USGS
science for a changing world

Ground-water resources of Tooele Valley, Utah

INTRODUCTION

Ground water provides much of the water supply for residents of Tooele Valley (fig. 1). The protection, development, and wise management of ground-water resources are important to support community growth and to ensure the continued availability of ground water for all users.

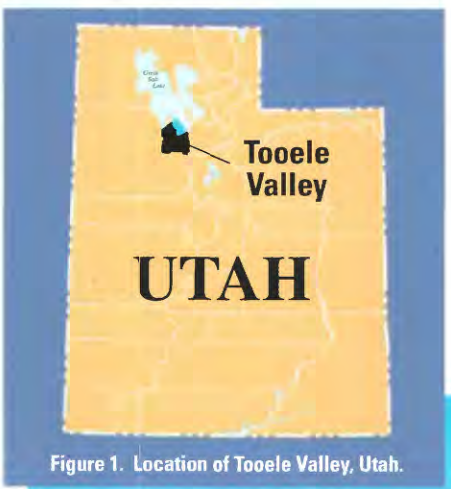

Figure 1. Location of Tooele Valley, Utah.

The U.S. Geological Survey, in cooperation with Tooele County, Tooele City, Grantsville City, the U.S. Army, and the State of Utah, has been studying the water resources of Tooele Valley since 1913 to define the quality and amount of water in the principal ground-water aquifers. The most recent studies in the 1990s have provided new insights into the hydrology of the valley. This fact sheet presents a synopsis of the recent studies and describes ground-water occurrence and movement, water quality, and a water budget for the principal basin-fill aquifer in Tooele Valley.

In western Utah, mountain ranges are typically bounded by faults and the adjacent basins are filled with sediments shed from the mountains. In most basins, including Tooele Valley, the sediments, called basin fill, can be thousands of feet thick. The basin fill is composed of gravel, sand, silt, and clay, often complexly interbedded (fig. 2). The basin fill is generally composed of coarse gravel and sand near the mountain

Oquirrh Mountains and Tooele Valley, Utah.

