LA-13986-MS



# Characterization Well R-22 Geochemistry Report

Los Alamos
NATIONAL LABORATORY

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*Produced by the Risk Reduction and Environmental Stewardship Division*

*Cover photo shows a modified Foremost DR-24 dual-rotary drill rig. The DR-24 is one of several drill-rig types being used for drilling, well installation, and well development in support of the Los Alamos National Laboratory Hydrogeologic Workplan. The Hydrogeologic Workplan is jointly funded by the Environmental Restoration Project and Defense Programs to characterize groundwater flow beneath the 43-square-mile area of the Laboratory and to assess the impact of Laboratory activities on groundwater quality. The centerpiece of the Hydrogeologic Workplan is the installation of up to 32 deep wells in the regional aquifer.*

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*Issued: September 2002*

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# *Geochemistry Report*

*Patrick Longmire*

Los Alamos
NATIONAL LABORATORY

Los Alamos NM 87545

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**List of Acronyms and Abbreviations**

| | |
|---|---|
| amu | atomic mass units |
| °C | (degrees) Celsius |
| C | colorimetry |
| CVAA | cold vapor atomic absorption |
| DOC | dissolved organic carbon |
| DOM | dissolved organic matter |
| DR | dual rotation |
| Eh | oxidation-reduction potential |
| EPA | (US) Environmental Protection Agency |
| ER | Environmental Restoration (Project) |
| ESP | Environmental Surveillance Program |
| GCMS | gas chromatography mass spectrometry |
| GEL | General Engineering Laboratory |
| HE | high explosive |
| HFO | hydrous ferric oxide |
| HSA | hollow-stem auger |
| IC | ion chromatography |
| ICPMS | inductively coupled argon plasma mass spectrometry |
| ICPOES | inductively coupled argon plasma optical emission spectroscopy |
| IDL | instrument detection limit |
| IRMS | isotope ratio mass spectrometry |
| ISE | ion selective electrode |
| JMML | Jemez Mountains meteoric line |
| LANL | Los Alamos National Laboratory |
| MCL | maximum contaminant level |
| MDA | minimum detectable activity |
| MDA | material disposal area |
| MEQ | milliequivalents |
| µS/cm | microsiemans per centimeter |
| mV | millivolts |
| MWL | (worldwide) meteoric water line |
| NMED | New Mexico Environmental Department |
| NMWQCC | New Mexico Water Quality Control Commission |
| NTU | nephelometric turbidity unit |
| ORP | oxygen-reduction potential |
| pH | negative $\log_{10}$ activity of the hydrogen ion |
| PAH | polycyclic aromatic hydrocarbons |
| PCB | polychlorinated biphenyl |
| RCRA | Resource Conservation and Recovery Act |
| RL | reporting limits |

| | |
|---|---|
| RRES-R | Risk Reduction and Environmental Stewardship–Remediation |
| RRT | relative retention time |
| SI | saturation index |
| SVOC | semivolatile organic compound |
| TA | technical area |
| TDS | total dissolved solids |
| TIMS | thermal ionization mass spectrometry |
| TKN | total Kjeldahl nitrogen |
| TOC | total organic carbon |

**Metric to English Conversions**

| Multiply SI (Metric) Unit | by | To Obtain US Customary Unit |
|---|---|---|
| kilometers (km) | 0.622 | miles (mi) |
| kilometers (km) | 3281 | feet (ft) |
| meters (m) | 3.281 | feet (ft) |
| meters (m) | 39.37 | inches (in.) |
| centimeters (cm) | 0.03281 | feet (ft) |
| centimeters (cm) | 0.394 | inches (in.) |
| millimeters (mm) | 0.0394 | inches (in.) |
| micrometers or microns (µm) | 0.0000394 | inches (in.) |
| square kilometers ($km^2$) | 0.3861 | square miles ($mi^2$) |
| hectares (ha) | 2.5 | acres |
| square meters ($m^2$) | 10.764 | square feet ($ft^2$) |
| cubic meters ($m^3$) | 35.31 | cubic feet ($ft^3$) |
| kilograms (kg) | 2.2046 | pounds (lb) |
| grams (g) | 0.0353 | ounces (oz) |
| grams per cubic centimeter ($g/cm^3$) | 62.422 | pounds per cubic foot ($lb/ft^3$) |
| milligrams per kilogram (mg/kg) | 1 | parts per million (ppm) |
| micrograms per gram (µg/g) | 1 | parts per million (ppm) |
| liters (L) | 0.26 | gallons (gal.) |
| milligrams per liter (mg/L) | 1 | parts per million (ppm) |
| degrees Celsius (°C) | 9/5 + 32 | degrees Fahrenheit (°F) |

**CHARACTERIZATION WELL R-22 GEOCHEMISTRY REPORT**

**by**

**Patrick Longmire**

## ABSTRACT

This report provides analytical results for groundwater collected during four characterization-sampling rounds conducted at well R-22 from March 2001 through March 2002. Characterization well R-22 was sampled from March 6 through 13, 2001; June 19 through 26, 2001; November 30 through December 10, 2001; and February 27 through March 7, 2002. The goal of the characterization efforts was to assess the hydrochemistry and to determine whether or not contaminants are present in the regional aquifer in the vicinity of the well. A geochemical evaluation of the analytical results for the well is also presented in this report.

Characterization well R-22 is located atop the mesa separating Cañada del Buey and Pajarito Canyon, east of Material Disposal Area (MDA) G within Technical Area (TA)-54, Los Alamos National Laboratory (LANL or the Laboratory). Well R-22 is downgradient of potential release sites where metals, anions (including perchlorate), radionuclides, and organic compounds are present at TA-54.

Well R-22 was completed on December 8, 2000, with five screens (872.3 to 914.2 ft, 947.0 to 988.9 ft, 1272.2 to 1278.9 ft, 1378.2 ft to 1384.9 ft, and 1447.3 to 1452.3 ft). A Westbay® Instrument, Inc., MP55® monitoring system was set in descending order within the Cerros del Rio lavas (screens #1 and #2), upper Puye Formation (screen #3), Older basalt (screen #4), and lower Puye Formation (screen #5).

Four rounds of groundwater characterization samples, collected from the regional aquifer from depths of 907.0 ft (screen #1), 962.5 ft (screen #2), 1273.5 ft (screen #3), 1378.0 ft (screen #4), and 1448.0 ft (screen #5), were chemically characterized for radionuclides, metals and trace elements, major ions, high-explosive compounds, total organic carbon, dissolved organic carbon, organic compounds, and stable isotopes (H, N, and O). Perched groundwater was not encountered at well R-22 during drilling and characterization sampling. Groundwater (filtered and nonfiltered) samples were analyzed using laboratory methods recommended by both the US Environmental Protection Agency (EPA) and the Risk Reduction and Environmental Stewardship-Remediation (formerly the Environmental Restoration Project).

Technetium-99 was detected in the first sampling round at activities of 4.3 (screen #4) and 4.9 (screen #3) pCi/L, slightly above instrument detection limit (3.8 and 3.5 pCi/L) using liquid scintillation. This isotope was not detected during subsequent sampling rounds. The presence of technetium-99 at well R-22 is not absolutely certain because of its low activity. Activities of iodine-129 were less than detection (maximum instrument detection level of 18 pCi/L) at well R-22. Activities of tritium were occasionally less than detection (0.26 pCi/L) during several sampling rounds (screens #2, #3, and #4). This finding suggests that some of the groundwater is between 3000 and 10,000 years old and predates the beginning of nuclear testing (based on the cosmogenic baseline of tritium of 1 pCi/L prior to testing). The nondetection of tritium in some groundwater samples indicates that portions of well R-22 have not been impacted by recharge within the past 50 years. Tritium, however, was detected above 2 pCi/L in groundwater samples collected from screens #1, #2 (first sample round), and #5.

Americium-241, cesium-137, plutonium-238, plutonium-239,240, and strontium-90 were not detected in the groundwater samples collected from well R-22. Activities of uranium-234, uranium-235, and uranium-

238 were generally detected only at concentrations less than 0.5 pCi/L, similar to activities of isotopic uranium measured in supply wells O-1, O-4, PM-1 through PM-5, and the Guaje well field according to an environmental surveillance conducted at Los Alamos in 2000. Gross alpha and gross beta activities were less than 4 pCi/L in one groundwater sample collected from screen #1. A gross gamma activity of 251 pCi/L measured in the sample was attributed to isotopes within the natural uranium-238, uranium-235, and thorium-232 decay chains.

Analytical results for well R-22 show that solute concentrations within the regional aquifer, excluding manganese (EPA secondary standard for drinking water of 0.05 mg/L) and iron (EPA secondary standard for drinking water of 0.3 mg/L), were below EPA and New Mexico Environmental Department (New Mexico Water Quality Control Commission) standards. Maximum concentrations of dissolved iron and manganese observed in the regional aquifer were 14.90 and 4.41 mg/L, respectively, in screen #1 during the fourth sampling round. Elevated concentrations of natural iron and manganese were the result of reductive dissolution of ferric (oxy)hydroxide and manganese dioxide in the presence of residual drilling fluid at well R-22. Concentrations of natural iron and manganese generally decreased during characterization sampling, suggesting that residual drilling fluids are breaking down or dissociating and the well is re-equilibrating with groundwater in the regional aquifer. Reducing conditions with respect to nitrogen (ammonium and total Kjeldahl nitrogen), sulfur, iron, and manganese dominate in portions of the regional aquifer (screens #1, #4, and #5) because of residual drilling fluids. Well R-22 is also re-equilibrating with groundwater as residual drilling fluid oxidizes to inorganic carbon (bicarbonate).

Groundwater within the regional aquifer ranged from a calcium-sodium-bicarbonate ionic composition within the Cerros del Rio lavas, Older basalt, and lower Puye Formation to a sodium-calcium-bicarbonate ionic composition within the upper Puye Formation. Calculated total dissolved solids in the Cerros del Rio lavas (screens #1 and #2) ranged between 145 and 484 mg/L and from 213 to 455 mg/L in the upper (screen #3) and lower (screen #5) Puye Formation. Variation in total dissolved solids within the different zones suggests that regional aquifer groundwater is still equilibrating because of the oxidation of residual drilling fluid to bicarbonate.

Average detectable concentrations of dissolved chloride, fluoride, nitrate plus nitrite (as N), and sulfate were 3.8, 0.4, 0.4, and 2.3 mg/L, respectively, within the Cerros del Rio lavas at depths of 907.0 and 962.5 ft. Average detectable concentrations of dissolved chloride, fluoride, nitrate plus nitrite (as N), and sulfate were 3.6, 0.5, 0.2, and 13.2 mg/L, respectively, within the upper and lower Puye Formation at depths of 1273.5 and 1448.0 ft. Within the Older basalt, average detectable concentrations of dissolved chloride, fluoride, nitrate plus nitrite (as N), and sulfate were 7.9, 0.6, 0.05 (single value), and 1.0 mg/L, respectively, at a depth of 1378.0 ft. Concentrations of alkalinity varied over time in the regional aquifer, probably the result of continued oxidation of residual drilling fluid (EZ-MUD®).

Stable isotope ratios for $\delta D$ and $\delta^{18}O$ imply that the sampled groundwater at well R-22 was derived from a local meteoric source consisting of precipitation and surface water. Results of $\delta^{15}N_{AIR}$-$NO_3$ analyses suggest that fractionation of natural nitrate plus nitrite (as N) has occurred (–3.5 to +6.4‰). Ammonium and total Kjeldahl nitrogen within the regional aquifer is derived from residual drilling fluid (EZ-MUD®) ($\delta^{15}N_{AIR}$-$NH_3$ of +1.4 to +3.7‰).

Geochemical calculations using the computer program MINTEQA2 were performed to evaluate solute speciation and mineral equilibrium in assessing groundwater chemistry and refining the geochemical conceptual model for well R-22. Geochemical calculations show that the well is re-equilibrating with groundwater impacted by residual drilling fluid. Uranium(IV) is calculated to be stable as $U(OH)_4^0$ under induced reducing conditions characterized by elevated total organic carbon and dissolved organic carbon and the absence of sulfate in portions of the regional aquifer at this well. As oxidizing conditions become re-established during breakdown of drilling fluids, uranyl dicarbonate and tricarbonate complexes are

calculated to be stable in the regional aquifer (screens #2 and #3). Groundwater in the Cerros del Rio lavas (screen #2) is calculated to be undersaturated with respect to $CaCO_3$ (calcite), $BaSO_4$, $FeCO_3$, $SrCO_3$, and amorphous silica precipitate. This groundwater is calculated to be oversaturated with respect to $Ca(UO_2)_2(Si_2O_5)_3 \cdot 5H_2O$. Groundwater in the upper Puye Formation (screen #3) is calculated to be undersaturated with respect to silica precipitate and oversaturated with respect to $CaCO_3$ (calcite), $SrCO_3$, and $Ca(UO_2)_2(Si_2O_5)_3 \cdot 5H_2O$. Groundwater samples collected from screen #3 are calculated to be in equilibrium with amorphous silica gel and show variable saturation with $BaSO_4$.

## 1.0 INTRODUCTION

This report provides analytical results for four groundwater-sampling rounds conducted at characterization well R-22. The goal of the characterization efforts was to assess the hydrochemistry and to determine if contaminants are present in the regional aquifer in the vicinity of the well. Figure 1.0-1 shows the well's location atop the mesa separating Cañada del Buey and Pajarito Canyon, east of Material Disposal Area (MDA) G within Technical Area (TA)-54 of the Los Alamos National Laboratory (LANL or the Laboratory) (Ball et al. 2002, 71471). Well R-22 is downgradient of potential release sites where metals, anions, radionuclides, and organic compounds are present at TA-54 (ESP 2002, 71301).

The Risk Reduction and Environmental Stewardship-Remediation (RRES-R) Program (formerly the Environmental Restoration [ER] Project) installed well R-22 as part of groundwater investigations to satisfy requirements of the "Hydrogeologic Workplan" (LANL 1998, 59599) and to support the Laboratory's "Groundwater Protection Management Program Plan" (LANL 1996, 70215). Well R-22 was designed primarily to provide geochemical or water quality and hydrogeologic data for the regional aquifer within the Cerros del Rio lavas, Puye Formation, and Older basalt.

This report also presents a geochemical evaluation of the analytical results for well R-22 and provides hydrogeochemical interpretations using analytical results for groundwater samples collected at the well. Discussion of other hydrogeochemical data collected within the east central portion of the Laboratory, however, is deferred until they can be evaluated in the context of sitewide information collected from other ER Project and Hydrogeologic Workplan characterization wells (R-16, R-20, R-21, R-23, and R-32). Once all deep groundwater investigations in the east-central portion of the Laboratory are completed, geochemical and hydrogeologic conceptual models for several watersheds (i.e., Cañada del Buey and Pajarito Canyon) may be included in a groundwater risk analysis. These models will include an evaluation of potential contaminant transport pathways.

Although well R-22 is primarily a characterization well, its design and construction also meet the requirements of a Resource Conservation and Recovery Act (RCRA)-compliant monitoring well as described in the US Environmental Protection Agency (EPA) document "RCRA Groundwater Monitoring: Draft Technical Guidance," November 1992, EPA 530-R-93-001. Incorporation of this well into a Laboratory-wide groundwater-monitoring program will be considered and more specifically evaluated (e.g., sampling frequency, analytes, etc.) when the results of the well R-22 characterization activities are comprehensively evaluated in conjunction with other groundwater investigations in the "Hydrogeologic Workplan" (LANL 1998, 59599).

## 2.0 DRILLING METHODS AND WELL DESIGN

### 2.1 Drilling Methods

Well R-22 was drilled in two phases. Phase I was conducted in August 2000 and consisted of using the hollow-stem auger (HAS) method to drill to a depth of 47 ft within the Tshirege Member of the Bandelier Tuff (Ball et al. 2002, 71471). Phase II was conducted from September through October 2000 using rotary methods that involved a combination of casing-advance and open-hole techniques. During Phase II, well R-22 was drilled to a depth of 1489.0 ft, and a multiscreen well containing five screened intervals was installed. A Foremost™ dual rotation (DR)-24 drill rig was used during Phase II drilling (Ball et al. 2002, 71471). Well R-22 was completed on December 8, 2000.

