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Chemical and Isotopic Data for Groundwater in Southern Nevada

Timothy P. Rose
Jacqueline M. Kenneally
David K. Smith
M. Lee Davisson
G. Bryant Hudson
Jo Ann H. Rego

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**CHEMICAL AND ISOTOPIC DATA FOR
GROUNDWATER IN SOUTHERN NEVADA**

**Timothy P. Rose
Jacqueline M. Kenneally
David K. Smith
M. Lee Davisson
G. Bryant Hudson
Jo Ann H. Rego**

**Isotope Sciences Division
Lawrence Livermore National Laboratory
Livermore, CA 94550**

July, 1997

EXECUTIVE SUMMARY

This document presents a compilation of chemical and isotopic data for groundwater samples analyzed by Lawrence Livermore National Laboratory (LLNL) in support of the Hydrology and Radionuclide Migration Program (HRMP) and the Underground Test Area Program (UGTA) for the U.S. Department of Energy, Nevada Operations Office. Included are data for 107 samples collected from wells and springs located on and around the Nevada Test Site (NTS), within an area approximately bounded by latitudes 36° to 38°15'N and longitudes 115° to 117°15'W. The samples were collected during the time period 1992 to early 1997. The data represents one of the largest internally consistent geochemical data sets to be gathered for groundwater in southern Nevada. This database is available in electronic or hardcopy formats to interested parties upon request.

In addition to the LLNL data, we have included a table of selected isotopic data summarized from a larger database compiled by GeoTrans, Inc. (1994). This data is included for comparative purposes as a means of placing the LLNL data in the context of other data for the same geographic region.

INTRODUCTION

The Isotope Sciences Division at Lawrence Livermore National Laboratory maintains a comprehensive database for chemical and isotopic analyses of groundwaters collected throughout southern Nevada. Although some of this data was previously reported in Davisson et al. (1994), a number of additional samples have been measured since that time. Details of more recent sampling efforts are given in Smith et al. (1996, 1997). Numerous requests for an updated version of this database have prompted the release of this document. An electronic version of this database (Microsoft Excel v. 5.0) is available upon request. Readers are encouraged to report errors to Tim Rose at the Isotope Sciences Division, L-231, Lawrence Livermore National Laboratory, Livermore, CA 94550; phone: (510) 422-6611; fax: (510) 422-3160; e-mail: rose23@llnl.gov.

Although this document does not include data interpretations, it precedes a manuscript in preparation that provides a detailed discussion of available stable isotope and ^{14}C data from southern Nevada (Davisson et al., 1997). Laboratory analytical procedures are described in the ISD/LLNL Standard Operating Procedures Manual for the UGTA Operable Unit (ISD, 1995), which is also available upon request.

LLNL DATA TABLES

The LLNL data is separated into four tables arranged according to increasing sample latitude. The first two columns of each table are the same, showing sample numbers (between 1 and 107) followed by a "sample identification" that provides the location name and brief descriptive information. Wells from the NTS are identified relative to the NTS Area where each is located. When multiple samples were collected from different depth intervals using a bailer, the sample depth is indicated in meters below surface level (mbsl). When a particular location was sampled on more than one occasion, the sampling date (month/year) is indicated in parentheses along with the sample name.

Table 1 provides geographical sample locations and sample acquisition dates (m/d/y). The geographical data includes both the latitude and longitude, as well as the township, range and section. Figure 1 is a map of southwestern Nevada showing sample locations. Numbered sample sites correspond to individual samples listed in Tables 1 through 4.

Table 2 describes field data and major ion chemistry. Field parameters include water temperature, electrical conductivity, dissolved oxygen (DO), and pH. The total dissolved inorganic carbon (TDIC, reported in mg/L as bicarbonate) was determined in the laboratory by acidifying the water sample under vacuum and cryogenically trapping the evolved CO₂ gas (Davisson and Velsko, 1994). Other anion concentrations (F⁻, Cl⁻ and SO₄²⁻) were determined by ion chromatography. Major cation concentrations (Na⁺, K⁺, Ca²⁺ and Mg²⁺) were measured by inductively-coupled plasma atomic emission spectroscopy.

Table 3 describes the trace element chemistry for 14 different elements, reported in units of mg/L. Li, B, Al, Si, Mn, Fe, Ni, Sr, Mo, and Ba were measured by inductively-coupled plasma atomic emission spectroscopy whereas As, Se, Pb, and U were measured by inductively-coupled plasma mass spectrometry.

Table 4 describes the results of isotopic measurements. Oxygen, hydrogen and carbon stable isotope ratios were measured on an isotope ratio mass spectrometer and are reported in the standard delta (δ) notation as per mil (‰) deviations from SMOW (oxygen and hydrogen) or PDB (carbon) reference standards (cf. Criss, 1994). Carbon-14 and ³⁶Cl were measured on the accelerator mass spectrometer at Lawrence Livermore National Laboratory. The ¹⁴C results are reported as percent modern carbon (pmc) relative to a NBS OX-1 standard that represents pre-nuclear testing atmospheric CO₂ abundances (Stuiver and Polach, 1977). Carbon-14 apparent ages (in years) were calculated using a ¹⁴C half life of 5730 years (Walker et al., 1989). The chlorine-36 results are reported as ³⁶Cl/Cl_{TOTAL} (× 10⁻¹³) ratios measured on AgCl precipitated from water (Elmore et al., 1979). ⁸⁷Sr/⁸⁶Sr and ²³⁴U/²³⁸U isotope ratios were determined on pure elemental separates using thermal ionization mass spectrometry. Dissolved noble gas abundances were

analyzed on a noble gas mass spectrometer. To determine the $^3\text{He}/^4\text{He}$ ratio relative to air, the $^3\text{He}/^4\text{He}$ values reported in Table 4 should be divided by 1.38×10^{-6} .

GEOTRANS DATA COMPILATION

Table 5 is a summary of selected isotopic data obtained from a database compiled by GeoTrans, Inc. (1994) for the U.S. Department of Energy, Nevada Operations Office. Our purpose in including it here is to provide a means of comparing the LLNL data set with other environmental isotope data from the same geographic area. The GeoTrans database was compiled from a variety of sources that include published literature as well as unpublished data from Lawrence Livermore National Laboratory, the U.S. Geological Survey, the Desert Research Institute, the U.S. Environmental Protection Agency, and the Reynolds Electrical Engineering Corporation (GeoTrans, 1994). Readers should refer to the 1994 GeoTrans database for the appropriate references for specific data entries.

The format and contents of Table 5 differs from the GeoTrans compilation in several ways. Table 5 does not include every location listed in the GeoTrans data compilation. Data was included if both a $\delta^{18}\text{O}$ and a δD analysis was available for a particular site. The GeoTrans compilation uses a master ID number as the identifier for a particular location. We have not included this number here, although the data in Table 5 can be easily referenced to the GeoTrans compilation using the latitude and longitude data. The first column in Table 5 gives the sample name, and when possible, a brief geographic description. In a number of cases, the original data compilation did not include a sample name. We verified each location name by plotting the coordinates on a map, and cross referencing the coordinates with original references whenever possible.

The second column in Table 5 gives the township, range, and section coordinates for the sample. These coordinates were not included in the original compilation, but this information was readily determined during the location verification process. Columns 3 and 4 list the sample latitude and longitude. As with Tables 1-4, Table 5 is arranged according to increasing sample latitude. In most cases, the latitude and longitude reported in Table 5 match the coordinates given by GeoTrans, but when errors were found, a new set of coordinates were entered.

It should be noted that the LLNL data that appeared in the original GeoTrans compilation (samples collected before November, 1994) is not duplicated in Table 5. However, when a well was sampled by both LLNL and by another agency, all the data is included in Table 5 as an averaged value. The total number of analyses used to obtain the average is shown in parentheses following the data entry. Significant outliers were not included in this average. For example, in some cases two pairs of $\delta^{18}\text{O}$ and δD values

were reported, but one set of analyses showed a marked isotopic enrichment, presumably due to evaporation. Under these circumstances, only the relatively unevaporated values are reported.

Slight discrepancies may exist between the latitude and longitude of samples that appear in both Table 1 and Table 5. In general, the coordinates given in Table 1 should be used for future reference to LLNL sample sites as these locations were carefully verified. Sampling dates in Table 5 are listed for locations that were sampled only once, but not for locations sampled on multiple occasions. In a few cases, sample dates were unavailable. Oxygen, hydrogen and carbon isotopic values are reported using the same conventions adopted for Table 4.

ACKNOWLEDGMENTS

We acknowledge the assistance of Rick Waddell and Chen Zhu of HSI GeoTrans, Inc. in providing us with a copy of their data compilation. We thank Greg Nimz for his efforts during the early stages of the project, and Jordan Clark for his laboratory assistance in measuring dissolved noble gas abundances. We also wish to acknowledge the Nevada Operations Office of the U.S. Department of Energy for HRMP and UGTA funding from FY91-FY97 to collect this data. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract number W-7405-Eng-48.

REFERENCES

- Criss, R.E. (1994) Stable isotope distribution: Variations from temperature, organic and water-rock interactions. In: Handbook of Physical Constants, Sec. 1-20. Am. Geophys. Union, 14 p.
- Davisson, M.L. and Velsko, C.A. (1994) Rapid extraction of dissolved inorganic carbon from small volumes of natural waters for ^{14}C determination by accelerator mass spectrometry. Lawrence Livermore National Laboratory Report UCRL-JC-119176, 22 p.
- Davisson, M.L., Kenneally, J.M., Smith, D.K., Hudson, G.B., Nimz, G.J. and Rego, J.H. (1994) Preliminary report on the isotope hydrology investigations at the Nevada Test Site: Hydrologic Resources Management Program, FY 1992-1993. Lawrence Livermore National Laboratory Report UCRL-ID-116122, 82 p.
- Davisson, M.L., Smith, D.K., Kenneally, J.M. and Rose, T.P. (1997) Isotope hydrology of southern Nevada groundwater. Manuscript in preparation.
- Elmore, D., Fulton, B.R., Clover, M.R., Marsden, J.R., Gove, H.E., Naylor, H., Purser, K.H., Kilius, L.R., Beukens, R.P. and Litherland, A.E. (1979) Analysis of ^{36}Cl in environmental water samples using an electrostatic accelerator. *Nature*, 277: 22-25.
- GeoTrans, Inc. (1994) A comprehensive chemistry database for groundwater and springs at the Nevada Test Site and vicinity. Unpublished report describing database prepared for the U.S. Department of Energy, November 22, 1994, 32 p.
- Isotope Sciences Division (1995) Underground Test Area Remedial Investigation Feasibility Study, Standard Operating Procedures. Lawrence Livermore National Laboratory, unpublished report.
- Smith, D.K., Esser, B.K., Kenneally, J.M., Nagle, R.J., Rego, J.H. and Royval, J.L. (1996) Hydrologic Resources Management Program, FY 1995 Progress Report. Lawrence Livermore National Laboratory Report UCRL-ID-123486, 36 p.
- Smith, D.K., Kersting, A.B., Kenneally, J.M., Rego, J.H. and Thompson, J.L. (1997) Hydrologic Resources Management Program, FY 1996 Progress Report. Lawrence Livermore National Laboratory Report UCRL-ID-126886, 40 p.
- Stuiver, M. and Polach, H. (1977) Reporting of ^{14}C data. *Radiocarbon*, 19: 355-363.
- Walker, F.W., Parrington, J.R. and Feiner, F. (1989) Nuclides and Isotopes. General Electric Co. Nuclear Energy Operations, San Jose, California, 57 p.

Figure 1. (overleaf) Map of southwestern Nevada showing locations of groundwater samples analyzed by Lawrence Livermore National Laboratory. Numbered sample sites correspond with individual samples listed in Tables 1 through 4. Base map is the U.S. Geological Survey topographic sheet for the state of Nevada.

117°

116°

115°

38°

37°

36°

0 10 20 30

Kilometers

Table 1. Sample Location and Date

	Sample Identification	Location	Latitude	Longitude	Sample Date
1	Shoshone Spring, Shoshone CA	sec.30, T22S, R7E	35°58'48"	116°16'20"	2/6/97
2	Big Spring, Ash Meadows (9/95)	sec.19, T18S, R51E	36°22'30"	116°16'25"	9/6/95
3	Big Spring, Ash Meadows (2/97)	sec.19, T18S, R51E	36°22'30"	116°16'25"	2/5/97
4	Point of Rocks Spring, Ash Meadows	sec.07, T18S, R51E	36°24'05"	116°16'25"	2/5/97
5	Cold Creek Spring, Spring Mountains	sec.01, T18S, R55E	36°24'32"	115°44'36"	2/6/97
6	Crystal Pool Spring, Ash Meadows (9/95)	sec.03, T18S, R50E	36°25'13"	116°19'23"	9/6/95
7	Crystal Pool Spring, Ash Meadows (2/97)	sec.03, T18S, R50E	36°25'13"	116°19'23"	2/5/97
8	Well, Furnace Creek, Death Valley, CA	sec.23, T27N, R1E	36°27'14"	116°50'37"	2/6/97
9	Five Springs Group, Ash Meadows	sec.23, T17S, R50E	36°27'50"	116°19'07"	2/5/97
10	Longstreet Spring, Ash Meadows	sec.22, T17S, R50E	36°28'03"	116°19'32"	2/5/97
11	Fairbanks Spring, Ash Meadows	sec.09, T17S, R50E	36°29'26"	116°20'28"	9/6/95
12	Garey Well, Amargosa Valley	sec.09, T16S, R49E	36°34'19"	116°27'39"	2/5/97
13	Indian Springs Sewer Co. Well #1, Indian Springs	sec.09, T16S, R56E	36°34'23"	115°40'00"	2/6/97
14	USAF Well #2, Indian Springs	sec.05, T16S, R58E	36°34'52"	115°40'30"	2/6/97
15	Army Well #1, NTS, Area 22	sec.05, T16S, R53E	36°35'30"	116°02'14"	5/12/93
16	Well, Jct. Hwy 95 and 373, Amargosa Valley	sec.18, T15S, R50E	36°38'34"	116°23'57"	2/5/97
17	J-12 Well, NTS, Area 25	sec.06, T14S, R50E	36°45'54"	116°23'24"	5/13/93
18	Neco Well, Amargosa Desert (US Ecology Site)	sec.35, T13S, R47E	36°46'04"	116°41'25"	2/5/97
19	Water Well 5c, NTS, Area 5	sec.31, T13S, R54E	36°47'20"	115°57'49"	5/20/93
20	J-13 Well, NTS, Area 25	sec.19, T13S, R50E	36°48'28"	116°23'40"	5/13/93
21	UE-5n Well, NTS, Area 5	sec.18, T13S, R54E	36°49'15"	115°57'41"	5/24/93
22	UE-5c Well, NTS, Area 5	sec.12, T13S, R53E	36°50'11"	115°58'47"	5/13/93
23	PW-1 Well, NTS, Area 5	sec.34, T12S, R54E	36°51'05"	115°56'58"	5/26/93
24	PW-2 Well, NTS, Area 5	sec.27, T12S, R54E	36°51'52"	115°56'57"	5/25/93
25	PW-3 Well, NTS, Area 5	sec.28, T12S, R54E	36°52'01"	115°58'16"	5/26/93
26	Specie Spring, Bare Mountain	sec.30, T12S, R48E	36°52'12"	116°39'33"	2/4/97
27	Well, Beatty 12S/47E-7dbd	sec.07, T12S, R47E	36°54'06"	116°45'24"	2/5/97
28	Water Well 4, NTS, Area 6	sec.12, T12S, R53E	36°54'18"	116°01'26"	5/20/93
29	Revert Spring (Beatty Spring), Oasis Valley	sec.05, T12S, R47E	36°55'04"	116°44'37"	9/7/95
30	Water Well C-1, NTS, Area 6	sec.06, T12S, R54E	36°55'07"	116°00'34"	5/19/93
31	Water Well C, NTS, Area 6	sec.06, T12S, R54E	36°55'08"	116°00'35"	5/19/93
32	Bailey Hot Spring, Oasis Valley	sec.16, T11S, R47E	36°58'27"	116°43'18"	9/7/95
33	Test Well B, NTS, Area 6	sec.13, T11S, R53E	36°58'48"	116°00'51"	6/7/93
34	ER-6-1 Well, NTS, Area 6	sec.18, T11S, R54E	36°59'04"	115°59'34"	11/23/92
35	Goss Spring, Oasis Valley	sec.10, T11S, R47E	36°59'45"	116°42'51"	9/7/95