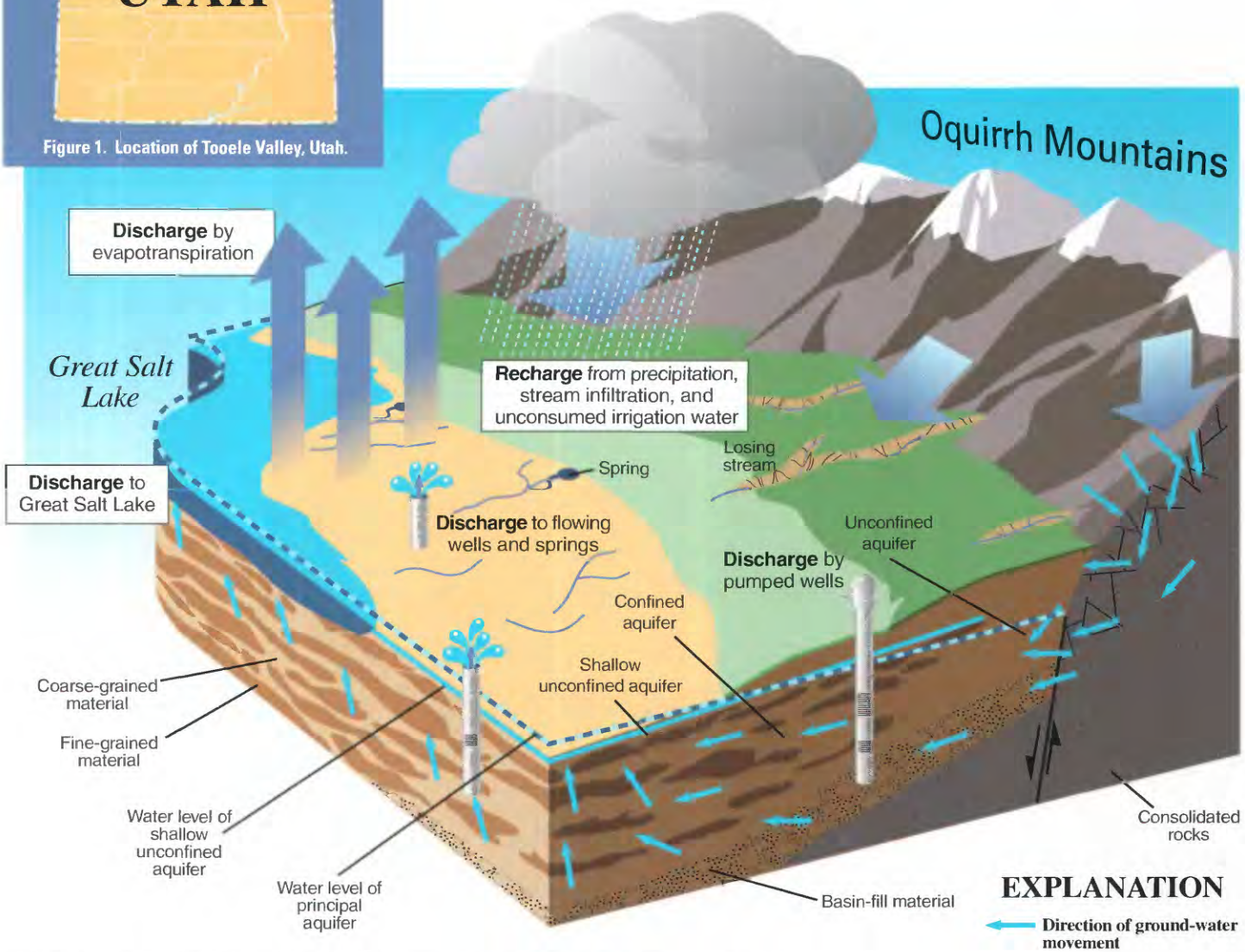

Figure 2. Generalized block diagram of the basin-fill ground-water flow system in Tooele Valley, Utah.

front and becomes finer in the center of the valley where silt and clay predominate. Many of these sediments were deposited in historic Lake Bonneville.

Ground-Water Occurrence and Movement

The basin-fill sediments contain ground water and make up the basin-fill aquifer. Ground water enters the basin-fill aquifer most readily near the mountain fronts in recharge areas and flows through the aquifer toward the center of the valley and Great Salt Lake (fig. 2). Here, water comes to the surface in springs, in wetlands, and in the lake bottom in discharge areas. Ground water dissolves salts and other minerals that it contacts as it flows from the mountain front to valley center. By the time the ground water reaches the center of the valley, it contains more dissolved salts and other constituents than water at the mountain front. Parts of the basin-fill aquifer, generally greater than 1,000 feet in depth, often contain water that is not suitable for drinking because of high concentrations of dissolved salts.

The depth (or height) of water in a well is called the water level. If water levels in wells are converted to altitudes, then contour maps showing the water-level altitude can be compiled. These maps are called potentiometric surface maps. The potentiometric surface map for March 1995 for Tooele Valley is shown in figure 3. The