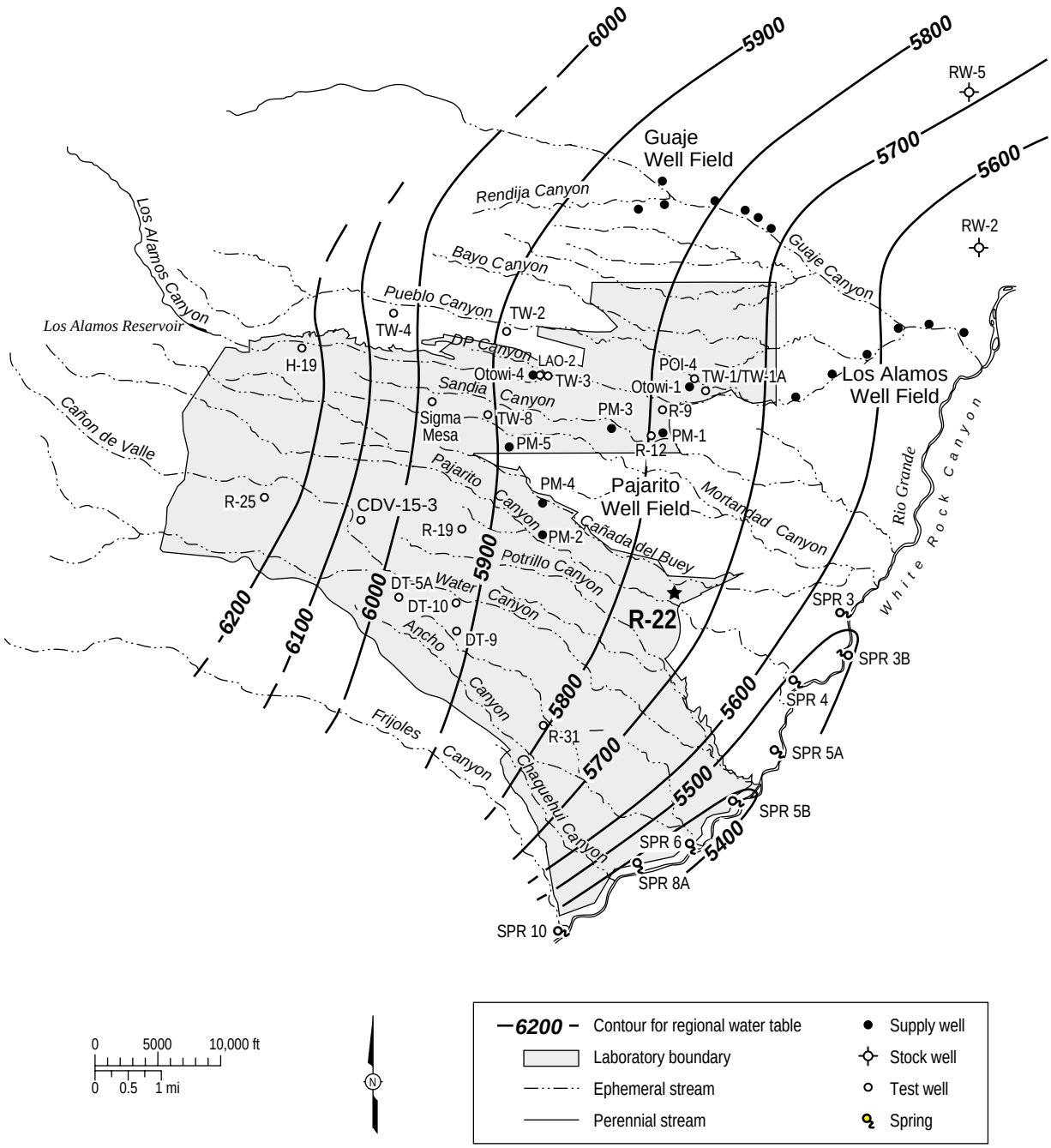
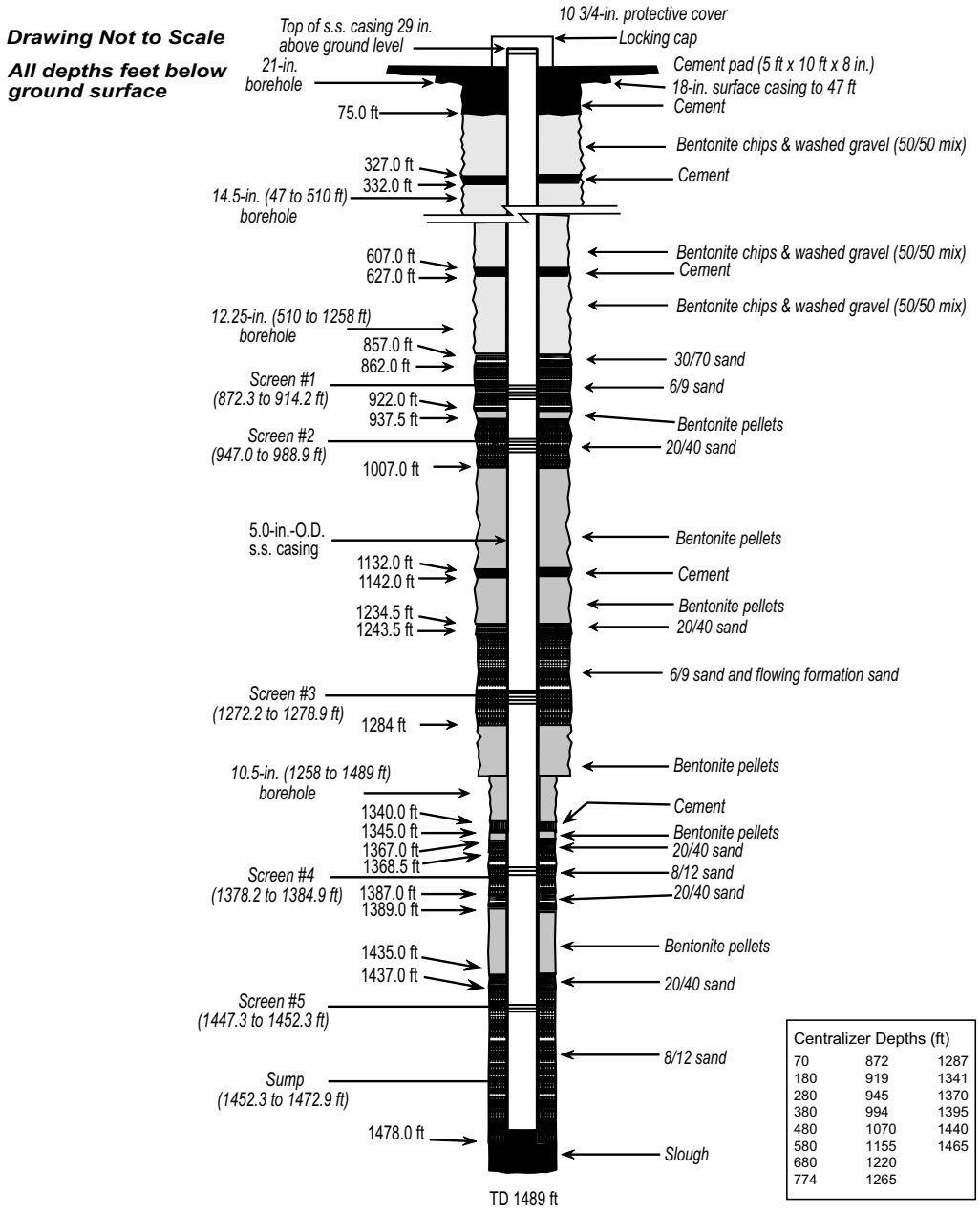



**Figure 1.0-1. Locations of well R-22, selected water supply wells, test wells, and springs near the Rio Grande, and generalized water-level contours for the regional aquifer (from Ball et al. 2002, 71471)**

During the second phase, drilling mud behind the casing was used for lubrication. TORKease® polymer, QUIKFOAM®, and EZ-MUD® bentonite slurries, mixed with community water obtained from a water line (spout) near the Los Alamos County landfill located at TA-61, were also used. These additives served to lubricate the outside of the casing system during drilling and to prevent binding the casing string to the borehole wall.

## 2.2 Well Design

Characterization well R-22 was designed as a multicompletion well with five pipe-based, wire-wrapped, stainless steel screens from 872.3 to 914.2 ft; 947.0 to 988.9 ft; 1272.2 to 1278.9 ft; 1378.2 to 1384.9 ft; and 1447.3 to 1452.3 ft (Ball et al. 2002, 71471). A Westbay® Instrument, Inc., MP55® monitoring system was set in the Cerros del Rio lavas (screens #1 and #2), upper Puye Formation (screen #3), Older basalt (screen #4), and lower Puye Formation (screen #5). Figure 2.2-1 shows final construction information for well R-22. After well development, the Westbay® MP55 System® for groundwater monitoring was installed in the steel-cased well. Model 2523 MOSDAX® System sampler-probe equipment was used to collect groundwater samples from the completed well.




*Note: The screen intervals list the footages of the pipe perforations, not the tops and bottoms of screen joints.*

**Figure 2.2-1. As-built well completion diagram of R-22 (Ball et al. 2002, 71471)**

## 3.0 HYDROGEOLOGY

### 3.1 Hydrostratigraphy

The principal hydrogeologic units penetrated in well R-22, in descending order, consist of the Tshirege Member of the Bandelier Tuff, Otowi Member of the Bandelier Tuff, Guaje Pumice Bed, Cerros del Rio lavas, an upper subunit of the Puye Formation, Older basalt, and a lower subunit of the Puye Formation (Ball et al. 2002, 71471). Continuous saturation was encountered in the regional aquifer with the water table at 883.05 ft during drilling.

Aquifer performance testing, consisting of straddle packer/injection slug tests, was conducted on well R-22. Testing of screens #2 (20-minute test duration), #3 (10-minute test duration), #4 (3-minute test duration), and #5 (3-minute test duration) resulted in hydraulic conductivities of 1.17, 2.32, 2.00, and 1.57 ft/day, respectively, using the Bouwer-Rice analytical method (Ball et al. 2002, 71471). Screen #1 straddles the regional water table, and no aquifer performance testing was conducted. Average injection rates of water for screens #2, #3, #4, and #5 were 12.6, 12.0, 16.0, and 17.0 gpm, respectively. Screen #2 is set in the Cerros del Rio lavas, screen #3 in the upper Puye Formation, screen #4 in the Older basalt, and screen #5 in the lower Puye Formation.

## 4.0 FIELD SAMPLING AND ANALYTICAL METHODS

### 4.1 Field Sampling Methods

Because of the low-flow (3.8 liters per hour) sampling method used at Westbay®-constructed wells, no casing volumes of groundwater were pumped or purged from well R-22 prior to groundwater sampling events. Field parameters including pH, specific conductance, turbidity, and temperature were recorded during each sampling event. A portable HACH® instrument (titration) was used to measure field alkalinity during the sampling events.

Groundwater samples were collected using the Westbay® MP55 system® and then were analyzed for inorganic and organic chemicals, stable isotopes, and radionuclides. Temperature, turbidity, pH, dissolved oxygen, alkalinity, and specific conductance were determined on-site from an aliquot collected during field sampling. Both filtered and nonfiltered samples were collected for chemical and radiochemical analyses. Only filtered samples were collected for analyses of isotopic americium, cesium, plutonium, strontium, and uranium during the third and fourth sampling events. Nonfiltered samples were analyzed for gross alpha, gross beta, gross gamma, technetium-99, and iodine-129 to provide a worst-case estimate of radioactivity in a groundwater sample. Groundwater samples were collected for analyses of dissolved organic carbon (DOC); total organic carbon (TOC); stable isotopes of hydrogen, oxygen, and nitrogen; major cations and anions; metals and trace elements; organic compounds; and radionuclides. Aliquots of the samples were filtered through a 0.45-µm Gelman filter and acidified with analytical-grade $HNO_3$ to a pH of 2.0 or less for metal and radionuclide analyses. DOC samples were filtered with a special 0.45-µm silver filter to eliminate biodegradation of organic solutes. All groundwater samples collected in the field were stored at 4°C until they were analyzed. The first round of groundwater characterization sampling took place approximately four months after well completion.

### 4.2 Field Parameters

Field-measured parameters for the groundwater samples, including pH, temperature, specific conductance, dissolved oxygen, and turbidity, are provided in Tables 4.2-1a through 4.2-1e. These parameters were measured at the time of sample collection when groundwater was in contact with the

atmosphere. Temperature, specific conductance, and pH were measured with an Orion meter (model 1230); turbidity was measured with a HACH® meter (model 53600-00). Both meters were calibrated daily using buffer solutions (pH 4.0 and 7.0) and known standards for turbidity. Dissolved oxygen was measured with a spectrophotometer (HACH® meter, model DR/2010) only during the fourth sampling round. Field measurements were recorded with daily activity logs submitted to the ER Project and are included in the analytical results. Turbidity values for these samples were generally less than 5 nephelometric turbidity units ([NTUs] Tables 4.2-1a through 4.2-1e), with a value as high as 39.5 NTUs in screen #1.

Measurements of water temperature on land surface recorded at well R-22 ranged from 16.7 to 24.2°C within the regional aquifer. The lowest temperature measurements were recorded in the winter of 2001. Variation in temperature reflects ambient surface temperature, even though temperature measurements were recorded immediately during sample collection.

**Table 4.2-1a**
**Field-Measured Parameters for Groundwater Samples Collected at Well R-22, Screen #1**

| Geologic Unit | Cerros del Rio lavas | Cerros del Rio lavas | Cerros del Rio lavas | Cerros del Rio lavas |
|---|---|---|---|---|
| **Depth (ft)** | **907.0** | **907.0** | **907.0** | **907.0** |
| **Date sampled (mo/d/yr)** | **03/13/01** | **06/19/01** | **011/30/01** | **02/27/02** |
| pH (standard units) | 7.21 | 6.93 | 7.16 | 7.08 |
| Dissolved oxygen (mg/L) | Not measured | Not measured | Not measured | 2.0 |
| Temperature (°C) | 19.6 | 23.0 | 18.0 | 19.3 |
| Specific conductance (µS/cm[a]) | 458 | 495 | 558 | 549 |
| Turbidity (NTU[b]) | 9.3 | 4.0 | 39.5 | 23.7 |

[a] µS/cm = microsiemens per centimeter.
[b] NTU = nephelometric turbidity unit.

**Table 4.2-1b**
**Field-Measured Parameters for Groundwater Samples Collected at Well R-22, Screen #2**

| Geologic Unit | Cerros del Rio lavas | Cerros del Rio lavas | Cerros del Rio lavas | Cerros del Rio Lavas |
|---|---|---|---|---|
| **Depth (ft)** | **962.5** | **962.5** | **962.5** | **962.5** |
| **Date sampled (mo/d/yr)** | **03/12/01** | **06/20/01** | **12/03/01** | **02/28/02** |
| pH (standard units) | 8.35 | 7.68 | 8.36 | 8.13 |
| Dissolved oxygen (mg/L) | Not measured | Not measured | Not measured | 6.4 |
| Temperature (°C) | 17.0 | 22.0 | 18.9 | 18.1 |
| Specific conductance (µS/cm[a]) | 153 | 148 | 153 | 149 |
| Turbidity (NTU[b]) | 0 | 0.6 | 0.9 | 0.3 |

[a] µS/cm = microsiemens per centimeter.
[b] NTU = nephelometric turbidity unit.

**Table 4.2-1c**
**Field-Measured Parameters for Groundwater Samples Collected at Well R-22, Screen #3**

| Geologic Unit | Puye Formation | Puye Formation | Puye Formation | Puye Formation |
|---|---|---|---|---|
| **Depth (ft)** | **1273.5** | **1273.5** | **1273.5** | **1273.5** |
| **Date sampled (mo/d/yr)** | **03/09/01** | **06/21/01** | **12/04/01** | **03/04/02** |
| pH (standard units) | 8.21 | 8.73 | 9.22 | 8.50 |
| Dissolved oxygen (mg/L) | Not measured | Not measured | Not measured | 7.6 |
| Temperature (°C) | 19.5 | 24.2 | 19.8 | 21.6 |
| Specific conductance (µS/cm[b]) | 478 | 316 | 285 | 264 |
| Turbidity (NTU[c]) | 3.8 | 1.7 | 1.5 | 0.9 |

[a]µS/cm = microsiemens per centimeter.
[b] NTU = nephelometric turbidity unit.

**Table 4.2-1d**
**Field-Measured Parameters for Groundwater Samples Collected at Well R-22, Screen #4**

| Geologic Unit | Older basalt | Older basalt | Older basalt | Older basalt |
|---|---|---|---|---|
| **Depth (ft)** | **1378.0** | **1378.0** | **1378.0** | **1378.0** |
| **Date sampled (mo/d/yr)** | **03/08/01** | **06/25/01** | **12/05/01** | **03/05/02** |
| pH (standard units) | 7.21 | 7.03 | 7.18 | 7.22 |
| Dissolved oxygen (mg/L) | Not measured | Not measured | Not measured | 3.6 |
| Temperature (°C) | 16.7 | 23.7 | 20.3 | 22.9 |
| Specific conductance (µS/cm[a]) | 533 | 523 | 509 | 456 |
| Turbidity (NTU[b]) | 12.8 | 4.0 | 14.4 | 11.7 |

[a]µS/cm = microsiemens per centimeter.
[b] NTU = nephelometric turbidity unit.

**Table 4.2-1e**
**Field-Measured Parameters for Groundwater Samples Collected at Well R-22, Screen #5**

| Geologic Unit | Puye Formation | Puye Formation | Puye Formation | Puye Formation |
|---|---|---|---|---|
| **Depth (ft)** | **1448.0** | **1448.0** | **1448.0** | **1448.0** |
| **Date sampled (mo/d/yr)** | **03/06/01** | **06/26/01** | **12/10/01** | **03/07/02** |
| pH (standard units) | 7.01 | 6.95 | 7.36 | 7.23 |
| Dissolved oxygen (mg/L) | Not measured | Not measured | Not measured | 5.9 |
| Temperature (°C) | 19.0 | 22.9 | 19.8 | 22.1 |
| Specific conductance (µS/cm[a]) | 290 | 331 | 317 | 311 |
| Turbidity (NTU[b]) | 3.1 | 4.2 | 1.2 | 5.9 |

[a]µS/cm = microsiemens per centimeter.
[b] NTU = nephelometric turbidity unit.

