk Moenkopi Formation, Sinbad Limestone Member of Moenkopi Formation, and Kaibab Limestone	⊹			

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5, briny



Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis.

MAP SHOWING LOCATIONS OF WELLS, SPRINGS, TEST HOLES, AND WATER-YIELDING MINE TUNNELS IN THE MOENKOPI AND CHINLE FORMATIONS IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

EXPLANATION

Pattern of outcrop		Water-bearing unit	Well symbol	Spring symbol
JTRgc	JTRgc	Glen Canyon Group	⊖	
	JTRn	Navajo Sandstone	⊖	⊖
	TRk	Kayenta Formation	⊖	⊖
	TRw	Wingate Sandstone	●	●
	TRk-TRw	Kayenta Formation and Wingate Sandstone	⊖	
	Jb-Je-JTRn	Bluff, Entrada, and Navajo Sandstones	⊕	
	Je-JTRn	Entrada and Navajo Sandstones	⊖	
	Je-JTRn-TRw	Entrada, Navajo, and Wingate Sandstones	⊖	

○ Well used to construct geologic sections

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5 briny

Sections shown on figures 3, 4, 8, and 16

(2)
Numbered areas refer to table 1

Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN THE GLEN CANYON GROUP IN THE COLORADO PLATEAU IN UTAH

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FIGURE 12 1966

EXPLANATION

Pattern of outcrop	Water-bearing unit		Well symbol	Spring symbol
JTRgc	JTRgc	Glen Canyon Group	⊖	
	JTRn	Navajo Sandstone	⊙	⊙~
	TRk	Kayenta Formation		⊙~
	TRw	Wingate Sandstone	●	●~
	TRk-TRw	Kayenta Formation and Wingate Sandstone	-⊙-	
	Jb-Je-JTRn	Bluff, Entrada, and Navajo Sandstones	◉	
	Je-JTRn	Entrada and Navajo Sandstones	⊙	
	Je-JTRn-TRw	Entrada, Navajo, and Wingate Sandstones	⊙	

○ Well used to construct geologic sections

Number near symbol indicates classification of water sample (see p. 8).
1. fresh; 2. slightly saline; 3. moderately saline; 4. very saline; 5 briny

Sections shown on figures 3, 4, 8, and 16

(2) Numbered areas refer to table 1

Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN THE GLEN CANYON GROUP IN THE COLORADO PLATEAU IN UTAH

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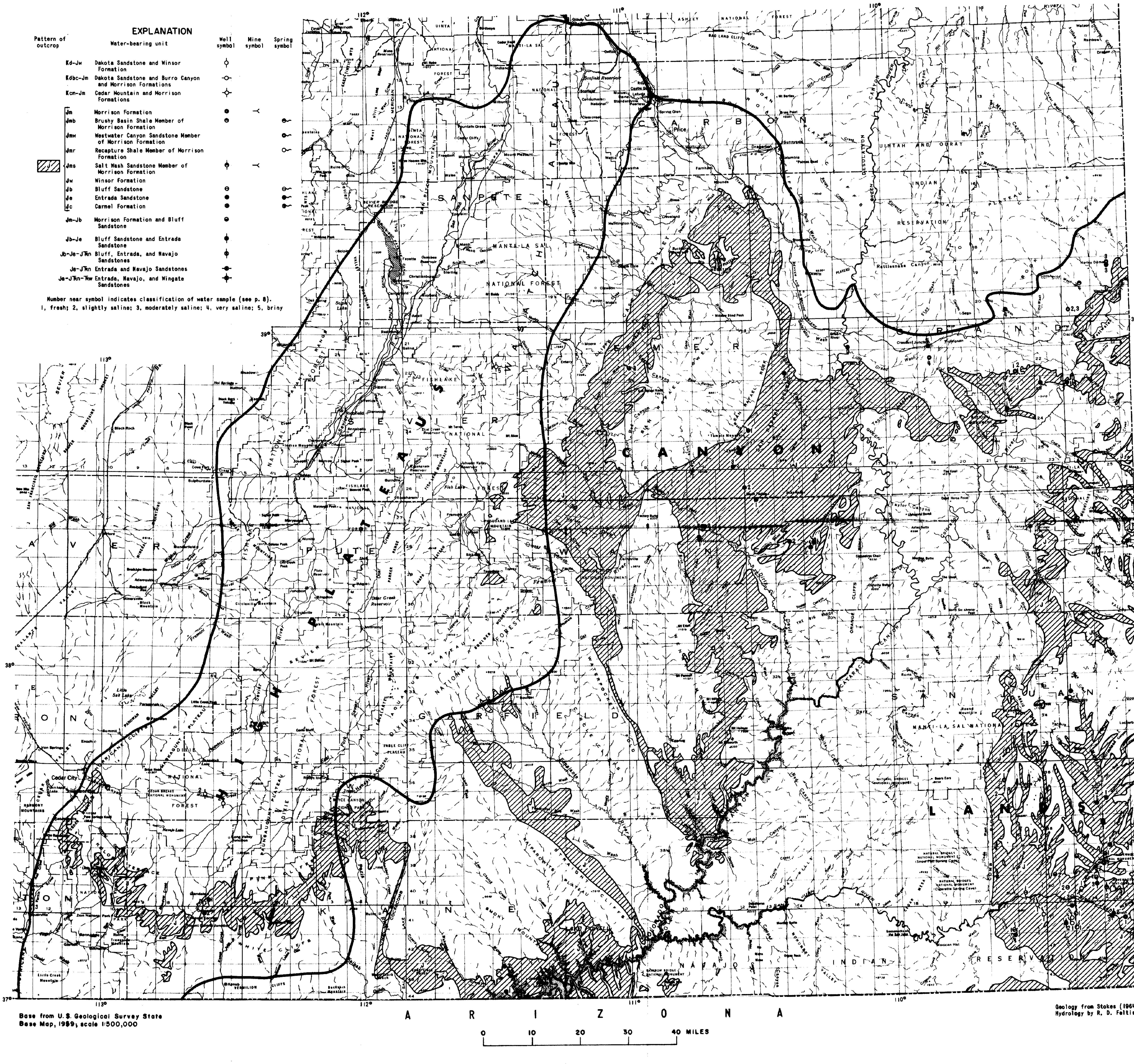
FIGURE 13 1966