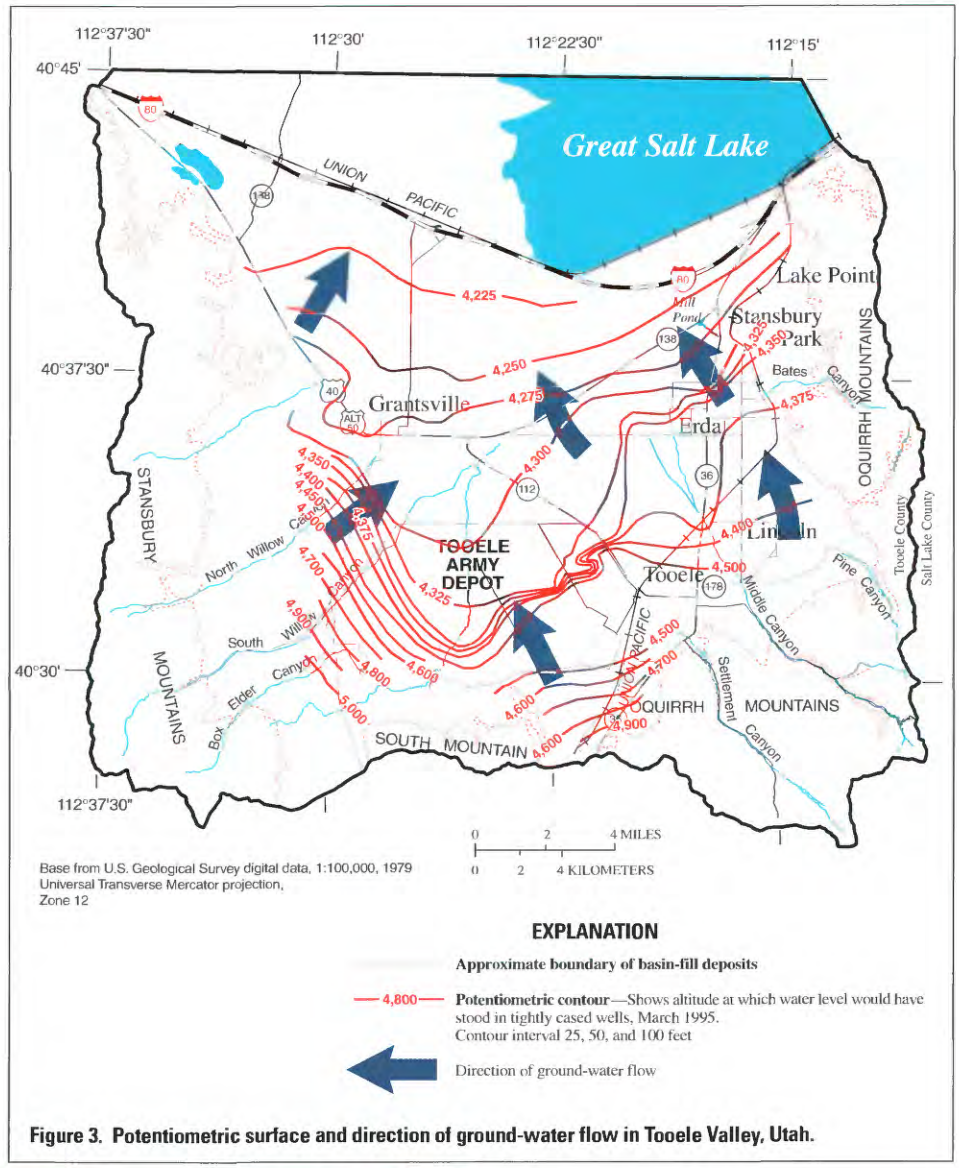

Figure 3. Potentiometric surface and direction of ground-water flow in Tooele Valley, Utah.

Ground water discharges to Mill Pond Spring near Stansbury Park, Utah.

map shows the altitude at which water levels would stand in wells completed in the basin-fill aquifer. Water levels in wells can vary with the well-completion depth because clay layers, also called confining layers, impede the vertical movement of water. In general, water levels in the basin-fill aquifer are near or above the land surface in the center of Tooele Valley and 500-600 feet below land surface in some areas along the mountain fronts. Generalized directions of ground-water flow are from the mountain fronts to the valley center and Great Salt Lake (fig. 3).

Recharge and discharge areas for the basin-fill aquifer have been mapped by the U.S. Geological Survey and the Utah Geological Survey (Steiger and Lowe, 1997). A primary recharge area is an area where water can infiltrate from the land surface and move downward unimpeded

by clay and silt layers into the deeper basin-fill aquifer. In primary recharge areas, water can rapidly infiltrate to the subsurface and any contaminants present are carried into the aquifer. Secondary recharge areas are areas with confining layers of silt and clay that may impede the downward infiltration of water. Shallow areas of ground water, often called perched water, can sit on top of the confining layers. Water in discharge areas flows upward from the basin-fill aquifer and is discharged at springs and seeps and to wetlands. Primary recharge areas generally occur along the mountain fronts, particularly in areas where streams enter the valley and sediments are coarser (fig. 4). Secondary recharge areas make up the transition area between the primary recharge and discharge areas.