## 4.3 Analytical and Validation Methods

### 4.3.1 Analytical Methods

Groundwater samples were analyzed using techniques specified in EPA SW-846 methods, including ion chromatography (IC) for bromide, chloride, fluoride, oxalate, nitrate plus nitrite, perchlorate, phosphate, and sulfate. Inductively coupled argon plasma optical emission spectroscopy (ICPOES) was the analytical method for trace elements (aluminum, arsenic, barium, boron, calcium, chromium, cobalt, copper, iron, magnesium, manganese, molybdenum, nickel, potassium, selenium, silicon [silica], silver, sodium, strontium, vanadium, and zinc). Total cyanide was analyzed by colorimetry (C), and mercury was analyzed by cold vapor atomic absorption (CVAA). Ammonium was analyzed by ion selective electrode (ISE). Total Kjeldahl nitrogen (TKN) was measured by distillation at Paragon Analytics, Inc., and General Engineering Laboratory (GEL). Antimony, beryllium, cadmium, lead, thallium, and uranium were analyzed by inductively coupled argon plasma mass spectrometry (ICPMS) during the first, second, third, and fourth sampling events. Manganese and molybdenum were also analyzed by ICPMS during the third and fourth sampling rounds.

The analytical work was performed by ER Project-approved subcontractor laboratories, including Paragon Analytics, Inc., (IC, C, ISE, CVAA, and ICPOES methods for the first and second sampling events) and GEL (IC, C, ISE, CVAA, ICPOES, ICPMS methods and perchlorate-IC for the third and fourth sampling events). Alkalinity was determined in the Paragon and GEL laboratories using standard titration techniques. Laboratory blanks were analyzed according to EPA and LANL procedures. The precision limits for major ions and trace elements were generally ±10%. DOC fractionation was performed using an XAD-8 column at Huffman Laboratories. (Elution of hydrophobic and hydrophilic organic compounds is based on physical adsorption.)

Tritium activity in groundwater was determined by electrolytic enrichment and direct counting. Radiometric methods included alpha spectrometry for americium, plutonium, and uranium isotopes; gamma spectrometry for iodine-129, cesium-137, and other gamma-emitting isotopes; gas proportional counting for strontium-90; and liquid scintillation for technetium-99. These analyses were performed by contract laboratories, including Paragon Analytics, Inc., (radionuclides in first and second rounds); GEL (radionuclides in third and fourth rounds); and the University of Miami (low-level tritium).

Geochron Laboratories (Cambridge, Massachusetts) analyzed stable isotope ratios of oxygen ($\delta^{18}O$) and hydrogen ($\delta D$) using isotope ratio mass spectroscopy (IRMS). Coastal Science Laboratories, Inc., (Austin, Texas) analyzed nitrogen isotope ratios ($\delta^{15}N_{AIR}$-$NO_3$ and $\delta^{15}N_{AIR}$-$NH_3$) using IRMS.

Volatile and semivolatile organic compounds (VOC s and SVOCs), HE compounds, polychlorinated biphenyls, and pesticides were analyzed by high-pressure liquid chromatography and gas chromatography mass spectrometry. Paragon Analytics, Inc., (first and second rounds) and GEL (third and fourth rounds) performed these organic analyses.

### 4.3.2 Validation Methods

Data quality validation, performed according to ER Project standard operation procedures, was done on chemical and radiochemical analytical results for groundwater samples collected from well R-22. The validation process generally revealed no deficiencies except with selected organic analyses. Groundwater samples were analyzed within required holding times. Laboratory blanks, percent tracer recovery, laboratory duplicate samples, laboratory control samples, internal standards, spike recovery, and analyte concentrations relative to instrument detection and reporting (quantitation) limits were evaluated as part of

the validation procedure. Charge-balance errors for analytical results were calculated for major and trace ions using the computer program MINTEQA2. Percent charge balance is defined as follows:

(100)[(∑ milliequivalents cations – ∑ milliequivalents anions) divided by
(∑ milliequivalents cations + ∑ milliequivalents anions)]. Eq. 1

"Detection" of a chemical in groundwater is defined as finding an analyte concentration that exceeds the instrument detection level (IDL). Detection of a radionuclide in groundwater occurs if its activity exceeds 3σ (three standard deviations) and the instrument minimum detectable activity (MDA). The 3σ values for every radionuclide are contained in the ER Project database and were included as part of data validation. A "nondetect" is defined as an analyte concentration that is recorded but is less than the IDL. The reporting limit (RL) is defined as the instrument quantitation limit.

## 5.0 GROUNDWATER ANALYTICAL RESULTS

This section presents analytical results obtained during four sampling rounds conducted at well R-22 from March 6 through 13, 2001; June 19 through 26, 2001; November 30 through December 10, 2001; and February 27 through March 7, 2002. Analyte suites include major ions, trace elements, trace metals, radionuclides, stable isotopes, organic compounds, and DOC.

Analytical results for well R-22 show that within the regional aquifer (screens #1, #4, and #5) contaminant concentrations were below standards, excluding total manganese with an EPA secondary standard of 0.05 mg/L and dissolved manganese with a New Mexico Water Quality Control Commission (NMWQCC) standard for water supply of 0.2 mg/L. Concentrations of manganese and iron are probably derived from natural sources as a result of the reduction and dissolution of manganese minerals in the presence of residual drilling fluids. Concentrations of iron are also above the EPA standard of 0.3 mg/L and the NMWQCC standard of 1.0 mg/L in well R-22 (screens #1, #4, and #5) for several sampling events.

### 5.1 Major Ions, Metals, Radionuclides, Organic Compounds, and Stable Isotopes

Groundwater samples were collected from the regional aquifer at depths of 907.0 ft (screen #1), 962.5 ft (screen #2), 1273.5 ft (screen #3), 1378.0 ft (screen #4), and 1448.0 ft (screen #5). Measurements for both field-measured (nonfiltered) and fixed-laboratory (filtered) alkalinity are provided in Tables 5.1-1 through 5.1-5.

Selected results of inorganic and organic analytes measured at well R-22 are provided in Tables 5.1-1 through 5.1-5, and complete analytical results are provided in Appendix A. Groundwater sampled at this well had speciated charge-balance errors, calculated by MINTEQA2, that were generally less than ±5%. The positive charge-balance errors in Tables 5.1-1 through 5.1-5 indicate excess cations from analytical results, a finding that is probably the result of analytical errors within acceptable instrument precision (< ±5%) associated with ICPOES at Paragon Analytics, Inc., and GEL. Negative charge-balance errors in Tables 5.1-1 through 5.1-5 indicate excess anions from analytical results, a finding that probably results from the measurement of alkalinity off-site at Paragon Analytics, Inc., and GEL.

**Table 5.1-1**
**Hydrochemistry of Selected Analytes for Well R-22, Screen #1**

| **Depth of Measurement Port (ft)** | **907.0** | **907.0** | **907.0** | **907.0** |
|---|---|---|---|---|
| **Geologic Unit** | **Cerros del Rio lavas** | **Cerros del Rio lavas** | **Cerros del Rio lavas** | **Cerros del Rio lavas** |
| **Sample Treatment** | **Filtered** | **Filtered** | **Filtered** | **Filtered** |
| **Date Sampled (mo/d/yr)** | **03/13/01** | **06/19/01** | **11/30/01** | **02/27/02** |
| Alkalinity ($CaCO_3$ mg/L) | 230 Lab | 151 Field, **250 Lab** | **243 Field**, 242 Lab | 344 Field, **291 Lab** |
| Ca (mg/L) | 48.0 | 55.0 | 60.8 | 63.3 |
| Mg (mg/L) | 12.0 | 14.0 | 16.5 | 17.4 |
| Na (mg/L) | 19.0 | 22.0 | 24.8 | 25.9 |
| K (mg/L) | 3.5 | 4.2 | 4.2 | 4.7 |
| Cl (mg/L) | 3.8 | 3.9 | 2.8 | 10.2 |
| $SiO_2$ (mg/L) | 25.7 | 34.2 | 44.1 | 47.5 |
| $SO_4$ (mg/L) | [1.0], U[a] | [1.0], U | 0.35 | 0.26 |
| $NH_4$ (as N) (mg/L) | 0.96 | 0.70 | [0.05], U | 1.06 |
| B (mg/L) | 0.032 | [0.033], U | 0.020 | [0.023], U |
| Ba (mg/L) | 0.130 | 0.160 | 0.181 | 0.190 |
| $ClO_4$ (mg/L) | [0.004], U | [0.004], U | [0.004], U | [0.004], U |
| F (mg/L) | 0.41 | 0.46 | [0.05], U | 0.62 |
| Fe (mg/L) | 5.0 | 9.1 | 9.46 | 14.90 |
| Mn (mg/L) | 2.9 | 3.1 | 3.41 | 4.41 |
| Mo (mg/L) | 0.040 | 0.030 | 0.025 | 0.026 |
| Ni (mg/L) | 0.004 | 0.001 | [0.012], U | 0.010 |
| $NO_3 + NO_2$ (as N) (mg/L) | [0.05], U | [0.05], U | 0.06 | 0.02 |
| Sr (mg/L) | 0.250 | 0.290 | 0.324 | 0.336 |
| P (total) (mg/L) | [0.05], U | [0.05], U | 0.16 | [0.050], U |
| DOC (mgC/L) | 8.10 | Not analyzed | Not analyzed | Not analyzed |
| TOC (mgC/L), NF[b] | 11.0 | 8.3 | 6.2 | 6.5 |
| TKN (mg/L) | [1.20], U | 0.95 | 1.31 | 1.62 |
| U (mg/L) | 0.000051 | 0.00002 | [0.0002], U | [0.0002], U |
| TDS[c] (mg/L) (calculated) | 352 | 398 | 411 | 484 |
| MEQ[d] cations | 4.592 | 5.410 | 6.053 | 6.544 |
| MEQ anions | 4.736 | 5.142 | 4.959 | 6.144 |
| Charge Balance (%) | -1.55 | 2.54 | 9.93 | 3.15 |
| Am-241 (pCi/L), F[e] | [-0.005], U | [-0.008], U | [0.022], U | [0.0105], U |
| Cs-137 (pCi/L), F | [0.1], U | [-1.5], U | [0.504], U | [-0.393], U |
| I-129 (pCi/L), NF | [-3.98], U | [1.1], U | [-0.0136], U | [0.0658], U |
| Pu-238 (pCi/L), F | [-0.002], U | [0.004], U | [0], U | [-0.002], U |
| Pu-239,240 (pCi/L), F | [0.021], U | [-0.004], U | [0.020], U | [-0.0115], U |
| Sr-90 (pCi/L), F | [0.5], U | [0], U | [0.001], U | [0.0001], U |
| Tc-99 (pCi/L), NF | [2.3], U | [1.9], U | [-1.15], U | [-2.53], U |
| Tritium (pCi/L), NF | 2.01 | 2.87 | 2.30 | 2.33 |

**Table 5.1-1 (continued)**

| Depth of Measurement Port (ft) | 907.0 | 907.0 | 907.0 | 907.0 |
|---|---|---|---|---|
| **Geologic Unit** | **Cerros del Rio lavas** | **Cerros del Rio lavas** | **Cerros del Rio lavas** | **Cerros del Rio lavas** |
| **Date Sampled (mo/d/yr)** | **03/13/01** | **06/19/01** | **11/30/01** | **02/27/02** |
| Gross alpha (pCi/L), NF | [0.98], U | Not analyzed | Not analyzed | Not analyzed |
| Gross beta (pCi/L), NF | 3.29 | Not analyzed | Not analyzed | Not analyzed |
| Gross gamma (pCi/L), NF | 251 | Not analyzed | Not analyzed | Not analyzed |
| U-234 (pCi/L), F | [0.077], U | [0.072], U | 0.033 | 0.0427 |
| U-235 (pCi/L), F | [-0.001], U | [0.008], U | [0.0039], U | [-0.0033], U |
| U-238 (pCi/L), F | [0.046], U | [0.062], U | [0.0156], U | [0.0099], U |
| δD (‰), NF | -78 | -76 | -77 | -79 |
| $\delta^{15}N$ ($NH_3$) (‰), NF | Insufficient sample volume[f] | +1.6 | +1.4 | +3.3 |
| $\delta^{15}N$ ($NO_3$) (‰), NF | +3.3 | Insufficient sample volume | Insufficient sample volume | Insufficient sample volume |
| $\delta^{18}O$ (‰), NF | -11.0 | -10.8 | -11.0 | -10.8 |

[a] U = not detected.

[b] NF = nonfiltered.

[c] TDS = total dissolved solids

[d] MEQ = milliequivalents.

[e] F= filtered.

[f] Nitrate (N) and ammonium (N) concentrations less than 1 mg/L require a one-gallon sample to measure $\delta^{15}N$.

**Table 5.1-2**
**Hydrochemistry of Selected Analytes for Well R-22, Screen #2**

| Depth of Measurement Port (ft) | 962.5 | 962.5 | 962.5 | 962.5 |
|---|---|---|---|---|
| **Geologic Unit** | **Cerros del Rio lavas** | **Cerros del Rio lavas** | **Cerros del Rio lavas** | **Cerros del Rio lavas** |
| **Sample Treatment** | **Filtered** | **Filtered** | **Filtered** | **Filtered** |
| **Date Sampled (mo/d/yr)** | **03/12/01** | **06/20/01** | **12/03/01** | **02/28/02** |
| Alkalinity ($CaCO_3$ mg/L | **65.7 Field**, 71 Lab | **64 Field**, 70 Lab | **65 Field**, 84.7 Lab | **71 Field**, 78.8 Lab |
| Ca (mg/L) | 9.3 | 9.6 | 10.6 | 10.8 |
| Mg (mg/L) | 4.5 | 4.7 | 5.1 | 5.1 |
| Na (mg/L) | 11.0 | 11.0 | 12.6 | 12.2 |
| K (mg/L) | 3.1 | 3.2 | 3.1 | 3.2 |
| Cl (mg/L) | 3.1 | 2.6 | 1.9 | 2.4 |
| $SiO_2$ (mg/L) | 68.5 | 64.2 | 42.2 | 67.8 |
| $SO_4$ (mg/L) | 3.9 | 3.5 | 2.8 | 3.2 |
| $NH_4$ (as N) (mg/L) | [0.05], U[a] | [0.10], U | 1.02 | [0.05], U |
| B (mg/L) | [0.017], U | [0.012], U | [0.05], U | [0.05], U |
| Ba (mg/L) | 0.014 | 0.013 | 0.017 | 0.015 |
| $ClO_4$ (mg/L) | [0.004], U | [0.004], U | [0.004], U | [0.004], U |
| F (mg/L) | 0.29 | 0.46 | [0.05], U | 0.36 |

**Table 5.1-2 (continued)**

| Depth of Measurement Port (ft) | 962.5 | 962.5 | 962.5 | 962.5 |
|---|---|---|---|---|
| Geologic Unit | Cerros del Rio lavas | Cerros del Rio lavas | Cerros del Rio lavas | Cerros del Rio lavas |
| Date Sampled (mo/d/yr) | 03/12/01 | 06/20/01 | 12/03/01 | 02/28/02 |
| Fe (mg/L) | [0.05], U | [0.01], U | 0.11 | [0.05], U |
| Mn (mg/L) | 0.003 | 0.004 | 0.02 | 0.005 |
| Mo (mg/L) | [0.004], U | [0.004], U | 0.002 | 0.001 |
| Ni (mg/L) | [0.0006], U | [0.0003], U | [0.012], U | [0.005], U |
| $NO_3 + NO_2$ (as N) (mg/L) | 0.72 | 0.61 | 0.58 | 0.58 |
| Sr (mg/L) | 0.045 | 0.043 | 0.054 | 0.055 |
| P (total) (mg/L) | [0.02], U | [0.05], U | 0.08 | 0.04 |
| DOC (mgC/L) | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| TOC (mgC/L) ), NF[b] | 0.3 | Not analyzed | 0.9 | 0.3 |
| TKN (mg/L) | 0.24 | 0.28 | 0.18 | 0.16 |
| U (mg/L) | 0.000478 | 0.00042 | 0.00021 | 0.00039 |
| TDS[c] (mg/L) (calculated) | 170 | 170 | 145 | 177 |
| MEQ[d] cations | 1.394 | 1.428 | 1.582 | 1.573 |
| MEQ anions | 1.497 | 1.449 | 1.419 | 1.576 |
| Charge Balance (%) | -3.58 | -0.76 | 5.45 | -0.10 |
| Am-241 (pCi/L), F[e] | [0.012], U | [0.004], U | [0.0125], U | [0.0122], U |
| Cs-137 (pCi/L), F | [1.3], U | [0.4], U | [1.02], U | [0.324], U |
| I-129 (pCi/L), NF | [-2.52], U | [1.3], U | [-0.238], U | [0.196], U |
| Pu-238 (pCi/L), F | [-0.001], U | [0.003], U | [0], U | [-0.007], U |
| Pu-239,240 (pCi/L), F | [0.006], U | [-0.004], U | [0.008], U | [0.004], U |
| Sr-90 (pCi/L), F | [0.7], U | [1.1], U | [0.009], U | [-0.004], U |
| Tc-99 (pCi/L), NF | [3.7], U | [-0.04], U | [1.04], U | [-0.13], U |
| Tritium (pCi/L), NF | 76.61 | [-0.10], U | [-0.32], U | [-0.16], U |
| Gross alpha (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| Gross beta (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| Gross gamma (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| U-234 (pCi/L), F | 0.29 | 0.34 | 0.268 | 0.27 |
| U-235 (pCi/L), F | [0.016], U | [0.02], U | [0.0096], U | [8.67], U |
| U-238 (pCi/L), F | [0.174], U | 0.127 | 0.115 | 0.108 |
| δD (‰), NF | -78 | -75 | -77 | -77 |
| $\delta^{15}N$ ($NH_3$) (‰), NF | Insufficient sample volume[f] | Insufficient sample volume | Insufficient sample volume | Insufficient sample volume |
| $\delta^{15}N$ ($NO_3$) (‰), NF | +2.6 | +0.6 | +2.7 | +5.6 |
| $\delta^{18}O$ (‰), NF | -11.3 | -11.1 | -11.2 | -11.0 |

[a] U = not detected.
[b] NF = nonfiltered.
[c] TDS = total dissolved solids
[d] MEQ = milliequivalents.
[e] F= filtered.
[f] Nitrate (N) and ammonium (N) concentrations less than 1 mg/L require a one-gallon sample to measure $\delta^{15}N$.