Table 1. Sample Location and Date

	Sample Identification	Location	Latitude	Longitude	Sample Date
36	UE-1h Well, NTS, Area 1, 603 mbel	sec.09, T11S, R53E	37°00'05"	116°04'03"	5/26/93
37	UE-1h Well, NTS, Area 1, 651 mbel	sec.09, T11S, R53E	37°00'05"	116°04'03"	5/26/93
38	Coffers Ranch, Windmill, Oasis Valley	sec.01, T11S, R48E	37°00'16"	116°33'26"	2/4/97
39	Unnamed Spring, Oasis Valley	sec.32, T10S, R47E	37°01'11"	116°44'00"	2/4/97
40	ER-3-1 Well, NTS, Area 3, (9/95)	sec.35, T10S, R54E	37°01'33"	115°56'13"	9/11/95
41	ER-3-1 Well, NTS, Area 3, (10/96)	sec.35, T10S, R54E	37°01'33"	115°56'13"	10/16/96
42	UE-16f Well, NTS, Area 16	sec.27, T10S, R52E	37°02'09"	116°09'25"	7/12/93
43	UE-1c Well, NTS, Area 1, 411 mbel	sec.20, T10S, R53E	37°02'53"	116°05'52"	9/2/92
44	UE-1c Well, NTS, Area 1, 499 mbel	sec.20, T10S, R53E	37°02'53"	116°05'52"	9/2/92
45	UE-1b Well, NTS, Area 1	sec.19, T10S, R53E	37°02'54"	116°06'42"	8/31/92
46	UE-1a Well, NTS, Area 1	sec.19, T10S, R53E	37°02'54"	116°07'06"	9/1/92
47	ER-30-1 Well, String #1, NTS, Area 30 (1/95)	sec.20, T10S, R51E	37°03'01"	116°18'58"	1/31/95
48	ER-30-1 Well, String #2, NTS, Area 30 (2/95)	sec.20, T10S, R51E	37°03'01"	116°18'58"	2/1/95
49	ER-30-1 Well, String #1, NTS, Area 30 (6/96)	sec.20, T10S, R51E	37°03'01"	116°18'58"	6/10/96
50	ER-30-1 Well, String #2, NTS, Area 30 (6/96)	sec.20, T10S, R51E	37°03'01"	116°18'58"	6/10/96
51	U3-cn #5 Well, NTS, Area 3	sec.24, T10S, R53E	37°03'34"	116°01'20"	1/29/97
52	UE-1q Well, NTS, Area 1	sec.15, T10S, R53E	37°03'37"	116°03'30"	7/10/92
53	U3-cn PS #2 Well, NTS, Area 3	sec.13, T10S, R53E	37°03'36"	116°01'18"	1/22/97
54	UE-16d Well, NTS, Area 16	sec.15, T10S, R52E	37°04'06"	116°09'56"	6/2/93
55	Test Well D, NTS, Area 4	sec.16, T10S, R53E	37°04'18"	116°04'45"	6/8/93
56	UE-17a Well, NTS, Area 17, 253 mbel	sec.15, T10S, R52E	37°04'19"	116°10'17"	6/9/93
57	UE-17a Well, NTS, Area 17, 302 mbel	sec.15, T10S, R52E	37°04'19"	116°10'17"	6/9/93
58	UE-17a Well, NTS, Area 17, 331 mbel	sec.15, T10S, R52E	37°04'19"	116°10'17"	6/9/93
59	UE-18r Well, NTS, Area 18	sec.24, T9S, R49E	37°08'05"	116°26'41"	8/11/92
60	Test Well 1, NTS, Area 17	sec.18, T9S, R52E	37°09'29"	116°13'23"	8/13/92
61	Water Well 8, NTS, Area 18	sec.09, T9S, R51E	37°09'56"	116°17'21"	6/2/93
62	ER-12-1 Well, NTS, Area 12	sec.04, T9S, R52E	37°11'06"	116°11'03"	1/6/93
63	UE-10j Well, Composite, NTS, Area 8 (10/93)	sec.04, T9S, R53E	37°11'08"	116°04'53"	10/3/93
64	UE-10j Well, Zone 1, NTS, Area 8 (3/97)	sec.04, T9S, R53E	37°11'08"	116°04'53"	3/17/97
65	UE-10j Well, Zone 2, NTS, Area 8 (3/97)	sec.04, T9S, R53E	37°11'08"	116°04'53"	3/20/97
66	UE-10j Well, Zone 3, NTS, Area 8 (3/97)	sec.04, T9S, R53E	37°11'08"	116°04'53"	3/24/97
67	ER-20-5 #3 Well, NTS, Area 20 (7/96)	sec.26, T8S, R49E	37°13'13"	116°28'39"	7/31/96
68	ER-20-5 #3 Well, NTS, Area 20 (4/97)	sec.26, T8S, R49E	37°13'13"	116°28'39"	4/22/97
69	ER-20-5 #1 Well, NTS, Area 20 (6/96)	sec.26, T8S, R49E	37°13'14"	116°28'39"	6/3/96
70	ER-20-5 #1 Well, NTS, Area 20 (4/97)	sec.26, T8S, R49E	37°13'14"	116°28'39"	4/22/97

Table 1. Sample Location and Date

	Sample Identification	Location	Latitude	Longitude	Sample Date
71	U-12s Well, NTS, Area 12	sec.19, T8S, R52E	37°13'42"	116°12'51"	7/13/93
72	Watertown #1 Well, Emigrant Valley	sec.14, T8S, R55E	37°14'40"	115°48'33"	8/16/95
73	UE-20bh-1 Well, NTS, Area 20	sec.17, T8S, R50E	37°14'42"	116°24'33"	6/20/93
74	Water Well 20, NTS, Area 20	sec.07, T8S, R50E	37°15'05"	116°25'45"	5/31/95
75	ER-20-6 #3 Well, NTS, Area 20 (12/96)	sec.08, T8S, R50E	37°15'33"	116°25'16"	12/16/96
76	ER-20-6 #2 Well, NTS, Area 20 (11/96)	sec.08, T8S, R50E	37°15'35"	116°25'16"	11/27/96
77	ER-20-6 #1 Well, NTS, Area 20 (12/96)	sec.08, T8S, R50E	37°15'36"	116°25'15"	12/17/96
78	Watertown #3 Well, Emigrant Valley	sec.10, T8S, R55E	37°15'39"	115°50'03"	8/15/95
79	UE-19c Well, NTS, Area 19	sec.06, T8S, R51E	37°16'08"	116°19'10"	8/13/92
80	US Fish and Wildlife Well, Pahranaagat Valley	sec.11, T8S, R61E	37°16'23"	115°07'06"	8/8/95
81	Watertown #4 Well, Emigrant Valley	sec.34, T7S, R54E	37°17'17"	115°56'12"	8/15/95
82	Tolicha Peak Well, US Air Force, Tolicha Peak (9/96)	sec.35, T7S, R46E	37°17'32"	116°47'25"	9/25/96
83	Tolicha Peak Well, US Air Force, Tolicha Peak (11/96)	sec.35, T7S, R46E	37°17'32"	116°47'25"	11/25/96
84	UE-19h Well, NTS, Area 19	sec.10, T7S, R50E	37°20'34"	116°22'25"	8/12/92
85	Alamo City Well #7, Pahranaagat Valley	sec.05, T7S, R61E	37°21'44"	115°10'06"	8/8/95
86	Spencer Well, Pahranaagat Valley	sec.30, T6S, R61E	37°23'42"	115°10'49"	8/6/95
87	Gold Flat 2 Well, US Air Force, Gold Flat	sec.09, T6S, R48E	37°25'43"	116°36'35"	11/25/96
88	Little Ash Spring, Pahranaagat Valley	sec.06, T6S, R61E	37°27'49"	115°11'30"	8/8/95
89	Sixmile Spring, South Pahroc Range	sec.25, T5S, R61E	37°29'32"	115°05'17"	8/8/95
90	Crystal Springs, Pahranaagat Valley	sec.10, T5S, R60E	37°31'55"	115°13'59"	8/7/95
91	Hiko Spring, Pahranaagat Valley	sec.14, T4S, R60E	37°35'54"	115°12'52"	8/7/95
92	Stewart Brothers Well, Pahranaagat Valley	sec.11, T4S, R60E	37°36'53"	115°13'32"	8/9/95
93	Penoyer Well, Sand Spring Valley	sec.28, T3S, R55E	37°39'00"	115°47'48"	2/3/97
94	Roller Coaster Well, Cactus Flat	sec.32, T2S, R47E	37°43'16"	116°44'11"	9/26/96
95	Rose Spring, Kawich Range	sec.24, T2S, R50E	37°44'46"	116°19'56"	5/2/96
96	Cedar Creek Pass Well, Cactus Flat	sec.22, T2S, R49E	37°44'48"	116°28'58"	4/30/96
97	Sumner Spring, Kawich Range (5/96)	sec.16, T2S, R51E	37°46'23"	116°17'25"	5/2/96
98	Sumner Spring, Kawich Range (9/96)	sec.16, T2S, R51E	37°46'23"	116°17'25"	9/24/96
99	Sandia Well #6, Cactus Flat	sec.07, T2S, R47E	37°47'03"	116°44'59"	9/28/96
100	Silverbow Spring, Kawich Range	sec.09, T1S, R49E	37°52'04"	116°30'23"	7/24/96
101	Goldfield City Well (Klondike)	sec.10, T1S, R42E	37°52'24"	117°14'42"	2/4/97
102	Oreana Spring, Seaman Range	sec.29, T1N, R61E	37°55'04"	115°09'04"	8/9/95
103	Adaven Spring, Quinn Canyon Range	sec.08, T3N, R57E	38°08'19"	115°36'05"	2/3/97
104	Warm Springs, Jct. Hwy 6 and 375, Hot Creek Range	sec.20, T4N, R50E	38°11'16"	116°22'21"	5/13/97
105	Tonopah City Well, Ralston Valley	sec.19, T4N, R44E	38°11'28"	117°04'41"	2/4/97

Table 1. Sample Location and Date

	Sample Identification	Location	Latitude	Longitude	Sample Date
106	Twin Springs Ranch Well, Pancake Range	sec.13, T4N, R51E	38°12'13"	116°10'29"	2/3/97
107	Sharp Ranch Well (Nyala), Railroad Valley	sec.31, T5N, R56E	38°14'56"	115°43'40"	2/3/97

Table 2. Field data and major ion chemistry

		Temp.	Cond.	DO	pH	TDIC*	F	Cl ⁻	SO ₄ ²⁻	Na ⁺	K ⁺	Ca ²⁺	Mg ²⁺
	Sample Identification	(°C)	(µS/cm)	(mg/L)		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1	Shoshone Spring, Shoshone CA	33	1360		7.4								
2	Big Spring, Ash Meadows (9/95)	36	794	3	7.8	320	1.3	23.7	106.0	98.0	9.1	42.8	19.2
3	Big Spring, Ash Meadows (2/97)	27	670		7.5								
4	Point of Rocks Spring, Ash Meadows	31	580		7.5								
5	Cold Creek Spring, Spring Mountains	8											
6	Crystal Pool Spring, Ash Meadows (9/95)	32	697	3	7.4	316	1.6	22.3	84.9	75.2	9.3	46.4	21.2
7	Crystal Pool Spring, Ash Meadows (2/97)	29	630		7.3								
8	Well, Furnace Creek, Death Valley, CA	34	850		7.7								
9	Five Springs Group, Ash Meadows	35	600		7.3								
10	Longstreet Spring, Ash Meadows	27	600		7.5								
11	Fairbanks Spring, Ash Meadows	30	706	3	7.6	308	1.6	20.3	78.9	70.4	8.1	46.2	20.9
12	Garey Well, Amargosa Valley	12	620		8.0								
13	Indian Springs Sewer Co. Well #1, Indian Springs	21	470		7.4								
14	USAF Well #2, Indian Springs	22	770		7.8								
15	Army Well #1, NTS, Area 22	29	625	4	7.5	400	1.1	24.0	54.7	40.0	5.0	43.5	20.0
16	Well, Jct. Hwy 95 and 373, Amargosa Valley	16	480		8.4								
17	J-12 Well, NTS, Area 25	27	299	6	7.4	100	1.8	8.3	21.4	40.0	4.0	13.9	3.6
18	Neco Well, Amargosa Desert	24	1060		7.8								
19	Water Well 5c, NTS, Area 5	25	603	3	8.8	268	1.0	12.3	29.6	130.0	6.0	13.5	0.8
20	J-13 Well, NTS, Area 25	29	338	6	7.3	105	2.0	7.9	17.6	41.0	4.0	12.0	1.8
21	UE-5n Well, NTS, Area 5	26	427	2	8.8	160	0.8	14.6	27.2	78.0	8.0	6.5	1.3
22	UE-5c Well, NTS, Area 5	26	452	6	8.0	150	1.8	14.1	45.6	83.0	6.0	8.0	2.2
23	PW-1 Well, NTS, Area 5	23	407	3	8.7	100	1.3	12.0	34.3	57.0	6.0	14.9	4.8
24	PW-2 Well, NTS, Area 5	23	462	3	8.5	100	1.1	15.2	26.6	56.0	6.0	19.2	4.9
25	PW-3 Well, NTS, Area 5	24	295	3	9.3	90	1.2	10.1	28.9	60.0	7.0	14.5	3.8
26	Specie Spring, Bare Mountain				7.5								
27	Well, Beatty 12S/47E-7dbd	9	1300		7.8								
28	Water Well 4, NTS, Area 6	25	415	6	7.4	134	0.9	15.2	41.7	48.0	5.0	23.0	5.9
29	Revert Spring, Oasis Valley	28	544	4	7.9	181	4.0	22.4	61.1	105.2	5.2	10.3	2.7
30	Water Well C-1, NTS, Area 6	33	1131	2	6.5	480	1.1	43.6	67.1	118.0	13.0	71.1	25.7
31	Water Well C, NTS, Area 6	35	1135	3	6.9	485	1.1	43.5	65.1	119.0	13.0	79.0	26.5
32	Bailey Hot Spring, Oasis Valley	43	738	3	7.4	211	5.9	35.4	107	144.3	7.1	13.1	0.4
33	Test Well B, NTS, Area 6	20	381	3	7.5	100	0.9	22.6	21.0	70.0	3.0	5.2	<1
34	ER-6-1 Well, NTS, Area 6	39	514	5	7.1	210		9.9		46.9	7.0	3.2	13.1
35	Goss Spring, Oasis Valley	22	715	4	7.7	181	2.8	45	78.1	116.5	5.1	17.5	1.3