Water Quality

The quality of water is measured by analyzing the chemical constituents dissolved in the water. A commonly used measure of water quality is dissolved-solids concentration, which is the total amount of all the dissolved constituents in the water. Water quality varies spatially in Tooele Valley and has changed over time (fig. 5). The dissolved-solids concentration of ground water in the valley is shown in figure 4. Generally, the concentration of dissolved solids is lower near the mountains in the recharge areas and higher near Great Salt Lake in the discharge areas. Water with a dissolved-solids concentration of less than 500 milligrams per liter generally makes excellent drinking water. Water with a concentration of 500 to 1,000 milligrams per liter is still drinkable, but the dissolved constituents may impart some taste to the water.

Several areas in Tooele Valley contain contaminated ground water. Organic chemicals have been detected in ground water under and adjacent to Tooele Army Depot. The upper 100 to 150 feet of the basin-fill aquifer east of Erda is contaminated with nitrates and dissolved-solids concentrations are high near Great Salt Lake (fig. 4).

Water Budget

About 70,000 to 75,000 acre-feet of water moves through the aquifers in Tooele Valley each year. One acre-foot is the amount of water that would cover an acre with 1 foot of water. The water originates from precipitation in the surrounding mountains, rain in Tooele Valley, seepage of unused irrigation water, and seepage from Rush Valley. The water is removed from the

