

3725-00023

Guyton Grndwtr Availability STM 1986

WILLIAM L. GUYTON  
MERVIN L. KLUG  
JOSEPH K. LONGACRE  
WILLIAM J. SEIFERT, JR.  
TED L. HARRIGER

*Senior Consultants*

WILLIAM F. GUYTON  
RALPH A. SCALAPINO

WILLIAM F. GUYTON ASSOCIATES, INC.

CONSULTING GROUND-WATER HYDROLOGISTS

AUSTIN-HOUSTON

580 WESTLAKE PARK BOULEVARD, SUITE 780 • HOUSTON, TEXAS 77079 • (713) 493-0606

January 7, 1986

Mr. Robert E. Firth  
Manager, Gas and Water  
Planning and Engineering  
Sierra Pacific Power Company  
Post Office Box 10100  
Reno, Nevada 89520

Dear Mr. Firth:

Our report on ground-water availability in the South Truckee Meadows area is attached. Results of the study indicate there is ground water available in the South Truckee Meadows area to help supply the water demand in the Company's Service area.

We wish to express our appreciation to you and Messrs. Bert Borda, P.E. and Richard D. Moser, P.E. for the cooperation and assistance provided us during this study.

If you or others with the Company have any questions concerning our report, please do not hesitate to let us know and we shall try to answer them.

Sincerely yours,

WILLIAM F. GUYTON ASSOCIATES, INC.

*W. John Seifert, Jr.*  
W. John Seifert, Jr.

REPORT ON GROUND-WATER AVAILABILITY  
IN THE SOUTH TRUCKEE MEADOWS AREA,  
WASHOE COUNTY, NEVADA

Prepared for  
Sierra Pacific Power Company  
Reno, Nevada

By  
WILLIAM F. GUYTON ASSOCIATES, INC.  
Consulting Ground-Water Hydrologists  
Austin - Houston, Texas

January 1986

## TABLE OF CONTENTS

	<u>Page</u>
PRINCIPAL CONCLUSIONS . . . . .	i
INTRODUCTION . . . . .	1
Well-Numbering System . . . . .	3
GEOLOGY . . . . .	4
General Geologic Structure . . . . .	7
EXISTING WELLS . . . . .	8
PUMPAGE AND WATER LEVELS . . . . .	10
Pumpage . . . . .	10
Water Levels . . . . .	12
RECHARGE, MOVEMENT, AND DISCHARGE OF GROUND WATER . . . . .	15
RESULTS OF PUMPING TESTS . . . . .	19
CHEMICAL QUALITY OF WATER . . . . .	21
TEMPERATURE OF WATER . . . . .	25
FUTURE AVAILABILITY OF GROUND WATER . . . . .	26
TEST HOLE DRILLING . . . . .	30
PILOT PRODUCTION WELL . . . . .	34

### TABLES

Table 1.	Records of Wells
Table 2.	Results of Pumping Tests
Table 3.	Chemical Analyses of Water from Wells
Table 4.	Results of Analyses for Heavy Metals

### ILLUSTRATIONS

Figure 1.	Well Locations
Figure 2.	Geologic Map
Figure 3.	Well Pumping Rate and Specific Capacity Data
Figure 4.	Static Water Level Elevations
Figure 5.	Pumpage and Water Level Data
Figure 6.	Chemical Analysis (Or Quality) Data
Figure 7.	Tentative Locations for Test Holes

## PRINCIPAL CONCLUSIONS

1. The principal water-bearing formations in the South Truckee Meadows area are the younger and older alluvium above the Truckee formation. The alluvium is screened in public supply wells in the area to depths that range from about 108 to 643 feet.
2. Pumpage of ground water in the South Truckee Meadows area is estimated to average about 3 million gallons per day (mgd). About 1.6 mgd of this total is estimated to be pumped for public supply. The remainder is pumped for irrigation and domestic and stock use. 1985? 3360 AF
3. The static water level in the Company's South Virginia Street Well has declined only a few feet in the past 16 years, while pumpage from the well from 1971 through 1984 has averaged about 0.6 mgd. The static water-level decline in the Company's DeLucchi Lane Well has been about 11 feet or less in the past 12 years while pumpage from the well has averaged about 0.22 mgd. The small amounts of static water-level decline in the South Virginia Street Well and DeLucchi Lane Well may be partly due to the shallow cones of depression caused by pumping the wells having intercepted some natural discharge from the aquifer and/or having induced additional recharge to enter the aquifer.

4. Available results of pumping tests show values of transmissivity for the water-bearing alluvium screened by wells in the study area ranging from 6,900 to 24,700 gallons per day per foot. The data also show that the higher values of transmissivity generally are for wells located in the northern part of the study area where some younger alluvium is screened in the wells.
5. It should be expected that the yields of future wells will vary roughly in direct proportion to the transmissivity of the water-bearing material screened by the well. The specific capacities of wells for which data are available in the South Truckee Meadows area range from 1.1 to 27.2 gallons per minute per foot of drawdown. The public supply wells located in the northern part of the study area generally have higher specific capacities than other wells located in the study area.
6. The natural recharge to and discharge from the water-bearing materials in the South Truckee Meadows area are estimated to average about 8,200 to 10,000 or more acre-feet per year. A majority of the recharge is believed to be attributable to deep percolation of water applied for irrigation and the leakage of water from irrigation ditches in the area. Thus, as irrigated acreage in the area declines, a significant source of recharge will be reduced. This reduction, however, should be partially

offset when pumping increases and the resulting water-level declines induce additional recharge where water is presently now being rejected, and intercept natural discharge which now occurs in the form of seepage into drains and transpiration by plants and evaporation where the water table is at or near land surface. *where?*

7. Generally, dissolved solids in water from wells in the western part of the study area are low and total hardness ranges from moderate to high.

Water samples obtained from water-bearing materials below the depth of about 250 feet in test holes drilled at the sites of the Company's South Virginia Street and DeLucchi Lane Wells contained manganese concentrations which exceed the maximum recommended level in water for public supply. These wells are in the northwestern part of the area and it is unknown whether this condition is prevalent in the western part of the area.

Available data show that dissolved solids in water from wells in the eastern part of the area are relatively high and the dissolved solids in water from some of the wells would be unacceptable for public supply. The data also show that the arsenic in water from some of the wells and test holes in the eastern part of the area exceeds the maximum concentration allowed for public supply.

8. It is estimated that a few to possibly 6 or 7 mgd of additional ground water can be developed from wells drilled in the South Truckee Meadows area. It also is estimated that there is about 240,000 acre-feet of good quality water in storage in the general area considered for test hole drilling.
9. The yields of wells drilled at sites with favorable test hole results probably will range from about 400 to 1,000 gallons per minute (gpm). Very favorable conditions will have to be encountered to obtain a yield of 1,000 gpm from a well.
10. Test hole drilling and water sampling are needed to locate sites with sufficient thicknesses of water-bearing materials that contain water of suitable quality for the construction of a large-capacity public supply well. At present it is estimated that test holes should be drilled to a depth of about 500 to 600 feet. Tentative sites for test holes are shown on Figure 7. Preliminary cost estimates for each 600-foot test hole including four water samples range from about \$45,000.00 to \$80,000.00.  
\$ 75/Ax      \$ 133 /Ax
11. Pilot production wells or production wells should be constructed at the test hole sites where favorable aquifer conditions are encountered. At present it is estimated

the depth of the wells could range from about 250 to 500 feet. The wells should be gravel-wall type wells, constructed with quality materials, and thoroughly developed to obtain the optimum yield with the minimum practicable amount of sand in the produced water.

## INTRODUCTION

This report presents the results of a study of ground-water conditions and availability in the South Truckee Meadows area. For this study, the South Truckee Meadows area is defined as that part of Truckee Meadows extending from the north edge of Huffaker Hills to Steamboat Hills at the south end of Truckee Meadows. Previous studies of ground-water conditions in Truckee Meadows have been performed by this firm but the emphasis of those studies was on the part of Truckee Meadows which is located west and north of Huffaker Hills. The study area for this report is shown on Figure 1.

The purpose of the study has been to determine, insofar as possible with available data, general areas where ground water might be developed in the South Truckee Meadows area to supply municipal needs in the Company's service area and the amounts that might be available.

This report presents information on the quantity and quality of water obtained from wells and on the yields and specific capacities of wells in the area of study. Data for the study were obtained from Sierra Pacific Power Company, governmental agencies, well drillers, and well owners. The work that was performed for this study includes:

1. Compilation and review of available published and unpublished reports on the geology and hydrology of the area in the files of Sierra Pacific Power Company, governmental agencies, and our firm.

2. Compilation of records of large-capacity wells and selected small-capacity wells in the area from the files and reports of the Nevada State Engineer, the U. S. Geological Survey, Sierra Pacific Power Company, and our firm.
3. A reconnaissance of the study area to locate new large-capacity wells and to obtain data for those wells for which data were not available from the above sources. Water samples were collected from selected wells for chemical analysis.
4. Collection and study of drillers' logs and electric logs for water wells and test holes drilled in and near the study area.
5. Compilation and review of available records of water-level data for wells measured by personnel of Sierra Pacific Power Company and Washoe County.
6. Compilation of chemical analyses of water samples from wells in and near the study area from the files of the Nevada Division of Health, the U. S. Geological Survey, Sierra Pacific Power Company, and our firm. Results of chemical analyses of water samples collected during the present study are included.
7. Preparation of this report.

A substantial part of the data for the northern part of the study area was compiled by Mr. Richard D. Moser and others of Sierra Pacific Power Company and their cooperation and assistance is gratefully acknowledged. Water Resources-Reconnaissance Series Report 57, "A Brief Water Resources Appraisal of the Truckee River Basin, Western Nevada", prepared by the State of Nevada Department of Conservation and Natural Resources and the U. S. Geological Survey, includes ground-water information on the study area. This information was used as a reference for this study. An earlier report on the area entitled "Evaluation of Hydrology and Hydrogeochemistry of Truckee Meadows Area,

Washoe County, Nevada" was prepared by the U. S. Geological Survey in cooperation with the Nevada Department of Conservation and Natural Resources. The report was published in 1964 as U. S. Geological Survey Water-Supply Paper 1779-S. The geologic map in Figure 2 of this report and the discussion of geology in this report are partly from Water-Supply Paper 1779-S. The estimated quantities of natural recharge to and discharge from the water-bearing sands and gravels in the South Truckee Meadows area are estimated from data presented in Report 57 and Water-Supply Paper 1779-S.

#### Well-Numbering System

The well-numbering system used in this report is the one used by the Nevada State Division of Water Resources and the U. S. Geological Survey. The wells are numbered according to their locations within the rectangular system for the subdivision of public lands with reference to the Mount Diablo Baseline and Meridian. The first two numbers of a well number (18-19-lcc) are the township and range, and the third number is the section number. The section number is followed by letters to designate the northeast (a), northwest (b), southwest (c), and southeast (d) subdivisions of the section. The first letter designates the quarter section, and the second letter designates the quarter-quarter section. If there is more than one well located in a quarter-quarter section

(a 40-acre tract), a subscript number is used to show the number of each well in the quarter-quarter section.

## GEOLOGY

The rocks which crop out in the South Truckee Meadows area may be grouped into two general classifications, consolidated and unconsolidated rocks. The general locations of the rock outcrops are shown on the geologic map in Figure 2.