Table 2. Field data and major ion chemistry

		Temp.	Cond.	DO	pH	TDIC*	F	Cl	SO ₄ ²⁻	Na ⁺	K ⁺	Ca ²⁺	Mg ²⁺
	Sample Identification	(°C)	(µS/cm)	(mg/L)		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
36	UE-1h Well, NTS, Area 1, 603 mbel	25	1029		8.2	260	0.7	43.2	n.d.<1	100.0	23.0	10.8	9.7
37	UE-1h Well, NTS, Area 1, 651 mbel	25	1029		8.2	260	0.7	43.6	2.5	102.0	25.0	15.3	7.5
38	Coffers Ranch, Windmill, Oasis Valley	10	350		8.7								
39	Unnamed Spring, Oasis Valley	11	1650		7.6								
40	ER-3-1 Well, NTS, Area 3, (9/95)	45	1246		6.5	815	1.9	42.2	64.8	138.0	18.8	89.3	33.4
41	ER-3-1 Well, NTS, Area 3, (10/96)	38	1208		6.7	1043	1.4	43.4	68.1	143.0	19.0	94.9	35.1
42	UE-16f Well, NTS, Area 16	29	1090	4	8.9	900	5.2	18.8	14.8	219.0	5.0	1.8	1.9
43	UE-1c Well, NTS, Area 1, 411 mbel	26	479	6	7.3	180		5.6		34.5	12.3	36.0	13.4
44	UE-1c Well, NTS, Area 1, 499 mbel	26	462	5	7.5	190		5.5		33.7	12.4	36.7	13.7
45	UE-1b Well, NTS, Area 1	27	448	4	7.4	184		5.9		31.3	10.7	37.4	13.7
46	UE-1a Well, NTS, Area 1	25	692	3	7.4	357		26.3		50.5	8.7	48.5	23.9
47	ER-30-1 Well, String #1, NTS, Area 30 (1/95)	24	271	5	9.2	100		6.2		66.0	1.0	2.2	0.1
48	ER-30-1 Well, String #2, NTS, Area 30 (2/95)	23	282	4	9.6	100		6.1		64.0	1.8	3.5	0.1
49	ER-30-1 Well, String #1, NTS, Area 30 (6/96)	25	295		9.2	113	1.1	6.9	13.0	65.1	0.9	2.0	0.1
50	ER-30-1 Well, String #2, NTS, Area 30 (6/96)	25	287		9.2	85	1.0	6.4	12.0	65.1	1.2	2.3	0.1
51	U3-cn #5 Well, NTS, Area 3	42	512		7.2	294	0.9	29.5	36.2	53.4	7.9	39.6	16.7
52	UE-1q Well, NTS, Area 1	31			7.8	160		5.3		31.2	4.6	29.4	15.3
53	U3-cn PS #2 Well, NTS, Area 3	34	488		7.6	277	0.8	7.2	19.3	87.3	17.7	14.1	3.3
54	UE-16d Well, NTS, Area 16	20	717	<1.0		200	0.6	14.3	59.4	27.0	6.0	70.2	22.7
55	Test Well D, NTS, Area 4	24	445	4	7.9	225	1.4	6.9	27.1	80.0	8.0	11.2	4.7
56	UE-17a Well, NTS, Area 17, 253 mbel	27	789	4	7.6	200	0.9	27.7	95.5	80.0	3.0	41.0	29.9
57	UE-17a Well, NTS, Area 17, 302 mbel	24	803	2	7.6	200	1.0	28.0	96.0	79.0	3.0	39.9	29.3
58	UE-17a Well, NTS, Area 17, 331 mbel	24	1325	2	8.3	540	3.2	43.1	45.0	298.0	<2	6.8	4.1
59	UE-18r Well, NTS, Area 18	32	394	4	8.1	164		6.3		72.5	2.0	15.6	0.3
60	Test Well 1, NTS, Area 17	27	238	2	8.7	104		3.2		51.3	0.5	1.2	0.01
61	Water Well 8, NTS, Area 18	25	194	6		30	0.9	9.2	14.2	29.0	2.0	7.9	1.3
62	ER-12-1 Well, NTS, Area 12	27		2	7.3	292		41.9		72.0	4.0	95.7	49.1
63	UE-10j Well, Composite, NTS, Area 8 (10/93)	34		2	7.0	450				59.0	12.0	107.9	41.1
64	UE-10j Well, Zone 1, NTS, Area 8 (3/97)	33	1087		6.4	891	0.3	24.0	83.0	64.0	12.3	101.0	42.3
65	UE-10j Well, Zone 2, NTS, Area 8 (3/97)	32	725		6.7	559	0.3	16.0	67.0	43.0	8.3	68.0	30.0
66	UE-10j Well, Zone 3, NTS, Area 8 (3/97)	32	589		7.0	429	0.3	12.5	60.8	35.0	6.9	56.0	25.4
67	ER-20-5 #3 Well, NTS, Area 20 (7/96)	29	330		8.8	109	3.2	17.8	35.1	73.0	3.0	3.1	0.1
68	ER-20-5 #3 Well, NTS, Area 20 (4/97)	34	302		8.6	108	3.3	17.0	35.0	70.0	3.1	3.2	0.1
69	ER-20-5 #1 Well, NTS, Area 20 (6/96)	35	540		8.4	187	10.3	26.4	40.6	113.0	4.2	6.1	0.2
70	ER-20-5 #1 Well, NTS, Area 20 (4/97)	34	621		8.2	186	10.1	23.0	39.0	104.0	4.5	6.6	0.3

Table 2. Field data and major ion chemistry

	Sample Identification	Temp. (°C)	Cond. (µS/cm)	DO (mg/L)	pH	TDIC ^a (mg/L)	F ⁻ (mg/L)	Cl ⁻ (mg/L)	SO ₄ ²⁻ (mg/L)	Na ⁺ (mg/L)	K ⁺ (mg/L)	Ca ²⁺ (mg/L)	Mg ²⁺ (mg/L)
71	U-12s Well, NTS, Area 12	26	632	7	10.5	158	n.d. <1	14.0	n.d. <1	24.0	5.0	35.6	0.1
72	Watertown #1 Well, Emigrant Valley	24	330	2	7.7	167	2.3	6.9	19.6	69.3	8.2	3.8	1.1
73	UE-20bh-1 Well, NTS, Area 20	26	186	12	8.3	60	n.d. <1	3.9	n.d. <1	38.0	<2	0.9	n.d. <1
74	Water Well 20, NTS, Area 20	34	308		8.2	92		12.0		59.0	2.1	6.2	0.3
75	ER-20-6 #3 Well, NTS, Area 20 (12/96)	28	310		8.4	109	2.5	13.6	31.8	56.0	3.6	10.1	0.8
76	ER-20-6 #2 Well, NTS, Area 20 (11/96)	26	308		8.2	112	3.8	11.6	31.5	61.1	3.1	8.3	0.7
77	ER-20-6 #1 Well, NTS, Area 20 (12/96)	21	302		8.1	103	2.9	12.3	32.3	60.6	2.2	7.1	0.6
78	Watertown #3 Well, Emigrant Valley	23	425	3	7.9	223	1.0	9.5	33.1	62.0	7.5	24.4	5.7
79	UE-19c Well, NTS, Area 19	37	174	6	7.7	37		3.1		35.8	0.5	1.4	0.01
80	US Fish and Wildlife Well, Pahranaqat Valley	14	1297	2	7.8	628	1.6	83.0	192.0	130.3	19.3	79.5	53.7
81	Watertown #4 Well, Emigrant Valley	25	1100	0.3	6.9	631	1.3	12.6	68.1	83.0	24.8	83.1	24.4
82	Tolicha Peak Well, Tolicha Peak (9/96)	31	407		8.0		0.9	26.0	39.1	57.8	4.2	24.4	1.1
83	Tolicha Peak Well, Tolicha Peak (11/96)	30	383		7.9								
84	UE-19h Well, NTS, Area 19	28	415	2	8.3	147		8.5		63.8	4.0	14.9	1.5
85	Alamo City Well #7, Pahranaqat Valley	19	1032	4	7.6	454	1.3	54.6	188.0	96.3	13.7	61.4	56.0
86	Spencer Well, Pahranaqat Valley	19	1070	1	7.7	466	1.6	45.9	158.0	119.4	14.5	53.8	44.0
87	Gold Flat 2 Well, US Air Force, Gold Flat	18	222		8.0		1.3	6.0	0.4				
88	Little Ash Spring, Pahranaqat Valley	37	468	2	7.4	250	0.8	9.5	35.0	29.8	7.3	45.3	15.4
89	Sixmile Spring, South Pahroc Range	22	779	5	7.9	207	0.1	3.2	11.7	16.9	1.3	45.2	10.6
90	Crystal Springs, Pahranaqat Valley	28	452	2	7.7	255	0.4	9.6	34.7	23.8	4.8	44.2	22.6
91	Hiko Spring, Pahranaqat Valley	27	542	2	7.7	273	0.5	46.3	38.1	25.6	6.6	46.4	23.3
92	Stewart Brothers Well, Pahranaqat Valley		1582	11	7.8	361	nd <0.8	13.9	438.0	181.2	10.8	90.0	57.3
93	Penoyer Well, Sand Spring Valley	13	450		7.3	181							
94	Roller Coaster Well, Cactus Flat	26	513		7.8	120	0.9	38.0	34.0	65.2	8.0	21.3	1.6
95	Rose Spring, Kawich Range	18	668	5	7.4	354	0.3	23.0	49.5	44.0	1.9	82.4	11.2
96	Cedar Creek Pass Well, Cactus Flat	28	288	6	7.7	105	0.5	15.2	25.0	34.7	9.4	20.7	0.5
97	Sumner Spring, Kawich Range (5/96)	15	530	5	7.8	243	0.3	23.6	50.1	41.0	2.7	62.7	8.7
98	Sumner Spring, Kawich Range (9/96)		551		7.7		0.4	22.8	50.5	43.1	2.1	65.8	9.0
99	Sandia Well #6, Cactus Flat	23	624		9.1	173	1.6	26.6	44.3	103.0	5.6	2.1	<0.01
100	Silverbow Spring, Kawich Range	24	577	4	7.1	270	0.4	22.6	43.3	47.0	2.3	49.1	9.1
101	Goldfield City Well (Klondike)	16	470		8.2	173							
102	Oreana Spring, Seaman Range	20	679		7.7	392	0.2	17.5	30.0	25.5	1.4	97.5	12.2
103	Adaven Spring, Quinn Canyon Range	10	500		7.1	358							
104	Warm Springs, Hot Creek Range	59	1322		6.6								
105	Tonopah City Well, Ralston Valley	12	290		7.4	195							

$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}$

Table 3. Trace element chemistry

		Li	B	Al	Si	Mn	Fe	Ni	As	Se	Sr	Mo	Ba	Pb	U
	Sample Identification	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1	Shoshone Spring, Shoshone CA														
2	Big Spring, Ash Meadows (9/95)	0.11	0.56	<0.06	13.5	<0.01	<0.02	<0.03	0.035	<0.01	1.03	<0.01	0.046	<0.001	0.0026
3	Big Spring, Ash Meadows (2/97)														
4	Point of Rocks Spring, Ash Meadows														
5	Cold Creek Spring, Spring Mountains														
6	Crystal Pool Spring, Ash Meadows (9/95)	0.09	0.39	<0.06	13.1	<0.01	<0.02	<0.03	0.023	<0.01	0.94	<0.01	0.069	<0.001	0.0027
7	Crystal Pool Spring, Ash Meadows (2/97)														
8	Well, Furnace Creek, Death Valley, CA														
9	Five Springs Group, Ash Meadows														
10	Longstreet Spring, Ash Meadows														
11	Fairbanks Spring, Ash Meadows	0.08	0.36	<0.06	10.8	<0.01	<0.02	<0.03	0.016	<0.01	0.870	<0.01	0.058	<0.001	0.0024
12	Garey Well, Amargosa Valley														
13	Indian Springs Sewer Co. Well #1														
14	USAF Well #2, Indian Springs														
15	Army Well #1, NTS, Area 22	0.051	0.22	<0.06	9.7	<0.01	0.33	<0.01	0.012	<0.01	0.744	0.005	0.076	0.0040	0.0022
16	Well, Jct. Hwy 95 and 373														
17	J-12 Well, NTS, Area 25	0.046	0.11	<0.06	26.6	<0.01	0.08	0.007	0.010	<0.01	0.042	0.007	0.002	0.0005	0.0006
18	Neco Well, Amargosa Desert														
19	Water Well 5c, NTS, Area 5	0.003	0.46	<0.06	24.0	0.0004	<0.01	<0.01	0.031	0.001	0.019	0.009	0.001	0.0004	0.0065
20	J-13 Well, NTS, Area 25	0.09	0.12	<0.06	27.3	0.001	0.10	0.008	0.010	0.006	0.037	0.007	0.001	0.001	0.0004
21	UE-5n Well, NTS, Area 5	0.021	0.31	<0.06	20.7	0.016	0.17	<0.01	0.008	0.004	0.046	0.005	0.003	0.0032	0.0026
22	UE-5c Well, NTS, Area 5	0.015	0.25	<0.06	30.9	0.001	0.07	<0.01	0.012	0.009	0.051	0.007	0.018	0.0001	0.0046
23	PW-1 Well, NTS, Area 5	0.022	0.21	<0.06	25.1	0.003	0.09	<0.01	0.008	0.002	0.105	0.005	0.013	0.0002	0.0045
24	PW-2 Well, NTS, Area 5	0.023	0.24	<0.06	14.6	0.041	0.10	<0.01	0.006	0.005	0.186	0.011	0.014	0.0005	0.0063
25	PW-3 Well, NTS, Area 5	0.023	0.22	<0.06	20.2	0.004	0.06	<0.01	0.012	0.010	0.107	0.008	0.011	0.0002	0.0035
26	Specie Spring, Bare Mountain														
27	Well, Beatty 12S/47E-7dbd														
28	Water Well 4, NTS, Area 6	0.021	0.20	<0.06	27.4	<0.01	0.10	<0.01	0.010	0.014	0.146	0.003	0.003	0.0002	0.0054
29	Revert Spring, Oasis Valley	0.10	0.24	<0.06	28.2	<0.01	<0.02	<0.03	0.034	<0.01	0.070	<0.01	0.002	<0.001	0.0046
30	Water Well C-1, NTS, Area 6	0.299	0.57	<0.06	13.7	0.001	0.52	0.002	0.008	<0.01	0.811	0.001	0.110	0.0012	0.0064
31	Water Well C, NTS, Area 6	0.302	0.59	<0.06	14.2	<0.01	0.52	<0.01	0.009	0.052	0.793	0.001	0.110	0.0007	0.0064
32	Bailey Hot Spring, Oasis Valley	0.22	0.23	<0.06	28.4	<0.01	<0.02	<0.03	0.026	<0.01	0.090	<0.01	0.017	<0.001	0.0082
33	Test Well B, NTS, Area 6	<0.10	0.27	<0.005	7.4	0.078	0.15	<0.001	0.001	<0.004	0.015	0.010	0.085	0.0007	0.0008
34	ER-6-1 Well, NTS, Area 6	0.03	140	<0.06	15.8	<0.03	<0.02	<0.05	<0.10	<0.10	0.180	<0.02	150	<0.0008	0.0033
35	Goss Spring, Oasis Valley	0.15	0.23	<0.06	23.5	<0.01	<0.02	<0.03	0.012	<0.01	0.090	<0.01	0.005	<0.001	0.0095