**Table 5.1-3**
**Hydrochemistry of Selected Analytes for Well R-22, Screen #3**

| **Depth of Measurement Port (ft)** | **1273.5** | **1273.5** | **1273.5** | **1273.5** |
|---|---|---|---|---|
| **Geologic Unit** | **Puye Formation** | **Puye Formation** | **Puye Formation** | **Puye Formation** |
| **Sample Treatment** | **Filtered** | **Filtered** | **Filtered** | **Filtered** |
| **Date Sampled (mo/d/yr)** | **03/09/01** | **06/21/01** | **12/04/01** | **03/04/02** |
| Alkalinity ($CaCO_3$mg/L) | **248 Field**, 250 Lab | 63 Field, **140 Lab** | **108 Field**, 125 Lab | **142 Field**, 128 Lab |
| Ca (mg/L) | 35.0 | 10.0 | 9.1 | 17.7 |
| Mg (mg/L) | 11.0 | 4.5 | 3.2 | 4.9 |
| Na (mg/L) | 54.0 | 41.0 | 39.1 | 31.1 |
| K (mg/L) | 9.7 | 7.5 | 7.2 | 7.1 |
| Cl (mg/L) | 3.9 | 4.0 | 4.4 | 4.3 |
| $SiO_2$ (mg/L) | 57.8 | 34.2 | 26.7 | 45.8 |
| $SO_4$ (mg/L) | 31.0 | 27.0 | 12.9 | 7.0 |
| $NH_4$ (as N) (mg/L) | [0.50], U[a] | [0.10], U | [0.05], U | [0.05], U |
| As (mg/L) | 0.003 | 0.004 | [0.005], U | [0.005], U |
| B (mg/L) | 0.072 | 0.046 | 0.045 | 0.032 |
| Ba (mg/L) | 0.140 | 0.048 | 0.051 | 0.099 |
| $ClO_4$ (mg/L) | [0.004], U | [0.004], U | [0.004], U | [0.004], U |
| F (mg/L) | 0.63 | 0.66 | 0.67 | 0.58 |
| Fe (mg/L) | 0.20 | [0.09], U | [0.03], U | [0.05], U |
| Mn (mg/L) | 0.20 | 0.018 | 0.014 | 0.021 |
| Mo (mg/L) | 0.011 | 0.016 | 0.012 | 0.009 |
| Ni (mg/L) | 0.001 | 0.001 | [0.005], U | [0.005], U |
| $NO_3 + NO_2$ (as N) (mg/L) | 0.40 | 0.23 | 0.25 | 0.18 |
| Sr (mg/L) | 0.940 | 0.44 | 0.578 | 0.584 |
| P (total) (mg/L) | [0.05], U | [0.05], U | 0.12 | [0.02], U |
| DOC (mgC/L) | 6.3 | Not analyzed | Not analyzed | Not analyzed |
| TOC (mgC/L), NF[b] | Not analyzed | 4.9 | 4.1 | 2.9 |
| TKN (mg/L) | 1.70 | 1.00 | 1.15 | 0.68 |
| U (mg/L) | 0.0152 | 0.00844 | 0.00192 | 0.00248 |
| TDS[c] (mg/L) (calculated) | 455 | 271 | 213 | 264 |
| MEQ[d] cations | 5.289 | 2.857 | 2.633 | 2.837 |
| MEQ anions | 5.747 | 3.508 | 2.598 | 3.014 |
| Charge Balance (%) | -4.15 | -10.23 | 0.67 | -3.03 |
| Am-241 (pCi/L), F[e] | [0.006], U | [0.009], U | [0.0325], U | [0.012], U |
| Cs-137 (pCi/L), F | [-1.7], U | [-1.3], U | [0.29], U | 0.807], U |
| I-129 (pCi/L), NF | [18], U | [-3.57], U | [0.512], U | [-0.006], U |
| Pu-238 (pCi/L), F | [-0.005], U | [-0.013], U | [0.0025], U | [0.003], U |
| Pu-239,240 (pCi/L), F | [0], U | [0], U | [0.0025], U | [-0.0001], U |
| Sr-90 (pCi/L), F | [0.9], U | [0.7], U | [0.052], U | [-0.01], U |
| Tc-99 (pCi/L), NF | 4.9 | [2], U | [-0.919], U | [0.021], U |
| Tritium (pCi/L), NF | 0.10 | 0.89 | [0.22], U | [-0.06], U |
| Gross alpha (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| Gross beta (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| Gross gamma (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| U-234 (pCi/L), F | 7.6 | [1.68], U | 0.994 | 1.39 |

**Table 5.1-3 (continued)**

| **Depth of Measurement Port (ft)** | **1273.5** | **1273.5** | **1273.5** | **1273.5** |
|---|---|---|---|---|
| **Geologic Unit** | **Puye Formation** | **Puye Formation** | **Puye Formation** | **Puye Formation** |
| **Date Sampled (mo/d/yr)** | **03/09/01** | **06/21/01** | **12/04/01** | **03/04/02** |
| U-235 (pCi/L), F | 0.267 | [0.065], U | 0.040 | 0.0412 |
| U-238 (pCi/L), F | 4.92 | [0.89], U | 0.616 | 0.829 |
| δD (‰), NF | -76 | -73 | -73 | -78 |
| $\delta^{15}N$ ($NH_3$) (‰), NF | Insufficient sample volume[f] | Insufficient sample volume | Insufficient sample volume | Insufficient sample volume |
| $\delta^{15}N$ ($NO_3$) (‰), NF | -3.5 | +0.7 | +1.2 | +6.4 |
| $\delta^{18}O$ (‰), NF | -11.2 | -11.0 | -10.9 | -10.7 |

[a] U = not detected.
[b] NF = nonfiltered.
[c] TDS = total dissolved solids
[d] MEQ = milliequivalents.
[e] F= filtered.
[f] Nitrate (N) and ammonium (N) concentrations less than 1 mg/L require a one-gallon sample to measure $\delta^{15}N$.

**Table 5.1-4**
**Hydrochemistry of Selected Analytes for Well R-22, Screen #4**

| **Depth of Measurement Port (ft)** | **1378.0** | **1378.0** | **1378.0** | **1378.0** |
|---|---|---|---|---|
| **Geologic Unit** | **Older basalt** | **Older basalt** | **Older basalt** | **Older basalt** |
| **Sample Treatment** | **Filtered** | **Filtered** | **Filtered** | **Filtered** |
| **Date Sampled (mo/d/yr)** | **03/08/01** | **06/25/01** | **12/05/01** | **03/05/02** |
| Alkalinity ($CaCO_3$ mg/L) | **258 field**, 280 Lab | 119 Field, **270 Lab** | **255 Field**, 304 Lab | **285 Field**, 300 Lab |
| Ca (mg/L) | 61.0 | 54.0 | 48.5 | 44.8 |
| Mg (mg/L) | 15.0 | 14.0 | 12.9 | 12.0 |
| Na (mg/L) | 23.0 | 30.0 | 42.5 | 44.9 |
| K (mg/L) | 5.1 | 5.6 | 4.9 | 4.7 |
| Cl (mg/L) | 7.8 | 8.3 | 8.1 | 7.5 |
| $SiO_2$ (mg/L) | 34.2 | 44.9 | 47.7 | 55.6 |
| $SO_4$ (mg/L) | [1.0], U[a] | [1.0], U | 0.89 | 1.12 |
| $NH_4$ (as N) (mg/L) | 1.80 | 1.0 | 0.99 | 0.76 |
| As (mg/L) | [0.001], U | 0.004 | [0.005], U | [0.005], U |
| B (mg/L) | 0.086 | 0.100 | 0.091 | 0.097 |
| Ba (mg/L) | 0.360 | 0.320 | 0.310 | 0.314 |
| $ClO_4$ (mg/L) | [0.004], U | [0.004], U | [0.004], U | [0.004], U |
| F (mg/L) | 0.80 | 0.51 | 0.63 | 0.62 |
| Fe (mg/L) | 4.90 | 5.70 | 3.23 | 2.47 |
| Mn (mg/L) | 1.60 | 1.60 | 1.18 | 1.20 |
| Mo (mg/L) | 0.042 | 0.024 | 0.013 | 0.010 |
| Ni (mg/L) | 0.003 | 0.005 | 0.004 | 0.003 |
| $NO_3$ + $NO_2$ (as N) (mg/L) | [0.10], U | [0.05], U | 0.05 | [0.05], U |
| Sr (mg/L) | 1.10 | 1.00 | 0.973 | 0.958 |

**Table 5.1-4 (continued)**

| Depth of Measurement Port (ft) | 1378.0 | 1378.0 | 1378.0 | 1378.0 |
|---|---|---|---|---|
| Geologic Unit | Older basalt | Older basalt | Older basalt | Older basalt |
| Date Sampled (mo/d/yr) | 03/08/01 | 06/25/01 | 12/05/01 | 03/05/02 |
| P (total) (mg/L) | 0.094 | [0.05], U | 0.14 | [0.05], U |
| DOC (mgC/L) | 8.3 | Not analyzed | Not analyzed | Not analyzed |
| TOC (mgC/L), NF[b] | Not analyzed | 23.0 | 20.1 | 18.0 |
| TKN (mg/L) | 2.30 | 1.50 | 1.17 | 1.17 |
| U (mg/L) | 0.000081 | 0.000079 | 0.00002 | 0.00029 |
| TDS[c] (mg/L) (calculated) | 417 | 439 | 429 | 464 |
| MEQ[d] cations | 5.675 | 5.586 | 5.643 | 5.457 |
| MEQ anions | 5.439 | 5.669 | 5.392 | 5.996 |
| Charge Balance (%) | 2.12 | -0.74 | 2.28 | -4.46 |
| Am-241 (pCi/L), F[e] | [-0.001], U | [0.004], U | [0.0118], U | [0.0254], U |
| Cs-137 (pCi/L), F | [0.7], U | [2.5], U | [0.232], U | [-0.528], U |
| I-129 (pCi/L), NF | [-5.43], U | [0.12], U | [0.26], U | [0.383], U |
| Pu-238 (pCi/L), F | [-0.002], U | [-0.003], U | [-0.002], U | [0.0123], U |
| Pu-239,240 (pCi/L), F | [0.008], U | [0], U | [0.004], U | [0.0123], U |
| Sr-90 (pCi/L), F | [0.8], U | [0], U | [0.015], U | [0.0377], U |
| Tc-99 (pCi/L), NF | 4.3 | [1.1],U | [-0.112], U | [-1.51], U |
| Tritium (pCi/L), NF | 0.45 | [-0.13], U | [0.26], U | 0.26 |
| Gross alpha (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| Gross beta (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| Gross gamma (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| U-234 (pCi/L), F | 0.108 | [0.068], U | 0.072 | 0.0973 |
| U-235 (pCi/L), F | [0.013], U | [-0.008], U | [0.022], U | [0.005], U |
| U-238 (pCi/L), F | 0.065 | [0.093], U | [0.037], U | 0.0497 |
| δD (‰), NF | -76 | -78 | -72 | -74 |
| $\delta^{15}N$ ($NH_3$) (‰), NF | +3.1 | +2.1 | Insufficient sample volume[f] | +3.7 |
| $\delta^{15}N$ ($NO_3$) (‰), NF | Insufficient sample volume | Insufficient sample volume | +5.5 | Insufficient sample volume |
| $\delta^{18}O$ (‰), NF | -11.0 | -10.8 | -10.5 | -10.5 |

[a] U = not detected.

[b] NF = nonfiltered.

[c] MEQ = milliequivalents.

[d] TDS = total dissolved solids

[e] F= filtered.

[f] Nitrate (N) and ammonium (N) concentrations less than 1 mg/L require a one-gallon sample to measure $\delta^{15}N$.

**Table 5.1-5**
**Hydrochemistry of Selected Analytes for Well R-22, Screen #5**

| **Depth of Measurement Port (ft)** | **1448.0** | **1448.0** | **1448.0** | **1448.0** |
|---|---|---|---|---|
| **Geologic Unit** | **Puye Formation** | **Puye Formation** | **Puye Formation** | **Puye Formation** |
| **Sample Treatment** | **Filtered** | **Filtered** | **Filtered** | **Filtered** |
| **Date Sampled (mo/d/yr)** | **03/06/01** | **06/26/01** | **12/10/01** | **03/07/02** |
| Alkalinity ($CaCO_3$ mg/L) | **143 Field**, 150 Lab | **150 Field**, 160 Lab | **147 Field**, 179 Lab | **185 Field**, 163 Lab |
| Ca (mg/L) | 33.0 | 37.0 | 37.6 | 36.6 |
| Mg (mg/L) | 5.3 | 6.1 | 5.7 | 6.6 |
| Na (mg/L) | 11.0 | 14.0 | 18.2 | 20.7 |
| K (mg/L) | 3.2 | 4.0 | 4.4 | 4.7 |
| Cl (mg/L) | 4.2 | 2.5 | 2.7 | 2.5 |
| $SiO_2$ (mg/L) | 49.2 | 49.2 | 46.9 | 53.5 |
| $SO_4$ (mg/L) | [1.0], U[a] | [1.0], U | 0.53 | 0.51 |
| $NH_4$ (as N) (mg/L) | 1.10 | 0.66 | 0.63 | 0.52 |
| B (mg/L) | [0.03], U | 0.029 | 0.020 | 0.019 |
| Ba (mg/L) | 0.120 | 0.130 | 0.144 | 0.137 |
| $ClO_4$ (mg/L) | [0.004], U | [0.004], U | [0.004], U | [0.004], U |
| F (mg/L) | 0.41 | 0.41 | 0.40 | 0.41 |
| Fe (mg/L) | 4.30 | 2.10 | 2.21 | 1.53 |
| Mn (mg/L) | 0.53 | 0.63 | 0.46 | 0.54 |
| Mo (mg/L) | 0.028 | 0.023 | 0.027 | 0.027 |
| Ni (mg/L) | 0.001 | 0.001 | [0.005], U | 0.001 |
| $NO_3$ + $NO_2$ (as N) (mg/L) | [0.10], U | [0.05], U | 0.01 | [0.05], U |
| Sr (mg/L) | 0.260 | 0.310 | 0.312 | 0.306 |
| P (total) (mg/L) | 0.04 | [0.05], U | 0.19 | 0.02 |
| DOC (mgC/L) | 5.6 | Not analyzed | Not analyzed | Not analyzed |
| TOC (mgC/L), NF[b] | 13.0 | 6.1 | 4.9 | 3.7 |
| TKN (mg/L) | 1.9 | 1.20 | 1.22 | 0.98 |
| U (mg/L) | [0.00018], U | 0.000061 | 0.00007 | [0.0002], U |
| TDS[c] (mg/L) (calculated) | 257 | 268 | 273 | 315 |
| MEQ[d] cations | 2.820 | 3.167 | 3.355 | 3.474 |
| MEQ anions | 3.012 | 3.100 | 3.064 | 3.802 |
| Charge Balance (%) | -3.30 | 1.07 | 4.53 | -4.50 |
| Am-241 (pCi/L), F[e] | [0.011], U | [0.004], U | [0.014], U | [0.003], U |
| Cs-137 (pCi/L), F | [-0.7], U | [-3.2], U | [-1.67], U | [-0.241], U |
| I-129 (pCi/L), NF | Not analyzed | [-0.86], U | [0.378], U | [0.076], U |
| Pu-238 (pCi/L), F | [0.003], U | [0.021], U | [0.014], U | [0.008], U |
| Pu-239,240 (pCi/L), F | [0.01], U | [0.004], U | [0.028], U | [0.015], U |
| Sr-90 (pCi/L), F | [0.3], U | [0.3], U | [-0.045], U | [-0.028], U |
| Tc-99 (pCi/L), NF | Not analyzed | [0.85], U | [0.090], U | [-0.298], U |
| Tritium (pCi/L), NF | 3.54 | 14.24 | 18.45 | 15.23 |
| Gross alpha (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| Gross beta (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| Gross gamma (pCi/L), NF | Not analyzed | Not analyzed | Not analyzed | Not analyzed |
| U-234 (pCi/L), F | 0.069 | 0.148 | 0.069 | 0.082 |

**Table 5.1-5 (continued)**

| Depth of Measurement Port (ft) | 1448.0 | 1448.0 | 1448.0 | 1448.0 |
|---|---|---|---|---|
| Geologic Unit | Puye Formation | Puye Formation | Puye Formation | Puye Formation |
| Date Sampled (mo/d/yr) | 03/06/01 | 06/26/01 | 12/10/01 | 03/07/02 |
| U-235 (pCi/L), F | [0.01], U | [0.031], U | [0.015], U | [0.007], U |
| U-238 (pCi/L), F | 0.062 | [0.041], U | [0.023], U | 0.052 |
| δD (‰), NF | -76 | -80 | -74 | -77 |
| $\delta^{15}N$ ($NH_3$) (‰), NF | +2.1 | +2.5 | Insufficient sample volume[f] | Insufficient sample volume |
| $\delta^{15}N$ ($NO_3$) (‰), NF | Insufficient sample volume | Insufficient sample volume | +4.2 | Insufficient sample volume |
| $\delta^{18}O$ (‰), NF | -11.2 | -11.2 | -10.7 | -11.3 |

[a] U = not detected.
[b] NF = nonfiltered.
[c] TDS = total dissolved solids
[d] MEQ = milliequivalents.
[e] F= filtered.
[f] Nitrate (N) and ammonium (N) concentrations less than 1 mg/L require a one-gallon sample to measure $\delta^{15}N$.

