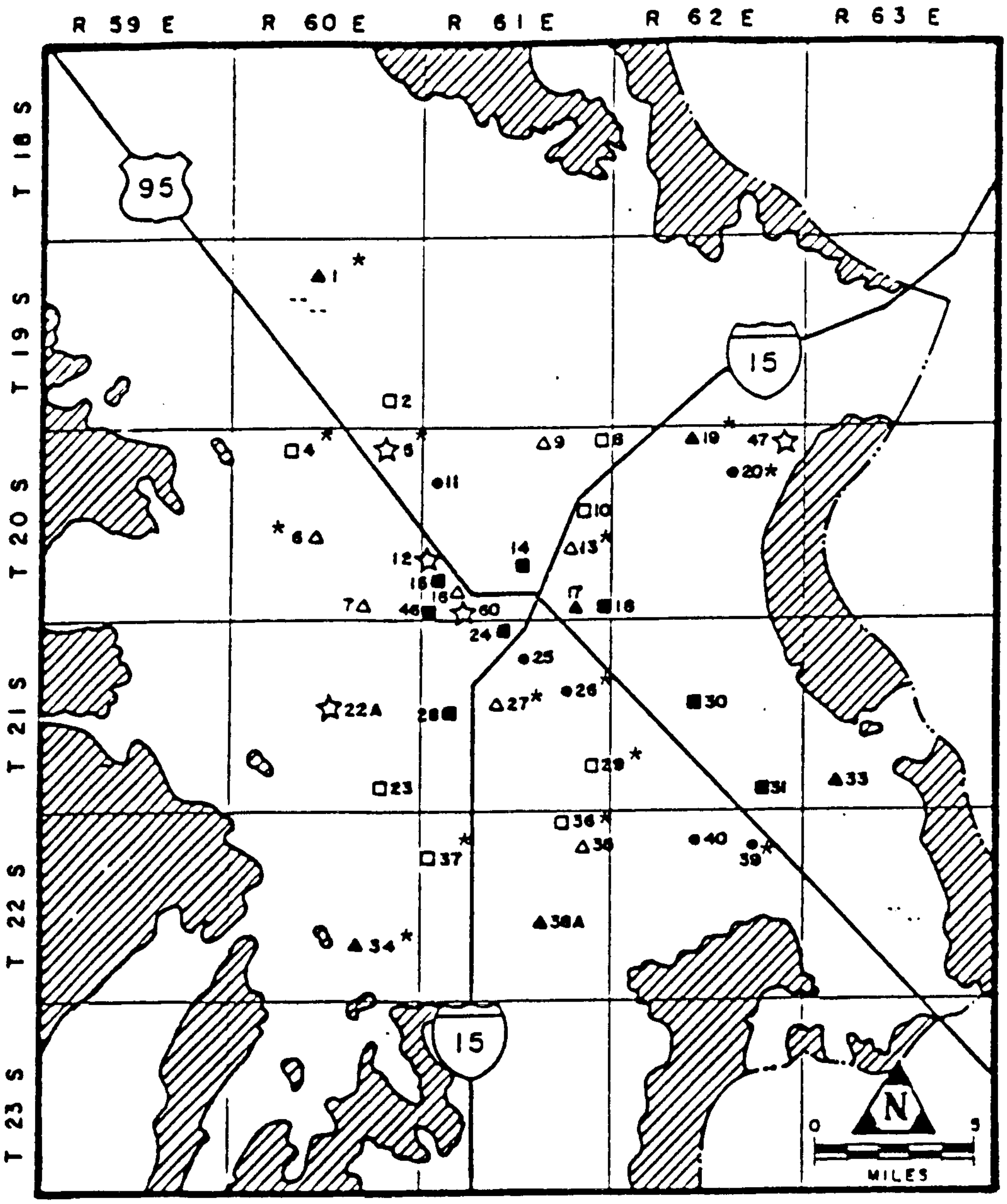
SUMMARY

Las Vegas Valley continues to experience rapid development. The continued urban growth has resulted in: importation of large volumes of Colorado River water to meet increasing demands; water level declines up to three hundred feet in the principal water supply aquifers and associated subsidence; and, water level rises in the poorer quality shallow aquifer located in the central and eastern parts of the valley.

Impacts of urban development on present and future ground-water quality has been a concern of water managers for the past decade. During the years 1981 to 1983, USGS established and sampled a ground-water monitoring network of forty wells that provides a fairly uniform areal distribution of sampling sites from the major depth zones (shallow, intermediate, and deep) valley-wide. In 1987, the Las Vegas Valley Water District resampled the majority of the monitoring network established by the USGS for the same principal chemical constituents, trace elements, nutrients, radiochemical indicators, and total organic carbon.

Shallow Aquifer

Comparison of the 1981-1983 and 1987 total dissolved solids (TDS) concentrations in wells completed in the shallow system (further defined for this study as 0-30 feet below the water table where the water table is within twenty feet of land surface) has shown a significant increase in four of the eight



EXPLANATION

CONSOLIDATED ROCKS

■ SHALLOW, 0–30 ft. below water table and the water table is within 20 ft. of land surface

□ SHALL./INTER. 0–200 ft. below water table and the water table is greater than 20 ft. below land surface

▲ INTERMEDIATE, 30–200 ft. below water table

△ INTER./DEEP, 30–>200 ft. below water table

● DEEP, >200 ft. below water table

☆ ALL ZONES

* potential candidate for monthly monitoring

Site numbers correspond to the appendix

Figure 26.--Potential candidates for monthly monitoring of conductivity, temperature, and pH.

sampled. This is probably due to the continued degradation of the shallow system resulting from secondary recharge as landscape irrigation. However, part of the apparent degradation could be due to seasonal fluctuations.