Table 3. Trace element chemistry

		Li	B	Al	Si	Mn	Fe	Ni	As	Se	Sr	Mo	Ba	Pb	U
	Sample Identification	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
36	UE-1h Well, NTS, Area 1, 603 mbsl	<0.10	0.26	<0.005	4.5	0.041	<0.02	<0.001	0.003	<0.004	0.169	0.066	0.055	0.0004	<0.0004
37	UE-1h Well, NTS, Area 1, 651 mbsl	0.083	0.17	0.04	5.5	0.024	0.12	0.010	0.006	0.004	0.200	0.061	0.064	0.0004	0.0001
38	Coffers Ranch, Windmill, Oasis Valley														
39	Unnamed Spring, Oasis Valley														
40	ER-3-1 Well, NTS, Area 3, (9/95)	0.51	0.93	<0.06	16.9	0.130	5.59	0.030	0.014	0.021	0.920	<0.005	0.170	0.0020	0.0049
41	ER-3-1 Well, NTS, Area 3, (10/96)	0.52	0.99	<0.06	17.3	0.160	10.80	<0.03	0.043	<0.01	0.970	<0.01	0.180	<0.001	0.0030
42	UE-16f Well, NTS, Area 16	0.045	0.42	<0.06	2.1	<0.01	0.15	<0.01	<0.001	<0.007	0.550	0.108	0.504	nd	nd
43	UE-1c Well, NTS, Area 1, 411 mbsl	0.01	180	<0.06	44.3	<0.03	<0.02	<0.05	<0.10	<0.10	0.410	<0.02	90	0.0009	0.0041
44	UE-1c Well, NTS, Area 1, 499 mbsl	0.01	180	<0.06	44.5	<0.03	<0.02	<0.05	<0.10	<0.10	0.420	<0.02	100	<0.0008	0.0044
45	UE-1b Well, NTS, Area 1	0.01	180	<0.06	37.8	<0.03	<0.02	<0.05	<0.10	<0.10	0.470	<0.02	120	<0.0008	0.0043
46	UE-1a Well, NTS, Area 1	0.02	230	<0.06	9.0	1	1.18	<0.05	<0.10	<0.10	0.630	<0.02	450	<0.0008	<0.0006
47	ER-30-1 Well #1, NTS, Area 30 (1/95)	0.09	0.12	<0.06	11.9	<0.01	0.30	<0.01	0.009	0.001	0.007	0.004	<0.002	<0.0003	0.0016
48	ER-30-1 Well #2, NTS, Area 30 (2/95)	0.083	0.16	0.06	14.1	0.020	0.32	<0.01	0.015	0.001	0.012	0.005	<0.002	0.0003	0.0019
49	ER-30-1 Well #1, NTS, Area 30 (6/96)	0.07	0.11	<0.06	12.5	0.013	0.15	<0.03	0.009	<0.01	0.007	0.018	0.001	<0.001	0.0020
50	ER-30-1 Well #2, NTS, Area 30 (6/96)	0.07	0.15	<0.06	12.7	0.015	0.16	<0.03	0.010	<0.01	0.009	0.028	0.001	<0.001	0.0020
51	U3-cn #5 Well, NTS, Area 3	0.06	0.17	0.04	16.7	0.040	1.64	<0.03	0.043	<0.01	0.230	<0.01	0.160	<0.001	<0.001
52	UE-1q Well, NTS, Area 1	0.01	140	120	23.8	<0.03	<0.02	<0.05	<0.10	<0.10	0.140	<0.02	40	0.0089	0.0023
53	U3-cn PS #2 Well, NTS, Area 3	0.04	0.24	0.28	27.1	0.040	0.04	<0.03	0.018	<0.01	0.020	<0.01	<0.01	0.0020	0.0110
54	UE-16d Well, NTS, Area 16	<0.10	0.22	<0.005	13.0	0.003	<0.02	0.004	0.002	<0.004	0.434	0.002	0.135	0.0004	0.0016
55	Test Well D, NTS, Area 4	<0.10	0.28	<0.005	21.8	0.023	1.00	<0.001	0.014	<0.004	0.125	0.006	0.019	0.0025	0.0007
56	UE-17a Well, NTS, Area 17, 253 mbsl	<0.10	0.43	<0.005	5.5	0.063	0.18	0.002	0.0004	<0.004	0.829	0.003	0.039	<0.0004	0.0004
57	UE-17a Well, NTS, Area 17, 302 mbsl	<0.10	0.47	<0.005	5.4	0.045	0.18	0.001	0.001	<0.004	0.855	0.003	0.035	<0.0004	0.0008
58	UE-17a Well, NTS, Area 17, 331 mbsl	<0.10	0.61	<0.005	6.6	0.011	<0.02	<0.001	0.001	<0.004	0.314	0.002	0.047	0.0004	<0.0004
59	UE-18r Well, NTS, Area 18	0.08	100	<0.06	21.6	<0.03	<0.02	<0.05	<0.10	<0.10	0.080	<0.01	20	<0.010	0.0035
60	Test Well 1, NTS, Area 17	0.02	<0.06	<0.06	9.1	<0.03	0.02	<0.05	<0.10	<0.10	0.010	<0.02	<0.01	<0.0008	<0.0006
61	Water Well 8, NTS, Area 18	<0.10	0.07	<0.005	20.8	0.002	<0.02	<0.001	0.003	<0.004	0.01	0.001	0.001	<0.0004	0.0006
62	ER-12-1 Well, NTS, Area 12	2.56	0.10	<0.06	11.8	0.049	1.03	0.005	0.448	0.002	0.199	0.022	0.011	0.0002	0.0048
63	UE-10j Composite, NTS, Area 8 (10/93)	0.238	0.36	<0.06	18.8	0.118	0.87	0.043	0.005	<0.01	0.432	0.002	0.135	0.0022	0.0059
64	UE-10j Zone 1, NTS, Area 8 (3/97)	0.33	0.55	<0.06	20.0	0.080	0.88	<0.03	0.030	<0.01	0.470	<0.01	0.100	<0.001	0.0050
65	UE-10j Zone 2, NTS, Area 8 (3/97)	0.15	0.33	<0.06	17.0	0.100	0.09	<0.03	0.018	<0.01	0.320	<0.01	0.070	<0.001	0.0030
66	UE-10j Zone 3, NTS, Area 8 (3/97)	0.09	0.25	<0.06	16.0	0.070	0.09	<0.03	0.016	<0.01	0.270	<0.01	0.050	<0.001	0.0030
67	ER-20-5 #3, NTS, Area 20 (7/96)	0.07	0.12	2.09	27.6	0.040	0.57	<0.03	0.006	<0.01	0.030	<0.01	<0.01	0.0030	0.0032
68	ER-20-5 #3, NTS, Area 20 (4/97)	0.07	0.11	3.64	29.0	0.080	1.24	<0.03	0.028	<0.01	0.020	<0.01	0.010	0.0070	0.0040
69	ER-20-5 #1, NTS, Area 20 (6/96)	0.092	0.28	0.20	28.7	0.004	0.04	<0.03	0.007	<0.01	0.012	0.020	0.001	<0.001	0.0150
70	ER-20-5 #1, NTS, Area 20 (4/97)	0.09	0.27	3.10	20.0	0.020	0.39	<0.03	0.042	<0.01	0.020	<0.01	<0.01	0.0010	0.0140

Table 3. Trace element chemistry

	Sample Identification	Li (mg/L)	B (mg/L)	Al (mg/L)	Si (mg/L)	Mn (mg/L)	Fe (mg/L)	Ni (mg/L)	As (mg/L)	Se (mg/L)	Sr (mg/L)	Mo (mg/L)	Ba (mg/L)	Pb (mg/L)	U (mg/L)
71	U-12s Well, NTS, Area 12	0.13	0.06	<0.06	10.3	<0.01	0.20	<0.03	<0.001	<0.007	2.06	0.006	0.166	nd	nd
72	Watertown #1 Well, Emigrant Valley	<0.01	<0.06	<0.06	34.4	<0.01	<0.02	<0.08	0.029	<0.01	0.030	<0.005	0.010	<0.001	<0.001
73	UE-20bh-1 Well, NTS, Area 20	<0.10	0.12	0.01	21.8	0.004	0.06	<0.001	0.006	<0.004	0.001	0.003	0.001	0.0006	0.0010
74	Water Well 20, NTS, Area 20	0.07	0.08	0.08	23.0	0.020	0.34	<0.08	0.005	<0.003	0.018	0.003	<0.001	0.0010	0.0020
75	ER-20-6 #3, NTS, Area 20 (12/96)	0.05	0.10	<0.06	23.3	0.040	0.17	<0.03	0.016	<0.01	0.030	<0.01	<0.01	<0.001	<0.001
76	ER-20-6 #2, NTS, Area 20 (11/96)	0.06	0.11	1.13	27.2	0.030	0.48	<0.03	0.051	<0.01	0.020	0.030	<0.01	0.0010	0.0030
77	ER-20-6 #1, NTS, Area 20 (12/96)	0.06	0.11	0.31	26.1	0.010	0.12	<0.03	0.039	<0.01	0.020	<0.01	<0.01	<0.001	0.0010
78	Watertown #3 Well, Emigrant Valley	<0.01	<0.06	<0.06	38.5	<0.03	<0.02	<0.08	0.011	<0.01	0.210	<0.02	0.010	0.0010	0.0070
79	UE-19c Well, NTS, Area 19	0.02	7.0	<0.06	19.7	<0.01	<0.02	<0.05	<0.10	<0.10	<0.01	<0.01	<0.01	<0.0008	<0.0006
80	US Fish and Wildlife, Pahranaqat Valley	<0.01	<0.06	<0.06	22.5	2.190	<0.02	<0.08	0.040	<0.01	0.900	<0.005	0.300	<0.001	0.0190
81	Watertown #4 Well, Emigrant Valley	<0.01	<0.06	<0.06	10.6	<0.01	<0.02	<0.08	0.009	<0.01	1.04	<0.005	0.040	0.0010	0.0040
82	Tolicha Peak Well, Tolicha Peak (8/96)	0.05	0.32	<0.06	26.0	<0.002	0.05	<0.03	0.049	<0.01	0.120	<0.01	<0.01	<0.001	<0.001
83	Tolicha Peak Well, Tolicha Peak (11/96)														
84	UE-19h Well, NTS, Area 19	0.09	160	<0.06	25.5	0.060	0.02	<0.05	<0.10	<0.10	0.270	<0.02	20	0.0050	0.0077
85	Alamo City Well #7, Pahranaqat Valley	<0.01	<0.06	<0.06	27.6	<0.01	<0.02	<0.08	0.037	<0.01	0.870	<0.005	0.070	0.0020	0.0110
86	Spencer Well, Pahranaqat Valley	<0.01	<0.06	<0.06	28.0	0.190	0.10	<0.08	0.058	<0.01	0.610	<0.005	0.070	0.0040	0.0090
87	Gold Flat 2 Well, US Air Force, Gold Flat														
88	Little Ash Spring, Pahranaqat Valley	<0.01	<0.06	<0.06	14.7	<0.01	<0.02	<0.08	0.035	<0.01	0.490	<0.005	0.160	0.0050	0.0070
89	Sixmile Spring, South Pahroc Range	<0.01	<0.06	<0.06	23.2	<0.01	<0.02	<0.08	0.002	<0.01	0.240	<0.005	0.020	<0.001	0.0050
90	Crystal Springs, Pahranaqat Valley	<0.01	<0.06	<0.06	11.6	<0.01	<0.02	<0.08	0.013	<0.01	0.250	<0.005	0.080	0.0010	0.0080
91	Hiko Spring, Pahranaqat Valley	<0.01	<0.06	<0.06	15.5	<0.01	<0.02	<0.08	0.017	<0.01	0.350	<0.005	0.110	0.0050	0.0120
92	Stewart Bros. Well, Pahranaqat Valley	<0.01	<0.06	<0.06	20.5	<0.01	<0.02	<0.08	0.038	0.012	0.770	<0.005	0.040	0.0020	0.0230
93	Penoyer Well, Sand Spring Valley														
94	Roller Coaster Well, Cactus Flat	0.04	0.46	<0.06	46.1	0.011	0.23	<0.03	0.052	<0.01	0.320	<0.01	0.067	<0.001	<0.001
95	Rose Spring, Kawich Range	0.07	0.27	<0.06	17.3	<0.01	<0.02	<0.03	0.001	<0.01	1.430	<0.01	0.005	<0.001	0.0120
96	Cedar Creek Pass Well, Cactus Flat	0.03	0.23	<0.06	44.1	<0.01	<0.02	<0.03	0.033	<0.01	0.177	<0.01	0.013	0.0010	0.0030
97	Sumner Spring, Kawich Range (5/96)	0.03	0.21	<0.06	18.0	<0.01	<0.02	<0.03	0.007	<0.01	0.873	<0.01	0.003	<0.001	0.0120
98	Sumner Spring, Kawich Range (9/96)	0.03	0.22	<0.06	19.2	<0.002	0.03	<0.03	0.039	<0.01	0.880	<0.01	0.010	<0.001	<0.001
99	Sandia Well #6, Cactus Flat	0.33	0.51	<0.06	37.0	0.003	0.34	<0.03	0.044	<0.01	0.030	<0.01	<0.01	<0.001	0.0060
100	Silverbow Spring, Kawich Range	0.02	0.35	<0.06	30.4	0.010	<0.02	<0.03	0.011	<0.01	0.430	<0.01	0.060	0.0020	0.0030
101	Goldfield City Well (Klondike)														
102	Oreana Spring, Seaman Range	<0.01	<0.06	<0.06	27.6	<0.01	<0.02	<0.08	0.002	0.020	0.460	<0.005	0.020	0.0020	0.0110
103	Adaven Spring, Quinn Canyon Range														
104	Warm Springs, Hot Creek Range														
105	Tonopah City Well, Ralston Valley														

Table 3. Trace element chemistry

[illegible]

Table 4. Isotopic Data

	Sample Identification	$\delta^{18}\text{O}$	δD	$\delta^{13}\text{C}$	^{14}C	^{14}C apparent age	$^{36}\text{Cl}/\text{Cl}_{\text{total}}$	$^{87}\text{Sr}/^{86}\text{Sr}$	$^{234}\text{U}/^{238}\text{U}$
		(‰)	(‰)	(‰)	(pmc)	(yr)	($\times 10^{-13}$)		
1	Shoshone Spring, Shoshone CA	-12.6	-96						
2	Big Spring, Ash Meadows (9/95)	-13.6	-98	-2.6	3.0	28987	3.868	0.71709	
3	Big Spring, Ash Meadows (2/97)	-13.2	-103						
4	Point of Rocks Spring, Ash Meadows	-13.7							
5	Cold Creek Spring, Spring Mountains	-13.9							
6	Crystal Pool Spring, Ash Meadows (9/95)	-13.6	-101	-3.1			4.372		
7	Crystal Pool Spring, Ash Meadows (2/97)	-13.7							
8	Well, Furnace Creek, Death Valley, CA	-13.6	-103						
9	Five Springs Group, Ash Meadows	-13.6	-102						
10	Longstreet Spring, Ash Meadows	-13.7							
11	Fairbanks Spring, Ash Meadows	-13.7	-104	-2.4	2.5	30528	4.215	0.71272	
12	Garey Well, Amargosa Valley	-13.2	-100						
13	Indian Springs Sewer Co. Well #1, Indian Springs	-13.4							
14	USAF Well #2, Indian Springs	-13.5							
15	Army Well #1, NTS, Area 22	-13.5	-100	-7.1	5.4	24128	4.227	0.71196	
16	Well, Jct. Hwy 95 and 373, Amargosa Valley	-13.1							
17	J-12 Well, NTS, Area 25	-13.1	-96		29.4	10128	5.030	0.71162	
18	Neco Well, Amargosa Desert	-14.1							
19	Water Well 5c, NTS, Area 5	-14.1	-105	-6.0	3.1	28637	6.961	0.71074	
20	J-13 Well, NTS, Area 25	-13.6	-95		29.3	10151	5.023	0.71155	
21	UE-5n Well, NTS, Area 5	-13.5	-110				422.5	0.70931	
22	UE-5c Well, NTS, Area 5	-13.8	-105	-7.5	6.7	22345	6.127	0.70975	
23	PW-1 Well, NTS, Area 5	-13.8	-107	-7.9	16.7	14790	8.415	0.71017	
24	PW-2 Well, NTS, Area 5	-13.8	-106	-8.1	33.8	8979	5.274	0.71116	
25	PW-3 Well, NTS, Area 5	-13.5	-102	-8.5	21.0	12897	6.779	0.71082	
26	Specie Spring, Bare Mountain	-12.8	-96						
27	Well, Beatty 12S/47E-7dbd	-14.2							
28	Water Well 4, NTS, Area 6	-12.5			18.2	14066	6.161	0.71024	
29	Revert Spring, Oasis Valley	-14.2	-106	-4.3	24.7	11573	4.939		
30	Water Well C-1, NTS, Area 6	-14.0	-110	-3.1	1.0	37825	1.663	0.71506	
31	Water Well C, NTS, Area 6	-13.9	-106	-4.2	0.6	42155	1.756	0.71503	
32	Bailey Hot Spring, Oasis Valley	-14.6	-107		18.4	14012	4.845		
33	Test Well B, NTS, Area 6	-13.3	-106	-10.2	20.3	13169	7.998	0.70968	
34	ER-6-1 Well, NTS, Area 6	-14.0	-110	-0.7	2.1	32015	3.923	0.71283	0.000229
35	Goss Spring, Oasis Valley	-14.7	-112		20.8	13000	4.880	0.71050	