MAP SHOWING LOCATIONS OF WELLS, SPRINGS, AND WATER-YIELDING MINE TUNNELS IN THE CARMEL FORMATION, ENTRADA AND BLUFF SANDSTONES, AND MORRISON AND WINSOR FORMATIONS IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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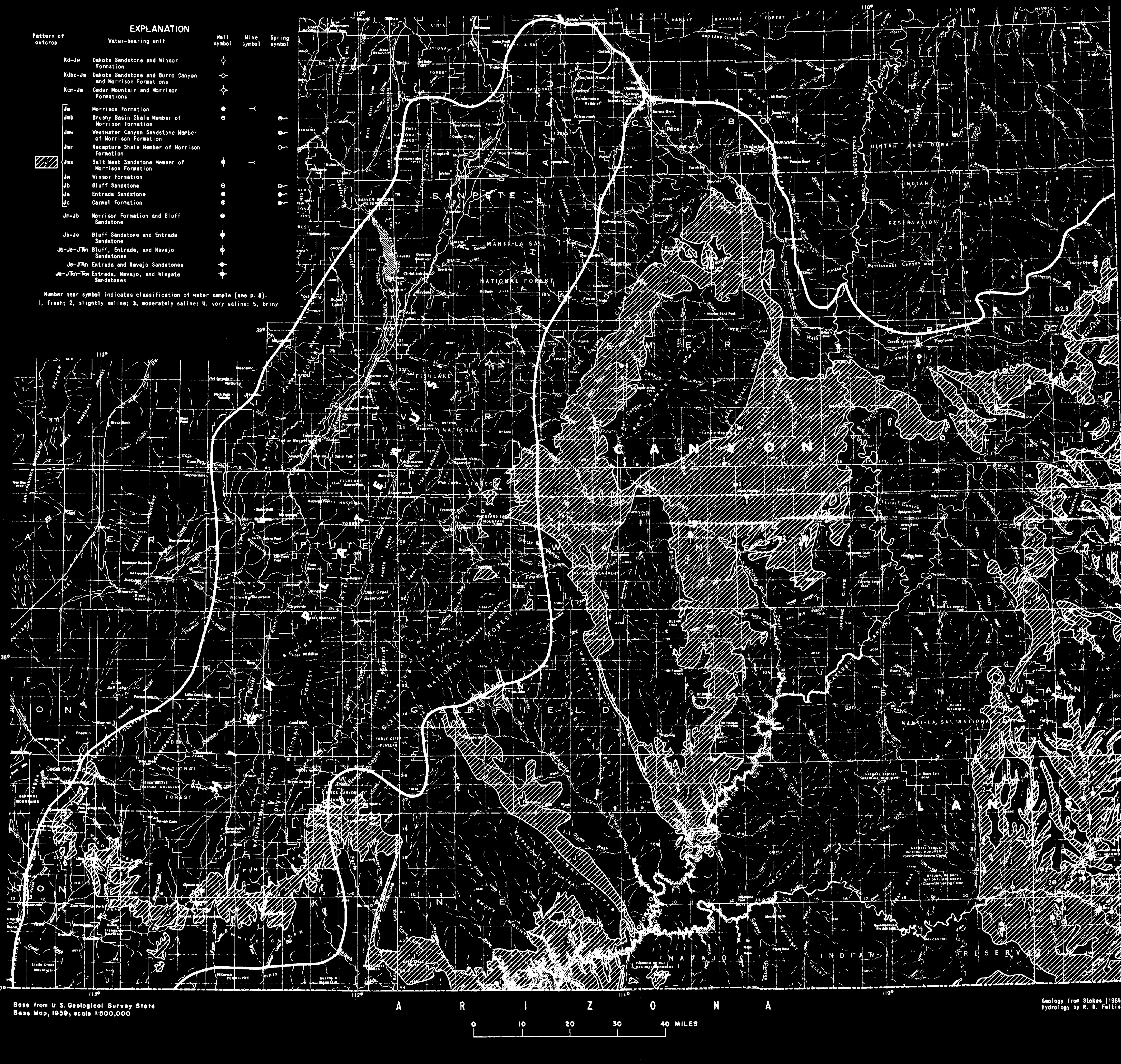
TECHNICAL PUBLICATION NO. 15
FIGURE 13 1966