The consolidated rocks occur in the Virginia Range east of the South Truckee Meadows area, the Carson Range to the west, in Huffaker Hills at the north end of the study area, and in Steamboat Hills at the south end of the study area. Consolidated rocks also occur in small unnamed hills located in the Meadows. The consolidated rocks consist of intrusive and extrusive igneous rocks, metamorphosed igneous rocks, and minor amounts of metamorphosed sedimentary rocks. The consolidated rocks generally are not capable of yielding large quantities of water to wells and to date have not proven to be a source of large supplies of good quality ground water in the South Truckee Meadows area. It is possible that some water could be developed on a long-term basis from fracture zones in the consolidated rocks but this is not known with certainty.

The unconsolidated rocks are principally of alluvial origin and are comprised of beds of clay, silt, sand, and gravel. The oldest of the formations described herein as unconsolidated is the Truckee formation of Pliocene age. Some

of the beds of the Truckee formation are partially consolidated. It is composed of diatomite interbedded with diatomaceous clay, silt, sand, gravel, and pumiceous material and probably is not a source of large supplies of water in Truckee Meadows. The Truckee formation crops out in just a few small areas in the western part of the South Truckee Meadows area.

Alluvium younger than the Truckee formation contains most of the good quality water in the South Truckee Meadows area. The alluvium has been divided on the surface into older alluvium and younger alluvium and the approximate outcrops of the two alluviums are shown on Figure 2. They are not differentiated in the subsurface because of the similarity of the materials in them. Individual beds of clay, silt, sand, and gravel in the alluvium are lenticular and they normally cannot be traced over long distances.

Based on available data, it appears that the zones of relatively coarse gravel that are found to depths as great as 500 feet north of Huffaker Hills are not present south of Huffaker Hills. The gravel beds probably were deposited by the Truckee River, and the river probably did not meander farther south than Huffaker Hills. Thus, the zones of relatively coarse gravel, if they occur in the study area, probably would be found in the northern part of the study area. Drillers' logs and electric logs examined as part of this study indicate that beds of clean, coarse gravel were not encountered in wells or test holes drilled in the central and southern part of the study area.

The thickness of the alluvium in the study area ranges from zero feet where consolidated rock is exposed at the surface to possibly as much as 1,750 feet where Test Well 18-20-16bd was drilled. The driller's log for Well 18-20-7ac shows that alluvium was still present at a depth of 250 feet less than one-half mile from where consolidated rocks are at the surface. The driller's log for Well 18-20-5cd, less than 1,000 feet from where consolidated rocks are exposed at the surface, shows hard gray rock was encountered at a depth of 185 feet. Descriptions of formation samples from Well 18-20-8ab, about 1,500 feet from where consolidated rocks are exposed, list andesite tuff in the depth interval from 151 feet to the total depth of 186 feet. The driller's log for Well 18-20-6ba (South Virginia Street Well) lists bedrock occurring at a depth of 490 feet. This well is about 3,000 feet from the nearest exposure of consolidated rocks. The driller's log for Well 18-20-7dc indicates that bedrock possibly was encountered at a depth of 201 feet. This well also is about 3,000 feet from the nearest exposure of consolidated rocks, but consolidated rocks also are exposed at only a slightly greater distance in the opposite direction. The driller's log for Well 18-19-12db lists hard rock (andesite) between the depths of 287 feet and 302 feet, but the log also shows that some sand and clay occurred in the interval from 302 feet to the total depth of the well of 385 feet. This well is about 1,000 feet from a small exposure of consolidated rocks. In the southern part of the study area,

the driller's log for Well 18-20-19ad shows that andesite, believed to be bedrock, was encountered at a depth of 710 feet, and the driller's log for Well 18-19-24ab shows red volcanic rock (solid) was encountered at a depth of 591 feet. These two wells are about a mile or more from exposures of consolidated rocks. The driller's log for Well 18-20-30cb<sub>1</sub>, located a few hundred feet from an exposure of consolidated rocks, lists fractured granite or granite for the depth interval from 149 feet to the total depth of the well of 831 feet. The above information shows that the depth to consolidated rock at a specific location generally cannot be predicted without nearby log data. However, it should be expected that reworked consolidated rock or consolidated rock would be present at relatively shallow depths near the consolidated rock outcrops in the study area.

#### General Geologic Structure

The South Truckee Meadows area is in a north-south trending structural depression or basin flanked on the east and west by the Virginia and Carson Mountain Ranges, respectively. The basin resulted from downwarping and from movement along faults bordering the basin. As shown on Figure 2 numerous faults cut the older alluvium and older unconsolidated rocks in the central and western part of the South Truckee Meadows area. Faulting has not been mapped in the younger alluvium in the study area, and no faults were evident in it from examination of electrical logs and drillers' logs of test holes and wells drilled

in the study area. The deposits which underlie the younger alluvium in the north and east parts of the South Truckee Meadows area probably have been displaced by faults but such faults would be obscured by the covering of the younger alluvium. Faults may provide avenues for hot water to move up from deeper consolidated rocks in the basin.

#### EXISTING WELLS

Records for 56 wells are given in Table 1 and the locations of the wells are shown on Figure 1. Twenty-eight of the wells were drilled for domestic or stock use, 7 were drilled for irrigation, 11 were drilled for public supply, and 10 were drilled as test wells. Three of the domestic and stock wells, one of the irrigation wells, and one of the public supply wells are reported to be unused.

There are many other small-capacity domestic wells in the study area, for which records are available, that are not included in the table or shown on the map. An attempt was made to obtain records for all large-capacity public supply, irrigation, and industrial wells in the study area and information for these wells is included in the table. Domestic wells were selected for inclusion in the table and on the map based on depth and availability of chemical quality or well productivity data for them. Many of the small-diameter domestic wells that are not in Table 1 or on Figure 1 are in the area between about 1/2 mile and 2 miles west of Highway 395 north of Zolezzi Lane.

The ownership shown in the table for many of the domestic wells and irrigation wells is that recorded on the initial forms filed by the drillers with the State Engineers Office. It is believed that in some cases the ownership of the land and the wells probably has changed since the records were filed with the State. Therefore, some of the well owners shown in the table may not be the current owners.

The water-bearing sections of the wells are screened with slotted pipe, mill-slotted pipe, louvered screen, or stainless steel wire-wrapped screen on pipe. A majority of the large-capacity public supply wells and test wells were constructed with gravel around the screened intervals. The thickness of the gravel envelope placed around the screened sections ranges from a few inches to about 10 inches. Well construction data are given in Table 1 for the wells shown on Figure 1.

Pumping rate, specific capacity, and screened interval data are given in Table 1 for wells for which the data are available. Pumping rate and specific capacity data are also shown on Figure 3.

The pumping rates at which specific capacities were determined for the public supply wells range from 120 to 1,000 gallons per minute (gpm). The specific capacities for Wells 18-20-6ba, 19-19-35ad, and 19-20-31ca were 16.1, 27.2, and 7.6 gallons per minute per foot of drawdown (gpm/ft), respectively, when the wells were drilled. These wells are Sierra Pacific Power Company's South Virginia Street Well, Lakeridge Well,

and DeLucchi Lane Well, respectively. The specific capacities for three public supply wells drilled for Washoe County and designated Wells 18-20-19aa<sub>2</sub>, 18-20-19ad, and 18-20-19db<sub>1</sub> were 7.5, 2.8, and 6.4 gpm/ft, respectively, in 1984. Test Wells 18-20-8ab and 18-20-8dc, which belong to Washoe County, had specific capacities of 9.2 and 11.7 gpm/ft, respectively, in January 1981 and February 1984. Thus, the available data indicate that the large-capacity public supply wells and test wells located in the south and east-central part of the study area generally do not have specific capacities as high as those for two of the three public supply wells drilled in the north part of the study area.

A former irrigation well, 18-20-7dc, is reported to have had a specific capacity of 23 gpm/ft when it was drilled in 1947. The U. S. Geological Survey reports that Well 18-19-12db, an unused stock and fish hatchery well, was pumped at a rate of 1,000 gpm when it was being used prior to 1964.

#### PUMPAGE AND WATER LEVELS

##### Pumpage

Available data indicate that very few wells had been drilled in the area prior to the late 1940's, and pumpage of ground water in the study area probably was very small prior to about 1950. Pumpage increased during the 1950's and 1960's as urbanization of the area occurred.

The Company's South Virginia Street and DeLucchi Lane Wells were drilled in 1968 and 1971, respectively, and records indicate that pumpage of ground water from them averaged 0.26, 0.7, 0.74, and 0.93 million gallons per day (mgd) in 1970, 1975, 1980, and 1984, respectively. Pumpage from the Company's Lake-ridge Well did not begin until May 1985.

In the southern part of the study area, Trans/Sierra Water Company pumped water from wells located in Sections 27 and 28 in T18N, R20E, until the summer of 1985. Pumpage data available for the period 1976 through 1982 show average daily pumpage from the wells was 0.43 mgd. Pumpage from these wells was discontinued in June 1985 because of the availability of better quality water, and water subsequently supplied to the Trans Sierra water distribution system has been obtained from wells located in Section 19 of T18N, R20E. Pumpage from these wells averaged 0.66 mgd for July through October 1985, while supplying water to about 750 connections. Water for public supply use also is obtained from Well 18-19-24ac and the pumpage is estimated to average less than 0.2 mgd. Based on available data, total ground-water pumpage for public supply in the South Truckee Meadows area is estimated to be about 1.6 mgd.

The exact amount of water that is pumped each year for irrigation is not known, although it is estimated to average less than one mgd. The amount of water withdrawn from numerous domestic and stock wells in the study area also is not known, although it is believed to be somewhat smaller than the amount

of water that is withdrawn for public supply in the study area. It is estimated that total ground-water pumpage in the South Truckee Meadows area during the past few years probably has averaged about 3 mgd.

#### Water Levels

Available water-level data are static water-level measurements made in Company wells by personnel of the Company, water levels measured in production wells or test wells owned by the County, and water levels measured in wells by drillers when the wells were drilled and constructed. The water-level data are given in Table 1. The elevation of the static water level, depth to static water level, total depth or screened interval of a well, and the date of the measurement are shown on Figure 4. The water-level elevations shown on Figure 4 indicate that the hydraulic gradient in the water-bearing alluvial material in the west and southwest part of the study area generally ranges from about 80 to 120 feet per mile with the direction of flow being to the east-northeast. As water moves through the alluvium to the east-northeast, the hydraulic gradient decreases generally as the slope of the land surface decreases. This could be attributable to a change in the transmissivity of the aquifer and it also could be attributable to natural discharge of water in the area along parts of Highway 395 and to the east of it. In the valley floor of the South

Truckee Meadows area the hydraulic gradient is on the order of of 20 to 30 feet per mile.

The only long-term records of water levels in wells in the study area are for the Company's DeLucchi Lane and South Virginia Street Wells. Hydrographs showing static water levels measured in the wells are given on Figure 5 along with pumpage records for the wells. Most of the pumpage from these wells occurs during the spring and summer months. Static water levels in the wells decline some during the spring and summer in response to pumpage, but the water levels recover during the fall and winter when pumpage from the wells normally is relatively small.

The static water-level data for the South Virginia Street Well show that there has been only a few feet of water-level decline in the well since pumpage began about 1970. Pumpage from the well averaged about 0.24 mgd in 1970, fluctuated between about 0.4 and 0.9 mgd between 1972 and 1981, and has averaged about 0.72 mgd for the period 1982 through 1984. Pumpage records are available for the DeLucchi Lane Well for the period 1972 through June 1985. The record indicates the average daily pumpage from the well has ranged from about 0.16 to about 0.3 mgd and averaged about 0.22 mgd for that time period. Water-level data for the DeLucchi Lane Well show that the static water level has declined no more than about 11 feet from the beginning of 1973 to the beginning of 1985. Thus, there has been only a small amount of water-level decline in both of

these wells since they were originally drilled and constructed, and static water levels in the wells were about 10 to 15 feet below land surface in December 1984. The water-level and pumpage data from these two wells indicate that possibly some natural discharge has been intercepted and/or additional recharge induced by the small amounts of static water-level declines that have occurred.