Gross alpha, gross beta, gross gamma, TOC, and DOC were not analyzed during some of the sampling events because of limited sample volumes collected from screens #1 through #5. The nonroutine parameters (TOC and DOC) did not need to be sampled quarterly. Analysis of stable isotopes of nitrogen requires a one-gallon sample if nitrate plus nitrite (as N) and ammonium (as N) concentrations are less than 1 mg/L. One-liter samples were typically collected for this analysis because of sample volume limitations. Screens #1 through #5 are within the regional aquifer and provide additional sampling ports within the Cerros del Rio lavas, Puye Formation, and Older basalt.

Concentrations of alkalinity, in bold in the Tables 5.1-1 through 5.1-5 above, were used for discussion in this report. Alkalinity was measured in the field and/or in an analytical laboratory, and generally field-measured alkalinity is more representative of groundwater conditions because of sample degassing prior to titration. Degassing of carbon dioxide results in higher pH values that cause a change in concentrations of bicarbonate and carbonate. The carbonate anion becomes more stable over bicarbonate at higher pH values (10.33 at 25°C). The most consistent alkalinity concentrations (in bold in Tables 5.1-1 through 5.1-5) provided the lowest charge-balance errors.

Distributions of major solutes in groundwater sampled from well R-22 are shown in Figures 5.1-1 through 5.1-5. Groundwater within the regional aquifer ranges from a calcium-sodium-bicarbonate ionic composition within the Cerros del Rio lavas (907.0 and 962.5 ft) (Figures 5.1-1 and 5.1-2) to a sodium-calcium-bicarbonate-sulfate ionic composition within the upper Puye Formation (1273.5 ft) (Figure 5.1-3). Groundwater collected from 962.5 ft has the lowest concentrations of major solutes and may approximate predrilling groundwater at well R-22. Elevated concentrations of sulfate and sodium in groundwater samples collected from screen #3 (1273.5 ft) probably resulted from colloidal bentonite present in the filter pack. Bentonite was used during well construction to prevent leakage down the well annulus between filter packs. Groundwater collected from screen #4 (1378.0 ft) is characterized by increasing concentrations of sodium and silica and decreasing concentrations of calcium (Figure 5.1-4). Precipitation of $CaCO_3$ (calcite) accounts for decreasing concentrations of calcium based on calculations using MINTEQA2 (Allison et al. 1991, 49930). Cation exchange between sodium and calcium may also contribute to decreasing concentrations of dissolved calcium. Groundwater within the lower Puye Formation is characterized by a calcium-sodium-bicarbonate composition with increasing concentrations of alkalinity occurring during characterization sampling (Figure 5.1-5).

Calculated total dissolved solids (TDS) in the Cerros del Rio lavas (screens #1 and #2) ranged from 145 to 484 mg/L (Tables 5.1-1 and 5.1-2) and from 213 to 455 mg/L in the upper (screen #3) and lower (screen #5) Puye Formation (Tables 5.1-3 and 5.1-5). Calculated TDS in the Older basalt (screen #4) ranged from 417 to 464 mg/L. Variation in TDS within the different zones suggests that regional aquifer groundwater is still equilibrating because of the oxidation of residual drilling fluid to bicarbonate. Average detectable concentrations of dissolved chloride, fluoride, nitrate plus nitrite (as N), and sulfate were 3.8, 0.4, 0.4, and 2.3 mg/L, respectively, within the Cerros del Rio lavas at depths of 907.0 and 962.5 ft (Tables 5.1-1 and 5.1-2). Average detectable concentrations of dissolved chloride, fluoride, nitrate plus nitrite (as N), and sulfate were 3.6, 0.5, 0.2, and 13.2 mg/L, respectively, within the upper and lower Puye Formation at depths of 1273.5 and 1448.0 ft (Tables 5.1-3 and 5.1-5), respectively. Within the Older basalt, average detectable concentrations of dissolved chloride, fluoride, nitrate plus nitrite (as N), and sulfate were 7.9, 0.6, 0.05 (single value), and 1.0 mg/L, respectively, at a depth of 1378.0 ft (Table 5.1-4). Concentrations of alkalinity varied over time in the regional aquifer, probably the result of continued oxidation of residual drilling fluid (EZ-MUD®).