MAP SHOWING LOCATIONS OF WELLS, SPRINGS, AND WATER-YIELDING MINE TUNNELS IN THE CARMEL FORMATION, ENTRADA AND BLUFF SANDSTONES, AND MORRISON AND WINSOR FORMATIONS IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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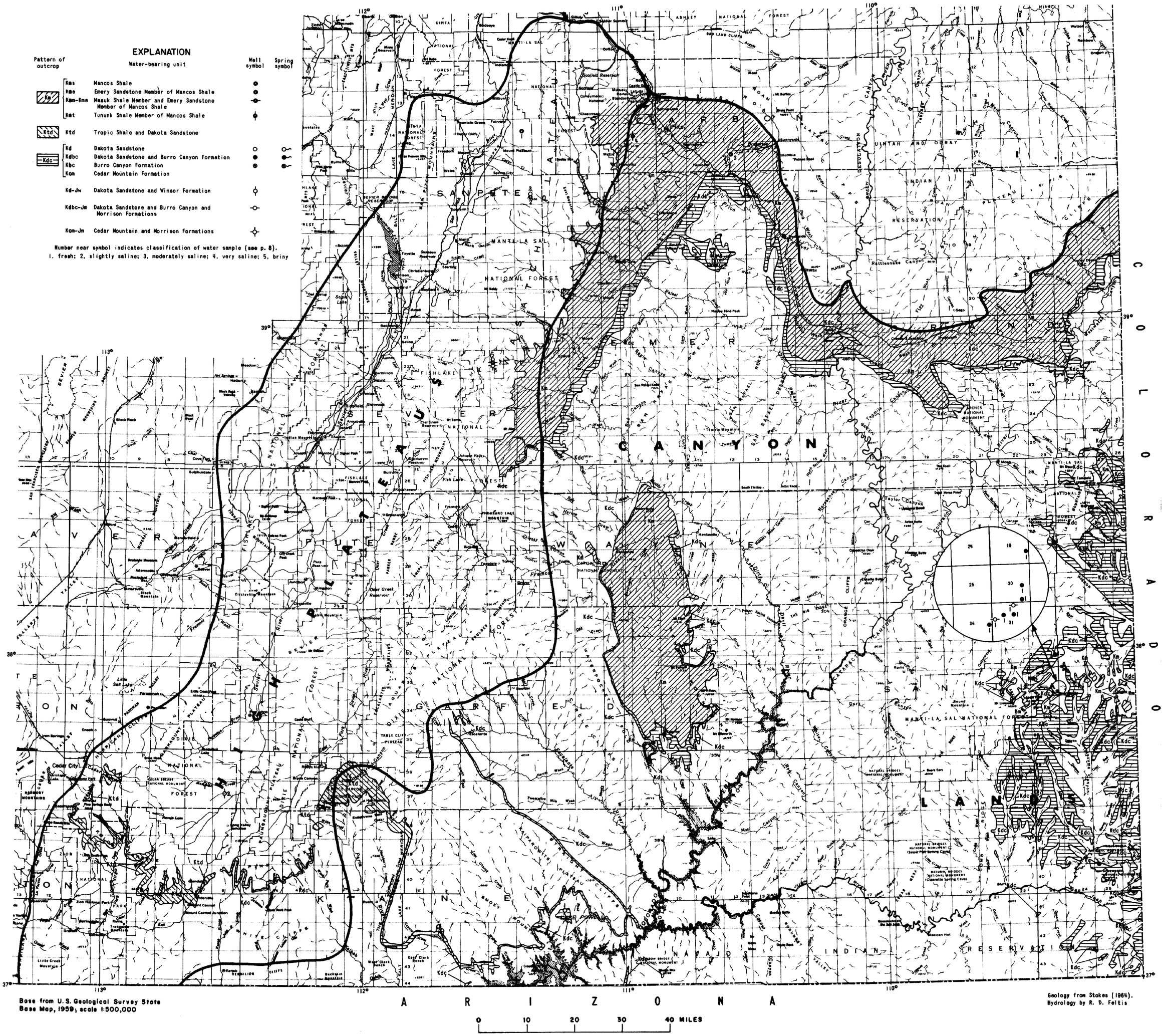
FIGURE 14 1966



MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN THE CEDAR MOUNTAIN AND BURRO CANYON FORMATIONS, DAKOTA SANDSTONE, AND MANCOS SHALE (EXCEPT FERRON SANDSTONE MEMBER) IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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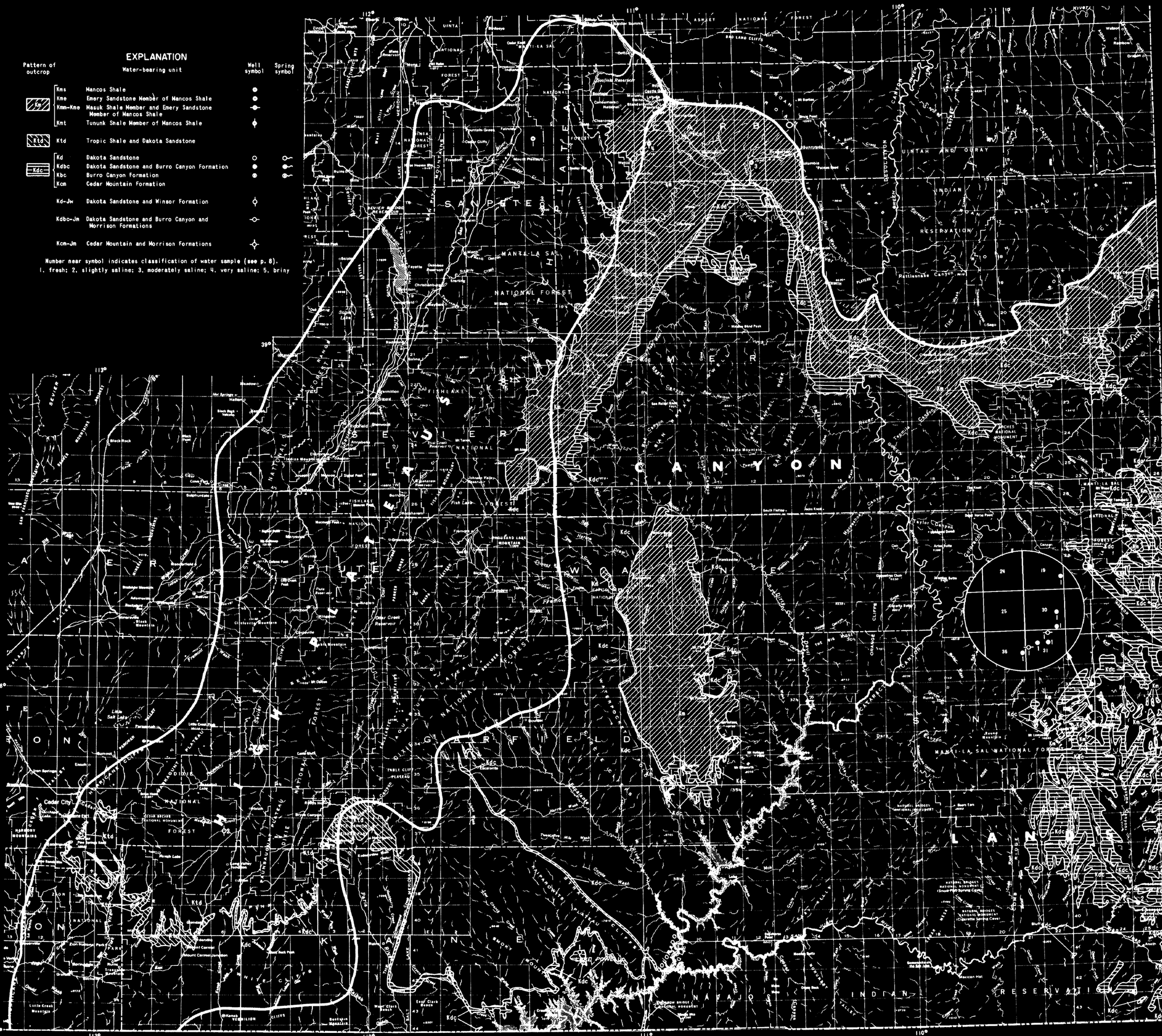
FIGURE 14 1966

EXPLANATION

Pattern of outcrop		Water-bearing unit	Well symbol	Spring symbol
Kmt	Kms	Mancos Shale	●	
	Kme	Emery Sandstone Member of Mancos Shale	●	
	Kmm-Kme	Masuk Shale Member and Emery Sandstone Member of Mancos Shale	⊸	
	Kmt	Tununk Shale Member of Mancos Shale	⧫	
Ktd	Ktd	Tropic Shale and Dakota Sandstone		
Kdc	Kd	Dakota Sandstone	○	○
	Kdbc	Dakota Sandstone and Burro Canyon Formation	●	●
	Kbc	Burro Canyon Formation	●	●
	Kcm	Cedar Mountain Formation		
	Kd-Jw	Dakota Sandstone and Winsor Formation	⊖	
	Kdbc-Jm	Dakota Sandstone and Burro Canyon and Morrison Formations	⊸	
	Kcm-Jm	Cedar Mountain and Morrison Formations	⊹	