Monthly measurements of the static water level in Well 18-20-7dc are available for 1950 through 1959. The well screens material in the depth interval above about 197 feet. The well is located about 800 feet northeast of Last Chance irrigation ditch. Water-level data collected during the 1950-to-1959 time period show that the static water level in the well responded to water flow in the ditch and irrigation in proximity to the well. The static water level in the well would start rising about one month after water started flowing down the ditch in the spring of the year. Water levels would continue to rise in the well, sometimes as much as 6 feet in one irrigation season, until about November of each year when the static water level in the well would be at about 8 feet. After November or early December, water levels would decline in the well until water was introduced into the irrigation ditch at the beginning of the next irrigation season.

## RECHARGE, MOVEMENT, AND DISCHARGE OF GROUND WATER

The water-bearing materials in the South Truckee Meadows area are recharged from infiltration of precipitation which falls on the land surface, seepage from streams entering or crossing the Meadows, underflow from tributary valleys, seepage from irrigation ditches, deep percolation of water applied for irrigation of pasture, row crops, lawns, and other plants, and from wastewater discharged from septic tanks. Average precipitation in the area of South Truckee Meadows where the alluvium occurs ranges from about 8 to 18 inches per year, and recharge from direct precipitation on the alluvium probably is small.

Two methods have been used in the past by the U. S. Geological Survey for estimating recharge in the Truckee Meadows area. One method is presented in Water-Supply Paper 1779-S published in 1964 and another method is presented in Water Resources-Reconnaissance Series Report 57. The two methods for estimating recharge are discussed in the following paragraphs.

The U. S. Geological Survey estimated in 1964 that recharge from infiltration of streamflow in all of Truckee Meadows, other than from the Truckee River, was less than 1,000 acre-feet per year. The Survey estimated that most of this recharge occurred on the west side of the Meadows. Underflow from Pleasant Valley into the South Truckee Meadows area was estimated by the U. S. Geological Survey to probably be less than 700 acre-feet per year. The U. S. Geological Survey estimated in 1964 that

on the average about 6,000 acre-feet per year of the 25,000 acre-feet of water lost from the irrigation ditches in Truckee Meadows reached the ground-water reservoir and that approximately 1 acre-foot per acre of the water applied for irrigation percolates into the ground-water reservoir. Since 1964 some of the irrigation ditches in Truckee Meadows have been lined with concrete or improved in other ways so they do not leak as much water. Observations made during this study indicate that almost all of the irrigation ditches in the South Truckee Meadows area are still unlined.

A significant amount of recharge to the water-bearing materials in the South Truckee Meadows area is from seepage from irrigation ditches and deep percolation of water applied for irrigation. The amount of irrigated acreage and the amount of water applied per acre per year directly impacts the amount of recharge to the water-bearing materials. A map prepared by Murray, Burns & Kienlen in 1981 shows that there were about 6,000 acres of irrigated land west and south of Huffaker Hills. Based on field work done for this study, it is estimated that irrigated acreage may have been reduced about 5 percent in the study area since 1981 due to changes in land use. There also are about 2,000 acres of land located to the south-southeast of Huffaker Hills along Steamboat Creek that are described by Murray, Burns & Kienlen as being marsh or meadow and irrigated by wild flooding or wastewater.

If it is assumed that about 1,000 to 2,000 acre-feet per year of recharge is attributable to losses from irrigation ditches based on the length of ditches in the study area, 6,000 acre-feet per year is attributable to deep percolation of irrigation water, 500 acre-feet per year comes from losses in streams that cross the South Truckee Meadows area, and 700 acre-feet per year comes from underflow from Pleasant Valley, then recharge in the South Truckee Meadows area would be about 8,200 to 9,200 acre-feet per year. This estimate of recharge could be low as it does not include any recharge to the water-bearing materials from precipitation directly on the alluvium and the consolidated rocks in the Virginia and Carson Ranges.

In Water Resources-Reconnaissance Series Report 57, potential recharge to all of Truckee Meadows was estimated to be about 26,000 acre-feet per year from the west side of Truckee Meadows and about 1,000 acre-feet per year from the east side of Truckee Meadows. Recharge was estimated using the general method described by Eakin and others in Nevada State Engineer Water Resources Bulletin 12. The method assumes that in each altitude zone a certain percentage of the precipitation recharges the ground-water reservoir, with that percentage depending on the average amount of snow and rainfall within the zone.

The aquifers in the South Truckee Meadows area are still essentially full even though pumpage of ground water has increased in the past 30 years. The rejection of recharge continues to occur as indicated by the continuing flow of water

in the drains in the area. As pumping increases in the study area and water levels are lowered in areas where the aquifers are essentially full and rejecting recharge, the recharge from streams, ditches, and irrigated land will increase. Also, as water levels are lowered in areas where natural discharge is occurring, part of the natural discharge will be intercepted.

Ground water moves from areas of recharge to areas/or points of discharge. Water is moving in generally a west-to-east and southwest-to-northeast direction in the South Truckee Meadows area. Discharge from the ground-water reservoir occurs as pumpage or flow from wells, as discharge into streams and drainage ditches where the elevation of the potentiometric head in the reservoir is greater than the elevation of the stream or ditch, and as evapotranspiration by plants where the roots extend to or near the water table, especially in the part of the South Truckee Meadows area east of Highway 395 where water levels are at or near the land surface.

The U. S. Geological Survey estimated that, excluding pumpage, about 10,000 acre-feet per year of ground-water discharge occurred in the area between the south side of Huffaker Hills and north of Steamboat Hills. The estimate of ground-water discharge was based on seepage measurements made along Steamboat Creek in December 1957. The pumpage of ground water in the South Truckee Meadows area in 1957 probably was relatively small and limited to a small number of irrigation wells and domestic and stock wells.

## RESULTS OF PUMPING TESTS

The transmissivity of a water-bearing formation is a measure of its ability to transmit water, and it is determined from analysis of data from pumping tests made of wells screened in the formation. Transmissivity is defined as the number of gallons of water that will move in one day through a vertical strip of the water-bearing formation 1-foot wide extending the full saturated height of the water-bearing formation when the hydraulic gradient is 1 foot per foot. The units for transmissivity given in this report are gallons per day per foot (gpd/ft).

Results of pumping tests performed on wells in the South Truckee Meadows area are given in Table 2. During a few of the tests, the computed transmissivities of the formations changed appreciably, and the different values of transmissivity are shown in the table for the different time periods of the tests. These changes reflect changes in the transmissivity of the formation with distance from the pumped well. Transmissivities computed from the data obtained during the latter part of the tests probably are more representative of the regional transmissivity of the permeable materials screened in the well that was tested.

The computed transmissivities range from 1,400 to 45,000 gpd/ft for the test data analyzed. The transmissivity of 1,400 gpd/ft was computed from a pumping test of Well 18-20-30cb<sub>1</sub> which is reported to screen fractured rock. The transmissivities for the Company's DeLucchi Lane Well, South Virginia

Street Well, and Lakeridge Well, which probably produce at least some water from the younger alluvium, range from 12,500 to 25,700 gpd/ft, and the average for the three wells is about 20,700 gpd/ft. The computed transmissivities for Wells 18-20-8ab and 18-20-8dc in the east-central part of the area are 10,200 and 12,000 gpd/ft, respectively, and those for Wells 18-20-19aa<sub>1</sub> and 18-20-19aa<sub>2</sub> in the south part of the study area are 6,900 and 10,100 gpd/ft, respectively. Wells 18-20-8ab and 18-20-8dc probably produce water from the younger alluvium or a combination of younger and older alluvium, and Wells 18-20-19aa<sub>1</sub> and 18-20-19aa<sub>2</sub> probably produce water from the older alluvium. Thus, based on the available data, the average transmissivity of the younger alluvium appears to be somewhat better than the transmissivity of the older alluvium. The specific capacity of a well varies roughly in direct proportion with the transmissivity of the formations screened by the well. Thus the wells with the best yields normally are those having the best specific capacities and screened in formations with the higher transmissivities. In the South Truckee Meadows area the best wells appear to be screened in the younger alluvium, or in the case of the Lakeridge Well, younger alluvium and reworked andesite and rhyolite.

Available data indicate that the water in the permeable materials screened in the wells occurs generally under artesian to leaky-artesian conditions in the study area. Thus, the

water in the permeable material is not completely confined and leakage from upper sands not screened in the wells occurs.

#### CHEMICAL QUALITY OF WATER

The chemical quality of the ground water in the South Truckee Meadows area ranges from excellent to poor. The poorest quality water appears to occur in the eastern part of the study area near the Virginia Range and in the southern part of the study area in proximity to the northeast part of Steamboat Hills. The good quality water occurs in the north-central and western part of the study area. The good quality water has low dissolved solids and moderate to high total hardness. The depth to the base of the good quality water varies in the study area.

Results of chemical analyses of water samples obtained from wells and test holes in the study area are given in Table 3. Results of analyses for heavy metals in water samples obtained from wells are given in Table 4. The dissolved solids, total hardness, arsenic, and manganese concentrations in water samples from wells and the screened intervals or total depths of the wells are shown on Figure 6.

In the north part of the study area at the locations of the Company's South Virginia Street Well and DeLucchi Lane Well, water sampling in the pilot holes drilled for the wells shows that good quality water extended to a depth of about 270 to 300 feet. Dissolved solids in the water from sands below these depths are relatively low, but the water in some of the deeper

sands contains unacceptable levels of manganese for public supply use. Results of chemical analyses show that, except for Well 18-19-11aa, the dissolved solids in water samples obtained from wells or test holes located in the western part of the study area range from 168 to 262 milligrams per liter (mg/l). The dissolved solids in the water sample obtained from 18-19-11aa was 478 mg/l. Total hardness in water samples obtained in the part of the study area containing good quality water ranges from 83 to 208 mg/l, with the exception of the water sample from Well 18-19-11aa which indicated a total hardness of 326 mg/l. In the eastern part of the area where the water quality is generally poor, the dissolved solids in water samples from the wells range from 669 to 2,674 mg/l.

The Nevada Department of Health's recommended upper limit for the iron content of water to be used for public supply is 0.30 mg/l. This recommended upper limit was exceeded in water samples obtained from Wells 18-19-12bb, 18-20-7db, and 18-20-23bd. The water sample from Well 18-19-12bb was collected after it had been pumping for about 25 minutes. The well had not been pumped for about 2 years prior to pumping for collection of the sample. The water sample had a slight brown color at the time of sampling, and it is probable that the iron in the water was dissolved from the pump, pump column, or casing and that the concentration of iron in the water sample is not truly representative of the water in the materials screened in the well. The analysis of the sample collected from Well

18-20-7db indicates an iron content of 0.31 mg/l. The water from the well is being used for domestic supply and the owner of the well did not report that the water produced from the well contained an unacceptable amount of iron. Chemical analyses of water samples obtained from some of the sands in the pilot holes for Wells 18-20-6ba and 19-20-31ca indicate concentrations of iron in excess of 0.30 mg/l. However, analysis of water samples obtained from these wells after they were completed do not show any concentrations of iron greater than 0.07 mg/l.