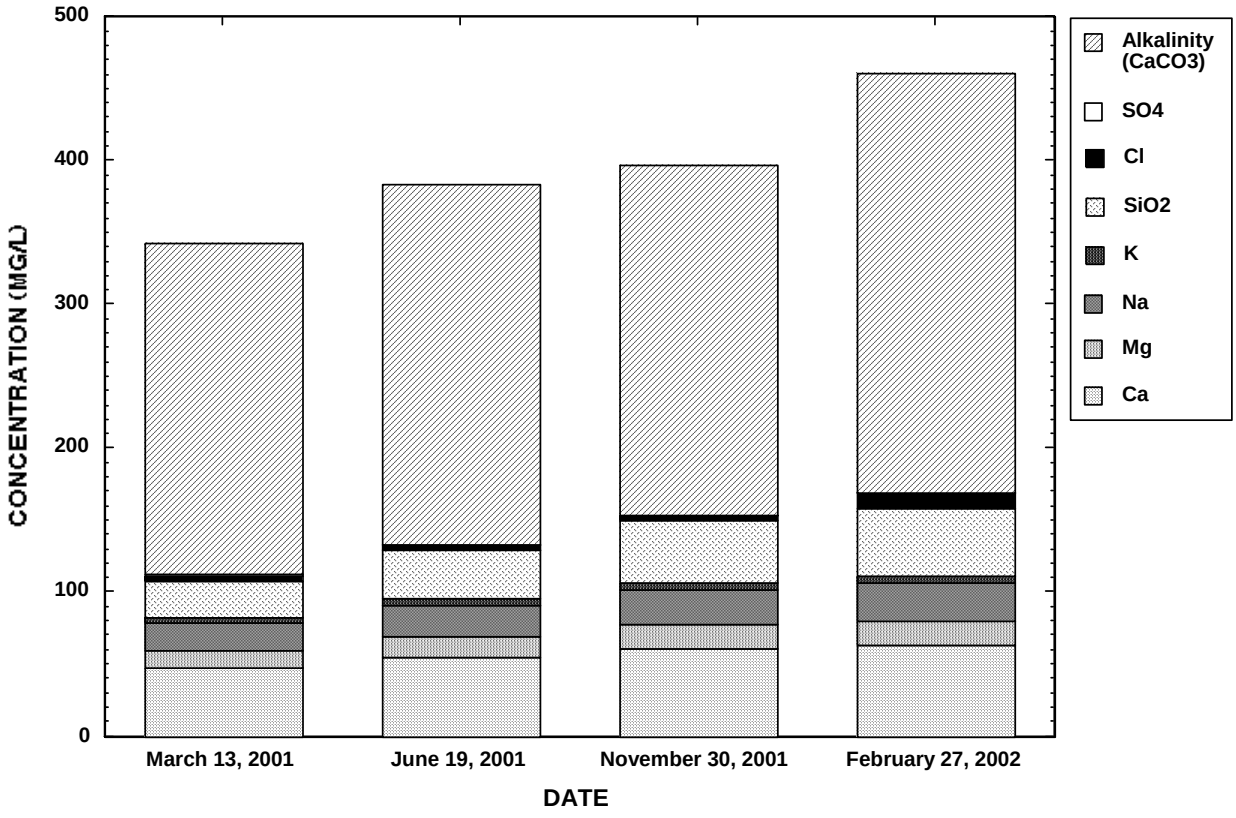



**Figure 5.1-1. Major ion chemistry for well R-22 (regional aquifer, 907.0 ft), screen #1**

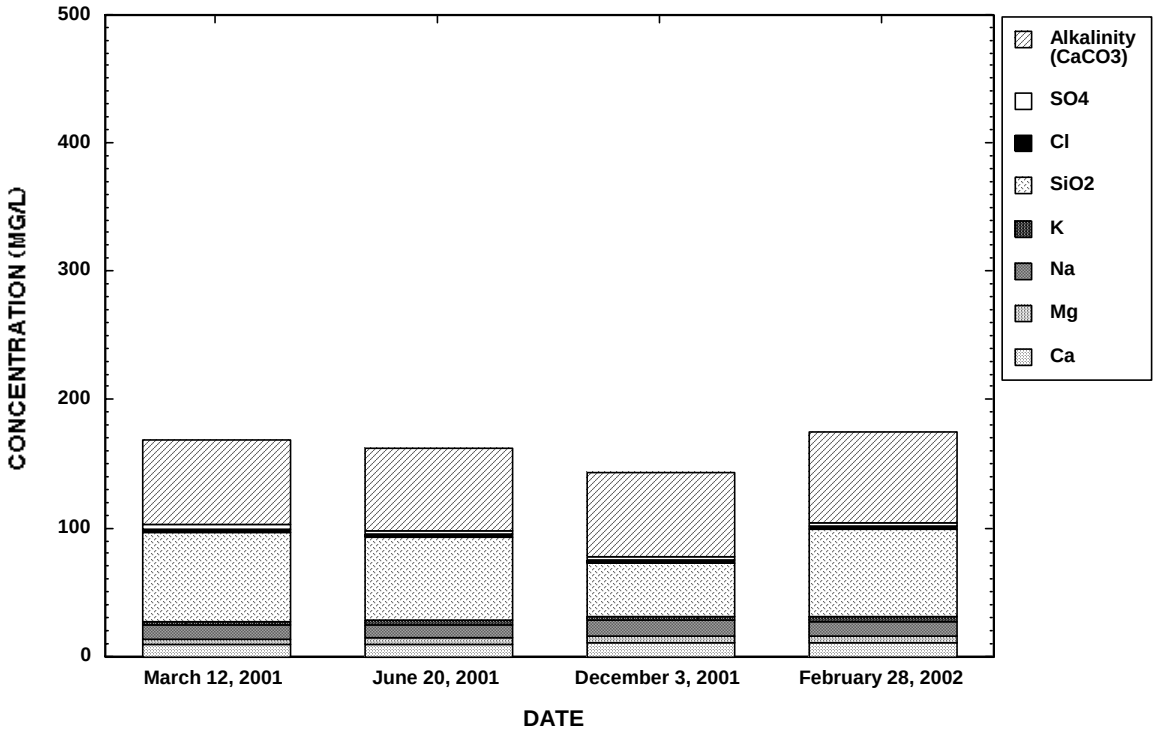



**Figure 5.1-2. Major ion chemistry for well R-22 (regional aquifer, 962.5 ft), screen #2**

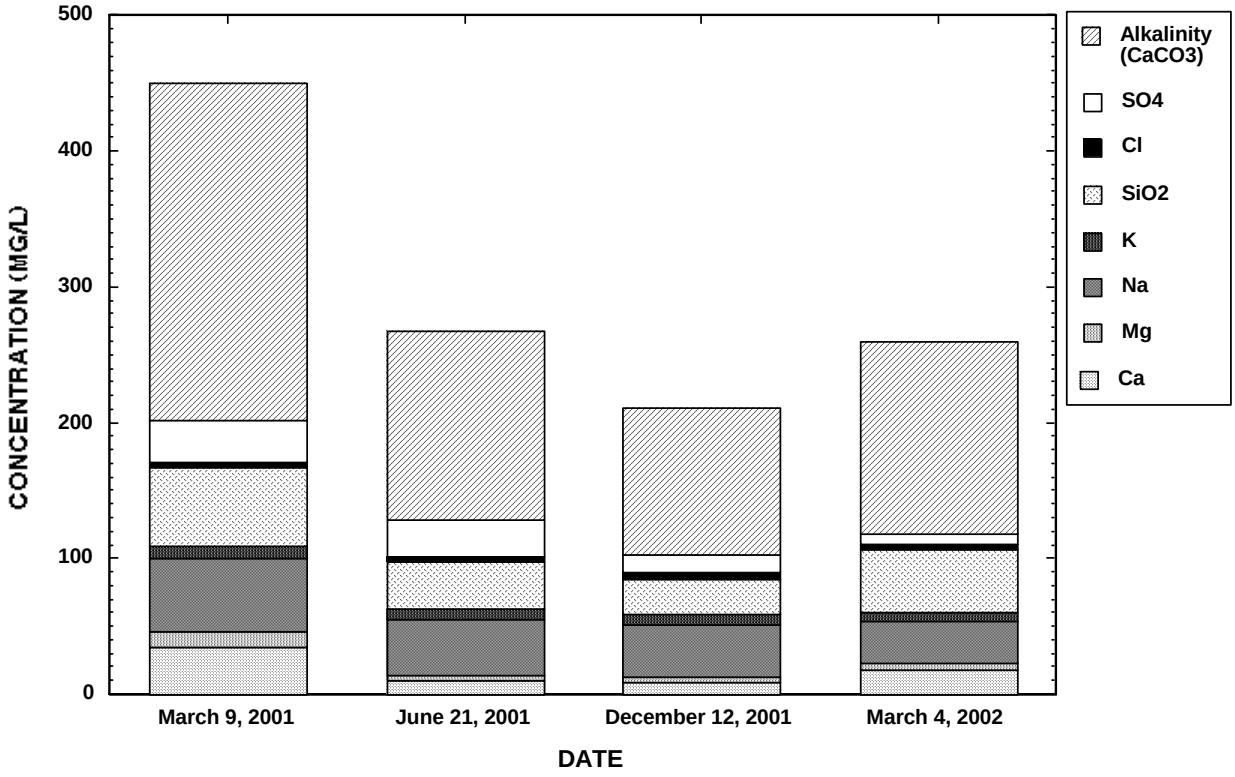



**Figure 5.1-3. Major ion chemistry for well R-22 (regional aquifer, 1273.5 ft), screen #3**

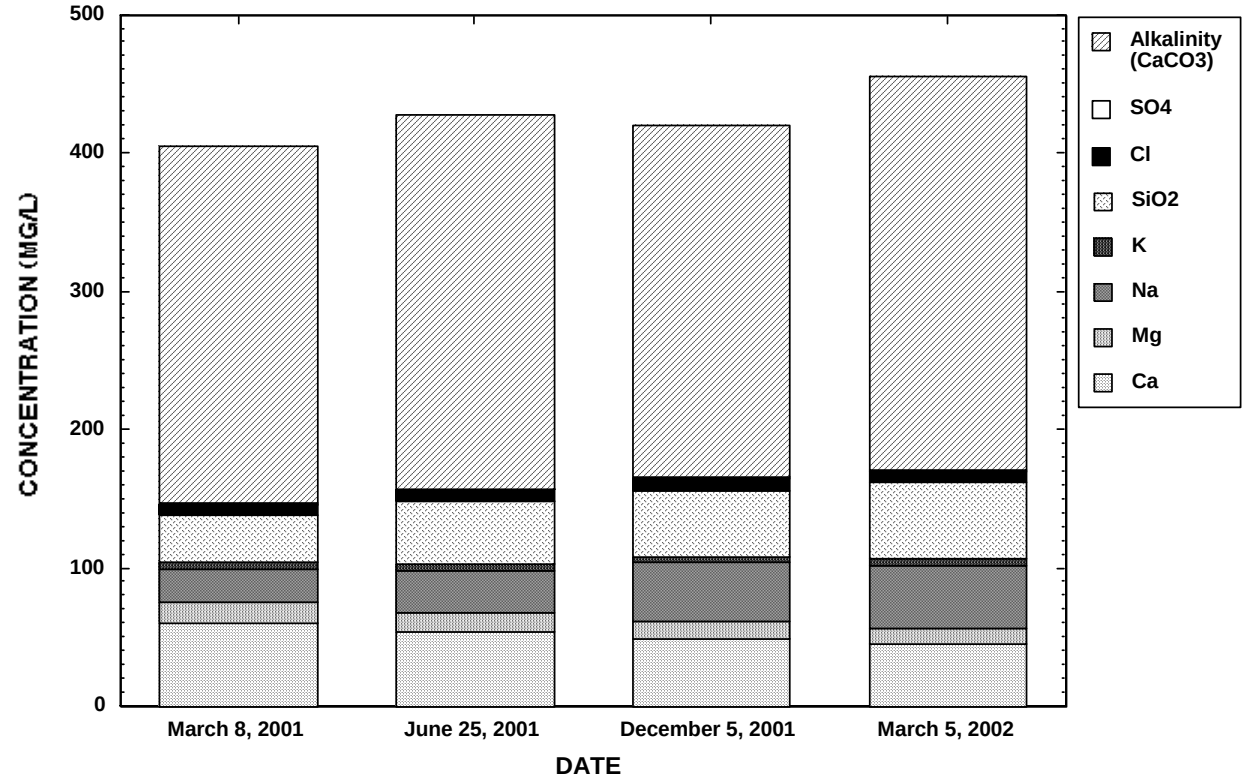



**Figure 5.1-4. Major ion chemistry for well R-22 (regional aquifer, 1378.0 ft), screen #4**

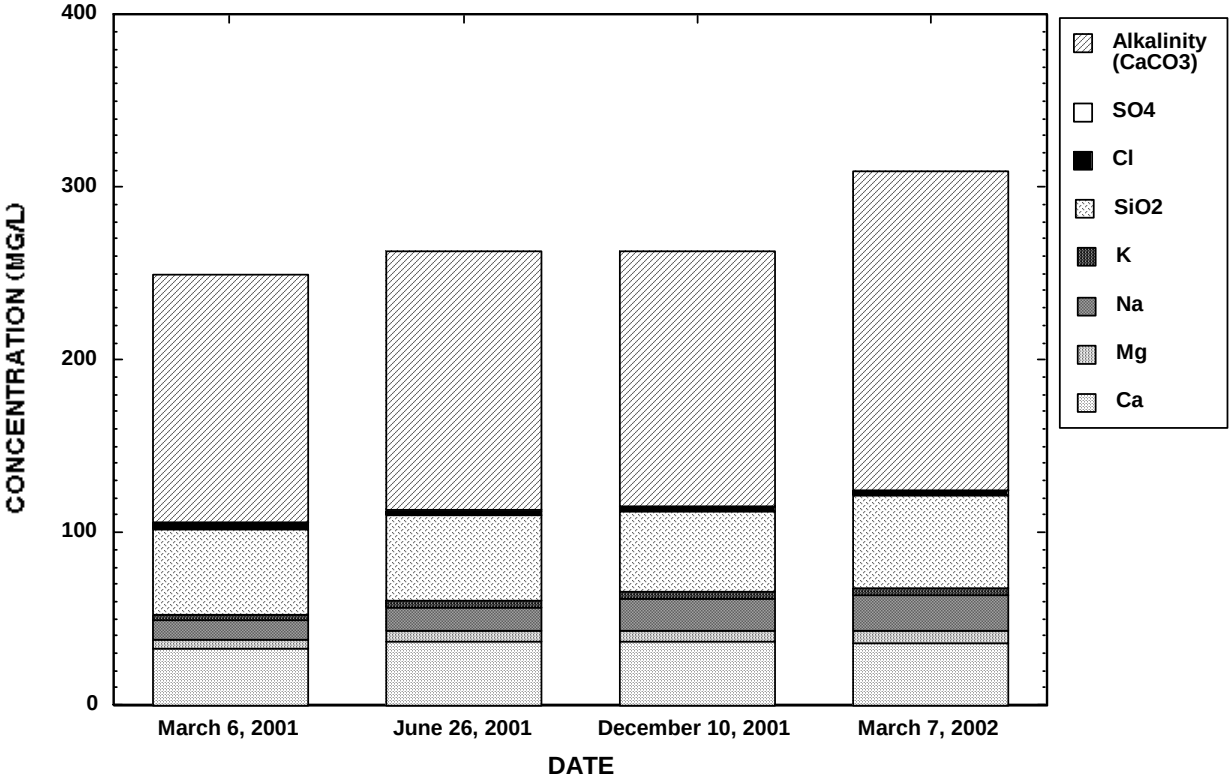



**Figure 5.1-5. Major ion chemistry for well R-22 (regional aquifer, 1448.0 ft), screen #5**

Concentrations of sulfate in the regional aquifer at well R-22 were less than detection (1.0 mg/L) in six groundwater samples collected from screens #1, #4, and #5. Decreasing concentrations of dissolved oxygen and sulfate and increasing concentrations of dissolved iron and manganese suggest that reducing conditions have been established in portions of the regional aquifer because of residual drilling fluids. Reduction of sulfate (electron acceptor) occurs during oxidation of organic carbon (electron donor) present in EZ-MUD® and other residual drilling fluids (Longmire 2002, 72800; Longmire 2002, 73282). Petroleum and/or sulfide odors were detected in the field for samples collected from screens #1, #4, and #5 during several sampling events. Sulfate is the preferred electron acceptor based on the occurrence of sulfate reduction, sulfide odor, and elevated concentrations of manganese and iron at well R-22.

Figures 5.1-6 through 5.1-8 show distributions of dissolved ammonium, TKN, iron, sulfate, and manganese and TOC in the regional aquifer (screens #1, #4, and #5) in well R-22. Reductive dissolution of ferric (oxy)hydroxide and manganese dioxide is evident based on elevated concentrations of dissolved and total iron and manganese (Appendix A) in groundwater samples collected from these three screens. Ammonium and TKN were associated with each other in the regional aquifer at 1387.0 (screen #4) (Figure 5.1-7), which suggests that EZ-MUD® has been dissociating. Elevated concentrations of TOC occurred in samples collected from screens #1, #4, and #5 because of residual drilling fluid. TKN was detected in the regional aquifer at concentrations ranging from 0.16 mg/L (Table 5.1-2) to 2.30 mg/L (Table 5.1-4). TKN represents complex forms of organic nitrogen that are associated with EZ-MUD®. Concentrations of sulfate are generally less than detection (≤1 mg/L) in groundwater samples collected from screens #1, #4, and #5 (Tables 5.1-1, 5.1-4, and 5.1-5), suggesting that sulfate reduction is occurring.

Residual drilling fluid (EZ-MUD®) present in well R-22 influences the water chemistry by providing organic carbon and nitrogen, which affect the oxidation-reduction chemistry of groundwater adjacent to the well screens. Longmire (2002, 72800) provides a detailed discussion of the chemistry of EZ-MUD® and its associated breakdown products, including ammonium and TKN, in well R-12. Ammonium is less mobile in groundwater relative to nitrate and nitrite (as N) because of cation exchange. Concentrations of detectable ammonium (as N) ranged from 0.52 to 1.80 mg/L within the regional aquifer (Tables 5.1-1 through 5.1-5). Nitrate is stable under oxidizing conditions and can be reduced to nitrogen gas in the presence of denitrifying bacteria and electron donors such as DOC and reduced manganese [Mn(II)] and iron [Fe(II)] (Langmuir 1997, 56037). Nitrate and nitrite (as N) are stable as anions and are generally conservative (mobile) in aqueous systems under oxidizing conditions (Langmuir 1997, 56037).

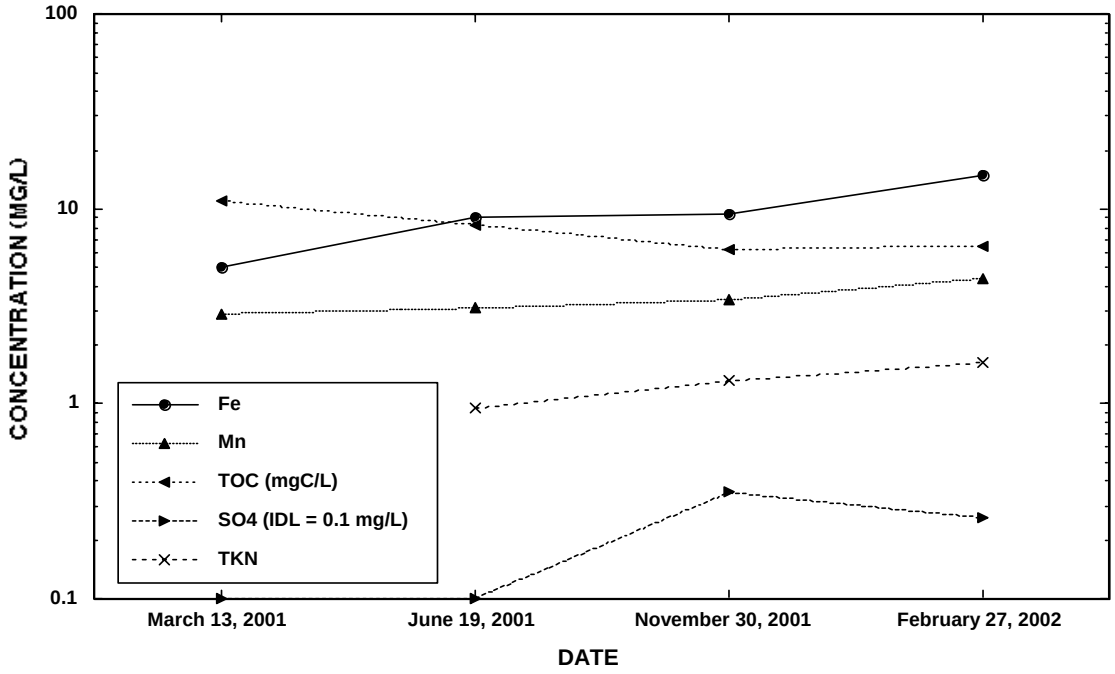



**Figure 5.1-6. Distributions of dissolved iron, manganese, TKN, and sulfate and total organic carbon versus time in well R-22, screen #1 (907.0 ft), TA-54 (IDL = instrument detection limit).**

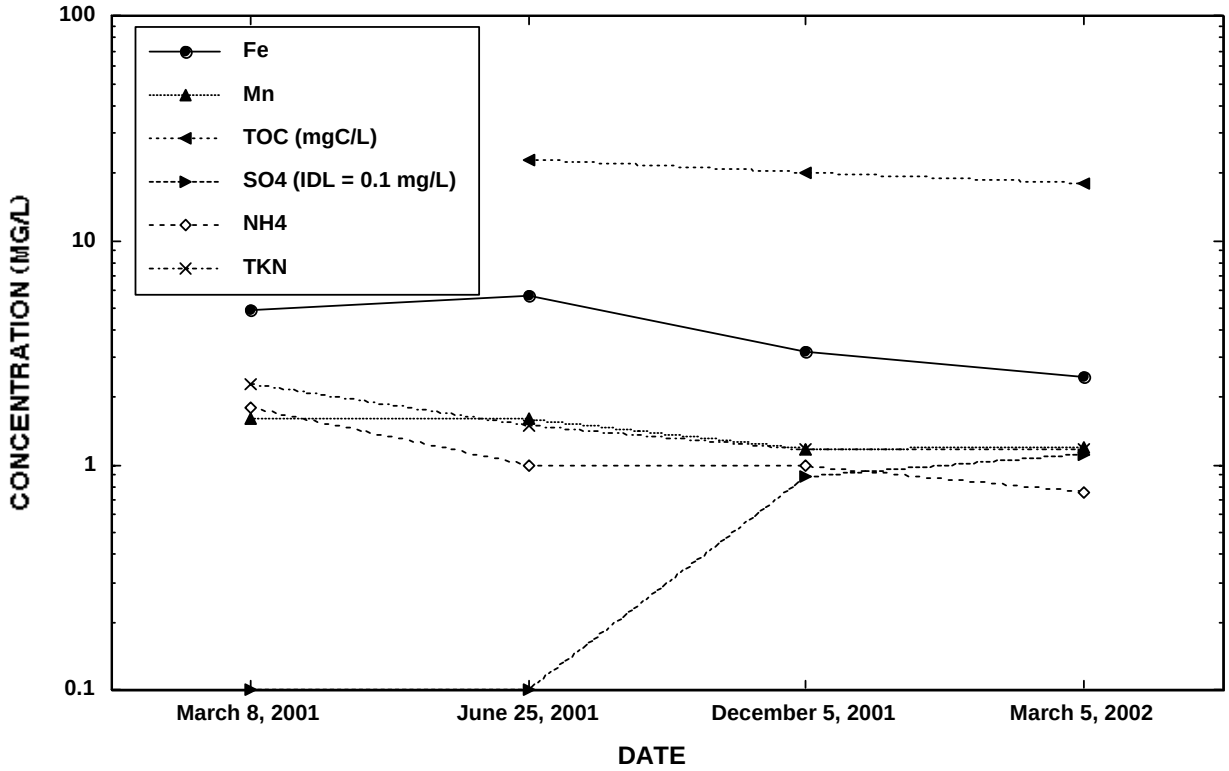



**Figure 5.1-7. Distributions of dissolved iron, manganese, ammonium, TKN, and sulfate and total organic carbon versus time in well R-22, screen #4 (1387.0 ft), TA-54.**

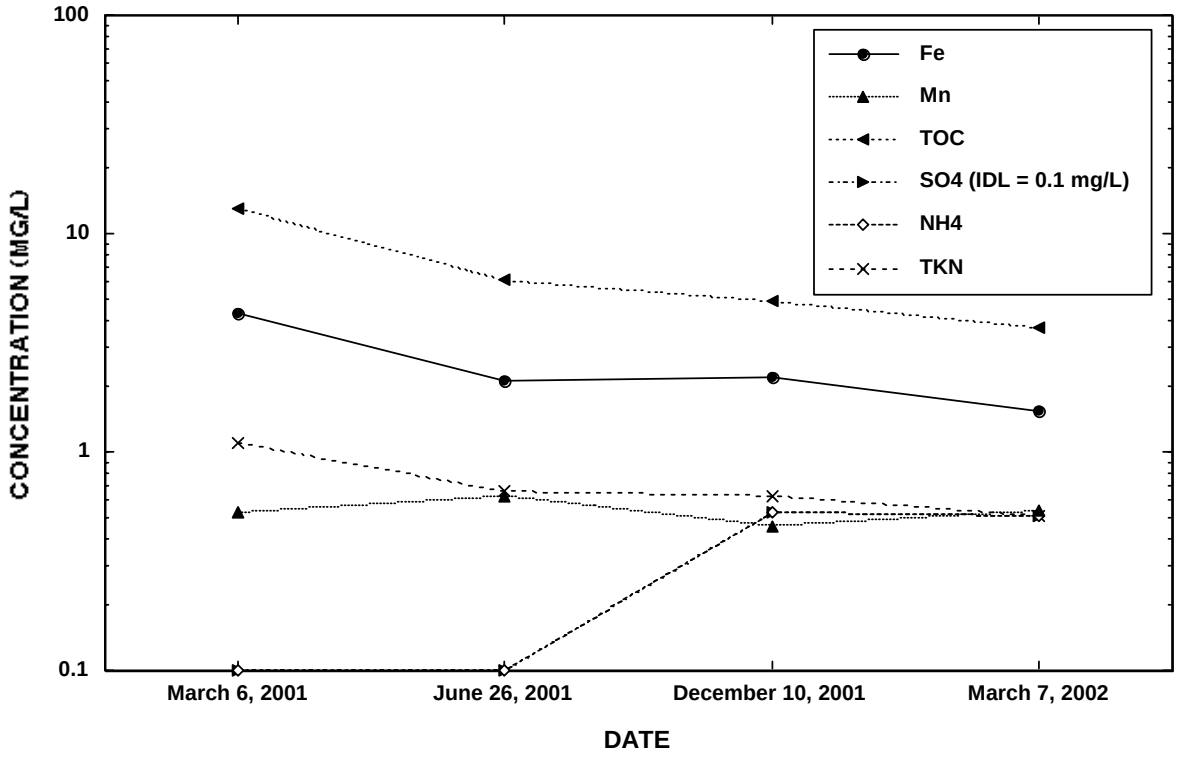



**Figure 5.1-8. Distributions of dissolved iron, manganese, ammonium, TKN, and sulfate and total organic carbon versus time in well R-22, screen #5 (1448.0 ft), TA-54.**

Elevated TOC values measured during the four sampling events at well R-22 indicate the presence of residual drilling fluid (EZ-MUD®) within the regional aquifer. Groundwater samples collected from the regional aquifer showed an average TOC concentration of 7.9 mgC/L (range of 0.3 to 23.0 mgC/L) (Tables 5.1-1 through 5.1-5). Concentrations of TOC decreased during characterization sampling of the regional aquifer, indicating that EZ-MUD® is oxidizing to inorganic carbon. Because of the reactions discussed above, regional aquifer groundwater at well R-22 is temporarily reducing with respect to sulfate (screens #1, #4, and #5) and nitrogen (screens #3, #4, and #5). Hydrogen sulfide (in the forms of $H_2S^0$ and $HS^-$), ammonium, TKN, and TOC are the stable species under the temporary reducing conditions imposed by the breakdown or dissociation of residual drilling fluids used during well drilling and construction.