Seven of the eight shallow wells sampled had total organic carbon (TOC) concentration greater than 1 mg/L. These higher TOC values could be due to the connection of the shallow ground-water with organic matter in the shallow zone. One of the eight shallow wells sampled in 1987 showed a significant decrease in TOC concentration compared to the 1981-1983 sample results. This decrease could be due to different sampling techniques resulting in less soil sediment and organic matter in the 1987 samples.

The shallow system is a resource that could be utilized for irrigation in the central and eastern parts of the valley. Defining the water quality near large turf areas would be the first step. Use of the shallow system would aid in conserving potable water supplies and help alleviate the problem of the rising shallow water table.

Near Surface Reservoir and Principal Aquifers

The general areal ground-water water quality in the near surface reservoir and principal aquifers found throughout the valley in 1987 is very similar to that reported in 1912 and 1945. The southeastern part of the valley consistently exhibits poorer water quality with TDS concentrations as high as 8,000 mg/L while ground-water quality in the northwest is of good quality with TDS values about 250 mg/L.

Nine of the thirty-two wells sampled in 1987 showed significant changes in conductivity when compared to the 1981-1983 samples. Degradation at four of the nine wells (site Nos. 17, 19, 36, and 29) can probably be attributed to the infiltration of water from the poorer quality shallow aquifer. Two of the wells (site Nos. 29 and 36) are open to the shallow/intermediate zone as well as the intermediate zone. The other two wells (site Nos. 17 and 19) are completed in the intermediate zone. The apparent changes in conductivity in another four wells (site Nos. 27, 33, 34, and 37) could be due to seasonal fluctuations. Monthly monitoring for conductivity, pH, and temperature is needed to further define seasonal fluctuations. Changes in water quality in the one remaining well (site No. 47) is thought to be due to insufficient pumping before collecting the sample. Even though a number of casing volumes were purged prior to sampling and the conductivity had stabilized within 10 percent, the sample collected might not have been representative.

The majority of nitrate values in samples collected from the principal aquifers in 1987 have not changed significantly since 1981-1983 sampling. All values for wells intercepting the principal ground-water aquifers are less than 10 mg/L (NO_3 as N), the

EPA drinking water standard. However, data from the Las Valley Water District's public supply wells have shown increasing values since 1975. The current values, about 1 mg/L (NO_3 as N) are still significantly below the drinking water standard. The increases in nitrates could indicate that some amount of secondary recharge from landscape irrigation is reaching the principal ground-water aquifers, carrying fertilizer nitrates from the shallow aquifer or flushing natural nitrates out of the overlying sediments.

The TOC concentrations in all but two of the wells sampled, completed in the near surface reservoir and principal aquifers, were less than 1 mg/L. These two wells (site Nos. 17 and 29) had TOC concentrations of 1.4 mg/L and 1.20 mg/L are also open to the shallow/intermediate zone, the probable source of the organic matter.

All trace metal concentrations found in the samples from wells completed in the principal aquifers were below drinking water standards except for site No. 39. The sample from the well located at site No. 39 had an arsenic concentration of 0.55 mg/L. This well is used solely for irrigation.

All gross alpha and beta values in samples from wells completed in the principal aquifer were below the drinking water standards of 15 pCi/L and 50 pCi/L, respectively. The majority of the values were below detectable limits; therefore, the values were not included in the Appendix.

Future Monitoring

Monthly monitoring of conductivity, pH, and temperature for fourteen wells completed in the near surface reservoir and principal aquifers (shown in Figure 26) would provide data regarding seasonal fluctuations. These fourteen wells are equipped with pumps and are fairly uniformly distributed throughout the valley.

Additional wells completed in the shallow aquifer should be installed in the western part of the valley. It would be beneficial to sample a representative number of the existing shallow wells quarterly for conductivity, pH, and temperature to provide information regarding seasonal fluctuations.

The existing monitoring network (as shown in Figure 2) should be sampled every two years for the principal constituents and nutrients. A sampling frequency of every six years is recommended for total organic carbon (TOC), dissolved organic carbon (DOC), and trace metals.

It must be noted that because of the dynamic nature of urban development in Las Vegas Valley, land-use pattern changes and increasing secondary recharge will be constantly impacting groundwater quality. Increased monitoring will help in delineating seasonal changes, however, evaluating changes in comparison to "static conditions" will be impossible.

The benefits from understanding the changes in ground-water quality are threefold: 1) protection of the near surface reservoir and principal aquifers because they are vital to water resource management, 2) prevention of potential adverse impacts to downstream surface-water quality due to water quality changes in Las Vegas Wash, and 3) use of the shallow ground-water system as a resource thereby reducing the threat to the near surface reservoir and principal aquifer system. Thus, timely basic data will provide water resource managers with valuable information that will assist in the decision making process.