The Nevada Department of Health's recommended upper limit for manganese in water for public supply is 0.05 mg/l. The concentrations of manganese in two water samples obtained from the depth intervals of 330 feet to 340 feet and 368 feet to 378 feet in the pilot hole drilled for Well 18-20-6ba (South Virginia Street Well) were 0.16 and 0.19 mg/l, respectively. Sands in the depth interval from 108 feet to 272 feet were screened in constructing a well that would produce water with an acceptable amount of manganese. Water samples subsequently obtained from the completed well have concentrations of manganese of less than 0.05 mg/l. Chemical analysis results for a water sample obtained from Well 18-20-19aa<sub>2</sub> in June 1984 show a manganese content of 0.11 mg/l. This well screens the depth interval from 260 feet to 520 feet. Results of a chemical analysis of another water sample obtained from this well in March 1984 show 0.00 mg/l of manganese.

The maximum upper limit for arsenic in water used for public supply in Nevada is 0.05 mg/l. This maximum upper limit was exceeded in water samples obtained from Wells 18-20-14bc, 18-20-17da, 18-20-20ab, 18-20-20ad, and 18-20-27bc. Wells 18-20-14bc and 18-20-27bc are located in the eastern part of the South Truckee Meadows area. The other three wells are located in the east-central part of the area. The concentrations of arsenic range from 0.057 to 0.3 mg/l. The depths of the wells range from 90 feet to 200 feet. Several small test wells were constructed in Sections 9, 16, and 17 of T18N, R20E, during exploratory work for a project that was called the Double Diamond Development. The depths and exact locations of the wells are not available to us, but results of chemical analyses of water samples show that the concentrations of arsenic in water from them range from 0.08 to 0.48 mg/l. Thus, the concentration of arsenic in the water throughout much of the east and central part of the South Truckee Meadows area probably is above the maximum upper limit for public supply.

The current maximum upper limit for fluoride is 1.8 mg/l for water to be used for public supply in the Reno area. This limit for fluoride was exceeded in water samples from Wells 18-20-28ba and 18-20-28cb. Analysis of water samples from other wells for which fluoride analyses are available did not show concentrations of fluoride greater than 1.8 mg/l.

Results of analyses for heavy metals in water samples from seven wells in the study area are given in Table 4. The

results show that the maximum upper limits for the heavy metals were not exceeded in any of the samples analyzed.

#### TEMPERATURE OF WATER

The temperature of the water increases with depth in all ground-water reservoirs. The temperature of the shallow near-surface water usually is about the same as the mean annual air temperature of the area in which it occurs. Available data for the Reno area indicate that the mean annual air temperature is about 50° Fahrenheit and that the ground-water temperature gradient is about 1 to 1-1/2 degrees per 100 feet of depth down to a depth of about 200 to 250 feet. Below about 250 feet the temperature appears to increase at a rate of about 2 to 4 degrees per 100 feet of depth. In places where hot water is present at shallow depths, the temperature gradient is of course much greater.

Information obtained for this study shows that the temperature of water from Well 18-20-16bd, which screens the interval from 1,700 to 1,740 feet, is 111° Fahrenheit. This temperature is in general conformance with the temperature gradients given above. The owner of Well 18-20-20ba which screens alluvium in the interval from 140 to 300 feet reports that the water produced from the well was 119° Fahrenheit, which would be abnormally high. Elevated water temperatures were not reported for the wells located nearby in Section 19, T18N, R20E or for the other shallow wells located in proximity

to Well 18-20-20ba. The available information indicates that hot water is not produced from any of the wells located in the northern part of the study area.

Temperatures of water produced by Wells 18-20-28ba and 18-20-28cb are reported to be 271° and 293° Fahrenheit, respectively. These wells are located at the north edge of Steamboat Hills which is a geothermal area. It appears that the rocks below the alluvium in the southern part of the study area still contain considerable latent heat, and that ground water which circulates near them and then up through faults in the older alluvium has an abnormally high temperature at shallow depths.

#### FUTURE AVAILABILITY OF GROUND WATER

As discussed previously in this report, the estimated potential recharge in the South Truckee Meadows area probably is at least 8,200 to 9,200 acre-feet per year and could be more. The U. S. Geological Survey estimated that natural discharge south of Huffaker Hills was about 10,000 acre-feet per year in 1957 and conditions probably are not appreciably different now. Thus there is a substantial quantity of water moving through the aquifer in the South Truckee Meadows area. Pumpage of ground water from the Company's South Virginia Street and DeLucchi Lane Wells in the north part of the study area has caused only a few to about 11 feet of static water-level decline.

At least, the amount of the annual recharge should be available to wells on a perennial basis. In order to develop the water without greatly lowering water levels it will be necessary to distribute the wells throughout the South Truckee Meadow area as much as possible. Distributing pumpage throughout the area will minimize the amount of interference drawdown between wells and limit the hydraulic gradient which would cause any poor quality water to move laterally or upward from below and enter the wells. If possible, wells should be located in areas where additional recharge might be induced or near areas of natural discharge. As poor quality water is known to be in the aquifer in the eastern part of the South Truckee Meadows area and much of the natural discharge occurs in this area, locations for wells near the areas of the natural discharge are somewhat limited.

In addition to the ground-water recharge available for interception, water is available from storage in the ground-water reservoir. Based on available data, it is estimated that water of good quality probably occurs to a depth of about 250 feet below the static water level in the western part of the study area. Based on examination of drillers' logs for wells and test holes drilled in the western part of the study area, and assuming that the average porosity of the sands and gravels is 25 percent, it is roughly estimated that there is about 240,000 acre-feet of good quality ground water in storage. It is estimated that one-half to possibly two-thirds of this water

could be removed from the ground-water reservoir before it becomes seriously contaminated with poor quality water moving in laterally and from below. If the average rate of pumping does not exceed the average rate of discharge that can be intercepted plus the additional recharge that can be induced, only the amount of water needed to lower water levels sufficiently to cause water to move to the wells will be withdrawn from storage.

As water is pumped from each well, a cone of depression is created around the well. Cones of depression from individual wells expand and overlap and create a regional cone of depression. When a well is initially pumped, water is withdrawn from storage in the sands and gravels located near the well. As pumping continues and a sufficient head difference is created, water will leak down from shallower sands and gravels and will be replaced by water that is currently flowing to drains or is being transpired by plants or evaporated where it is near or at land surface. Some of the water that will be intercepted is currently being wasted by transpiration by plants and by evaporation in marsh or swamp areas. Some of the ground water that will be intercepted would otherwise flow into the drains and eventually reach the Truckee River.

Pumpage of ground water in the South Truckee Meadows area is still relatively small and probably averages about 3 mgd. Water-level data show that the pumping has at most caused only a small decline in water levels in wells on a regional basis.

The static water level in the Company's South Virginia Street Well has declined only a few feet in the past 17 years, and in the DeLucchi Lane Well it has declined about 11 feet or less in the past 12 years.

Based on the amount of recharge estimated to be available in the South Truckee Meadows area and on information assembled and analyzed as part of this study, it is estimated that from a few to possibly as much as 6 or 7 mgd of additional good quality ground water is available for development in the study area. Available data indicate that conditions for developing the additional water possibly are better in the north part of the study area than in the south part of it, although this is not known with certainty. At present it is estimated that the yield of wells drilled in the area could range from about 400 to 1,000 gpm. It is believed, however, that very favorable conditions would have to exist at a well site to obtain a yield of 1,000 gpm from a well.

As additional ground water is developed in the South Truckee Meadows area, water-level, pumpage, and chemical quality data for the production wells and water-level data from other wells in the area should be collected on a continuous basis to determine how the aquifer is responding to the additional pumpage. Analysis of the water-level data will provide the basis for making a more refined estimate of the amount of ground water available in the South Truckee Meadows area.

## TEST HOLE DRILLING

Test holes should be drilled in the South Truckee Meadows area at potential production well sites to determine if the aquifer conditions are favorable for construction of a large-capacity well at the sites. The purpose of the test hole drilling is to obtain information on the position, thickness, and character of the sands and gravels in the alluvium, the water levels in them, and the quality of the water they contain. Information on the depth to bedrock also may be obtained if it is encountered at shallow depths during test hole drilling.

Tentative locations for test holes are shown on Figure 7. The primary sites are located where it is believed water of acceptable quality occurs to a depth of at least 250 feet and the tentative locations would provide relatively uniform spacing between wells, should conditions at the sites be favorable for construction of large-capacity wells. Three secondary test hole sites are shown in an area that is in the very southwest part of the Company's service area. Only a small amount of ground-water data are available in this part of the study area. Should the Company need to provide water to this part of its service area in the future, it is believed test holes should be drilled in the area to determine if the alluvium is capable of supplying an adequate quantity of acceptable quality water to make wells feasible.

It is understood that the Company plans to build a booster station in the north-central part of Section 7, T18N, R20E, and would like to have a production well at the site. Therefore, the first test hole should be drilled at the site in the north-central part of Section 7 to determine whether conditions are favorable for construction of a well. Subsequent test holes should be drilled to the north and south of the site in Section 7 to help identify other sites where conditions are favorable, in terms of productivity and water quality, for the construction of production wells.

For planning purposes it is estimated that the first test hole in Section 7 should be drilled to a depth of about 500 to 600 feet. Data obtained from the first test hole should be used to help determine the depths to which subsequent test holes should be drilled. Circulated drill cutting samples should be collected at 10-foot intervals from all water-bearing material in each test hole. A Schlumberger-type electric log with multiple resistivity curves should be made in each test hole after the total depth is reached. After the drill cutting samples and electric log from the test hole are examined, intervals for water sampling can be selected.

Based on previous test hole drilling and water sampling for the Company's South Virginia Street and DeLucchi Lane Wells, it is believed that several water samples should be obtained from each test hole. The water samples would help to determine which permeable sands contain water of acceptable quality

for public supply and in particular acceptable levels of iron, manganese, and arsenic.

There are a number of methods for taking water samples. The method that was used successfully during exploratory drilling in alluvial deposits at the Company's North Valmy Generating Station is the gravel-up method. With this method, a temporary small-diameter (4-1/2-inch) gravel-walled well is constructed in the test hole with 4-1/2-inch casing and 4-1/2-inch slotted pipe or screen opposite the permeable interval to be sampled. Gravel is placed below, around, and above the slotted pipe or screen set in the interval to be sampled to provide a means for isolating this section from other permeable strata in the test hole. Water should be pumped by airlift and/or with a submersible pump until the water is clear and acceptable for sampling and chemical analysis. After a water sample is obtained from the deepest interval to be sampled, the temporary casing and screen are removed from the hole and used to construct a temporary well in the next shallowest interval to be sampled. The procedure is repeated until water samples have been obtained from all zones selected for sampling. It may be possible to take water samples from permeable strata above a depth of about 250 feet by constructing wells using 4-inch or 6-inch diameter PVC casing and screen.

Preliminary estimates of the cost of test hole drilling were obtained from two well drilling contractors. One of the contractors, Layne Texas Company, drilled all of the wells

currently in use in the Company's water system except the Lakeridge Well. The other estimate was obtained from Sargent Irrigation Company in Reno. Representatives of both companies stated that the estimates are preliminary and that the estimates are subject to change after specifications are presented for bid. Also Sargent Irrigation Company's estimate is based on the assumption that drilling will progress smoothly and that the owner would pay the contractor for remedying any problems resulting from lost circulation in the hole. Mr. Leland Lawson, Vice President for Drilling Operations with Layne Texas Company, estimated the cost of a 600-foot test hole complete with a Schlumberger-type electric log would be \$33,000.00. In addition, the cost of mobilization and demobilization from Houston, Texas to Reno and back was estimated at \$45,000.00. The cost of taking a water sample in a test hole using the gravel-up method was estimated at \$7,500.00 to \$8,500.00 per sample. Ms. Karen Rosenau of Sargent Irrigation Company estimated the cost to drill a 600-foot test hole complete with a Schlumberger-type electric log would be about \$13,000.00. She did not provide a price for taking water samples by the gravel-up method, but stated it sounded like a good method for water sampling and that Sargent Irrigation Company would be willing to quote a price after reviewing specifications outlining the procedure. Thus, at this time we estimate the cost of a 600-foot deep test hole and four water samples obtained from it could cost about \$45,000.00 to about \$80,000.00. These estimates assume a price

of \$8,000.00 per water sample and that three test holes would be drilled making the price estimate for Layne Texas Company, including mobilization and demobilization, \$48,000.00 per test hole exclusive of water sampling.