Number near symbol indicates classification of water sample (see p. 8).
1. fresh; 2. slightly saline; 3. moderately saline; 4. very saline; 5. briny



Base from U.S. Geological Survey State Base Map, 1959, scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN THE CEDAR MOUNTAIN AND BURRO CANYON FORMATIONS, DAKOTA SANDSTONE, AND MANCOS SHALE (EXCEPT FERRON SANDSTONE MEMBER) IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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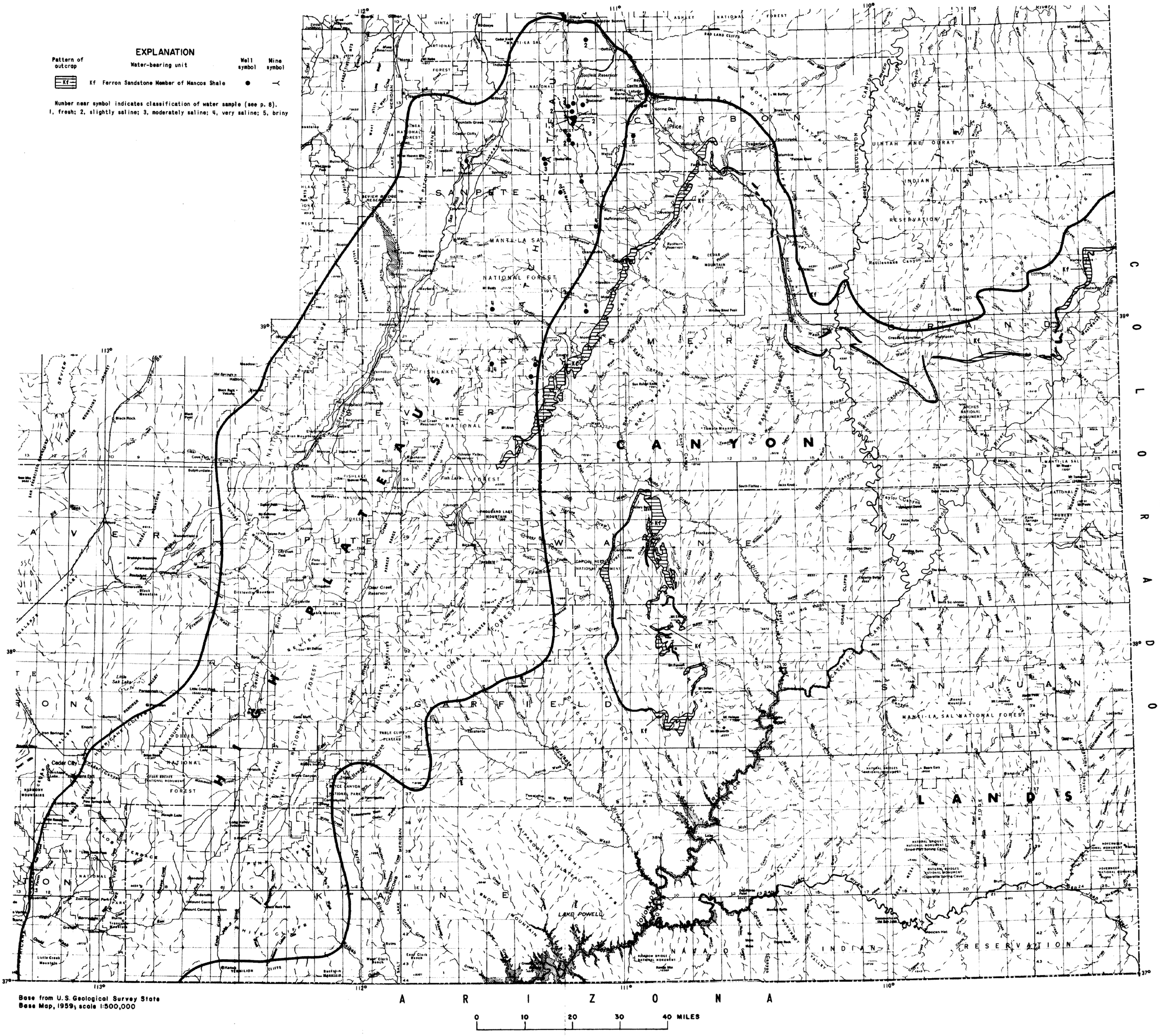
FIGURE 15 1966