Table 4. Isotopic Data

	Sample Identification	$\delta^{18}\text{O}$	δD	$\delta^{13}\text{C}$	^{14}C	^{14}C apparent age	$^{36}\text{Cl}/\text{Cl}_{\text{total}}$	$^{87}\text{Sr}/^{86}\text{Sr}$	$^{234}\text{U}/^{238}\text{U}$
		(‰)	(‰)	(‰)	(pmc)	(yr)	($\times 10^{-13}$)		
36	UE-1h Well, NTS, Area 1, 603 mbsl	-13.7	-105	-12.1	12.2	17384	1.516	0.70924	
37	UE-1h Well, NTS, Area 1, 651 mbsl	-13.8	-104	-10.3	23.9	11842	1.713	0.70955	
38	Coffers Ranch, Windmill, Oasis Valley	-12.8							
39	Unnamed Spring, Oasis Valley	-13.4	-104						
40	ER-3-1 Well, NTS, Area 3, (9/95)				0.6	42155	1.295	0.71823	0.000208
41	ER-3-1 Well, NTS, Area 3, (10/96)	-14.2	-112	-3.2	0.8	39811	1.319	0.71825	0.000209
42	UE-16f Well, NTS, Area 16	-13.5	-104	-11.7	3.4	27928	3.115	0.71136	
43	UE-1c Well, NTS, Area 1, 411 mbsl	-13.8	-104	-4.6	2.6	30331	7.137	0.70988	
44	UE-1c Well, NTS, Area 1, 499 mbsl	-13.8	-104	-5.3	2.6	30331	7.220	0.70988	
45	UE-1b Well, NTS, Area 1		-105	-4.5	16.0	15144	6.257	0.70953	
46	UE-1a Well, NTS, Area 1	-13.5	-103	-8.6	60.5	4153	8.633	0.70959	
47	ER-30-1 Well, String #1, NTS, Area 30 (1/95)				43.6	6862	5.55	0.70824	0.000137
48	ER-30-1 Well, String #2, NTS, Area 30 (2/95)				33.9	8942	5.38	0.70795	0.000107
49	ER-30-1 Well, String #1, NTS, Area 30 (6/96)			-7.4	44.7	6860	5.202	0.70829	0.000135
50	ER-30-1 Well, String #2, NTS, Area 30 (6/96)				44.5	6893	5.319	0.70825	0.000142
51	U3-cn #5 Well, NTS, Area 3	-14.1	-106	-6.1	3.2	28454	4.079	0.71321	0.000193
52	UE-1q Well, NTS, Area 1	-14.0		-2.4	7.7	21195	7.9	0.71129	0.000268
53	U3-cn PS #2 Well, NTS, Area 3	-14.0	-103	-7.5	51483	>modern	12428	0.70962	0.000165
54	UE-16d Well, NTS, Area 16	-12.9	-95	-10.1	8.0	20890	6.355	0.71011	
55	Test Well D, NTS, Area 4	-14.3		-5.5	2.8	29707	7.236	0.71218	
56	UE-17a Well, NTS, Area 17, 253 mbsl	-13.3	-100	-9.9	4.9	24999	5.850	0.71020	
57	UE-17a Well, NTS, Area 17, 302 mbsl	-13.3	-100	-10.4	4.0	26630	5.659	0.71021	
58	UE-17a Well, NTS, Area 17, 331 mbsl	-12.6		-11.4	0.7	40901	3.577	0.71011	
59	UE-18r Well, NTS, Area 18	-14.7	-110	-1.4	8.2	20675	6.360	0.70909	
60	Test Well 1, NTS, Area 17	-14.7		-10.2	30.1	9934	9.681	0.70893	
61	Water Well 8, NTS, Area 18	-13.3		-9.5	24.9	11506	5.826	0.71027	
62	ER-12-1 Well, NTS, Area 12	-12.5		-9.2	10.7	18483	50.6	0.71175	0.000275
63	UE-10j Well, Composite, NTS, Area 8 (10/93)	-13.4		-0.1	3.3	28300	2.76	0.71451	0.000274
64	UE-10j Well, Zone 1, NTS, Area 8 (3/97)	-13.6		-4.6	7.5	21446		0.71464	0.000277
65	UE-10j Well, Zone 2, NTS, Area 8 (3/97)	-13.2		-6.4	11.4	17937		0.71352	0.000273
66	UE-10j Well, Zone 3, NTS, Area 8 (3/97)	-12.8		-7.9	12.6	17150		0.71261	0.000271
67	ER-20-5 #3 Well, NTS, Area 20 (7/96)	-15.1	-114	-5.7	1450	>modern	173	0.70849	0.000157
68	ER-20-5 #3 Well, NTS, Area 20 (4/97)	-15.1		-5.8					0.000155
69	ER-20-5 #1 Well, NTS, Area 20 (6/96)	-14.9	-114	-2.3	28169	>modern	39400	0.71066	0.000168
70	ER-20-5 #1 Well, NTS, Area 20 (4/97)	-15.0		-2.8					0.000166

Table 4. Isotopic Data

	Sample Identification	$\delta^{18}\text{O}$	δD	$\delta^{13}\text{C}$	^{14}C	^{14}C apparent age	$^{36}\text{Cl}/\text{Cl}_{\text{total}}$	$^{87}\text{Sr}/^{86}\text{Sr}$	$^{234}\text{U}/^{238}\text{U}$
		(‰)	(‰)	(‰)	(pmc)	(yr)	($\times 10^{-13}$)		
71	U-12a Well, NTS, Area 12	-12.6	-94		100	modern	3.346	0.70555	
72	Watertown #1 Well, Emigrant Valley	-14.6	-109	-5.3	12.1	17459	6.529	0.71566	
73	UE-20bh-1 Well, NTS, Area 20	-14.7	-109	-9.2	21.0	12921	6.450		
74	Water Well 20, NTS, Area 20				9.1	19814	5.67	0.71119	0.000259
75	ER-20-6 #3 Well, NTS, Area 20 (12/96)	-15.0	-109	-7.2	16.3	14991	0.1519	0.70974	0.000257
76	ER-20-6 #2 Well, NTS, Area 20 (11/96)	-15.0	-110	-7.3	1068.5	>modern	82.26	0.71029	0.000138
77	ER-20-6 #1 Well, NTS, Area 20 (12/96)	-15.0	-115	-6.7	344.2	>modern	15.55	0.71016	0.000221
78	Watertown #3 Well, Emigrant Valley	-13.7	-105	-6.0	27.0	10827	5.821	0.71551	
79	UE-19c Well, NTS, Area 19	-15.0		-5.3	8.1	20797	6.257	0.70943	
80	US Fish and Wildlife Well, Pahranaqat Valley	-10.2	-87	-9.1	97.0	256	7.474		
81	Watertown #4 Well, Emigrant Valley	-14.3	-108	-2.3	1.0	38152	3.622	0.72571	
82	Tolicha Peak Well, Tolicha Peak (9/96)	-13.4	-105						
83	Tolicha Peak Well, Tolicha Peak (11/96)	-13.6	-105						
84	UE-19h Well, NTS, Area 19	-14.8		-3.3	9.4	19546	4.786	0.71104	
85	Alamo City Well #7, Pahranaqat Valley	-13.5	-101	-10.9	80.4	1800	7.414		
86	Spencer Well, Pahranaqat Valley	-13.7	-104	-9.3	73.1	2589	7.037	0.71164	
87	Gold Flat 2 Well, US Air Force, Gold Flat	-12.8	-98						
88	Little Ash Spring, Pahranaqat Valley	-14.2	-107	-4.6	6.2	22933	6.514	0.71415	
89	Sixmile Spring, South Pahroc Range	-13.1	-93	-11.9	88.6	1001	7.157		
90	Crystal Springs, Pahranaqat Valley	-14.4	-107	-5.7			6.425	0.71087	
91	Hiko Spring, Pahranaqat Valley	-14.5	-108	-5.2	6.0	23313	6.080	0.71108	
92	Stewart Brothers Well, Pahranaqat Valley	-14.4	-107	-5.2			7.033		
93	Penoyer Well, Sand Spring Valley	-15.1	-118	-8.9					
94	Roller Coaster Well, Cactus Flat	-16.0	-129	-6.6	13.2	16746			
95	Rose Spring, Kawich Range	-12.8	-104	-8.7	66.7	3353			
96	Cedar Creek Pass Well, Cactus Flat	-14.1	-111	-10.1	21.9	12551			
97	Sumner Spring, Kawich Range (5/96)	-12.5	-103	-8.6	79.1	1940			
98	Sumner Spring, Kawich Range (9/96)	-13.3	-107						
99	Sandia Well #6, Cactus Flat	-15.4	-122	-6.7					
100	Silverbow Spring, Kawich Range	-13.1	-108	-13.7	110.9	>modern			
101	Goldfield City Well (Klondike)	-14.1		-10.7					
102	Oreana Spring, Seaman Range	-10.2	-85	-8.9	96.7	281	35.19		
103	Adaven Spring, Quinn Canyon Range	-14.1		-10.0					
104	Warm Springs, Hot Creek Range	-14.4	-109	-2.8					
105	Tonopah City Well, Ralston Valley	-14.6		-13.6					

Table 4. Isotopic Data

	Sample Identification	$\delta^{18}\text{O}$	δD	$\delta^{13}\text{C}$	^{14}C	^{14}C apparent age	$^{38}\text{Cl}/\text{Cl}_{\text{total}}$	$^{87}\text{Sr}/^{86}\text{Sr}$	$^{234}\text{U}/^{238}\text{U}$
		(‰)	(‰)	(‰)	(pme)	(yr)	($\times 10^{-13}$)		
106	Twin Springs Ranch Well, Pancake Range	-14.7		-2.8					
107	Sharp Ranch Well (Nyala), Railroad Valley	-14.4	-110	-7.1					

Table 4. Isotopic Data

	Sample Identification	^4He	$^3\text{He}/^4\text{He}$	^{20}Ne	^{40}Ar	^{84}Kr	^{132}Xe
		(atoms/ml)		(atoms/ml)	(atoms/ml)	(atoms/ml)	(atoms/ml)
1	Shoshone Spring, Shoshone CA						
2	Big Spring, Ash Meadows (9/95)	4.40E+13		4.07E+12	6.50E+15	8.24E+11	5.16E+10
3	Big Spring, Ash Meadows (2/97)						
4	Point of Rocks Spring, Ash Meadows						
5	Cold Creek Spring, Spring Mountains						
6	Crystal Pool Spring, Ash Meadows (9/95)	5.91E+12		4.08E+12	6.69E+15	8.10E+11	5.34E+10
7	Crystal Pool Spring, Ash Meadows (2/97)						
8	Well, Furnace Creek, Death Valley, CA						
9	Five Springs Group, Ash Meadows						
10	Longstreet Spring, Ash Meadows						
11	Fairbanks Spring, Ash Meadows	5.07E+12		4.27E+12	6.73E+15	8.13E+11	5.47E+10
12	Garey Well, Amargosa Valley						
13	Indian Springs Sewer Co. Well #1, Indian Springs						
14	USAF Well #2, Indian Springs						
15	Army Well #1, NTS, Area 22	9.91E+12		4.30E+12	7.36E+15	9.08E+11	6.30E+10
16	Well, Jct. Hwy 95 and 373, Amargosa Valley						
17	J-12 Well, NTS, Area 25	1.98E+12		4.06E+12	6.90E+15	8.57E+11	5.72E+10
18	Neco Well, Amargosa Desert						
19	Water Well 5c, NTS, Area 5	8.69E+12		4.54E+12	8.42E+15	1.12E+12	7.33E+10
20	J-13 Well, NTS, Area 25	4.09E+12		4.04E+12	6.67E+15	8.24E+11	5.60E+10
21	UE-5n Well, NTS, Area 5						
22	UE-5c Well, NTS, Area 5	2.25E+13		4.26E+12	7.74E+15	1.00E+12	6.51E+10
23	PW-1 Well, NTS, Area 5						
24	PW-2 Well, NTS, Area 5						
25	PW-3 Well, NTS, Area 5						
26	Specie Spring, Bare Mountain						
27	Well, Beatty 12S/47E-7dbd						
28	Water Well 4, NTS, Area 6	3.10E+12		4.11E+12	7.15E+15	9.38E+11	5.93E+10
29	Revert Spring, Oasis Valley						
30	Water Well C-1, NTS, Area 6	7.81E+12		3.29E+12	4.89E+15	5.90E+11	4.12E+10
31	Water Well C, NTS, Area 6	7.99E+12		3.33E+12	5.01E+15	5.92E+11	4.15E+10
32	Bailey Hot Spring, Oasis Valley	2.73E+13		3.48E+12	6.02E+15	7.62E+11	5.10E+10
33	Test Well B, NTS, Area 6						
34	ER-6-1 Well, NTS, Area 6	1.03E+13	8.65E-07	7.22E+12	9.25E+15	1.12E+12	7.20E+10
35	Goss Spring, Oasis Valley	1.56E+12		3.92E+12	7.00E+15	8.72E+11	5.69E+10

Table 4. Isotopic Data

	Sample Identification	^4He (atoms/ml)	$^3\text{He}/^4\text{He}$	^{20}Ne (atoms/ml)	^{40}Ar (atoms/ml)	^{84}Kr (atoms/ml)	^{132}Xe (atoms/ml)
36	UE-1h Well, NTS, Area 1, 603 mbel						
37	UE-1h Well, NTS, Area 1, 651 mbel						
38	Coffers Ranch, Windmill, Oasis Valley						
39	Unnamed Spring, Oasis Valley						
40	ER-3-1 Well, NTS, Area 3, (9/95)	4.89E+13	1.90E-06	2.99E+12	4.25E+15	5.09E+11	3.71E+10
41	ER-3-1 Well, NTS, Area 3, (10/96)	3.66E+13	1.90E-06				
42	UE-16f Well, NTS, Area 16						
43	UE-1c Well, NTS, Area 1, 411 mbel						
44	UE-1c Well, NTS, Area 1, 499 mbel						
45	UE-1b Well, NTS, Area 1						
46	UE-1a Well, NTS, Area 1						
47	ER-30-1 Well, String #1, NTS, Area 30 (1/95)	2.33E+12	1.12E-06				
48	ER-30-1 Well, String #2, NTS, Area 30 (2/95)	3.24E+12	1.08E-06				
49	ER-30-1 Well, String #1, NTS, Area 30 (6/96)	2.24E+12	9.77E-07				
50	ER-30-1 Well, String #2, NTS, Area 30 (6/96)	2.45E+12	9.79E-07				
51	U3-cn #5 Well, NTS, Area 3	9.08E+13	<9.96E-05	5.11E+12	8.42E+15	1.10E+12	7.73E+10
52	UE-1q Well, NTS, Area 1	1.84E+12	8.80E-07	4.40E+12	7.98E+15	1.04E+12	7.09E+10
53	U3-cn PS #2 Well, NTS, Area 3	4.16E+12	1.61E-01				
54	UE-16d Well, NTS, Area 16						
55	Test Well D, NTS, Area 4						
56	UE-17a Well, NTS, Area 17, 253 mbel						
57	UE-17a Well, NTS, Area 17, 302 mbel						
58	UE-17a Well, NTS, Area 17, 331 mbel						
59	UE-18r Well, NTS, Area 18						
60	Test Well 1, NTS, Area 17						
61	Water Well 8, NTS, Area 18						
62	ER-12-1 Well, NTS, Area 12	4.89E+12	1.51E-06	2.55E+13	2.60E+16	2.56E+12	1.38E+11
63	UE-10j Well, Composite, NTS, Area 8 (10/93)	1.49E+14	1.06E-08	8.14E+12	1.23E+16	1.47E+12	9.18E+10
64	UE-10j Well, Zone 1, NTS, Area 8 (3/97)	2.78E+14	7.72E-07				
65	UE-10j Well, Zone 2, NTS, Area 8 (3/97)	9.59E+13	7.63E-07	7.99E+12	1.10E+16	1.29E+12	7.83E+10
66	UE-10j Well, Zone 3, NTS, Area 8 (3/97)	6.61E+13	7.57E-07	5.48E+12	8.58E+15	1.02E+12	6.75E+10
67	ER-20-5 #3 Well, NTS, Area 20 (7/96)	1.92E+12	1.86E-03				
68	ER-20-5 #3 Well, NTS, Area 20 (4/97)						
69	ER-20-5 #1 Well, NTS, Area 20 (6/96)	5.18E+13	1.36E-01				
70	ER-20-5 #1 Well, NTS, Area 20 (4/97)						