We suggest that specifications be prepared for the test hole drilling and that the two contractors who provided cost estimates as well as others the Company wants to consider be invited to submit bids for the work. It is believed that the gravel-up method of water sampling and possibly a few other methods of water sampling including constructing wells using PVC should be given in the specifications.

#### PILOT PRODUCTION WELL

A pilot production well should be drilled and constructed at the site selected for the first production well based on test hole drilling results. The exact depth of the first pilot well will not be known until after drilling at least one test hole. It is estimated the depth of the well could range from about 250 to 500 feet. It also is estimated that at least 100 feet of surface casing will be set in the well and that the screen in the well should be at least 14 inches in diameter.

The underreamed gravel-wall type of well construction was used for construction of the Company's existing wells except for the Lakeridge Well. Those wells have produced good yields and a minimum of sand with the water. The same type of gravel-wall construction should be considered for the pilot production

TABLE 1. RECORDS OF WELLS

Casing and Screen Data																
Well Number	Well Owner	Driller	Year Completed	Altitude of Land Surface (feet)	Screen or Slotted Pipe		Depth in Feet (from)	Depth in Feet (to)	Static Water Level Data		Pumping Rate (gpm)	Well Performance		Use of Water	Temperature (°F)	
					Well Diameter (inches)	Depth (feet)			Level (feet)	Date		Pumping Level (feet)	Specific Capacity (gpm/ft)			Date
18-19-1cc	Luther Mack	McKay Drilling	1984	-	160	8	-	-	-	-	-	-	-	D	-	
18-19-1dc	Vernon Segale	R. G. Ogden	1963	4,542	300	12	236	300	2	6-1-63	-	-	-	Irr	55	
18-19-2aa	Joe Petrucco	John Champion	1955	-	365	8	315	365	44	5-28-55	-	-	-	D	-	
18-19-2ab	Robert Games	E. J. Fischer	1964	-	343	6	288	343	35	5-16-64	50	-	-	D	52	
18-19-11aa	T. G. McLeary	-	1983	-	137	-	-	-	-	-	-	-	-	Irr	-	
18-19-12bb	Paul Elcano	R. W. Gibson Drilling Co.	1966	4,655	168	12	127	167	flowing	12-21-66	-	-	-	Irr	60	
18-19-12c	Paul Brevod	John Champion	1964	-	438	8	-	-	104	5-13-64	-	-	-	D	-	
18-19-12cb	John B. Kaye	-	1982	-	200	6	-	-	-	-	-	-	-	D	-	
18-19-12db	Paul Christman	John Champion	1950	4,590	385	14	181	280	44	3-50	300	-	-	S(U)	-	
18-19-24ab	South Truckee Meadows General Improvement District	Paul Williams & Sons	1982	4,930	636	2	510	615	228	12-82	-	-	-	TW	56	
18-19-24ac	Leonard J. Wykoff Leonard M Otten	Paul Williams & Sons	1978	5,070	690	8	459	591	290	4-78	300	-	-	PS	-	
18-19-26ca	Morris Rush	Enloe Drilling Co.	1967	-	435	8	260	435	236	5-67	20	242	-	D	-	
18-20-3bc	Bella Vista Ranch	-	-	-	107	3	-	-	11.7	5-11-56	-	-	-	D(U)	-	
18-20-5cd	R. C. Flindt	J. N. Pitcher Co.	1960	-	200	12	70	192	38	1-9-60	-	-	-	Irr	62	
18-20-6ba	Sierra Pacific Power Co., South Virginia Well	Layne Texas Co.	1968	4,460 4/	286	16	108	144	6.8	11-16-68	1,000	81.2	-	PS	-	
						16	158	210	6.5	9-78	-	-	-	-	-	
						16	228	272	5.5	2-81	-	-	-	-	-	
									-	-	1,000	-	-	-	-	
									8.0	3-1-85	-	-	-	-	-	
18-20-6dc	T. C. Harper	AcB Contractors	1959	-	180	8	130	180	40	4-59	60	-	-	D	-	
18-20-7ac	Roy Casazza	J. N. Pitcher Co.	1958	4,522	250	6	-	-	17	1985	-	-	-	D	-	
18-20-7da	Gary Hull	Aqua Drilling & Well Services	1981	-	15	8	130	150	5	1-81	40	-	-	D	-	
18-20-7db	Ron Krump	W. L. MacDonald & Co.	1975	4,554	180	6	128	170	25	3-11-75	55	-	-	D	-	
											7	-	-	-	-	
18-20-7dc	Craig Paulsen	John Champion	1947	4,545	203	12	-	96	11	8-47	750	-	-	D	-	
						12	1-4	130	13.7	5-58	-	-	-	-	-	
						12	191	197	7.8	11-58	-	-	-	-	-	

Table 1. Records of Wells (Continued)

Well Number	Well Owner	Driller	Year Completed	Altitude of Land Surface (feet)	Depth of Well (feet)	Screen or Slotted Pipe Diameter (inches)	Casing and Screen Data				Well Performance				Use of Water	Temperature (°F)
							Static Water Level (feet)	Depth in feet (from)	Pumping Rate (gpm)	Pumping Level (feet)	Specific Capacity (gpm/ft)	Date				
18-20-8ab	Washoe County	Sage Brothers Drilling Co.	1980	4,465	185	8	58	184	flowing	1-9-81	100	12.8	7.8	1-2-81	TW	-
											305	38	8.1	1-2-81		-
											650	71	9.2	1-9-81		-
											200	-	10.5	2-84		-
											500	-	8.1	2-84		-
18-20-8dc	Washoe County	Sage Brothers Drilling Co.	1981	4,485	429	8	114	234	flowing	1-9-81	402	-	15.1	1-81	TW	58
							8	252	332		257	17.6	16.9	1-21-81		-
							8	348	429		560	43.3	13.7	1-21-81		-
											845	72.4	12.1	1-21-81		-
											510	-	11.7	2-84		-
18-20-10ad	Gerald Adamson	-	-	-	55	12	-	-	-	-	-	-	-	-	D	-
18-20-14bc	William P. Conley	-	-	-	160	6	-	-	-	-	-	-	-	-	D	-
18-20-16bd	Double Diamond Ranch	Aqua Drilling & Well Services	1981	4,470	1,770	4	1,700	1,740	flowing	1-10-81	600	-	-	1-10-81	TW	111
18-20-17ac	Bob Farah	Mark Bridges	1980	-	141	8	60	141	11	5-10-80	50	-	-	5-80	D	-
18-20-17bd	Burnie Johnston	John Hampton	1970	-	142	12	26	138	7	2-10-50	600	-	-	2-50	Irr (U)	-
18-20-17cd	Bill Embien	W. L. MacLennan & Co.	1975	-	400	6	313	325	30	10-15-75	300	-	-	10-75	TW	70
18-20-17cd	Hellman's Trailer Park	Harold J. Faretto and Son	1964	-	86	6	-	-	40	5-64	15	45	3	5-64	D	56
18-20-17da	Barbara O'Donnell	-	-	-	130	6	-	-	-	-	-	-	-	-	D	-
18-20-18d	Arnold Pitts	Aqua Drilling & Well Services	1978	-	210	6	185	205	135	5-24-78	15	175	0.4	5-24-75	D	-
18-20-19aa <sub>1</sub>	South Truckee Meadows General Improvement District	Paul Williams & Sons	1983	4,690	452	6	252	432	92	2-2-83	340	174	4.2	2-2-83	TW	60
									90.5	4-23-84						-
									88.7	1-16-85						-
18-20-19aa <sub>2</sub>	South Truckee Meadows General Improvement District	Charles Sargent Irrigation Inc.	1984	4,690	530	12	260	520	92.2	3-24-84	600	171.8	7.5	3-24-84	PS	68
18-20-19ad	South Truckee Meadows General Improvement District	Charles Sargent Irrigation Inc.	1984	4,710	515	14	255	505	130.0	6-14-85	230	226.6	2.8	6-17-84	PS	68
18-20-19ba	South Truckee Meadows General Improvement District	Paul Williams & Sons	1983	4,420	513	-	189	273	174.5	4-23-84	-	-	-	-	TW	60
							34	315	175.4	4-3-85						
							10	357								
							4	441								
18-20-19da	South Truckee Meadows General Improvement District	Charles Sargent Irrigation Inc.	1984	4,620	400	3	86	286	190	8-84	-	-	-	-	TW	-

Table 1. Records of Wells (Continued)

Page 3

Well Number	Well Owner	Driller	Year Completed	Altitude of Land Surface (feet)	Depth of Well (feet)	Slotted Pipe Diameter (inches)	Depth in feet from (to)	Static Water Level Data		Well Performance			Use of Water	Temperature (°F)		
								Depth (feet)	Date	Pumping Rate (gpm)	Pumping Water Level (feet)	Specific Capacity (gpm/ft)				
18-20-19db <sub>1</sub>	South Truckee Meadows General Improvement District Production Well 3	Charles Sargent Irrigation Inc.	1984	4,780	590	14	240 580	160	9-6-84	120 305	183 232.8	6.4	9-7-84 9-9-84	PS	67	
18-20-19db <sub>2</sub>	South Truckee Meadows General Improvement District	Charles Sargent Irrigation Inc.	1984	-	680	3	126 186	155	8-85	-	-	-	-	TW	67	
18-20-19dd	South Truckee Meadows General Improvement District	Charles Sargent Irrigation Inc.	1984	4,760	440	3	186 306	180	8-84	-	-	-	-	TW	68	
18-20-20ab	Superior Trailer Park	-	-	-	90	6	-	-	-	-	-	-	-	D	-	
18-20-20ad	Four Seasons Trailer Park	-	-	-	90	6	-	-	-	-	-	-	-	D	-	
18-20-20ba	H. Murphy	American Drilling Co.	1977	-	300	8	140 300	35	12-15-77	-	-	-	-	D	119	
18-20-23bd	C. Harrison	-	-	-	350	6	-	-	-	-	-	-	-	D	-	
18-20-27bc	State Mortgage Co.	Reno Pump and Supply	1959	4,585	112	12	56 108	60	5-27-59	-	-	-	-	PS	65	
18-20-28aa	W. J. Bianco	J. N. Pitcher Co.	1961	-	110	12	50 110	40	6-6-61	-	-	-	-	PS	70	
18-20-28ba	-	-	-	-	151	-	-	-	-	-	-	-	-	D	271	
18-20-28cb	-	-	-	-	200	-	-	-	-	-	-	-	-	D	293	
18-20-30cb <sub>1</sub>	Washoe County	Paul Williams & Sons	1981	5,140	831	8	700 831	492 504.1 492.0	4-81 6-19-82 9-20-84	-	-	608.4	3.4	6-19-82	PS	-
18-20-30cb <sub>2</sub>	Otten-Wykoff	Sierra Pump and Drilling Co.	1981	5,135	325	6	-	194.2 189.3	4-23-84 4-9-85	-	-	-	-	D(U)	-	
18-20-30cd	-	-	-	-	300	-	-	-	-	-	-	-	-	D	67	
18-20-30dc	Mesa Corporation	J. C. Faretto & Son	1958	-	350	6	-	295	6-17-58	-	-	-	-	D	78	
19-19-35aa	White Pine Lumber Co.	Matthews & Son	1974	4,550 4/	308	8	268 308	41.60 42.20	11-30-83 10-1-84	200 150	-	2.3 1.1	1975 11-79	D(U)	-	
19-19-35ad	Sierra Pacific Power Company, Lakeridge Well	Sage Drilling Co.	1981	4,610 4/	400	12	180 400	65.0 74.0 77.0	11-10-83 2-1-85 4-1-85	750 1,000 400	93.5 140.8 99.0	27.2 13	12-1-83 12-1-83 6-11-85	PS	-	
19-19-35cd	Reynolds West Inc., Meadowsridge Well 1A	Aqua-Reliance Well Services	1981	4,550 4/	440	8	-	77.7	5-2-85	100 200	-	5.0 3.5	1981 1981	PS(U)	-	