MAP SHOWING LOCATIONS OF WELLS AND A WATER-YIELDING MINE TUNNEL IN THE FERRON SANDSTONE MEMBER OF THE MANCOS SHALE IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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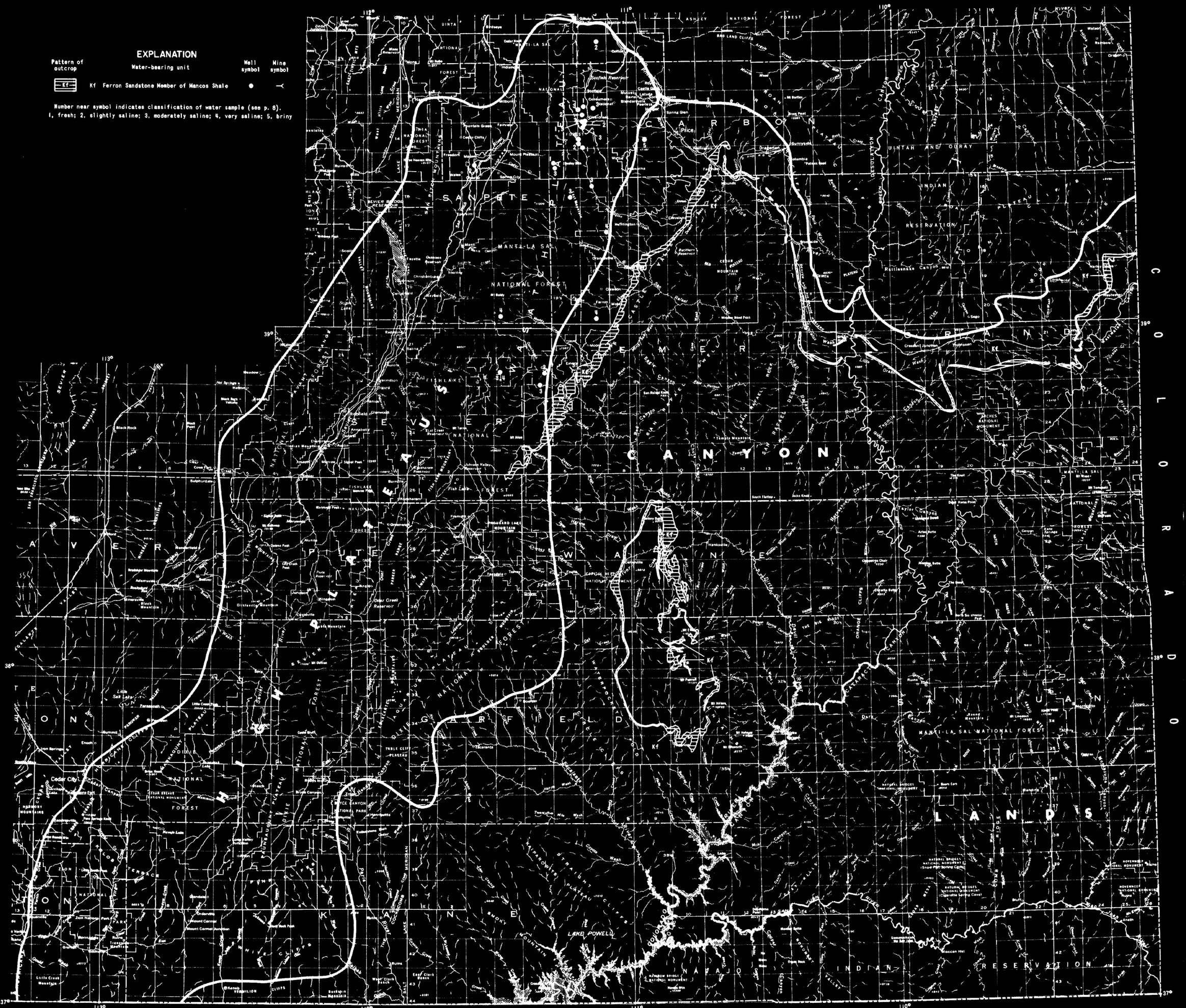
FIGURE 15 1966

EXPLANATION

Pattern of outcrop	Water-bearing unit	Well symbol	Mine symbol
Kf	Kf Ferron Sandstone Member of Mancos Shale	●	⊣

Number near symbol indicates classification of water sample (see p. 8).
1, fresh; 2, slightly saline; 3, moderately saline; 4, very saline; 5, briny



MAP SHOWING LOCATIONS OF WELLS AND A WATER-YIELDING MINE TUNNEL IN THE FERRON SANDSTONE MEMBER OF THE MANCOS SHALE IN THE CANYON LANDS AND HIGH PLATEAUS SECTIONS, COLORADO PLATEAU, UTAH

