U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
U.S. ARMY-ROCKY MOUNTAIN ARSENAL, U.S. DEPARTMENT OF ENERGY-ROCKY FLATS FIELD OFFICE, COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, COLORADO DEPARTMENT OF NATURAL RESOURCES-STATE ENGINEERS OFFICE, DENVER WATER DEPARTMENT, LITTLETON-ENGLEWOOD WASTEWATER TREATMENT PLANT, EAST CHERRY CREEK VALLEY WATER AND SANITATION DISTRICT, METRO WASTEWATER RECLAMATION DISTRICT, WILLOWS WATER DISTRICT, AND CITIES OF AURORA, LAKEWOOD, AND THORNTON

HYDROLOGIC INVESTIGATIONS ATLAS HA–736
Altitude of the water table—SHEET 3 of 5
Robson, S.G., 1996, Geohydrology of the shallow aquifers in the Denver metropolitan area, Colorado

HYDROLOGY

Water in the unconsolidated sediments is derived primarily from infiltration of precipitation, leakage from streams, canals, and ponds, and infiltration of irrigation water applied to lawns, gardens, and commercial crops. The downward movement of the infiltrating water is hindered by the less permeable underlying bedrock, and the water accumulates to form a shallow aquifer with a water table in the unconsolidated sediments. During wet seasons, or periods of intensive irrigation, large rates of infiltration can cause the water table to rise, and the aquifer can extend laterally into upland areas. Dry periods can cause the water table to decline, and the unconsolidated sediments in the upland areas may be drained. Ground water primarily is discharged from the aquifer by evapotranspiration from vegetation, withdrawal from wells, and discharge to springs and streams. The larger stream valleys are important areas of ground-water discharge. Some water also can discharge by downward movement into permeable zones in the underlying bedrock (Robson, 1987).

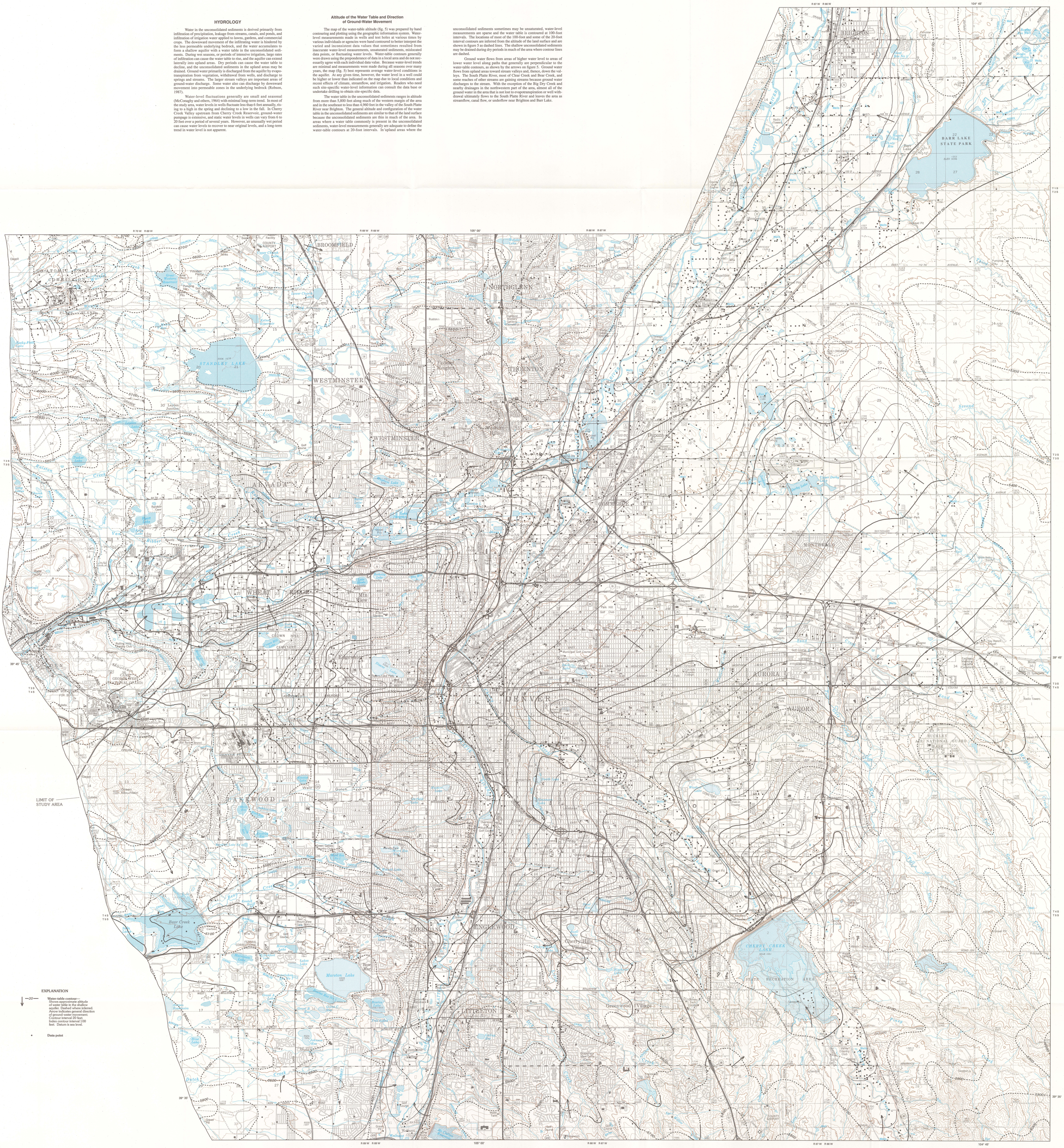
Water-level fluctuations generally are small and seasonal (McConaghy and others, 1964) with minimal long-term trend. In most of the study area, water levels in wells fluctuate less than 6 feet annually, rising to a high in the spring and declining to a low in the fall. In Cherry Creek Valley upstream from Cherry Creek Reservoir, ground-water pumpage is extensive, and static water levels in wells can vary from 6 to 20 feet over a period of several years. However, an unusually wet period can cause water levels to recover to near original levels, and a long-term trend in water level is not apparent.