Table 4. Isotopic Data

	Sample Identification	⁴ He	³ He/ ⁴ He	²⁰ Ne	⁴⁰ Ar	⁸⁴ Kr	¹³² Xe
		(atoms/ml)		(atoms/ml)	(atoms/ml)	(atoms/ml)	(atoms/ml)
71	U-12a Well, NTS, Area 12	4.27E+12					
72	Watertown #1 Well, Emigrant Valley	2.13E+12		4.04E+12	7.21E+15	9.07E+11	6.22E+10
73	UE-20bh-1 Well, NTS, Area 20						
74	Water Well 20, NTS, Area 20	4.26E+12	4.74E-07				
75	ER-20-6 #3 Well, NTS, Area 20 (12/96)	6.99E+12	9.27E-07	1.27E+13	1.40E+16	1.43E+12	8.54E+10
76	ER-20-6 #2 Well, NTS, Area 20 (11/96)	4.91E+12	<1E-03	1.10E+13	1.44E+16	1.39E+12	8.31E+10
77	ER-20-6 #1 Well, NTS, Area 20 (12/96)	1.01E+13	<1E-03	4.88E+12	7.08E+15	8.71E+11	6.14E+10
78	Watertown #3 Well, Emigrant Valley	7.08E+12		4.24E+12	7.08E+12	1.03E+12	6.89E+10
79	UE-19c Well, NTS, Area 19	8.98E+12		3.43E+12	7.56E+15	1.15E+12	8.28E+10
80	US Fish and Wildlife Well, Pahranaagat Valley						
81	Watertown #4 Well, Emigrant Valley	1.32E+14		3.96E+12	7.96E+15	1.07E+12	6.91E+10
82	Tolicha Peak Well, Tolicha Peak (9/96)						
83	Tolicha Peak Well, Tolicha Peak (11/96)						
84	UE-19h Well, NTS, Area 19						
85	Alamo City Well #7, Pahranaagat Valley	1.42E+12		4.68E+12	8.60E+15	1.07E+12	7.17E+10
86	Spencer Well, Pahranaagat Valley	1.66E+12		5.46E+12	9.17E+15	1.18E+12	7.27E+10
87	Gold Flat 2 Well, US Air Force, Gold Flat						
88	Little Ash Spring, Pahranaagat Valley	6.56E+12		3.58E+12	6.42E+15	8.35E+11	5.93E+10
89	Sixmile Spring, South Pahroc Range						
90	Crystal Springs, Pahranaagat Valley	1.04E+13		8.29E+12	9.71E+15	1.12E+12	7.62E+10
91	Hiko Spring, Pahranaagat Valley	7.33E+12		4.47E+12	7.47E+15	1.18E+12	6.99E+10
92	Stewart Brothers Well, Pahranaagat Valley						
93	Penoyer Well, Sand Spring Valley						
94	Roller Coaster Well, Cactus Flat						
95	Rose Spring, Kawich Range						
96	Cedar Creek Pass Well, Cactus Flat						
97	Sumner Spring, Kawich Range (5/96)						
98	Sumner Spring, Kawich Range (9/96)						
99	Sandia Well #6, Cactus Flat						
100	Silverbow Spring, Kawich Range						
101	Goldfield City Well (Klondike)						
102	Oreana Spring, Seaman Range						
103	Adaven Spring, Quinn Canyon Range						
104	Warm Springs, Hot Creek Range						
105	Tonopah City Well, Ralston Valley						

Table 4. Isotopic Data

	Sample Identification	^4He	$^3\text{He}/^4\text{He}$	^{20}Ne	^{40}Ar	^{84}Kr	^{132}Xe
		(atoms/ml)		(atoms/ml)	(atoms/ml)	(atoms/ml)	(atoms/ml)
106	Twin Springs Ranch Well, Pancake Range						
107	Sharp Ranch Well (Nyala), Railroad Valley						

Table 5. Summary of Isotopic Data compiled by GeoTrans, Inc.

Sample Name	Location	Latitude	Longitude	Date	$\delta^{18}\text{O}$ (‰)	δD (‰)	$\delta^{13}\text{C}$ (‰)	^{14}C (pmc)	^{14}C app. age (years)
Jean Prison Well, Ivanpah Valley	sec.10, T26S, R59E	35°47'18"	115°20'43"	21-Jun-85	-12.1	-95	-7.6	2.4	30830
Castillo Well, Goodsprings	sec.26, T24S, R58E	35°50'02"	115°26'09"	21-Jun-85	-12.8	-94	-9.3	39.4	7700
Bird Spring, Bird Spring Range	sec.04, T24S, R59E	35°53'20"	115°22'12"	23-Jun-85	-11.7	-88	-7.8	67.5	3250
Wilson Tank, Bird Spring Range	sec.24, T23S, R58E	35°56'02"	115°25'28"	22-Jun-85	-10.9	-87	-9.4	60.4	4170
Sky Harbor Airport Well, Henderson	sec.03, T23S, R61E	35°58'23"	115°08'48"	28-Feb-86	-13.1	-95	-6.8	3.0	28990
Shoshone Spring, nr. Shoshone, CA	sec.30, T22S, R7E	35°58'48"	116°16'23"	25-Apr-82	-12.7	-95	-6.7	15.2	15570
Tenaya Well, Arden	sec.27, T22S, R60E	36°00'42"	115°15'05"	10-May-83	-12.3	-92	-7.4	99.9	modern
Hidden Hills Ranch Well	sec.24, T22S, R54E	36°00'51"	115°51'51"	30-Jul-87	-13.7	-98	-8.2	50.5	5650
Mountain Springs Fire Station	sec.20, T22S, R58E	36°01'08"	115°30'24"	30-Jul-87	-12.5	-90	-9.8	32.7	9240
Mountain Spring, Spring Mtns.	sec.20, T22S, R58E	36°01'19"	115°30'20"	18-Jun-87	-12.3	-91			
Mule Spring, Spring Mtns.	sec.16, T22S, R57E	36°01'53"	115°34'48"	17-Jun-87	-12.7	-90			
Showboat Country Club well #2	sec.08, T22S, R62E	36°02'51"	115°04'48"	27-Feb-86	-13.3	-97	-7.8	8.0	20880
Bootleg Spring, Spring Mtns.	sec.07, T22S, R58E	36°02'56"	115°30'30"	17-Jun-87	-12.5	-92			
Rainbow Spring, Spring Mtns.	sec.07, T22S, R58E	36°03'10"	115°30'32"	17-Jun-87	-12.9	-94	-9.6	73.4	2560
Genstar Gypsum Well, Blue Diamond	sec.05, T22S, R59E	36°03'20"	115°23'34"	11-Jul-86	-12.3	-86	-9.7	59.0	4360
Sandstone Spring #1, Red Rock Canyon	sec.03, T22S, R58E	36°03'47"	115°28'09"	25-Jun-85	-12.2	-89	-10.6 (2)	49.8 (2)	5760
Lost Cabin Spring, Spring Mtns.	sec.36, T21S, R56E	36°05'00"	115°39'08"	17-Jun-87	-12.1	-88			
Spanish Trails Country Club well	sec.27, T21S, R60E	36°05'56"	115°15'38"	13-Mar-86	-12.2	-89			
Stock Mills Well, SW Las Vegas	sec.22, T21S, R60E	36°06'03"	115°15'41"	13-Mar-86	-12.4	-86	-7.9	11.0	18250
Tropicana Country Club South well #1	sec.21, T21S, R61E	36°06'22"	115°10'09"	16-May-86	-13.2	-95			
Pine Creek Spring, Red Rock Canyon	sec.17, T21S, R58E	36°07'09"	115°29'52"	7-Aug-87	-12.0	-87			
Sands Hotel and Casino well #3	sec.16, T21S, R61E	36°07'28"	115°10'09"	19-May-86	-13.5	-98			
Sparkletts Drinking Water Co., Las Vegas	sec.18, T21S, R61E	36°07'41"	115°11'45"	22-Apr-86	-13.6	-99			
BLM Visitors Center, Red Rock Canyon	sec.13, T21S, R58E	36°07'44"	115°26'03"	30-Jun-85	-12.3	-89	-9.3	46.0	6420
Las Vegas Country Club well	sec.10, T21S, R61E	36°08'20"	115°08'49"	8-Jul-86	-13.7	-100			
CC Spring, Spring Mtns.	sec.09, T21S, R57E	36°08'33"	115°35'30"	18-Jun-87	-13.0	-90			
Red Spring, Red Rock Canyon	sec.06, T21S, R59E	36°08'40"	115°25'10"	—	-12.3 (2)	-89 (2)	-10.5 (2)	62.4	3900
Cimmeron Well, Las Vegas	sec.04, T21S, R60E	36°08'47"	115°16'04"	3-Apr-86	-12.4	-90			
Manse Spring, Pahrump Valley	sec.03, T21S, R54E	36°09'17"	115°53'42"	27-Jun-85	-13.6	-99	-8.3	46.9	6260
LVVWD well #1a	sec.35, T20S, R60E	36°09'36"	115°13'30"	14-May-86	-13.2	-94	-8.3	17.0	14650
Shetland Mutual Water Users Assoc.	sec.32, T20S, R61E	36°09'39"	115°10'33"	3-Mar-86	-13.5	-100			
Willow Spring (Red Rock), Spring Mtns.	sec.33, T20S, R58E	36°09'41"	115°29'51"	26-Jun-85	-12.3	-91			
Coal Spring, Spring Mtns.	sec.31, T20S, R57E	36°09'44"	115°37'12"	18-Jun-87	-12.9	-91			
LVVWD well #11a	sec.31, T20S, R61E	36°09'53"	115°11'22"	13-Jun-86	-13.4	-97	-7.3	14.0	16250
Klup Spring, Spring Mtns.	sec.31, T20S, R56E	36°09'56"	115°43'28"	—	-12.9 (2)	-93 (2)			

Table 5. Summary of Isotopic Data compiled by GeoTrans, Inc.

Sample Name	Location	Latitude	Longitude	Date	$\delta^{18}\text{O}$ (‰)	δD (‰)	$\delta^{13}\text{C}$ (‰)	^{14}C (pmc)	^{14}C app. age (years)
Bootlegger Spr. (Cave Spr), Spring Mtns.	sec.33, T20S, R57E	36°09'59"	115°35'48"	—	-12.8 (3)	-93 (3)			
Union Pacific Railroad well #3	sec.33, T20S, R61E	36°10'05"	115°09'13"	9-Apr-86	-13.8	-100			
LVVWD well #7a	sec.31, T20S, R60E	36°10'06"	115°17'51"	17-Jun-86	-13.2	-96			
Sky Mt. Resort, Spring Mtns.	sec.34, T20S, R57E	36°10'13"	115°34'44"	28-Jun-85	-13.3	-96.5	-10.1	84.1	1430
LVVWD well #14	sec.31, T20S, R61E	36°10'18"	115°11'22"	6-May-86	-13.2	-97			
White Rock Spring, Spring Mtns.	sec.33, T20S, R58E	36°10'27"	115°28'43"	—	-12.6 (3)	-91 (3)	-10.4	44.8	6640
LVVWD well #34	sec.29, T20S, R61E	36°10'31"	115°11'06"	15-May-86	-13.6	-99			
LVVWD well #15a	sec.30, T20S, R61E	36°10'31"	115°11'23"	14-May-86	-13.8	-97			
LVVWD well #16	sec.30, T20S, R61E	36°10'31"	115°11'39"	4-Jun-86	-13.6	-97			
LVVWD well #17	sec.30, T20S, R61E	36°10'31"	115°11'39"	4-Jun-86	-13.5	-97			
La Madre Spring, Spring Mtns.	sec.29, T20S, R58E	36°11'01"	115°30'20"	5-Aug-87	-13.1	-93			
LVVWD well #18a	sec.27, T20S, R60E	36°11'12"	115°14'38"	6-Jun-86	-13.4	-94			
LVVWD well #45	sec.19, T20S, R61E	36°11'50"	115°12'13"	13-May-86	-14.0	-101			
LVVWD well #22a	sec.21, T20S, R60E	36°12'05"	115°15'43"	4-Jun-86	-14.0	-100			
NLVWD Robinson Well	sec.18, T20S, R61E	36°12'17"	115°11'41"	3-Jun-86	-14.1	-100			
Pahrump Spring Well, Pahrump	sec.14, T20S, R59E	36°12'27"	115°59'01"	27-Jun-85	-13.6	-97	-7.6	26.0	11135
Nellis AFB #13, NE Las Vegas	sec.16, T20S, R62E	36°12'44"	115°03'00"	3-Apr-86	-13.8	-98			
NLVWD West Cheyenne Well	sec.18, T20S, R61E	36°12'56"	115°11'42"	12-Jun-86	-13.8	-100			
Trout Spring, Spring Mtns.	sec.10, T20S, R56E	36°13'22"	115°40'59"	—	-13.6 (22)	-98 (20)			
Hartzski Well, Las Vegas	sec.04, T20S, R61E	36°14'03"	115°09'16"	4-Mar-86	-12.4	-90			
NLVWD Desert Aire Well	sec.06, T20S, R61E	36°14'15"	115°12'16"	6-Mar-86	-14.0	-102		19.0	13730
Lake Mead Base Well #3, Las Vegas	sec.01, T20S, R62E	36°14'21"	115°00'16"	29-Sep-86	-13.8	-102	-5.3	5.6	23830
Echo Spring, Spring Mtns.	sec.01, T20S, R56E	36°14'21"	115°38'21"	16-Apr-80	-12.8	-95			
Harris Spring, Spring Mtns.	sec.01, T20S, R57E	36°14'27"	115°32'35"	15-Jul-87	-13.7	-97			
Craig Ranch Country Club 2, Las Vegas	sec.03, T20S, R61E	36°14'29"	115°09'00"	4-Mar-86	-14.5	-106		3.0	28990
Rainbow Spring #2, Spring Mtns.	sec.06, T20S, R57E	36°14'36"	115°37'55"	19-Aug-82	-12.4	-96	-9.8	91.7	716
Peak Spring Canyon Creek, Spring Mtns.	sec.05, T20S, R56E	36°14'40"	115°43'09"	—	-13.3 (6)	-95 (6)			
Nellis AFB #4, NE Las Vegas	sec.36, T19S, R62E	36°14'56"	115°00'15"	3-Apr-86	-13.2	-95	-6.3	21.0	12900
Calneva Pipe, N. of Hwy 604, Las Vegas	sec.33, T19S, R62E	36°14'59"	115°02'39"	—	-13.1	-98			
Kyle Spring, Spring Mtns.	sec.31, T19S, R57E	36°15'00"	115°37'44"	21-Oct-88	-13.6	-96			
Peak Spring, Spring Mtns.	sec.28, T19S, R56E	36°15'40"	115°41'49"	23-Jun-87	-13.1	-94	-9.5	97.7	192
Pat Well, NW Las Vegas	sec.25, T19S, R59E	36°15'45"	115°19'37"	31-Mar-87	-12.9	-92	-8.5	11.2	18100
Kyle Canyon Hwy Well 1, Spring Mtns.	sec.28, T19S, R57E	36°15'54"	115°35'59"	21-Oct-88	-14.0	-97		83.0	1540
Taylor's Steak House Restaurant	sec.22, T19S, R60E	36°17'08"	115°14'41"	3-Nov-86	-13.7	-101	-7.1	14.0	16250
Martin Well, NW Las Vegas Valley	sec.22, T19S, R60E	36°17'25"	115°14'35"	30-Jun-85	-13.4	-100	-6.7	1.9	32760