Dissolved silica in the form of $Si(OH)_4^0$ was the second most abundant solute in the regional aquifer (Cerros del Rio lavas, Puye Formation, and Older basalt) at well R-22. Concentrations of dissolved silica ranged from 25.7 to 68.5 mg/L within the regional aquifer. Concentrations of perchlorate at well R-22 were less than detection (Tables 5.1-1 through 5.1-5). The IDL for the IC analysis of perchlorate was initially reported to be 0.001 mg/L by the subcontractor laboratory. This IDL was determined by using standard solutions prepared in an ultrapure water matrix, and GEL set an RL of 0.004 mg/L. For the method to reflect the effect of real groundwater matrices, which often contain interfering anions, the subcontractor laboratory provided revised RL and IDL values for perchlorate, as determined by the IC method: they are 0.004 and 0.012 mg/L, respectively.

The following section provides a discussion of redox potential calculated from the $Fe^{2+}/Fe(OH)_3$ redox couple at ferrous iron concentrations above 1 mg/L. Concentrations of detectable dissolved iron in the

regional aquifer ranged from 0.11 to 14.9 mg/L, suggesting that the regional aquifer groundwater adjacent to well screens #1, #4, and #5 is reducing with respect to iron. Calculated oxidation-reduction potential (Eh) values ranged between +40.0 millivolts (mV) at pH 7.08 (14.9 mg/L ferrous iron, screen #1, fourth sampling round and +66.2 mV at pH 7.23 (1.53 mg/L ferrous iron concentration, screen #5, fourth sampling round). The following half-cell reaction was used to calculate Eh based on the $Fe^{2+}/Fe(OH)_3$ redox couple (20°C):

$$Fe(OH)_3 + 3H^+ + e^- = Fe^{2+} + 3H_2O. \quad \text{Eq. 2}$$

This redox couple is electrochemically reversible at concentrations of ferrous iron above $10^{-5}$ molal (0.56 mg/L) (Langmuir 1997, 56037) and may provide a partial control on Eh at well R-22 (screens #1, #4, and #5).

Oxidation-reduction potential (ORP) was measured for three groundwater samples collected from screens #1, #3, and #5 on August 29, 2002. The ORP values were –125, –135, and –76 mV for samples collected from screens #1, #3, and #5, respectively. Eh values calculated from corrected ORP measurements (addition of +212.9 mV for 3N KCl-Ag/AgCl at 20°C) were +87.9 mV (screen #1), +77.9 mV (screen #3), and +136.9 mV (screen #5). Field ORP measurements conducted at well R-22 probably represent mixed redox couples consisting of $H_2O/O_2$, $Mn^{2+}/MnO_2$, $Fe^{2+}/Fe(OH)_3$, and $H_2S^0/SO_4^{2-}$ pairs, which typically occur in groundwater under circumneutral pH conditions (Langmuir 1997, 56037). The dissolved oxygen, manganese, and sulfur redox couples, however, are not as electrochemically active as the iron couple and, therefore, they provide less control on redox. Relatively oxidizing conditions were stable as well R-22 prior to drilling. Residual drilling fluids, however, have enhanced manganese, iron, and sulfate reduction.

Concentrations of total (nonfiltered) iron detected within portions of the regional aquifer ranged from 0.02 to 19.3 mg/L (Appendix A). Significant differences between total and dissolved iron, up to a factor of 69 (screen #2, third sampling event), indicated the presence of suspended material, possibly clay minerals and ferric oxyhydroxide, that are stable under oxidizing conditions in the absence of reductants (DOC and TOC).

Concentrations of natural iron within the regional aquifer exceeded both the EPA secondary standard for drinking water (0.3 mg/L) and the NMWQCC standard for water supply (1.0 mg/L) for several sampling rounds. Concentrations of manganese in the regional aquifer exceeded both the EPA secondary standard of 0.05 mg/L and the NMWQCC standard of 0.2 mg/L for domestic water supply for several sampling rounds.

Concentrations of barium and strontium ranged from 0.013 (screen #2) to 0.360 mg/L (screen # 4) and from 0.043 (screen #2) to 1.10 mg/L (screen #4) (Tables 5.1-2 and 5.1-4), respectively. Concentrations of these two solutes were elevated in screen #4 relative to those in screens #1, #2, #3, and #5. Barium and strontium adsorb onto ferric oxyhydroxide (Langmuir 1997, 56037), and their presence in groundwater (screen #4) is possibly related to dissolution of ferric oxyhydroxide under reducing conditions. Elevated concentrations of these naturally occurring metals are the result of reducing conditions in the presence of residual drilling fluid. Concentrations of trace elements, including antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), lead (Pb), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), silver (Ag), strontium (Sr), thallium (Tl), uranium (U), vanadium (V), and zinc (Zn), were within the low-to-moderate μg/L range and were less than their respective EPA and NMWQCC standards.

An activity of 109 pCi/L tritium was measured near the regional water table (883 ft) during drilling of well R-22 (Ball et al. 2002, 71471). Since 2000, activities of tritium measured in screen #1 (907.0 ft) averaged 2.38 pCi/L (Table 5.1-1), which suggests that some recent recharge to the regional aquifer has occurred.

Dilution of native groundwater during aquifer-performance (slug-injection) testing prior to well completion may account for decreased tritium activities observed near the regional water table during characterization sampling. Activities of tritium measured in screen #5 (1448.0 ft) averaged 8.42 pCi/L during characterization sampling. Possible sources of detectable tritium at well R-22 include atmospheric fallout and/or Laboratory discharges, subject to aqueous and vapor-phase movement, that have entered the regional water table upgradient of the well. This hypothesis of upgradient recharge is consistent with measurements of higher tritium activities observed in screen #5, while it generally was not detected in screens #2, #3, and #4. The nondetection of tritium in screens #2, #3, and #4 suggests that the regional aquifer (from 947 to 1385 ft) has not received recharge in the past 50 years, which predates the beginning of nuclear testing. Perched zones were not encountered during the drilling of R-22, suggesting that vertical recharge through the vadose zone at the well site is unlikely.

According to calculations using the well-mixed and piston-flow models presented by Blake et al. (1995, 49931), the age of the regional aquifer beneath Pajarito Plateau, the springs discharging in White Rock Canyon, and the San Ildefonso areas ranges between 3000 (≤1.6 pCi/L tritium using the well-mixed model) and 10,000 (≤0.5 pCi/L tritium) years. Because activities of tritium were generally less than detection (≤0.22 pCi/L) at well R-22, it is very likely that the age of the groundwater ranges between 3000 and 10,000 years in some portions of the regional aquifer (screens #2, #3, and #4).

Activities of selected radionuclides are provided in Tables 5.1-1 through 5.1-5. Americium-241, cesium-137, plutonium-238, plutonium-239,240, and strontium-90 were not detected in the groundwater samples collected from well R-22 (Appendix A). Gross alpha and gross beta activities were less than 4 pCi/L in a nonfiltered sample collected from screen #1 (Table 5.1-1). Measurable gross gamma (251 pCi/L) was attributed to isotopes within the natural uranium-238, uranium-235, and thorium-232 decay chains (Langmuir 1997, 56037) (Table 5.1-1). Activities of uranium-238, uranium-235, and uranium-234 were generally less than 0.5 pCi/L in groundwater samples collected from well R-22 (Tables 5.1-1 through 5.1-5). Similar activities of uranium were measured in supply wells during 2000 (ESP 2002, 71301).

Elevated activities of uranium-234, uranium-235, and uranium-238 and concentrations of natural uranium were measured in groundwater samples collected from screen #3 during the first and second sampling rounds. Additional analyses were conducted on groundwater samples collected from screen #3 using thermal ionization mass spectrometry (TIMS) at LANL. This analytical method provides the most precise measurement of uranium and plutonium isotopes. Natural uranium is characterized by an atom ratio of uranium-238/uranium-235 equal to 137.88, which is calculated from the natural abundance of uranium-238 (99.2745 percent) divided by that of uranium-235 (0.720 percent). Enriched uranium is characterized by an atom ratio for these two isotopes of less than 137.88, and depleted uranium has an atom ratio that is greater than 137.88. Groundwater samples (filtered) collected from screen #3 during the second and third sampling rounds were characterized by atom ratios of uranium-238/uranium-235 of 137.83 ±0.18 and 137.97 ±0.18, respectively (Appendix A). The most likely source of the elevated isotopic uranium observed in screen #3 is from bentonite used as annular fill between well screens. Bentonite from Wyoming contains natural uranium in the 1–10 mg/kg range. Concentrations of uranium decreased to 3 μg/L during characterization sampling in screen #3 at well R-22.

The presence of technetium-99 is not absolutely certain because of its low activity, measured just above IDL at well R-22. Technetium-99 was detected slightly above the IDL (liquid scintillation) in two groundwater samples collected from screens #3 and #4 during the first characterization sampling round (Tables 5.1-3 and 5.1-4). The activity of technetium-99 measured in screen #3 was 4.9 ± 3.6 (3σ) pCi/L with an MDA of 3.5 pCi/L. The activity of technetium-99 measured in screen #4 was 4.3 ± 3.8 (3σ) pCi/L with an MDA of 3.8 pCi/L. Activities of technetium-99 were less than detection in the last three sampling

rounds. The lack of reproducibility of the detection of technetium-99 raises doubts about its presence in well R-22.

Technetium(VII) is stable as $TcO_4^-$ under oxidizing conditions in screen #3, and this oxyanion does not adsorb onto aquifer material under circumneutral pH conditions (Langmuir 1997, 56037). Technetium(IV) was calculated to be stable as $TcO(OH)_2^0$ under manganese- and iron-reducing conditions at the well (screen #4).

Reduction of technetium(VII) to technetium(IV) is thermodynamically feasible in the presence of residual drilling fluid at well R-22. Reduction of $TcO_4^-$ to $TcO(OH)_2^0$ is given by the following half equation:

$$TcO_4^- + 4H^+ + 3e^- = TcO(OH)_2^0 + H_2O. \quad \text{Eq. 3}$$

At pH 7.21 (screen #4, first sampling round), the equilibrium Eh ($TcO_4^-/TcO(OH)_2^0$) was calculated to be equal to 26 mV at 25ºC using thermochemical data provided in Langmuir (1997, 56037). This value is more oxidizing than the redox couple for $SO_4^{2-}/HS^-$ (–231 mV). Technium(IV) species are stable under sulfate-reducing conditions observed in screens #4 and #5. This groundwater was also calculated to be undersaturated with respect to $TcO_2 \cdot 2H_2O(am)$, having a saturation index (SI) of –4.02. The SI is a measure of the degree of saturation, undersaturation, or oversaturation of a solid phase in water (SI = $\log_{10}$ {activity product/solubility product}; at equilibrium SI = $0 \pm 0.05$) (Langmuir 1997, 56037).

Activities of technetium-99, however, were less than detection in groundwater samples collected from screens #1 and #2 (Tables 5.1-1 and 5.1-2). Based on these findings, it is not likely that the isotope migrated from TA-54 because it was not observed at the regional water table at well R-22. The source of technetium-99 as possible detects observed during the first sampling round is not known. Nondetection of tritium in screen #3 adds complications to the presence of technetium-99 because both species are mobile in the subsurface. Iodine-129, a mobile radionuclide disposed at MDA G, was not detected in groundwater samples collected from well R-22 (Tables 5.1-1 through 5.1-5). Additional sampling for these two isotopes will provide data for trend analysis and resolve the uncertainty regarding possible detection.

Analyses of $\delta^{18}O$ and $\delta D$ were performed on groundwater samples collected from well R-22 (Tables 5.1-1 through 5.1-5), and the results are shown in Figure 5.1-9. The R wells (R-9, R-12, R-15, and R-22) plot close to each other, suggesting that they have similar sources of recharge. Springs discharging in the Sierra de los Valles are characterized by lighter stable isotope ratios; thus, these waters are not the source of recharge for the above R wells. The Jemez Mountains meteoric line (solid) and the worldwide meteoric water line (dashed) are denoted by JMML and MWL, respectively, in Figure 5.1-9. Analytical uncertainties of $\delta^{18}O$ and $\delta D$ are $\pm$ 0.1 and $\pm$ 1‰, respectively. Results of stable isotope analyses for well R-22 indicate a meteoric source in which the groundwater samples plot close to both the JMML and MWL (Figure 5.1-9). The distribution of isotopic ratios suggests that evaporation of well R-22 groundwater has not taken place to a significant extent. Groundwater at well R-22 appears to be well mixed between depths of 907.0 and 1448.0 ft, as suggested by the overlap of $\delta^{18}O$ and $\delta D$ ratios for the different samples.

Stable isotope data have been collected at R-9, R-9i, R-12, R-15, R-22 and other characterization wells. The location of these wells in the east-central portion of the Laboratory warrants comparing the analytical results for stable isotopes to evaluate the sources of water. Well R-22 is generally lighter in $\delta^{18}O$ and $\delta D$ (depletion of oxygen-18 and deuterium) as compared to well R-9 (Figure 5.1-9). Stable isotope ratios for groundwater samples collected at well R-22 are slightly heavier than those for R-15, although there is some overlap between the two wells. $\delta^{18}O$ and $\delta D$ values for wells R-12 and R-22 are very similar. Groundwater samples collected from the regional aquifer at wells R-9, R-12, R-15, and R-22 are heavier in $\delta^{18}O$ and $\delta D$ ratios relative to Water Canyon Gallery (WCG) and Apache Spring that discharge within the Sierra de los Valles (Blake et al. 1995, 49931) (Figure 5.1-9).

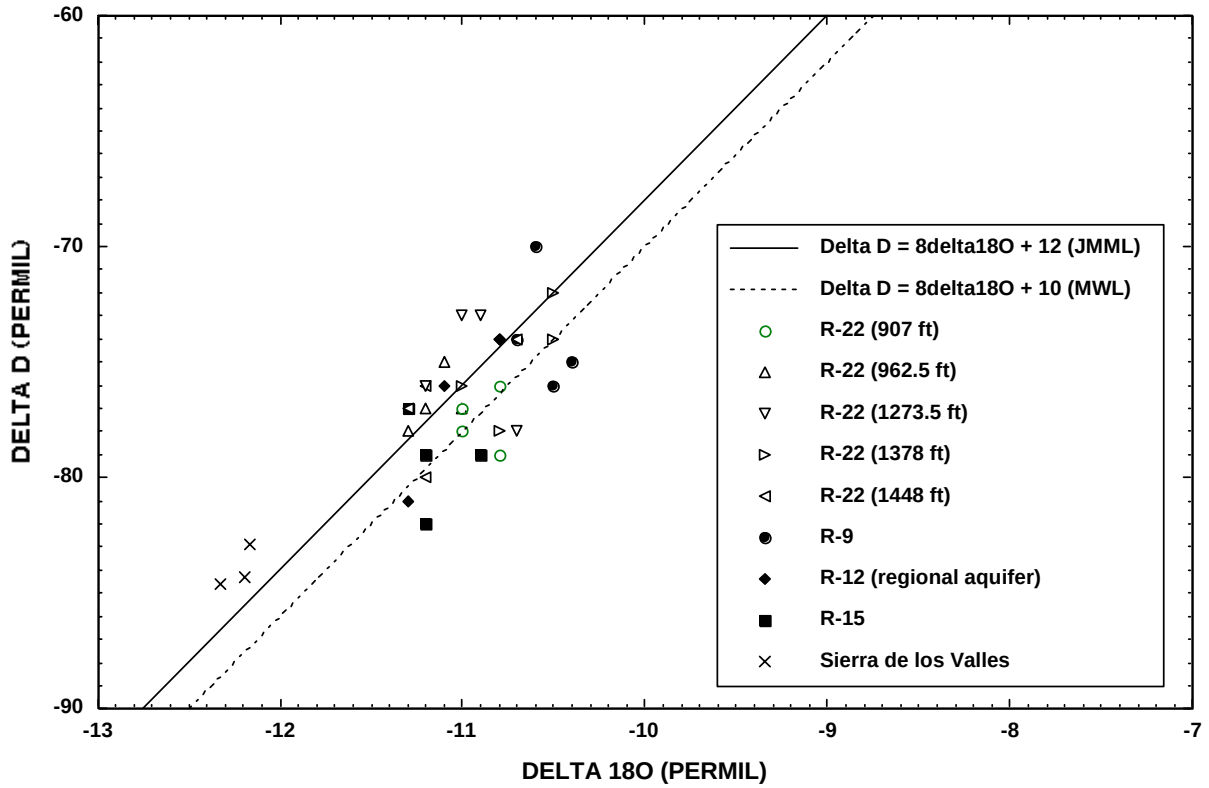



**Figure 5.1-9. Stable isotope results for wells R-9, R-12, R-15, and R-22 and Sierra de los Valles springs (Water Canyon Gallery and Apache Spring). The solid line is the JMML, and the dashed is the MWL.**

The regional aquifer at wells R-9, R-12, R-15, and R-22 have similar $\delta^{18}O$ and $\delta D$ ratios, suggesting a similar source of recharge. Precipitation of meteoric water at higher elevations, for example near the Sierra de Los Valles and Pajarito Plateau, is characterized by cooler temperatures (depletion of oxygen-18) relative to other waters found at lower elevations in the Rio Grande valley. Long-term (paleotemperatures) and seasonal variations in temperature also influence $\delta^{18}O$ and $\delta D$ values because of enrichment or depletion of oxygen-18 and deuterium.