Table 1. Records of Wells (Continued)

Well Number	Well Owner	Driller	Year Completed	Altitude of Land Surface (feet)1/	Casing and Screen Data				Well Performance					Use of Water	Temperature (°F) 3/
					Depth of Well (feet)	Pipe Diameter (inches)	Depth in feet (from)	Static Water Level Depth (feet)	Pumping Rate (gpm)	Pumping Water Level (feet)	Specific Capacity (gpm/ft)	Date			
19-19-36d	William Harrah	Nevada Pump and Irrigation Co. Inc.	1962	-	245	12	45 125 12 150 230	3	10-15-62	300	-	-	1962	Irr	-
19-19-36dd	Roland J. Giroux	Mel Meyer	1948	-	546	12	124 526	flowing	10- 9-48	60	flowing	-	10- 9-48	Irr	6.2
19-20-3lca	Sierra Pacific Power Company, Delucchi Lane Well	Layne Texas Co.	1971	4,455 4/	323	14	114 126 14 130 148 14 160 208 14 232 308	9.7	1-25-71	548	71.9	7.6	1-30-71	PS	-

FOOTNOTES: 1/ Elevation estimated from U.S. Geological survey topographic maps, except where noted otherwise.

2/ Identifying letters: D - Domestic  
TW - Test Well  
PS - Public Supply D(U), etc - Unused or abandoned well with former use indicated

3/ Temperatures supplied by owner or driller, except for wells at locations 18-20-28ba and 18-20-28cb supplied by U. S. Geological Survey.

4/ Elevations surveyed by Sierra Pacific Power Company.

TABLE 2. RESULTS OF PUMPING TESTS

Well Location	Depth of Screened Interval, feet		Total Length of Screen or Slotted Pipe in Interval, feet	Pumping Rate, gpm	Computed Coefficient of Transmissivity, gpd/ft	Period of Test Analyzed, hours		Alignment of Data	Analysis By
	From	To				From	To		
18-20-6ba	108	272	132	1,000	25,700	0	48	Good	WFGA
18-20-8ab	58	184	126	450	10,200	0	24	Good	CHMH
18-20-8dc	114	429	280	640	12,000	0	25	Good	CHMH
18-20-19aa <sup>1</sup>	252	432	180	340	4,500	0	2/3	Good	CHMH
				340	2,400	2-1/2	2-1/2	Poor	CHMH
				340	6,900	2-1/2	21-1/2	Fair	CHMH
18-20-19aa <sup>2</sup>	260	520	260	600	6,000	0	2	Good	WFGA
				600	10,100	4	26	Fair	WFGA
18-20-30cb <sup>1</sup>	700	831	131	246	1,400	100	242	Good	CHMH
19-19-35ad	180	400	220	900	45,000	0	11	Good	WFGA
					24,000	11	111-3/4	Good	WFGA
19-20-31ca	114	308	154	548	12,500	0	48	Good	WFGA

## FOOTNOTES:

<sup>1/</sup> Test data from water-level drawdown measurements except Well 18-20-19aa<sup>2</sup>, which was for water-level recovery measurements.

<sup>2/</sup> WFGA is for William F. Guyton Associates, Inc.; CHMH is for CH<sub>2</sub>M Hill.

TABLE 3. CHEMICAL ANALYSES OF WATER FROM WELLS  
(Results in milligrams per liter except specific conductance and pH)

Well Number	Depth or Screened Interval (feet)	Temperature (°F)	Lab- oratory	Silica (SiO2)	Iron (Fe)	Manga- nese (Mn)	Cal- cium (Ca)	Magne- sium (Mg)	Sodium (Na)2/ (K) (HCO3)	Po- tas- sium (K)	Bil- carbonate (SO4)	Chlo- ride (Cl)	Fluo- ride (F)	Ni- trate (NO3)	Dissolved Solids	Total Hardness as CaCO3	Specific Conductance (Micromhos/ cm @ 25° C)	pH	Barium (Ba)	Arsenic (As)	Boron (B)	Copper (Cu)	Zinc (Zn)	
18-19-1cc	160	-	6-18-84 NDH	73	0.11	0.01	22	9	20	2	139	14	0	0.24	6.0	212	92	-	6.96	0.03	0.005	0.0	0.00	0.14
18-19-1dc	236-300	-	11-85 SPP	-	0.0	0.00	32	17.6	-	-	182	4.7	1.0	0.16	4.3	194	128	-	7.0	-	0.012	-	0.00	-
18-19-11aa	137	-	3-17-83 NDH	34	0.05	0.00	81	30	21	4	246	121	33	0.05	25.6	478	326	-	7.58	0.07	0.000	0.0	0.00	0.70
18-19-12bb	127-167	-	10-18-85 SPP	-	2.14	0.03	18.1	9.6	-	-	160	6.4	2.1	0.13	4.7	191	86	-	7.7	-	0.007	-	0.02	-
18-19-12cb	200	-	10-14-82 NDH	62	0.01	0.00	35	17	18	4	217	7	5	0.20	4.8	262	157	-	7.65	0.26	0.010	0.1	0.00	0.09
18-19-24ac	459-696	-	9-23-81 NDH	66	0.27	0.00	18	13	12	5	146	3	0	0.15	1.0	168	98	-	7.39	0.05	0.005	0.0	0.03	0.20
18-20-3bc	107	55	5-11-56 BR	48.5	0.05	-	7.06	26.8	163.3	39.1	224.5	65.8	282.2	0.1	0.2	876	287	1,428	8.1	-	-	12.7	-	-
18-20-5cd	70-192	-	1-9-81 SEM	67	-	-	24	17	16	8.2	207.3	<2	4	<0.1	-	246.3	208	340	7.8	<0.5	0.02	<0.1	-	-
18-20-6ba	114-134	60	7-31-68 MSL	63	0.03	<0.02	22	16	16*	-	179	2	2	0.2	4.8	211	121	286	7.5	-	0.001	-	-	-
161-181	62	8-3-68 MSL	60	0.04	<0.02	22	11	16	19*	-	162	3	2	0.3	3.4	188	102	259	7.7	-	0.003	-	-	-
217-237	65	8-12-68 MSL	57	0.08	0.02	20	10	20	26*	-	168	3	1	0.3	3.4	197	90	267	8.3	-	0.007	-	-	-
330-340	69	8-15-68 MSL	61	0.14	0.16	20	8	20	31*	-	157	14	2	0.1	1.2	204	81	281	7.9	-	0.018	-	-	-
368-378	70	8-17-68 MSL	61	0.05	0.19	20	7	20	36*	-	160	20	2	0.3	0.5	217	78	295	8.0	-	0.025	-	-	-
475-485	71	8-20-68 MSL	62	0.48	0.08	14	4	45*	45*	-	154	18	2	0.2	0.8	213	51	277	7.9	-	0.014	-	-	-
108-272	62	11-26-68 MSL	56	<0.05	<0.02	22	13	18*	18*	-	170	4	3	0.2	1.4	205	109	266	7.75	-	-	-	-	-
-	-	6-17-82 SPP	-	0.00	0.01	17.9	12.7	-	-	-	166	4	1.3	0.12	2.88	197	97	7.3	-	0.000	-	0.00	-	-
-	-	12-1-83 SPP	-	0.00	0.008	21.1	14.4	-	-	-	168	4	1.6	0.02	3.5	196	112	-	7.8	0.09	0.006	-	0.0	-
59	4-30-84 SPP	-	0.02	0.014	25.3	22.6	-	-	-	-	226	13.0	1.8	0.00	3.39	250	156	-	7.5	-	-	0.011	-	-
62	11-8-84 SPP	-	0.07	0.00	26	20	-	-	-	-	207	11	2.4	0.11	3.6	243	145	-	7.7	-	-	0.00	-	-
-	-	6-6-85 SPP	-	0.00	0.003	30.0	19.9	-	-	-	215	12.5	3.3	0.00	2.8	242	164	-	7.4	-	-	0.003	-	-
18-20-7ac	250	-	10-18-85 SPP	-	0.06	<0.02	18.9	13.5	-	-	142	3.2	1.7	0.16	6.1	214	103	-	7.4	-	<0.005	-	0.01	-
18-20-7db	128-170	-	10-19-85 SPP	-	0.31	0.02	16.0	11.4	-	-	120	3.6	1.9	0.13	6.7	186	88	-	7.2	-	<0.005	-	0.01	-
18-20-7dc	203	-	10-19-85 SPP	-	0.04	<0.02	19.7	14.5	-	-	154	2.9	1.2	0.14	4.5	194	110	-	7.7	-	<0.005	-	0.02	-
18-20-8ab	58-184	64	1-6-81 SEM	67	-	-	24	17	-	-	8.4	208.5	<2	3	<0.1	5.8	246	-	8.0	<0.5	0.02	<0.1	-	-
64	1-9-81 SEM	67	-	-	-	-	24	17	-	-	8.2	207.3	<2	4	<0.1	5.9	246.3	-	7.8	<0.5	0.02	<0.1	-	-
18-20-8dc	114-429	62	1-24-81 SEM	67	-	-	17	12	-	-	6.7	155	3	4	<0.1	3.8	200.7	-	7.4	<0.5	0.004	0.1	-	-
62	1-27-81 SEM	65	-	-	-	-	17	13	-	-	7.0	148	3	4	<0.1	4.6	197.1	-	7.7	<0.5	0.004	0.1	-	-
18-20-10ad	55	-	12-4-84 NDH	81	0.02	0.00	71	2	321	23	293	174	415	0.35	4.1	1,316	186	-	7.29	0.06	0.011	19.6	0.00	0.07
18-20-14bc	200	-	2-18-83 NDH	103	0.06	0.01	64	4	198	16	242	137	257	0.41	5.6	972	176	-	7.38	0.07	0.085	13.7	0.06	1.41
18-20-17da	130	-	3-17-85 NDH	83	0.01	0.00	2	0	67	5	173	7	3	0.78	8.4	235	5	-	8.0	0.02	0.300	0.4	0.00	0.00
18-20-19aa2	260-520	-	3-26-84 NDH	66	0.06	0.00	15	9	9	5	110	2	1	0.10	1.9	143	75	-	7.8	0.05	0.000	0.0	0.01	0.01
-	-	6-8-84 NDH	58	0.22	0.11	15	9	9	10	5	115	2	1	0.10	2.1	171	75	-	8.05	0.05	0.000	0.0	0.00	0.01
18-20-19ad	255-505	-	4-19-84 NDH	64	0.19	0.01	13	7	14	4	95	4	0	0.13	2.6	149	61	-	8.23	0.05	0.015	0.0	0.00	0.00
18-20-20ab	90	-	1-11-85 NDH	75	0.00	0.00	2	0	45	3	-	-	-	-	-	-	5	-	-	0.02	0.073	0.4	0.00	0.06
18-20-20ad	90	-	1-11-85 NDH	68	0.00	0.00	7	2	42	6	-	-	-	-	-	-	26	-	-	0.02	0.057	0.2	0.01	0.03