Altitude of the Water Table and Direction of Ground-Water Movement

The map of the water-table altitude (fig. 5) was prepared by hand contouring and plotting using the geographic information system. Water-level measurements made in wells and test holes at various times by various individuals or agencies were hand contoured to better interpret the varied and inconsistent data values that sometimes resulted from inaccurate water-level measurements, unsaturated sediments, mislocated data points, or fluctuating water levels. Water-table contours generally were drawn using the preponderance of data in a local area and do not necessarily agree with each individual data value. Because water-level trends are minimal and measurements were made during all seasons over many years, the map (fig. 5) best represents average water-level conditions in the aquifer. At any given time, however, the water level in a well could be higher or lower than indicated on the map due to local conditions and recent effects of climate, streamflow, and irrigation. Readers who need such site-specific water-level information can consult the data base or undertake drilling to obtain site-specific data.

The water table in the unconsolidated sediments ranges in altitude from more than 5,800 feet along much of the western margin of the area and in the southeast to less than 4,960 feet in the valley of the South Platte River near Brighton. The general altitude and configuration of the water table in the unconsolidated sediments are similar to that of the land surface because the unconsolidated sediments are thin in much of the area. In areas where a water table commonly is present in the unconsolidated sediments, water-level measurements generally are adequate to define the water-table contours at 20-foot intervals. In upland areas where the unconsolidated sediments sometimes may be unsaturated, water-level measurements are sparse and the water table is contoured at 100-foot intervals. The locations of most of the 100-foot and some of the 20-foot interval contours are inferred from the altitude of the land surface and are shown in figure 5 as dashed lines. The shallow unconsolidated sediments may be drained during dry periods in much of the area where contour lines are dashed.

Ground water flows from areas of higher water level to areas of lower water level along paths that generally are perpendicular to the water-table contours, as shown by the arrows on figure 5. Ground water flows from upland areas toward stream valleys and, thence, down the valleys. The South Platte River, most of Clear Creek and Bear Creek, and some reaches of other streams are gaining streams because ground water discharges to the stream. With the exception of the Big Dry Creek and nearby drainages in the northwestern part of the area, almost all of the ground water in the area that is not lost to evapotranspiration or well withdrawal ultimately flows to the South Platte River and leaves the area as streamflow, canal flow, or underflow near Brighton and Barr Lake.



EXPLANATION

—20— **Water-table contour**—Shows approximate altitude of water table in the shallow aquifer. Dashed where inferred. Arrow indicates general direction of ground-water movement. Contour interval 20 feet. Index contour interval 100 feet. Datum is sea level.

Data point

FIGURE 5 — Altitude of the water table and direction of ground-water movement

Base from U.S. Geological Survey 1:50,000 County Maps for Adams, Arapahoe, Denver and Jefferson Counties

SCALE 1:50,000
1 1/2 0 1 2 3 4 MILES
1 1/2 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 20 AND 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1996

GEOHYDROLOGY OF THE SHALLOW AQUIFERS IN THE DENVER METROPOLITAN AREA, COLORADO

By
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1996