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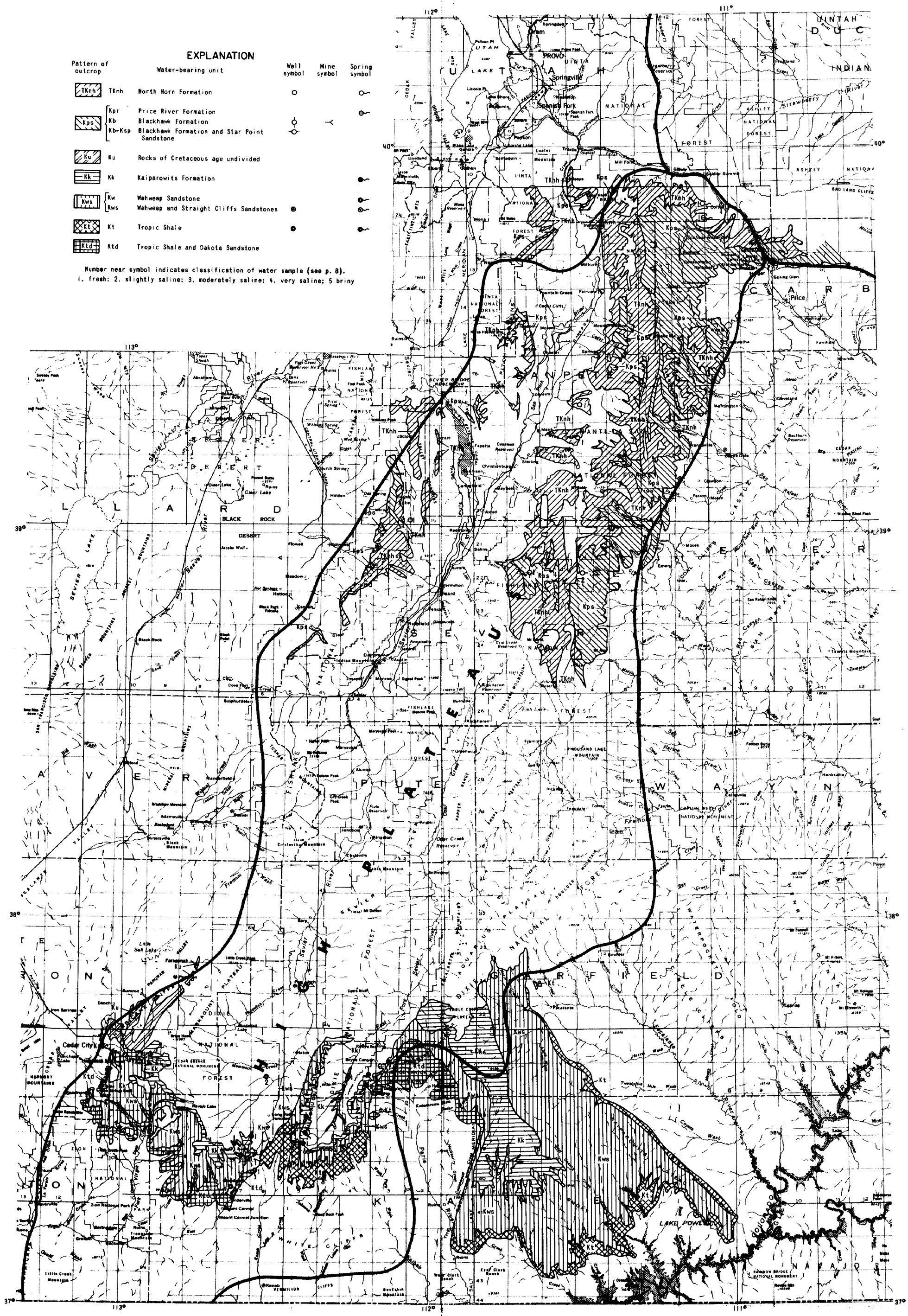
TECHNICAL PUBLICATION NO. 15
FIGURE 17 1966



Base from U.S. Geological Survey State Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis.

MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN ROCKS OF LATE CRETACEOUS AGE (EXCEPT DAKOTA SANDSTONE AND MANCOS SHALE) IN THE HIGH PLATEAUS SECTION, COLORADO PLATEAU, UTAH

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FIGURE 17 1966

EXPLANATION

Pattern of outcrop		Water-bearing unit	Well symbol	Mine symbol	Spring symbol
TKnh	TKnh	North Horn Formation	○		○
Kps	Kpr	Price River Formation			○
	Kb	Blackhawk Formation	○	⊥	
	Kb-Ksp	Blackhawk Formation and Star Point Sandstone	○		
Ku	Ku	Rocks of Cretaceous age undivided			
Kk	Kk	Kaiparowits Formation			○
Kws	Kw	Wahweap Sandstone			○
	Kws	Wahweap and Straight Cliffs Sandstones	◍		◍
Kt	Kt	Tropic Shale	◆		○
Ktd	Ktd	Tropic Shale and Dakota Sandstone			

Number near symbol indicates classification of water sample (see p. 8).
1. fresh; 2. slightly saline; 3. moderately saline; 4. very saline; 5 briny

Base from U. S. Geological Survey State Base Map, 1959; scale 1:500,000

Geology from Stokes (1964).
Hydrology by R. D. Feltis.