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Sample Name	Location	Latitude	Longitude	Date	$\delta^{18}\text{O}$	δD	$\delta^{13}\text{C}$	^{14}C	^{14}C app. age
					(‰)	(‰)	(‰)	(pmc)	(years)
Lee Canyon Skd Spring 1, Spring Mtns.	sec.15, T19S, R56E	36°17'32"	115°41'03"	8-Aug-87	-13.6	-96			
East Horse Spring, Spring Mtns.	sec.14, T19S, R54E	36°17'50"	115°52'15"	25-Jun-87	-13.6	-96			
Grapevine Spring, E. Spring Mtns.	sec.16, T19S, R58E	36°18'03"	115°29'25"	—	-13.2	-92 (2)	-9.1	46.0	6420
Deer Creek Spring #1, Spring Mtns.	sec.12, T19S, R56E	36°18'23"	115°38'15"	—	-13.9 (7)	-98 (7)			
Deer Creek Spring #2, Spring Mtns.	sec.07, T19S, R57E	36°18'27"	115°37'37"	28-Jun-85	-13.4	-98	-9.6	102 (2)	modern
Amargosa R. (well) nr.Death Valley Jct, CA	sec.18, T25N, R6E	36°18'33"	116°22'00"	21-Nov-83	-12.7	-98		48.7	5950
Racel Well, NW Las Vegas Valley	sec.09, T19S, R60E	36°18'40"	115°15'39"	10-May-83	-13.3	-99	-6.7	99.9	modern
Gilbert Well, N. of Hwy 157	sec.07, T19S, R59E	36°18'45"	115°25'06"	20-Aug-82	-12.7	-98	-8.8	61.4	4030
Stewart Well, Spring Mtns.	sec.10, T19S, R58E	36°19'10"	115°40'20"	24-Jun-86	-13.4	-100	-8.0	31.6	9520
Tule Spring Well, Floyd Lamb State Park	sec.09, T19S, R60E	36°19'14"	115°16'00"	30-Jun-85	-13.4	-99	-7.0	13.9	16310
Clark Spring, Spring Mtns.	sec.08, T19S, R56E	36°19'14"	115°43'15"	24-Jun-87	-13.7	-99			
Mulder Well, NW Las Vegas Valley	sec.01, T19S, R60E	36°19'25"	115°13'22"	25-Jun-86	-13.2	-97	-7.2	23.8	11870
Mifflin Well, N. of Hwy 157	sec.01, T19S, R58E	36°19'32"	115°25'23"	—	-13.4 (2)	-102 (2)	-7.7	16.4	14950
Lee Canyon West Spring, Spring Mtns.	sec.02, T19S, R56E	36°19'37"	115°39'45"	15-Jul-87	-14.0	-100			
Cortney Well, Hwy 157, NW Las Vegas	sec.02, T19S, R59E	36°19'42"	115°20'52"	21-Oct-88	-13.9	-99	-7.9	48.4	6000
Adams Well, nr. Jct. Hwy 157 and 95	sec.01, T19S, R59E	36°19'47"	115°19'50"	20-Aug-82	-12.7	-98	-8.2	50.1	5710
Lee's Oasis Well, Jct. Hwy 157 and 95	sec.01, T19S, R59E	36°19'48"	115°18'55"	24-Jun-86	-13.4	-98	-8.6	49.6	5800
Holland Well, NW Las Vegas Valley	sec.05, T19S, R60E	36°20'00"	115°17'00"	20-Aug-82	-12.6	-98	-6.2	11.3	18020
Summer Homes Well, Spring Mtns.	sec.35, T18S, R56E	36°20'06"	115°39'18"	26-Sep-86	-13.7 (2)	-100 (2)	-10.8	91.1	770
Upper Macka Canyon Spr., Spring Mtns.	sec.33, T18S, R56E	36°20'07"	115°41'11"	15-Jul-87	-14.3	-103			
Grassy Spring, Spring Mtns.	sec.32, T18S, R58E	36°20'23"	115°29'57"	28-Jul-87	-13.5	-99			
Buck Spring, Spring Mtns.	sec.35, T18S, R55E	36°20'37"	115°46'29"	1-Jul-87	-13.6	-98			
Palute Indian Reservation Well	sec.26, T18S, R59E	36°21'02"	115°20'33"	21-Aug-82	-14.0	-98	-8.2	57.0	4650
Wood Spring, Spring Mtns.	sec.25, T18S, R55E	36°21'09"	115°44'39"	3-Jul-88	-13.4	-98			
Mud Springs, Spring Mtns.	sec.22, T18S, R56E	36°22'16"	115°41'00"	28-Jul-87	-14.1	-106			
Trough Spring, Spring Mtns.	sec.23, T18S, R55E	36°22'38"	115°46'28"	1-Jul-87	-14.1	-100			
McFarland Spring, Spring Mtns.	sec.13, T18S, R55E	36°22'54"	115°44'38"	13-Jul-87	-13.7	-99	-10.8	84.6	1380
Wood Canyon Spring, Spring Mtns.	sec.08, T18S, R54E	36°23'58"	115°55'54"	7-Jul-87	-13.2	-93			
Point of Rocks Springs, Ash Meadows	sec.07, T18S, R51E	36°24'06"	116°16'23"	9-Mar-81	-13.6	-102	-6.5 (3)	7.7 (3)	21220
Cold Creek Spring, Spring Mtns.	sec.01, T18S, R55E	36°24'32"	115°44'36"	—	-13.8 (20)	-100 (18)		73.4 (3)	2560
Willow Spring, Spring Mtns.	sec.02, T18S, R55E	36°25'00"	115°45'47"	5-Apr-88	-13.6	-98	-9.6	79.2	1930
Young Well, NW Las Vegas Valley	sec.04, T18S, R59E	36°25'11"	115°22'58"	25-Sep-86	-12.8	-93	-6.7	13.7	16430
Crystal Pool, Ash Meadows	sec.03, T18S, R50E	36°25'13"	116°19'23"	—	-13.7 (2)	-102 (2)	-5.0	11.6	17810
Johnnie Gold Pan Well	sec.01, T18S, R52E	36°25'14"	116°04'12"	30-Jul-87	-12.7	-91	-10.1	10.6	18630
Brooks Well, NW Las Vegas Valley	sec.04, T18S, R59E	36°25'20"	115°22'40"	24-Jun-86	-12.7	-93	-6.9	35.7	8515

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Shown Well, NW Las Vegas Valley	sec.04, T18S, R59E	36°25'31"	115°22'44"	25-Sep-86	-13.0	-94	-8.8	20.4	13140
Crystal Springs, Spring Mtns.	sec.36, T17S, R53E	36°25'39"	115°58'25"	7-Jul-87	-12.6	-91	-4.8	10.5	18630
Corn Creek Spring, NW Las Vegas Valley	sec.34, T17S, R59E	36°28'20"	115°21'26"	—	-12.9 (4)	-94 (4)	-9.4 (2)	15.9	15230
Travertine Springs, Death Valley, CA	sec.26, T27N, R1E	36°26'27"	116°49'49"	22-Apr-82	-13.9	-102	-8.5	10.9	18300
Horseshutem Spring, Spring Mtns.	sec.27, T17S, R53E	36°26'35"	115°59'57"	9-Jul-87	-13.1	-93			
Big Timber Spring, Spring Mtns.	sec.29, T17S, R54E	36°26'42"	115°55'37"	27-Jun-85	-13.3	-93	-8.8	87.3	1120
Grapevine Springs, Spring Mtns.	sec.21, T17S, R53E	36°27'25"	116°01'32"	—	-13.0 (2)	-92 (2)			
Texas Spring, Death Valley, CA	sec.23, T27N, R1E	36°27'28"	116°50'11"	22-Apr-82	-13.7	-102			
Gold Spring, Spring Mtns.	sec.24, T17S, R53E	36°27'48"	115°57'39"	14-Jul-87	-13.6	-94			
Corn Creek Ranch Well	sec.20, T17S, R59E	36°27'52"	115°23'53"	2-Dec-86	-13.5	-95	-7.7	7.0	21980
Kwichup Spring, Spring Mtns.	sec.17, T17S, R53E	36°28'21"	116°02'16"	9-Jul-87	-13.2	-96			
Silver Flag α -Well, Nellis AF Range	sec.14, T17S, R58E	36°28'34"	115°28'45"	18-Dec-87	-13.7	-99			
Fairbanks Spring, Ash Meadows	sec.09, T17S, R50E	36°29'26"	116°20'29"	—	-13.7 (2)	-104 (2)	-6.2 (2)	4.3 (4)	26050
Nevaras Springs, Death Valley, CA	sec.36, T28N, R1E	36°30'44"	116°49'14"	22-Apr-82	-13.6	-104	-9.3	9.2	19720
Divide Well, Three Lakes Valley	sec.31, T16S, R58E	36°30'45"	115°28'45"	26-Jul-87	-13.7	-98			
Indian Springs Prison Well #1	sec.33, T16S, R57E	36°30'52"	115°33'15"	26-Jun-85	-13.7	-102	-6.6	4.9	24930
Mathew's Well, Amargosa Valley	sec.36, T16S, R49E	36°31'32"	116°24'00"	11-May-81	-13.7	-104	-4.4	10.9	18300
Old Dry Well, Three Lakes Valley	sec.29, T16S, R58E	36°31'35"	115°28'14"	19-Dec-87	-13.2	-95			
Point Bravo Well (Alpha Post)	sec.29, T16S, R57E	36°32'08"	115°33'55"	23-Jun-86	-13.2	-98	-7.1	6.1	23120
South Black Hills Well	sec.26, T16S, R58E	36°32'12"	115°24'03"	5-Aug-87	-12.1	-87	-6.2	9.2	19720
Well, Amargosa Valley	sec.22, T16S, R48E	36°32'52"	116°32'30"	12-May-81	-11.9	-99	-8.4	28.4	10405
Well, Amargosa Valley	sec.16, T16S, R49E	36°33'20"	116°28'09"	6-May-81	-11.6	-98	-5.2	25.8	11200
Well, SE side of Desert Range	sec.14, T16S, R58E	36°33'32"	115°24'40"	4-Feb-89	-12.6	-92	-7.7	1.3	35900
Indian Springs	sec.16, T16S, R58E	36°33'54"	115°40'06"	—	-13.3 (3)	-99 (3)	-7.8	7.7	21195
Well, Amargosa Valley	sec.15, T16S, R48E	36°34'05"	116°32'40"	6-May-81	-13.0	-103	-7.1	18.0	14200
Well, Amargosa Valley	sec.07, T16S, R50E	36°34'25"	116°23'50"	8-May-81	-13.4	-104	-4.0	7.5	21410
Well, Amargosa Valley	sec.10, T16S, R48E	36°34'25"	116°33'20"	10-May-81	-12.2	-101	-5.0	16.5	14895
Indian Springs AFB Well 1	sec.08, T16S, R58E	36°34'47"	115°40'47"	27-Jun-85	-13.0	-96	-6.9	7.3	21640
Amargosa Well #5, Amargosa Valley	sec.08, T16S, R49E	36°34'56"	116°28'41"	17-Nov-72	-13.2	-100	-6.8	21.4	12745
Cow Camp Spring, Sheep Range	sec.02, T16S, R59E	36°35'01"	115°18'26"	—	-12.6 (2)	-92 (2)			
Amargosa Well #4, Amargosa Valley	sec.05, T16S, R49E	36°35'28"	116°28'42"	4-Mar-74	-13.2	-103	-7.1	19.3	13600
Army Well #1, Mercury Valley	sec.05, T16S, R53E	36°35'30"	116°02'14"	—	-13.4 (3)	-100 (3)	-8.2 (3)	4.9 (4)	24935
Well, Amargosa Valley 15S/49E-22dc	sec.22, T15S, R49E	36°37'40"	116°26'39"	—	-12.8	-102		15.6	15360
Wiregrass Spring, Sheep Range	sec.13, T15S, R60E	36°38'00"	115°12'29"	—	-12.8 (10)	-94 (10)	-10.2	96.8	269
Mormon Well, E. of Sheep Range	sec.12, T15S, R61E	36°38'38"	115°05'52"	—	-12.7 (3)	-92 (3)			