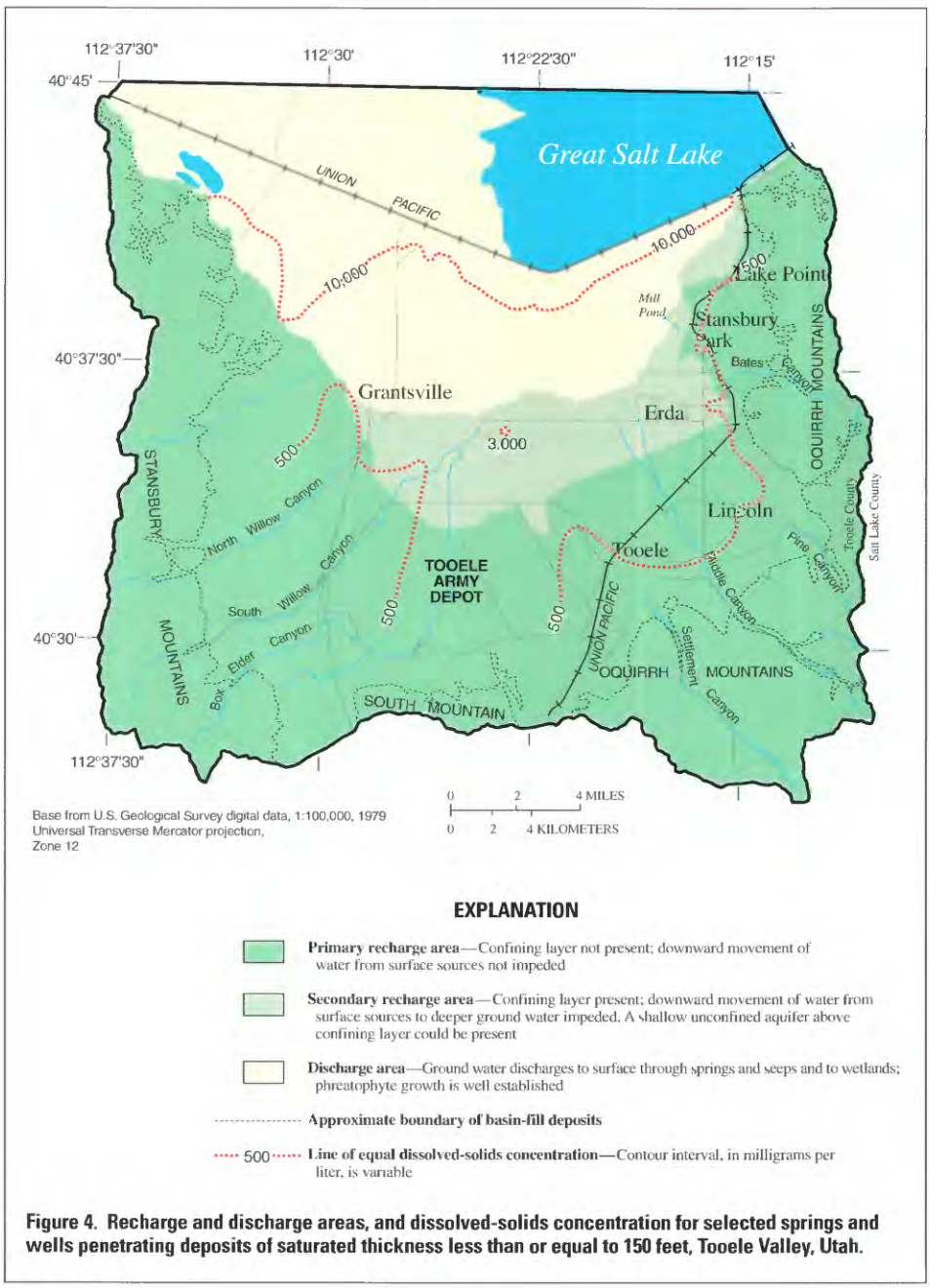

Figure 4. Recharge and discharge areas, and dissolved-solids concentration for selected springs and wells penetrating deposits of saturated thickness less than or equal to 150 feet, Tooele Valley, Utah.

Collecting a water sample from a new well, Tooele Valley, Utah.

