Table 1.--Description of geologic units known to underlie parts of the lower Dirty Devil River basin area--Continued

Erathem	System	Series	Geologic unit	Character of material	Hydrologic characteristics
MESOZOIC (200MSZC)	Cretaceous	Upper Cretaceous	Mancos Shale: Ferron Sandstone Member (211FRRN)	Pale-yellow thin- to thick-bedded lenticular sandstone and interbedded carbonaceous shale and coal. Thickens westward from 50 to 750 feet; 150 to 300 feet near Henry Mountains.	Low permeability. Yields small amounts of fresh to slightly saline water to springs such as (D-29-10)22ccb-S1 and (D-24-5)13bcd-S1. May be fully saturated in Henry Mountain structural basin, but water from wells in that area would be saline.
			Mancos Shale: Tununk Member (211TNNK)	Dark-gray to black carbonaceous shale interbedded with thin beds of pale-yellow sandstone. Thickens westward from 250 to 650 feet; 525 to 650 feet thick west of Henry Mountains. Forms nearly barren badlands as in center of North Blue Flat.	Very low permeability.
			Dakota Sandstone (210DKOT)	Light-yellow and yellowish-brown friable to quartzitic coarse-grained cross-bedded fluvial sandstone, conglomeratic sandstone, and conglomerate, with minor interbedded carbonaceous shale and impure coal. 0 to 125 feet thick; occurs mainly as discontinuous lenses.	Low(?) permeability. May be a source of water locally, but thinness and discontinuity indicate formation is not important as an aquifer in study area.
		Lower Cretaceous	Cedar Mountain Formation (217CDMR): Shale Member	Light-gray, grayish-green, and purple lacustrine shale and mudstone, with minor sandstone lenses and limestone beds. Some minor coarser material. 0 to 250 feet thick.	Very low permeability.
			Cedar Mountain Formation (217CDMR): Buckhorn Conglomerate Member (217BCKR)	Dark-brown irregularly bedded ledge-forming fluvial conglomerate with minor lenses of conglomeratic sandstone. Pebbles are mainly of black chert, averaging slightly more than 1 inch in diameter. Maximum thickness 100 feet; thins and pinches out southward.	Very low(?) to low(?) permeability. May contain water in structurally low areas but is not known to be an aquifer. Well (D-28-7)36bbb-1 reportedly penetrated the formation at the east edge of North Blue Flat; the driller reported no water.
	Jurassic (220JRSC)	Upper Jurassic	Morrison Formation Total thickness 0 to 750 feet: Brushy Basin Shale Member (221BRSB)	Light-red, purple, and grayish-green bentonitic lacustrine mudstone; minor limestone lenses; minor white, gray, and buff crossbedded sandstone lenses; minor conglomerate lenses. Thickens northeastward from 0 to 400 feet.	Very low permeability. Bentonitic surfaces prevent deep infiltration; these barren surfaces contribute much sediment to surface runoff during torrential thunderstorms; sediment seals surfaces of otherwise permeable alluvium and reduces permeability when mixing with alluvium.
			Morrison Formation Total thickness 0 to 750 feet: Salt Wash Sandstone Member (221SLWS)	Light-gray, tan, and white thickly crossbedded fine- to coarse-grained lenticular fluvial sandstone with thin beds of conglomerate; contains interbeds of variegated sandy mudstone. Contains gypsum beneath North Blue Flat, and northeast of Henry Mountains as much as 50 feet of massive gypsum occurs at the base. Thickens southeastward from 0 to 400 feet.	Low(?) permeability, but potential aquifer in areas where it is fully saturated. Supplies small amounts of slightly saline water to springs such as (D-27-6)23cba-S1 and flowing wells (D-26-9)24dbc-1 and (D-28-7)36bbb-1. The water mainly is of the sodium sulfate type. Freshwater was found in the Morrison Formation at only one spring, which is in the Henry Mountains.
		Middle Jurassic	San Rafael Group (321SRFL): Summerville Formation (221SMVL)	Reddish-brown even- and thin-bedded siltstone, sandstone, and mudstone. Local small channel(?) sandstone. Thin beds and veinlets of gypsum. character as seen about 1 mile west of Hanksville extends over most of area. 100 to 300 feet thick.	Very(?) low permeability. May supply water to a few seeps. Such water as may occur probably is at best slightly saline and of the calcium sulfate type.
			San Rafael Group (321SRFL): Curtis Formation (221CRTS)	Greenish-gray and brown fine- to coarse-grained thin- to thick-bedded glauconitic marine sandstone and siltstone with minor greenish-gray to red shale and local thin lenses of conglomerate. Forms prominent marker bed between the darker Summerville Formation and Entrada Sandstone. Caps many of the bluffs from the Red Desert northwestward to the Last Chance Desert. (See fig. 25 and Smith and others, 1963, fig. 14.) 0 to 240 feet thick; near Caineville about 80 feet thick.	Very(?) low permeability. Not known to be an aquifer. Any water in the formation probably is saline.
			San Rafael Group (321SRFL): Entrada Sandstone (221ENRD)	In the northeastern part of area, light-reddish-brown to tan massive crossbedded eolian sandstone dominates (fig. 5); changes westward to an earthy reddish-brown thin- to thick-bedded fine-grained sandstone with substantial amount of clay (fig. 25). Thickens westward and probably southward from about 300 feet to nearly 800 feet in Capitol Reef National Park.	Very low to moderate permeability. Western facies not known to be an aquifer. At Hansville, the formation is the only source of fresh ground water; there, the estimated values for K range from 2 to 16 ft/d (table 2). The area of freshwater occurrence is limited, however, and the chemical quality of the water deteriorates within a mile westward from Hanksville. The freshwater is generally of the sodium bicarbonate sulfate type. In the Burr and San Rafael Deserts, the sandstone is the source of small amounts of slightly to moderately saline water, in which sulfate is the dominant anion.
			San Rafael Group (321SRFL): Carmel Formation (221CRML)	Removal of limestone and gypsum has lead to considerable distortion of the formation and overlying rocks. Two examples (fig. 4) are the Gypsum Sink (also called Meteorite Crater), a karst feature in the Entrade Sandstone (in the SW¼SW¼ sec. 36, T. 25 S., R. 5 E.), and Glass Mountain, a mass of hydrothermally(?) emplaced gypsum (in the NW¼NW¼NW¼ sec. 20, T. 27 S., R. 7 E.). For the purpose of this report, the base of the formation is defined as the bottom of a red shale and siltstone that occurs throughout the area. It can be seen along the flanks of the San Rafael Swell as flatirons (fig. 23 and Baker, 1946, pls. 16 and 17A) and the canyon of the Fremont River in Capitol Reef National Park (fig. 6). It has a distinctive configuration on gamma-ray and resistivity logs, which provide part of the basis for discussion of structural distortion in the text.	Very low to locally high(?) permeability. Formation in undisturbed state probably has very low permeability, but where the rocks are fractured or exposed, water, which percolates from the surface or rises from below, dissolved gypsum and limestone. Circulation of ground water accelerates the local development of highly permeable zones in the formation. For example, Caine Springs, at the crest of an anticline, discharge about 2 ft^3/s from limestone and gypsum. (See also the ICPA well in Hood and Danielson, 1979, table 8.) The basal siltstone of the Carmel Formation impedes drainage of ground water downward into the Navajo Sandstone. Thus, Robbers Roost Spring, (D-28-14)22cad-S1, discharges water from the formation where the underlying Navajo has been partly or completely drained. Other similar occurrences probably include Swazys Seep, (D-25-12)4aac-S1, at the edge of the San Rafael Swell.