0 10 20 30 40 MILES

MAP SHOWING LOCATIONS OF WELLS AND SPRINGS IN ROCKS OF LATE CRETACEOUS AGE (EXCEPT DAKOTA SANDSTONE AND MANCOS SHALE) IN THE HIGH PLATEAUS SECTION, COLORADO PLATEAU, UTAH

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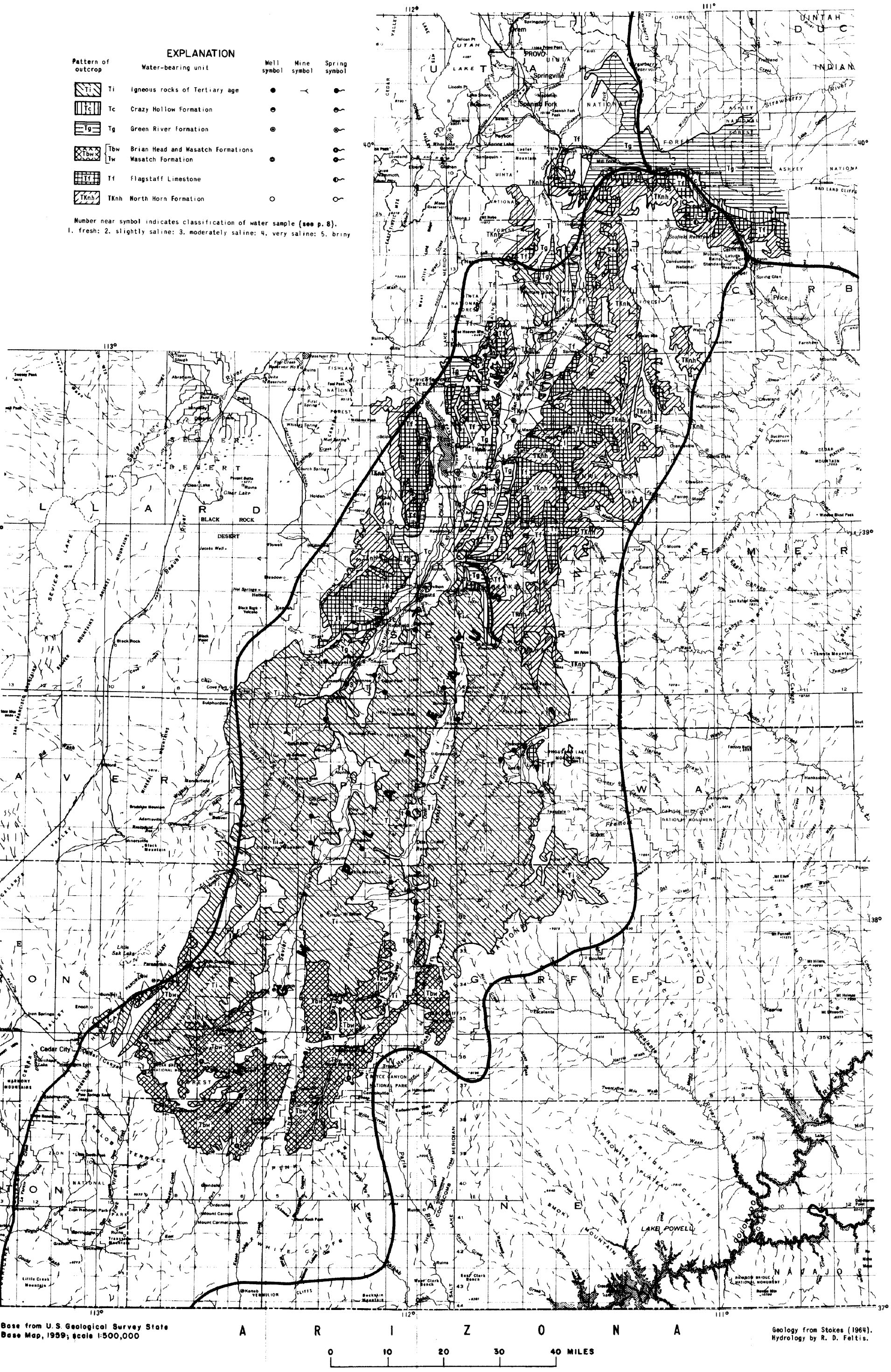
FIGURE 18 1966



MAP SHOWING LOCATIONS OF WELLS, SPRINGS, AND WATER-YIELDING MINE TUNNELS IN ROCKS OF TERTIARY AGE IN THE HIGH PLATEAUS SECTION, COLORADO PLATEAU, UTAH

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TECHNICAL PUBLICATION NO. 15
FIGURE 18 1966

MAP SHOWING LOCATIONS OF WELLS, SPRINGS, AND WATER-YIELDING MINE TUNNELS IN ROCKS OF TERTIARY AGE IN THE HIGH PLATEAUS SECTION, COLORADO PLATEAU, UTAH