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Keene Wonder Springs, Death Valley, CA	sec.01, T15S, R46E	36°40'25"	116°55'11"	23-Apr-82	-13.0	-100			
Sawmill Spring, Sheep Range	sec.30, T14S, R61E	36°40'50"	115°10'34"	19-May-88	-12.9	-92			
White Rock Spring, Sheep Range	sec.22, T14S, R60E	36°42'30"	115°14'20"	—	-9.9 (2)	-84 (2)			
J-12 well, Area 25, Nevada Test Site	sec.06, T14S, R50E	36°45'54"	116°23'24"	—	-13.1 (5)	-97 (5)		30.5 (2)	9820
Well, U.S. Ecology Site, Amargosa Desert	sec.35, T13S, R47E	36°45'56"	116°41'35"	16-Aug-89	-14.0	-108	-6.7	26.2	11070
Well, U.S. Ecology Site, Amargosa Desert	sec.35, T13S, R47E	36°45'57"	116°41'14"	9-Dec-92	-13.9	-104	-6.5	17.1	14190
Well, U.S. Ecology Site, Amargosa Desert	sec.35, T13S, R47E	36°45'57"	116°41'15"	9-Dec-92	-13.9	-104	-7.8	13.8	16370
Well, U.S. Ecology Site, Amargosa Desert	sec.35, T13S, R47E	36°46'01"	116°41'41"	8-Dec-92	-14.0	-104	-6.7	25.0	11460
Well, U.S. Ecology Site, Amargosa Desert	sec.26, T13S, R47E	36°46'15"	116°41'24"	—	-14.0 (2)	-106 (2)	-7.2 (2)	14.6 (2)	15935
USW VH-1 well, Crater Flat	sec.27, T13S, R48E	36°47'32"	116°33'07"	—	-14.2	-108	-8.5	12.2	17390
J-13 well, Area 25, Nevada Test Site	sec.19, T13S, R50E	36°48'28"	116°23'40"	—	-13.2 (3)	-96 (3)	-7.3	29.9 (2)	9990
UE-25p-1 well, Yucca Mtn.	sec.14, T13S, R49E	36°49'38"	116°25'21"	—	-13.8 (2)	-107 (2)			
UE-25c-2 well, Yucca Mtn.	sec.14, T13S, R49E	36°49'45"	116°25'43"	13-Mar-84	-13.4	-101	-7.0	15.3	16520
UE-25c-3 well, Yucca Mtn.	sec.14, T13S, R49E	36°49'47"	116°25'43"	—	-13.5 (2)	-103 (2)	-7.3 (2)	15.4 (2)	16490
USW H-4 well, Yucca Mtn.	sec.36, T12S, R49E	36°50'32"	116°26'54"	17-May-82	-14.0	-104	-7.4	11.8	17670
USW H-6 well, Yucca Mtn.	sec.34, T12S, R49E	36°50'49"	116°28'55"	16-Oct-82	-13.8	-106	-7.5	17.1	14600
Tim Spring, Pintwater Range	sec.05, T13S, R57E	36°50'58"	115°34'10"	2-Jan-88	-13.2	-99			
UE-25b-1 well, Yucca Mtn.	sec.31, T12S, R50E	36°51'08"	116°26'23"	—	-13.2 (3)	-100 (3)	-9.5 (2)	18.2 (2)	14080
USW G-4 well, Yucca Mtn.	sec.36, T12S, R49E	36°51'14"	116°27'04"	9-Dec-82	-13.8	-103	-9.1	22.0	12520
Well, 5 miles SW of Beatty	sec.27, T12S, R46E	36°51'28"	116°49'20"	9-Jul-88	-13.5	-102			
USW H-1 Piezometer 4, Yucca Mtn.	sec.25, T12S, R49E	36°51'57"	116°27'12"	8-Dec-82	-13.5	-101	-11.4	23.9	11830
Well nr. Amargosa R., 12S/47E-19abc	sec.19, T12S, R47E	36°52'45"	116°45'18"	—	-13.3	-104	-8.0	92.8	614
Spring, S. of Beatty 12S/47E-20bbb	sec.20, T12S, R47E	36°53'06"	116°45'00"	—	-13.6	-106	-8.0		
Sheep Spring, Sheep Range	sec.23, T12S, R61E	36°53'42"	115°06'53"	—	-13.6 (2)	-102 (2)	-7.0	64.7	4000
Well, Beatty 12S/47E-06cdd	sec.06, T12S, R47E	36°54'56"	116°45'40"	—	-13.3	-102	-6.9 (2)	37.0 (2)	8230
Beatty Spring, N. side of Beatty Mtn.	sec.05, T12S, R47E	36°55'07"	116°44'37"	—	-14.1	-108	-7.0 (2)	34.2 (2)	8880
UE-29a-2 well, Nevada Test Site	sec.34, T11S, R50E	36°56'29"	116°22'26"	—	-12.8	-93	-12.8 (3)	66.0 (3)	3435
Lamb Spring, Sheep Range	sec.35, T11S, R61E	36°56'42"	115°06'21"	19-May-88	-13.2	-93			
Spring, Oasis Valley 11S/47E-28dac	sec.28, T11S, R47E	36°57'00"	116°43'00"	—	-14.1	-109	-6.9		
Desert Lake Well, Desert Valley	sec.36, T11S, R60E	36°57'11"	115°11'51"	18-Mar-87	-13.1	-98	-5.3	1.3	35900
Well, Oasis Valley 11S/47E-28aac	sec.28, T11S, R47E	36°57'18"	116°43'10"	—	-14.1	-108	-7.1		
Spring, Oasis Valley 11S/47E-21dbb	sec.21, T11S, R47E	36°57'56"	116°43'20"	—	-14.0	-109	-4.5		
Piapi Canyon, Shoshone Mtn., NTS	sec.14, T11S, R51E	36°58'30"	116°15'29"	11-Feb-81	-14.2	-108	-8.5	12.8	17000
Quartz Spring, Pintwater Range	sec.17, T11S, R57E	36°59'10"	115°36'00"	2-Jan-88	-11.6	-88			
Surprise Springs, Death Valley, CA	sec.18, T11S, R43E	37°00'08"	117°20'37"	20-Apr-82	-14.5	-110	-6.9	23.0 (2)	12165

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Spring, Oasis Valley 11S/47E-04cad	sec.04, T11S, R47E	37°00'30"	116°43'30"	—	-14.0	-108	-5.0		
Spring, Oasis Valley 10S/47E-32dda	sec.32, T10S, R47E	37°01'11"	116°44'00"	—	-13.4	-102	-6.0		
Grapevine Springs, Death Valley, CA	sec.10, T11S, R42E	37°01'11"	117°23'11"	19-Apr-82	-14.2	-109			
Spring, Oasis Valley 10S/47E-33aab	sec.33, T10S, R47E	37°01'49"	116°43'07"	—	-14.0	-108	-4.9	100.0	modern
Peacock Spring, Springdale, Oasis Valley	sec.31, T10S, R47E	37°01'51"	116°45'17"	—	-13.4	-102	-5.3	99.8	18
Spring, 1 mi. E of Scotty's Castle, CA	sec.05, T11S, R43E	37°01'56"	117°19'29"	20-Apr-82	-14.5	-110	-5.2	19.6 (2)	13490
Well, Oasis Valley 10S/47E-27cba	sec.27, T10S, R47E	37°02'16"	116°42'42"	—	-14.3	-111	-5.3	38.9	7805
Well, Oasis Valley 10S/47E-30acc	sec.30, T10S, R47E	37°02'18"	116°45'20"	—	-13.4	-102	-5.2	35.0	8680
Spring, Oasis Valley 10S/47E-14bab	sec.14, T10S, R47E	37°04'27"	116°41'24"	—	-14.5	-112	-4.0 (2)	10.7 (2)	18475
Maynard Lake Spring, Pahranaagat Valley	sec.04, T9S, R62E	37°11'30"	115°02'02"	14-Jan-85	-12.3	-94			
Lone Tree Spring, Pahranaagat Valley	sec.05, T9S, R62E	37°12'07"	115°03'32"	14-Jan-85	-10.9	-90			
U-20a 2 well, Nevada Test Site	sec.17, T8S, R50E	37°14'34"	116°26'16"	—	-14.8	-114	-13.5	15.3	15520
UE-19gs well, Nevada Test Site	sec.26, T7S, R50E	37°18'30"	116°21'53"	—	-14.5	-114			
Cane Spring, Groom Range	sec.09, T7S, R55.5E	37°20'27"	115°44'50"	15-May-85	-13.2	-92			
Cattle Spring, Groom Range	sec.16, T6S, R55.5E	37°24'57"	115°45'05"	15-May-85	-9.4	-85			
Rock Spring, Groom Range	sec.16, T6S, R56E	37°25'53"	115°41'23"	15-May-85	-10.9	-86			
Quail Spring, Groom Range	sec.09, T6S, R56E	37°26'29"	115°41'01"	15-May-85	-11.9	-92			
Hells Acre Gulch Spring, Hiko Range	sec.03, T6S, R61E	37°27'37"	115°07'29"	14-Jan-85	-12.3	-93			
Ash Springs, Pahranaagat Valley	sec.06, T6S, R61E	37°27'49"	115°11'30"	20-Jul-81	-14.1	-108		6.8	22220
Indian Spring, Groom Range	sec.33, T5S, R55.5E	37°27'50"	115°44'28"	15-May-85	-10.4	-88			
Rabbitbrush Spring, Groom Range	sec.28, T5S, R56E	37°28'56"	115°41'28"	14-May-85	-11.2	-89			
Bullwhack Spring, Groom Range	sec.20, T5S, R55.5E	37°29'45"	115°45'47"	17-May-85	-10.2	-88			
Crystal Springs, Pahranaagat Valley	sec.10, T5S, R60E	37°31'53"	115°13'58"	20-Jul-81	-14.3	-109		7.8	21090
April Fool Spring, Groom Range	sec.04, T5S, R55.5E	37°32'14"	115°44'19"	16-May-85	-10.7	-89			
Hiko Spring, Pahranaagat Valley	sec.14, T4S, R60E	37°35'54"	115°12'52"	14-Jan-85	-15.3	-110	-7.0	6.5	22600
Sand Spring, Sand Spring Valley	sec.26, T2S, R55E	37°44'20"	115°45'06"	3-Jan-88	-11.9	-88			
The Seeps, Timpahute Range	sec.28, T2S, R57E	37°44'22"	115°34'32"	15-Jan-85	-13.3	-98			
Cedar Pass Well, Cactus Flat	sec.22, T2S, R49E	37°44'48"	116°28'58"	10-Sep-80	-14.0	-110			
Cedar Spring, Kawich Range	sec.22, T2S, R51E	37°45'05"	116°16'25"	15-Jan-85	-13.6	-101			
Well 9, Cactus Flat, Tonopah Test Range	sec.16, T1S, R47E	37°51'15"	116°43'06"	—	-14.3	-113			
Georges Water, Kawich Range	sec.14, T1S, R50E	37°51'37"	116°20'57"	15-Jan-85	-13.6	-98			
Well 1A, Cactus Flat, Tonopah Test Range	sec.01, T1S, R46E	37°53'00"	116°46'53"	—	-14.5	-118			
Eden Creek Ranch Spring, Kawich Range	sec.04, T1N, R50E	37°56'12"	116°22'53"	15-Jan-85	-13.9	-99			
Unnamed Spring, Golden Gate Range	sec.09, T3N, R59E	38°07'56"	115°20'46"	15-Jan-81	-14.6	-110		10.6	18550
Adavan Spring, Quinn Canyon Range	sec.08, T3N, R57E	38°08'05"	115°35'58"	31-Jul-85	-14.0	-103			

Table 5. Summary of Isotopic Data compiled by GeoTrans, Inc.

Sample Name	Location	Latitude	Longitude	Date	$\delta^{18}\text{O}$	δD	$\delta^{13}\text{C}$	^{14}C	^{14}C app. age
					(‰)	(‰)	(‰)	(pmc)	(years)
Little Cherry Creek, Quinn Canyon Range	sec.35, T4N, R56E	38°10'02"	115°39'12"	31-Jul-85	-13.9	-103			
Warm Springs, Jct. Hwy 6 and 375	sec.20, T4N, R50E	38°11'15"	116°22'21"	1-Jan-74	-14.2	-114			
Moon River Spring, White River Valley	sec.25, T6N, R60E	38°21'06"	115°10'50"	27-Apr-82	-15.8	-120	-7.5	6.4	22720
Hot Creek Spring, White River Valley	sec.18, T6N, R61E	38°22'59"	115°09'09"	19-Jul-81	-15.5	-118		4.6	25510
Hot Creek discharge area	sec.09, T6N, R61E	38°23'18"	115°07'58"	19-Jul-81	-15.3	-118			
Flag Spring #3, White River Valley	sec.33, T7N, R62E	38°25'17"	115°01'20"	17-Jan-84	-14.3	-105			
Bullwhacker Springs, Railroad Valley	sec.28, T7N, R57E	38°26'20"	115°34'08"	15-Jun-83	-15.2	-114			
Butterfield Spr, White River Valley	sec.28, T7N, R62E	38°26'23"	115°00'39"	19-Jul-81	-14.2	-105		31.3	9600
Butterfield Sprs, Railroad Valley	sec.27, T8N, R67E	38°31'16"	115°32'46"	15-Jun-83	-15.0	-116			
Big Spring, Railroad Valley	sec.15, T8N, R55E	38°33'21"	115°46'15"	16-Jul-81	-15.4	-120		3.0	28990
Blue Eagle Spring, Railroad Valley	sec.11, T8N, R57E	38°33'47"	115°31'39"	17-Jul-81	-15.0	-114		10.3	18800
Albert Spring, Grant Range	sec.08, T8N, R59E	38°34'06"	115°21'42"	24-Jul-85	-14.0	-107			
Moorman Spring, White River Valley	sec.32, T9N, R61E	38°35'41"	115°08'18"	18-Jul-81	-15.7	-119		4.2	26210
Emigrant Springs, White River Valley	sec.19, T9N, R62E	38°37'26"	115°02'51"	18-Jul-81	-14.5	-108		56.6	4705
Rogers Ranch Springs, Big Smoky Valley	sec.20, T11N, R43E	38°48'15"	117°10'48"	1-Jan-74	-15.5	-123			
Darrough Hot Springs, Big Smoky Valley	sec.18, T11N, R43E	38°49'09"	117°10'58"	1-Jan-74	-15.3	-119			
Secret Spring, Horse Range	sec.01, T11N, R59E	38°50'20"	115°17'23"	16-Jun-83	-14.0	-110			
Lund Spring, White River Valley	sec.04, T11N, R62E	38°51'00"	115°00'09"	27-Apr-82	-15.4	-113			
Little Currant Creek Sprs.	sec.18, T12N, R59E	38°53'39"	115°22'58"	15-Jun-83	-14.0	-107			
Little Currant Creek Sprs.	sec.18, T12N, R59E	38°54'02"	115°22'57"	15-Jun-83	-14.1	-105			
Unnamed Spring, White Pine Range	sec.07, T12N, R59E	38°54'36"	115°23'11"	15-Jun-83	-15.0	-116			
Nicholas Springs, White River Valley	sec.12, T12N, R61E	38°54'45"	115°03'37"	27-Apr-82	-16.1	-124	-8.0	6.5	22600
Indian Ranch Spring, White River Valley	sec.02, T12N, R61E	38°55'38"	115°04'57"	—	-15.8 (2)	-124 (2)	-5.9	2.3 (2)	31110
Preston Big Spring, White River Valley	sec.02, T12N, R61E	38°56'01"	115°04'50"	—	-15.8 (2)	-125 (2)	-5.8 (2)	12.5 (2)	17190
Well, 4 km ESE of Gardner Ranch	sec.33, T13N, R60E	38°56'52"	115°13'41"	29-Apr-82	-15.8	-118			
Big Warm Spring, Duckwater	sec.32, T13N, R56E	38°57'01"	115°42'06"	13-Jun-83	-15.9	-125	-4.4	3.1	28720
Diana's Punch Bowl (Hot Spr)	sec.22, T14N, R47E	39°01'47"	116°40'02"	1-Jan-74	-16.2	-125			
Butler Ranch, Monitor Valley	sec.02, T14N, R48E	39°04'57"	116°32'34"	1-Jan-74	-16.3	-128			
Fish Creek Springs, Little Smoky Valley	sec.08, T16N, R53E	39°16'37"	116°02'18"	17-Jul-81	-15.6	-121		3.1	28720
USGS Well #23, Smith Ck. Valley	sec.04, T16N, R40E	39°16'59"	117°29'02"	5-Aug-82	-16.4	-132			
USGS Well #55, Smith Ck. Valley	sec.27, T17N, R40E	39°17'54"	117°29'47"	12-Aug-82	-15.2	-124			
Spencer Hot Springs, Big Smoky Valley	sec.13, T17N, R45.5E	39°18'45"	116°51'05"	1-Jan-74	-16.0	-136			
Spencer Hot Springs, Big Smoky Valley	sec.12, T17N, R45.5E	39°19'31"	116°51'03"	16-Jan-85	-16.4	-135			
Sand Spring, White Pine Range	sec.21, T17N, R58E	39°19'50"	115°27'18"	14-Jul-81	-16.2	-123			
Wild Horse Spring, White Pine Range	sec.21, T17N, R58E	39°20'01"	115°26'36"	14-Jul-81	-16.8	-129			

Table 5. Summary of Isotopic Data compiled by GeoTrans, Inc.

Sample Name	Location	Latitude	Longitude	Date	$\delta^{18}\text{O}$ (‰)	δD (‰)	$\delta^{13}\text{C}$ (‰)	^{14}C (pmc)	^{14}C app. age (years)
Clobe Hot Spring, Antelope Valley	sec.28, T18N, R50E	39°24'10"	116°20'24"	1-Jan-74	-16.3	-128			
Blackbird Ranch Spring, Toiyabe Range	sec.18, T18N, R45E	39°25'41"	116°58'01"	18-Jan-85	-15.4	-119			
Blackbird Spring, Toiyabe Range	sec.01, T18N, R44E	39°26'49"	116°59'12"	13-Jul-81	-16.1	-125			

Technical Information Department • Lawrence Livermore National Laboratory
University of California • Livermore, California 94551