Table 3. Chemical Analyses of Water from Wells (Continued)

Well Number	Depth or Screened Interval (feet)	Temperature (°F)	Lab- oratory	Date	Silica (SiO <sub>2</sub> )	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na) 2/ (K)	Potassium (K) (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved Solids as CaCO <sub>3</sub>	Total Hardness as CaCO <sub>3</sub>	Conductance (Micromhos/cm @ 25° C)	pH	Barium (Ba)	Arsenic (As)	Boron (B)	Copper (Cu)	Zinc (Zn)
18-20-23bd	350	-	9-1-82 NDH	73	0.40	0.05	9	1	858	1	56	1,717	11	0.46	0.3	2,674	27	-	7.43	0.00	0.00	0.00	0.01	0.15
18-20-27bc	110	-	12-3-76 NDH	-	0.02	0.00	-	2	197	-	-	32	140	0.26	6.6	669	-	-	-	-	0.085	-	-	-
18-20-28ba	151	271	6-3-58 USGS	121	0.00	0.00	1.4	0.0	660	-	172	130	836	2.5	2.0	1,980	4	3,360	8.7	-	-	-	-	-
18-20-28cb	200	293	1-5-50 USGS	299	-	-	11	1.0	640	64	337	94	836	2.1	-	2,226	-	3,150	7.6	-	-	-	-	-
18-20-30cb1	700-831	-	6-23-82 CH <sub>2</sub> M	-	<0.05	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-19-35ad	180-400	-	12-12-83 SPP	-	0.11	0.01	25.4	14.5	-	153	27.4	27.4	3.1	0.19	3.97	216	123	-	-	<0.1	<0.005	-	<0.02	<0.02
19-19-35cd	280	-	3-1-81 SEM	72	0.11	<0.02	27	9.2	28*	-	128	59	6	<0.1	2.5	260	108	-	7.7	-	0.006	-	0.01	-
19-19-36dd	124-256	-	8-11-69 BC	66	<0.01	<0.01	30	15	19	3	193	10	5	0.2	0.7	236	136	327	7.8	-	0.004	-	<0.02	<0.02
19-20-31ca	115-137	58	10-31-70 EW	54	0.13	0.02	26	17	21*	-	198	10	2	1.4	3.3	238	136	319	7.48	-	-	-	-	-
156-176	60	11-2-70 BC	-	0.06	<0.01	-	-	-	-	-	-	-	-	0.32	-	-	-	-	-	-	-	-	-	-
197-207	61	11-2-70 BC	-	0.74	<0.02	26	16	20*	-	195	6	1	1.7	2.3	-	221	130	302	7.67	-	0.003	-	-	-
235-256	63	11-5-70 FW	54	0.08	<0.01	-	-	-	-	-	-	-	<1	0.48	-	-	124	310	7.55	-	0.006	-	-	-
271-292	64	11-11-70 BC	56	0.69	0.05	25	15	22*	-	192	6	-	2.7	3.4	-	214	129	306	7.72	-	0.004	-	-	-
361-371	67	11-14-70 EW	55	0.17	<0.01	-	-	-	-	198	4	2	1.1	1.9	-	223	125	307	7.71	-	0.005	-	-	-
114-308	68	11-18-70 BC	55	0.11	<0.01	-	-	-	-	198	7	2	1.1	1.2	-	234	121	315	7.78	-	0.006	-	-	-
114-308	69	11-18-70 BC	55	0.32	<0.02	25	15	24*	-	198	7	2	1.4	0.5	-	227	132	325	7.5	-	0.023	-	-	-
114-308	70	11-18-70 BC	55	0.24	<0.01	-	-	-	-	198	7	2	1.4	0.5	-	227	132	325	7.5	-	0.002	-	-	-
114-308	71	11-18-70 BC	55	0.09	0.08	-	-	-	-	198	7	2	1.4	0.5	-	227	132	325	7.5	-	0.002	-	-	-
114-308	72	11-18-70 BC	55	0.05	<0.01	27	16	13	5	190	10	<1	0.18	2.0	-	248	132	325	7.5	-	0.002	-	-	-
114-308	73	11-18-70 BC	55	0.00	0.00	28.9	21.1	-	-	228	13	2	0.12	-	-	246	132	325	7.5	-	0.002	-	-	-
114-308	74	11-18-70 BC	55	0.00	0.014	20.3	20.5	-	-	200	7	2	0.12	-	-	246	132	325	7.5	-	0.002	-	-	-
114-308	75	11-18-70 BC	55	0.019	0.014	25.3	22.6	-	-	226	13	2	0.12	-	-	246	132	325	7.5	-	0.002	-	-	-
114-308	76	11-18-70 BC	55	0.06	0.04	26	20	-	-	207	11	2.4	0.11	3.6	-	243	145	-	7.7	-	0.011	-	-	-
114-308	77	11-18-70 BC	55	0.00	0.003	30	19.9	-	-	215	12.5	3.3	0.00	2.8	-	242	164	-	7.4	-	0.005	-	-	-

## FOOTNOTES:

- 1/ Identifying letters are: NDH - Nevada Department of Health  
 CH<sub>2</sub>M - CH<sub>2</sub>M Hill Environmental Laboratory  
 EW - Edna Wood Laboratories, Inc.  
 SEM - Sierra Environmental Monitoring  
 SPP - Sierra Pacific Power Company  
 USGS - U. S. Geological Survey  
 AM - Amtech American Technical Laboratories Inc.  
 BC - Brown and Caldwell Laboratories  
 BR - U. S. Bureau of Reclamation  
 MSI - Microbiology Service Laboratories

2/ Asterisk (\*) indicates potassium and sodium reported as potassium.

TABLE 4. RESULTS OF ANALYSES FOR HEAVY METALS  
(Analyses in milligrams per liter)

Well Number	Well Name	Date of Collection	Laboratory	Screened Interval (feet)	Barium (Ba)	Cadmium (Cd)	Chromium (Cr)	Lead (Pb)	Mercury (Hg)	Selenium (Se)	Silver (Ag)
18-20-6ba	Sierra Pacific Power Company, South Virginia	2-80 8-16-83	NDH NDH	108-272	<0.25 0.09	<0.001 <0.001	<0.005 <0.005	<0.005 <0.005	<0.0005 <0.0005	<0.0025 <0.0025	<0.005 <0.005
18-20-19aa1	South Truckee Meadows General Improvement District	6- 8-84	NDH	252-432	0.05	<0.001	<0.005	<0.005	<0.0005	<0.0025	<0.005
18-20-19cd	South Truckee Meadows General Improvement District	4-19-84	NDH	255-505	0.05	<0.001	<0.005	<0.005	<0.0005	<0.0025	<0.005
18-20-30cb1	Washoe County	6-23-82	CH <sub>2</sub> M	700-831	<0.1	<0.01	<0.02	<0.05	<0.001	<0.01	<0.02
19-19-35ad	Sierra Pacific Power Company Lakeridge Well	12-12-83	NDH	180-400	0.05	<0.001	<0.005	<0.005	<0.0005	<0.0025	<0.005
19-19-35cd	Reynolds West Inc., Meadowridge Well	3- 1-81	SEM	280-	<0.5	<0.01	<0.02	<0.05	<0.0005	<0.005	<0.01
19-20-31ca	Sierra Pacific Power Company Delucchi Lane Well	2-80	NDH	114-308	<0.25	<0.001	<0.005	<0.005	<0.0005	<0.0025	<0.005
Environmental Protection Agency Standards					1.0	0.01	0.05	0.05	0.002	0.01	0.05

FOOTNOTE:

1/ Identifying letters are:  
 NDH - Nevada Department of Health  
 CH<sub>2</sub>M - CH<sub>2</sub>M Hill Environmental Laboratory  
 SEM - Sierra Environmental Monitoring