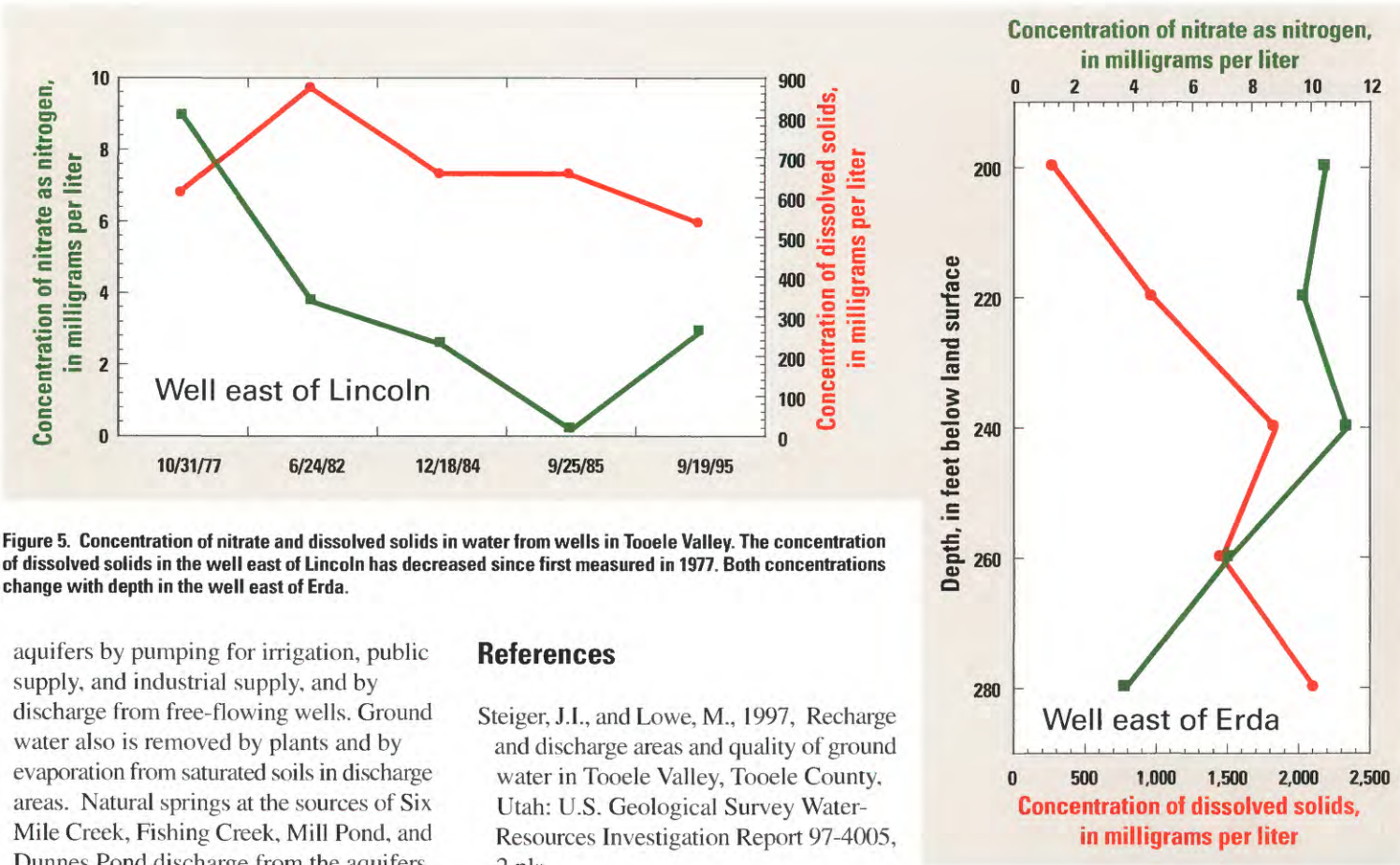

Figure 5. Concentration of nitrate and dissolved solids in water from wells in Tooele Valley. The concentration of dissolved solids in the well east of Lincoln has decreased since first measured in 1977. Both concentrations change with depth in the well east of Erda.

aquifers by pumping for irrigation, public supply, and industrial supply, and by discharge from free-flowing wells. Ground water also is removed by plants and by evaporation from saturated soils in discharge areas. Natural springs at the sources of Six Mile Creek, Fishing Creek, Mill Pond, and Dunnes Pond discharge from the aquifers. The remaining groundwater is discharged to Great Salt Lake and to shallow drains and ditches in the area.

— By David D. Susong

References

Steiger, J.I., and Lowe, M., 1997, Recharge and discharge areas and quality of ground water in Tooele Valley, Tooele County, Utah: U.S. Geological Survey Water-Resources Investigation Report 97-4005, 2 pls.

Stolp, B.J., 1994, Hydrology and potential for ground-water development in southeastern Tooele Valley and adjacent areas in the Oquirrh Mountains, Tooele County, Utah: Utah Department of Natural Resources, Technical Publication No. 107, 67 p.

Estimated long-term average annual recharge to and discharge from the basin-fill aquifer in Tooele Valley

Recharge	
Flow from consolidated-rock and stream-channel deposits	48,000 acre-feet
Infiltration of precipitation	12,000 acre-feet
Seepage of unconsumed irrigation water	10,000 acre-feet
Subsurface inflow from Rush Valley	5,000 acre-feet
TOTAL	**75,000 acre-feet**
Discharge	
Withdrawal from pumped wells	13,500 acre-feet
Discharge from flowing wells	12,500 acre-feet
Evapotranspiration	23,000 acre-feet
Flow to springs	16,000 acre-feet
Outflow to Great Salt Lake	3,000 acre-feet
Flow to shallow drains and ditches	unknown
TOTAL	**68,000 acre-feet**

For additional information write to:

District Chief
U.S. Geological Survey
Room 1016 Administration Building
1745 West 1700 South
Salt Lake City, Utah 84104

Additional information about water resources in Utah is available on the World Wide Web at

http://ut.water.usgs.gov

U.S. Department of the Interior
1849•1999

Printed on recycled paper

☆ U.S. GOVERNMENT PRINTING OFFICE : 19 — 773-087 / 30026 Region No