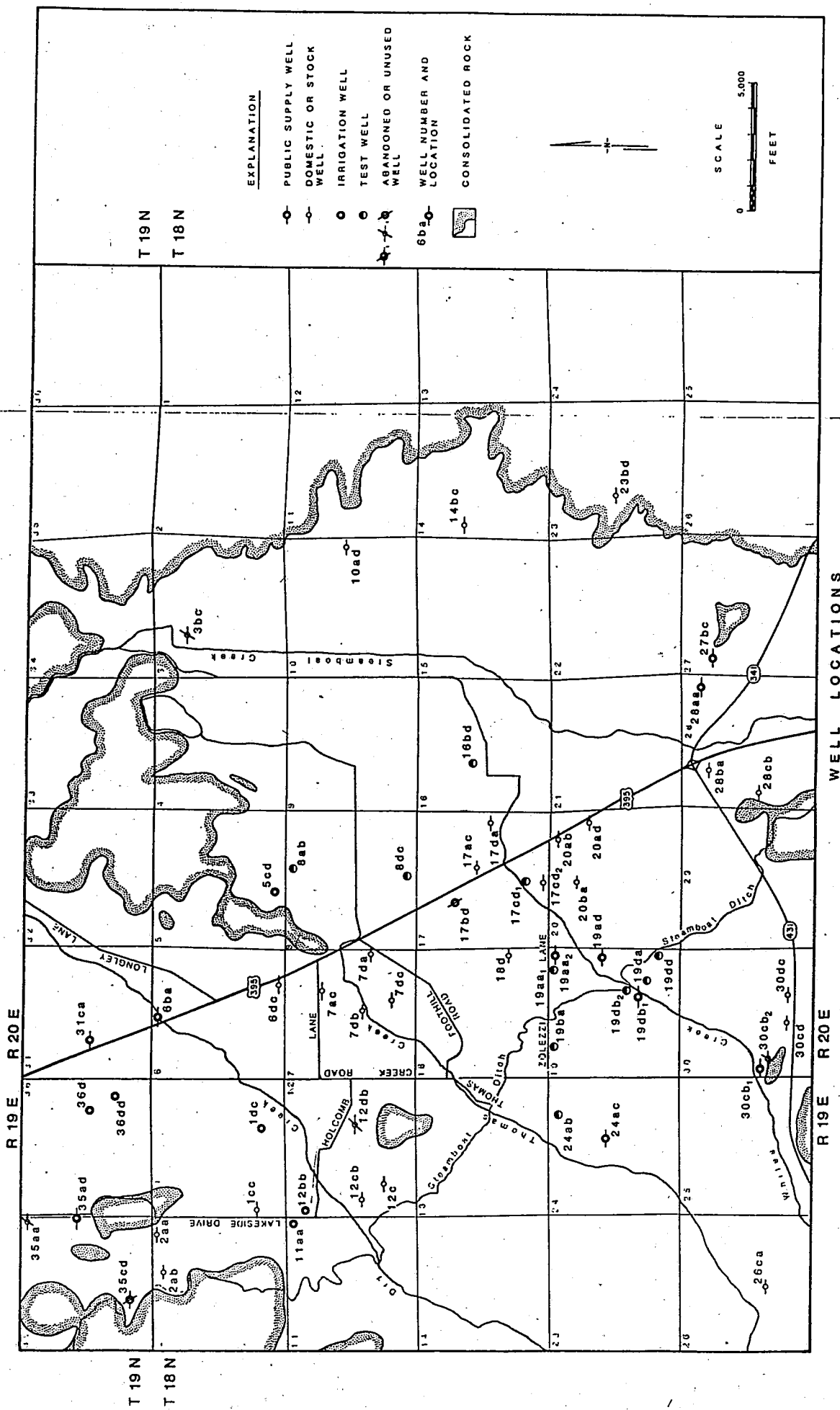
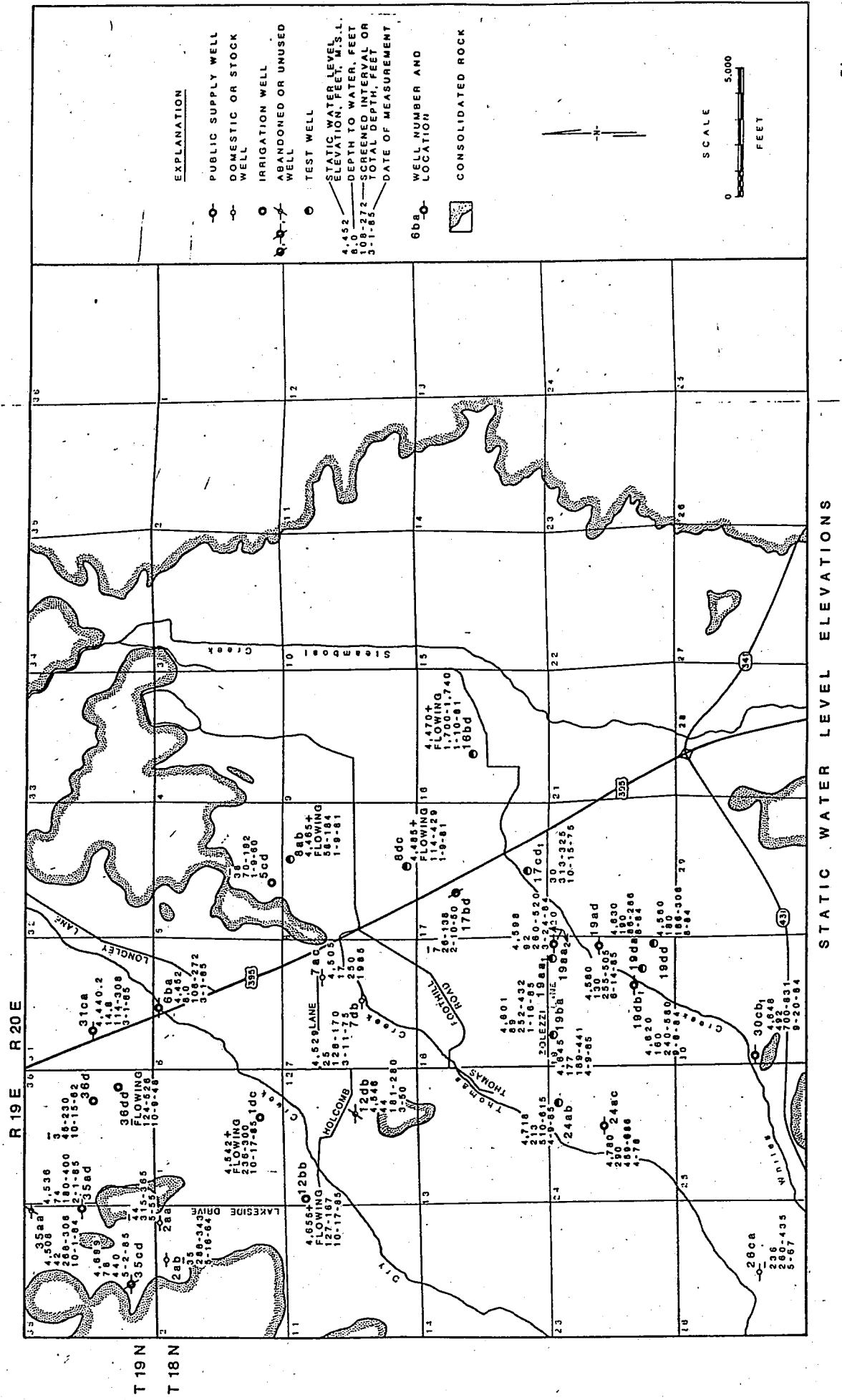


Figure 1





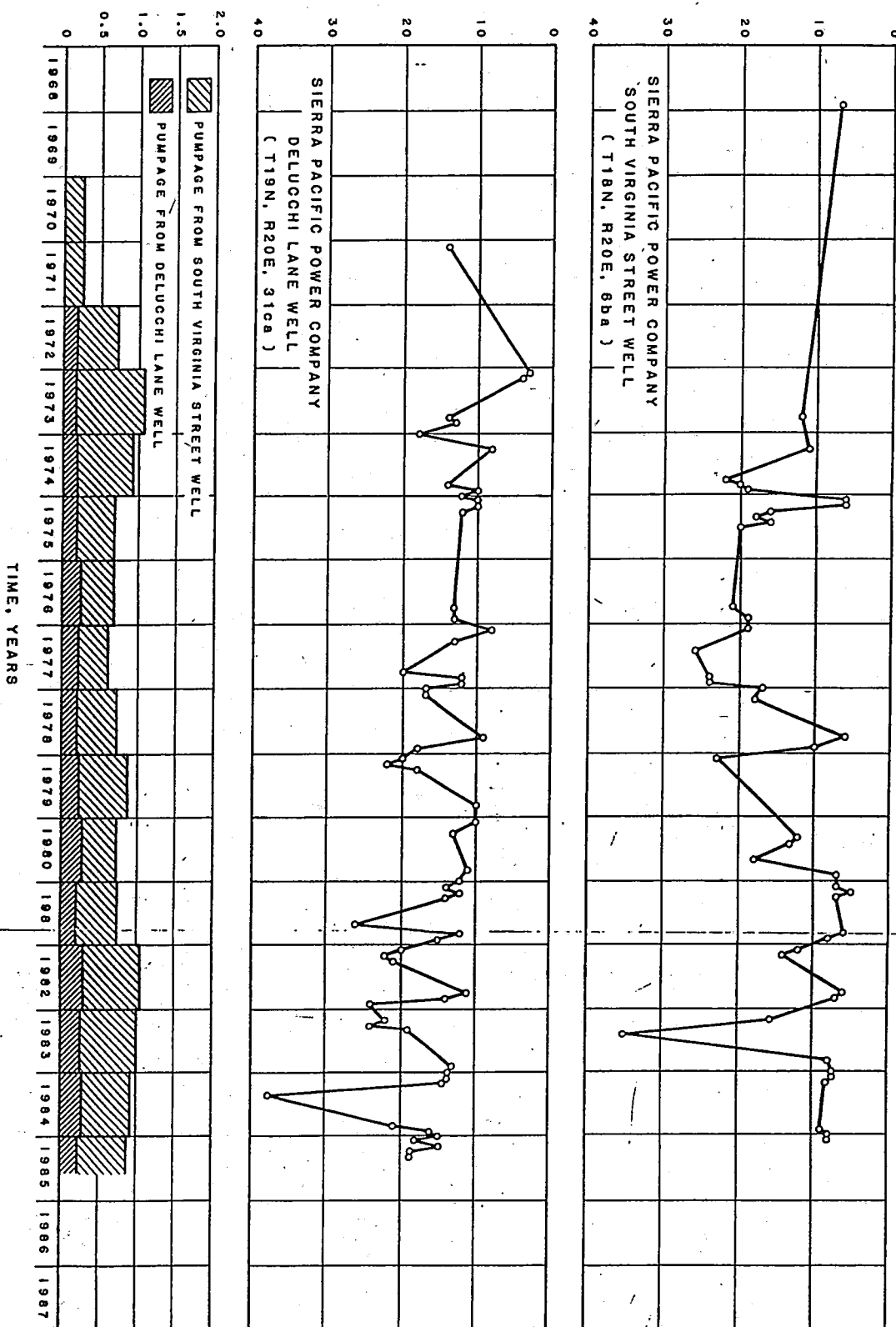


STATIC WATER LEVEL ELEVATIONS

PUMPAGE, MILLIONS  
OF GALLONS  
PER DAY

DEPTH TO WATER, FEET

DEPTH TO WATER, FEET



PUMPAGE AND WATER LEVEL DATA



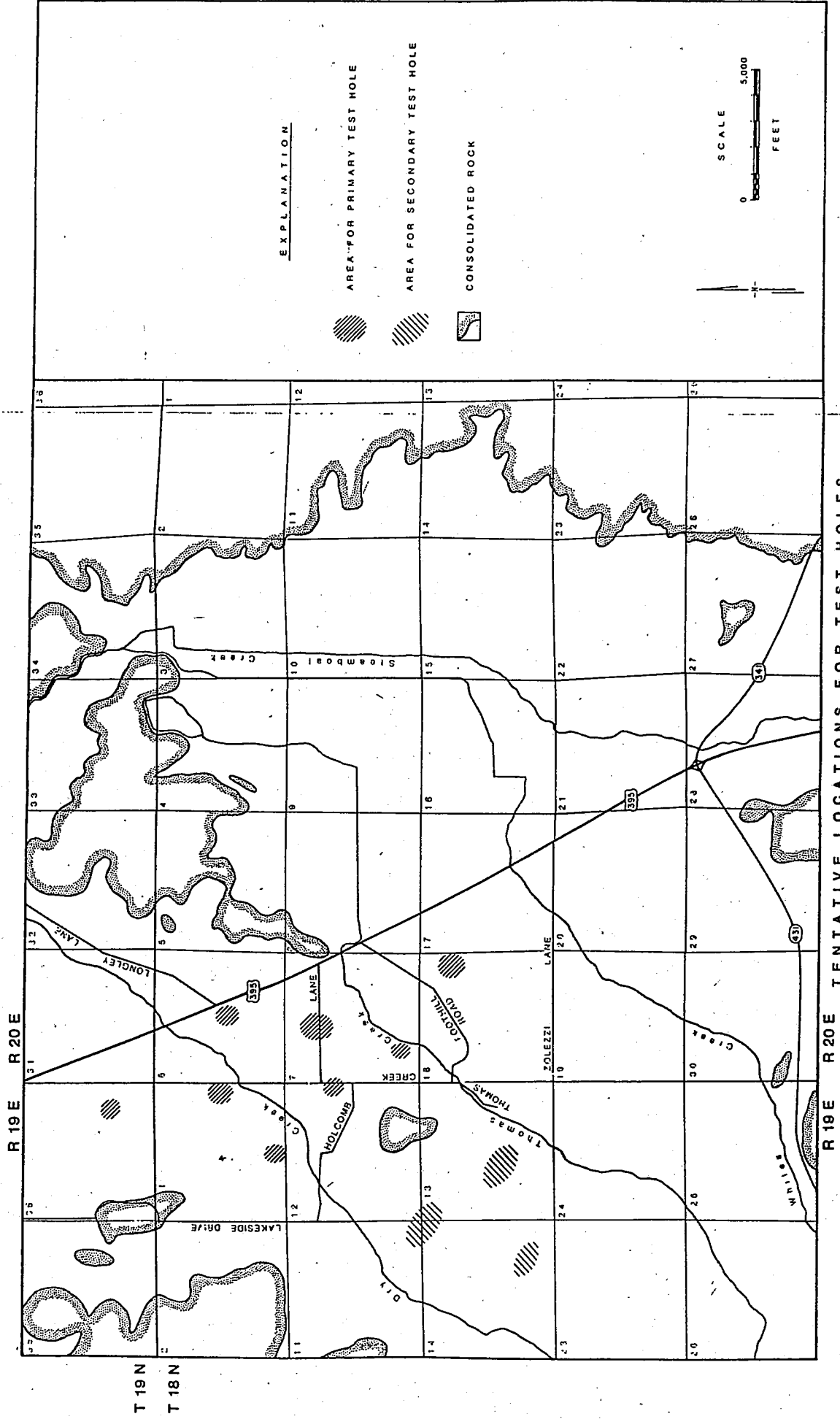


Figure 7