This section presents a discussion of the activities of tritium and $\delta^{18}O$ ratios measured at wells R- 9, R-9i, R-12, R-15, and R-22. These wells are downgradient from known and possible (R-22) sources of tritium. Stable isotope ratios provide information on the source of recharge water based on isotopic fractionation because of differences in elevation of precipitation.

Activities of tritium decrease with depth within perched zones (wells R-9i, R-12, and MCOBT-4.4) and the regional aquifer (wells R-9, R-12, and R-15) near the eastern boundary of the Laboratory (Longmire 2002, 72800; Longmire 2002, 72713; and Longmire 2002, 72614). Figure 5.1-10 shows $\delta^{18}O$ versus $\log_{10}$activity of tritium for wells R-9, R-9i, R-12, R-15 (combined with MCOBT-4.4), and R-22. Perched zones at wells R-9i, R-12, and MCOBT-4.4 had log activities of tritium ranging from 1.893 (78.2 pCi/L) at well R-12 to 4.107 (12,797 pCi/L) at MCOBT-4.4 (Longmire 2002, 72800; Longmire 2002, 72713; and Longmire 2002, 73455). The regional aquifer at wells R-9, R-12, R-15, and R-22 had measurable log activities of tritium ranging from –0.113 (0.77 pCi/L) at well R-15 to 1.917 (82.7 pCi/L) at well R-12 (Longmire 2002, 72800; Longmire 2002, 72713; and Longmire 2002, 72614). Measurable log activities of this isotope at well R-22 ranged from –1.0 (0.10 pCi/L) in screen #3 to 1.884 (76.61 pCi/L) in screen #2.

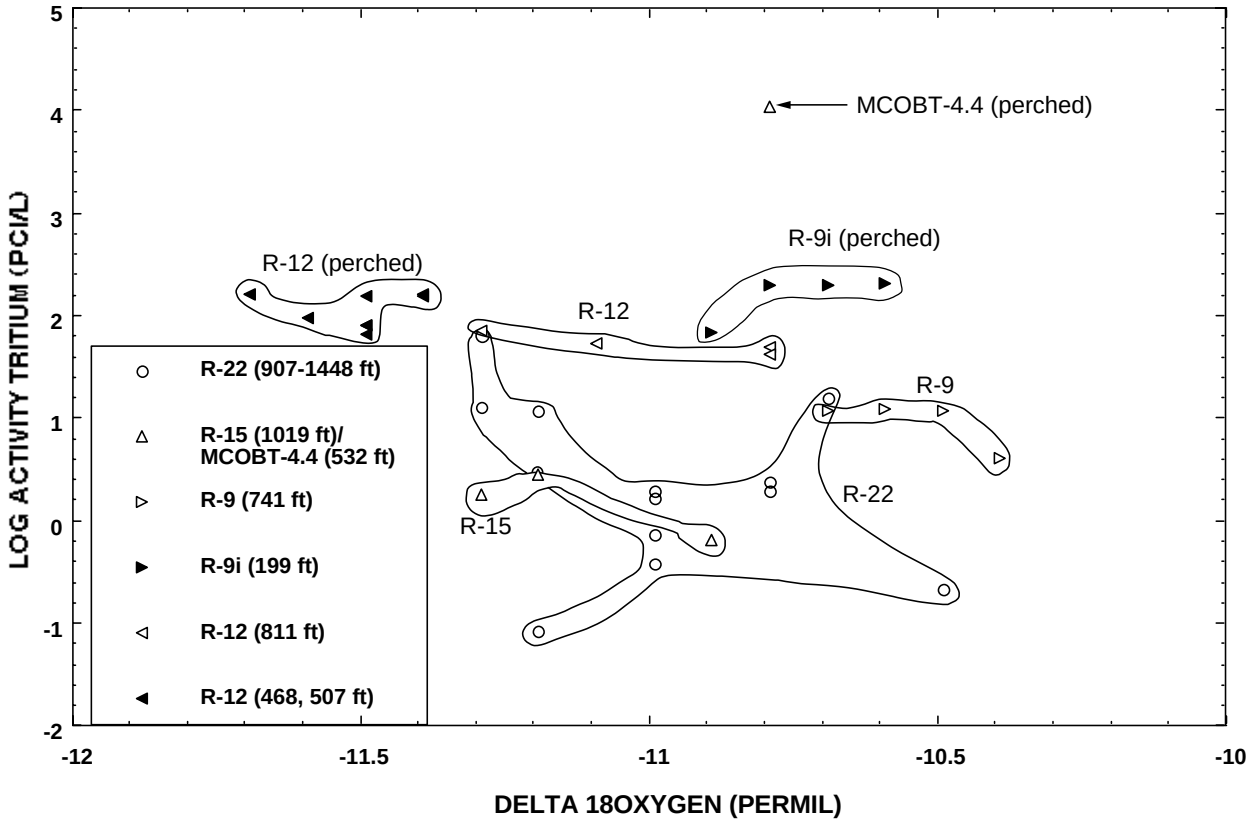



**Figure 5.1-10. Delta$^{18}$O (permil) versus log activity tritium (pCi/L) for wells R-9, R-9i, R-12, R-15, R-22, and MCOBT-4.4**

Wells R-9i and MCOBT-4.4 had similar $\delta^{18}O$ ratios that were heavier than those for the perched zone at well R-12 (Figure 5.1-10). Stable isotope ratios for wells R-9, R-12 (regional aquifer), R-15, and R-22 are similar, suggesting that the upper portion of the regional aquifer has a common source of recharge (Figure 5.1-10). Additional stable isotope and tritium analyses from wells R-20, R-21, R-23, and R-32 should provide supplemental data that may be used to determine the source(s) of tritium observed at well R-22.

The similar distribution of $\delta^{18}O$ ratios for wells R-9 and R-9i, as well as measurable tritium, provides support for the hypothesis of a line source of recharge within Los Alamos Canyon (Figure 5.1-10). The perched zone at well R-12 is characterized by lighter $\delta^{18}O$ ratios than for the regional aquifer at the well. This finding suggests that the perched and regional zones at well R-12 may have different sources of recharge within Sandia Canyon. The perched zone at well R-12 possibly receives recharge from higher elevations in upper Sandia Canyon (depletion of oxygen-18) than does the regional aquifer.

Nitrogen isotopes (nitrogen-15 and nitrogen-14, $\delta^{15}N_{AIR}$ of $NO_3$ and $\delta^{15}N_{AIR}$-$NH_3$) provide a useful tool for evaluating different sources of nitrogen (nitrate plus nitrite and ammonium) found in the environment. The isotopic standard for $\delta^{15}N$ is nitrogen in air, which has a value of 0‰ (Clark and Fritz 1997, 59168). Nitrate derived from treated septic effluent is enriched in nitrogen-15 or depleted in nitrogen-14 and is characterized by positive $\delta^{15}N$ ratios of +7 to > +30‰ (Clark and Fritz 1997, 59168; Longmire 2002, 72800). During denitrification, which is the reduction of nitrate to nitrogen gas in the presence of organic carbon, residual nitrate becomes enriched in nitrogen-15. Subsequently, $\delta^{15}N$ ratios for nitrite become more positive with increasing denitrification.

Groundwater samples collected from screens #1 through #5 at well R-22 were analyzed for $\delta^{15}N_{AIR}$-$NO_3$, with results ranging from +0.6 to +6.4‰ (Tables 5.1-1 through 5.1-5). These ratios fell within the range of volcanic deposits reported by Clark and Fritz (1997, 59168). The negative isotopic value measured in a groundwater sample collected from 1273.5 ft suggests slight enrichment of nitrogen-14, whereas positive values indicate enrichment of nitrogen-15. The range of $\delta^{15}N_{AIR}$-$NO_3$ ratios showed fractionation of nitrogen (increasing positive isotopic ratios), possibly resulting from denitrification during the sampling events. Concentrations of nitrate plus nitrite (as N) in the perched zone ranged from 0.01 to 0.72 mg/L, which is similar to natural nitrate (as N) measured in supply wells on the Pajarito Plateau (ESP 2000, 68661, and ESP 2002, 71301). Concentrations of ammonium (as N) were less than detection in some samples, and it was not possible to measure $\delta^{15}N_{AIR}$-$NH_3$ in every groundwater sample because of limited sample volume.

Groundwater samples collected from the regional aquifer at well R-22 were also analyzed for $\delta^{15}N_{AIR}$-$NH_3$, with results ranging from +1.4 to +3.7‰ (Tables 5.1-1, 5.1-4, and 5.1-5). The positive values indicate slight enrichment of nitrogen-15. The range of $\delta^{15}N_{AIR}$-$NH_3$ ratios showed some fractionation of nitrogen, which was probably derived from breakdown of polyamide functional groups present in residual EZ-MUD®. Concentrations of detectable ammonium (as N) in the regional aquifer ranged from 0.52 to 1.80 mg/L.

Several VOCs and SVOCs (validated results) were detected at well R-22 including acetone (2.5 to 32 μg/L); benzoic acid (3 to 12.5 μg/L); toluene (0.2 to 0.76 μg/L); methylene chloride (0.62 and 2.2 μg/L); chloroform (0.94 μg/L); pentachlorophenol (6.2 μg/L); phenol (19 and 32 μg/L); 4-methylphenol (44 to 210 μg/L); and 2-butanone (6.9 to 8.9 μg/L) (Appendix A). Several substituted benzene compounds also were identified at the well, including isopropylbenzene (0.16 to 0.54 μg/L); 1,4-dichlorobenzene (0.16 to 0.23 μg/L); and 1,3,5-trinitrobenzene (0.12 μg/L). Methylene chloride is a laboratory solvent used during SVOC, pesticide, herbicide, and polychlorinated biphenyls (PCB) analyses using gas chromatography mass spectrometry (GCMS). Bis(2-ethylhexyl)phthalate, a constituent of plastic, was detected at concentrations of 1.0 and 3.9 μg/L in the regional aquifer during the first and fourth sampling events (Appendix A).

The occurrence of acetone at well R-22 can be regarded as a false positive for several reasons. QUIKFOAM® used during drilling consists of isopropyl alcohol, which has a molecular weight of 60.1 atomic mass units (amu). Acetone has a mass of 58.08 amu, which is very similar to that of isopropyl alcohol. These compounds will elute in nearly the same retention time on a typical GC/MS system following SW-846 Method 8260. The mass units for isopropyl alcohol are (mass/charge, m/z) 45, 43, 59, and 58, and the mass units for acetone are 43 and 58. For qualification purposes, the mass spectrometer uses the mass units and retention time. The analyte must elute in a certain retention-time window and have the correct corresponding mass units for identification. Because of the similar retention times and mass units for both acetone and isopropyl alcohol, these two compounds can be misidentified. This explanation is supported by the mass spectra data. Acetone can be misidentified because the secondary ion for isopropyl alcohol is 43, which is the primary ion for acetone. This misidentification also occurred in groundwater samples collected from wells R-7, R-12, and R-19.

High-explosive (HE) compounds were falsely detected only during the first sampling event at well R-22 and included 1,3,5-trinitrobenzene (0.12 μg/L) (screen #2); octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine ([HMX] 1.3 μg/L) (screen #4); 4-amino-2,6-dinitrotoluene (0.42 μg/L) (screen #1); 2-amino-4,6-dinitrotoluene (0.51 μg/L) (screen #1); and hexahydro-1,3,5-trinitro-1,3,5-triazine ([RDX] 0.34 μg/L) (screen #5). The reported results for the HE compounds and their degradation products can also be regarded as false positives for several reasons. The EZ-MUD® drilling agent consists of a polyacrylamide-polyacrylate copolymer that is made up of nitro and amino functional groups similar to the functional groups present in the HE compounds and their degradation products. Thus, residual EZ-MUD® constituents may be significant interferents in the liquid chromatography mass spectrometry method.

Further analysis using ultraviolet diode array spectroscopy detection, which provides more accurate identification of eluting compounds, failed to detect any HE compounds or degradation products.

Polycyclic aromatic hydrocarbons (PAHs), including acenaphthene (0.42 μg/L), acenaphthylene (0.4 μg/L), anthracene (0.36 μg/L), benzo(a)pyrene (0.24 μg/L), benzo(b)fluoranthene (0.41 μg/L), benzo(k)fluoranthene (0.38 μg/L), 2-chloronaphthalene (0.46 μg/L), fluoranthene (0.38 μg/L), fluorene (0.42 μg/L), 2-methylnaphyhalene fluorene (0.42 μg/L), phenanthrene (0.4 μg/L), and pyrene (0.49 μg/L), were detected during the third sampling event at well R-22 (screen #5). Groundwater samples contained 4,4'-DDT in screen #1 (0.02 μg/L, third sampling event); screen #2 (0.008 μg/L, third sampling event); screen #3 (0.017 μg/L, third sampling event and 0.009 μg/L, fourth sampling event); screen #4 (0.02 μg/L, third sampling event); and screen #5 (0.024 μg/L, third sampling event). Reported results for these compounds are unusual, and their false positive occurrence at well R-22 is described below. These compounds are characterized by low aqueous solubility (part per billion range), adsorb strongly onto sediments and solid organic carbon, and are not mobile in groundwater.

Detection of PAHs at well R-22 (Appendix A) could be suspect because these compounds were analyzed by SW-846 Method 8270C. According to Section 7.6 of the method, the conditions for qualitative identification are as follows:

(1) The relative retention time (RRT) of the sample component is within 0.06 RRT units of the RRT of the standard component.

(2) The characteristic ions from the reference mass spectrum are defined as the three ions of greatest relative intensity, or any ions over 30% relative intensity, if fewer than three ions occur in the reference spectrum.

Many of the reported detects for PAHs did not meet specifications for the second criterion. Secondary and tertiary ions were not present in the sample, and/or the secondary ions of greatest intensity of the sample spectrum were not present in the reference spectrum.

Detection of 4,4'-DDT at well R-22 could be the result of drilling fluid (QUIKFOAM®), leading to a misidentification of the compound. The last surrogate failed during the original extraction because of problems with extraction efficiency in the analytical process. The sample was re-extracted, and 4,4'-DDT was not present in the second extraction; the surrogate samples also passed validation.

Analysis of the DOC fractionation (also termed "humic substances"), including both hydrophobic and hydrophilic fractions, was performed on four groundwater samples (screens #1, #3, #4, and #5) collected during the first event (Appendix A). Both fractions contained acid-, neutral-, and base-organic substances. Hydrophobic acids include humic and fulvic acids (carboxylic acids and phenols), whereas the hydrophobic neutral fraction includes aliphatic organic compounds (Vilks and Bachinski 1996, 71515). Hydrophobic bases include aromatic amines and other nitrogen-containing compounds. The hydrophilic fraction contains low-molecular weight (5 carbon atoms) polyelectrolytic and aliphatic acids (acid fraction), aliphatic amines and amino acids (base fraction), and alcohols, esters, aliphatic amides, and carbohydrates (neutral fraction) (Vilks and Bachinski 1996, 71515). These two DOC fractions occur naturally in groundwater (Vilks and Bachinski 1996, 71515) with a median concentration of 0.7 mgC/L (Thurman 1985, 71514). Anthropogenic sources, including refined petroleum products, drilling fluids, and high-molecular weight organic compounds, are also possible.

A DOC concentration of 8.1 mgC/L was measured in a groundwater sample collected from the screen #1 (Cerros del Rio lavas) at a depth of 907.0 ft on March 13, 2001. This sample contained 3.2 mgC/L hydrophobic fraction consisting of 1.4 mgC/L acid fraction, 1.6 mgC/L neutral fraction, and 0.1 mgC/L base fraction. The neutral fraction consisted of short-chain aliphatic compounds as breakdown products of the EZ-MUD® copolymer. The groundwater also contained 4.9 mgC/L hydrophilic fraction, which

consisted of 4.2, 0.4, and 0.4 mgC/L acid, neutral, and base fractions, respectively. The base fraction consisted of amino acids and other nitrogen-related compounds characteristic of EZ-MUD®.

A DOC concentration of 6.3 mgC/L was measured in a groundwater sample collected from the screen #3 (upper Puye Formation) at a depth of 1273.5 ft on March 9, 2001. This sample contained 4.2 mgC/L hydrophobic fraction consisting of 1.3 mgC/L acid fraction and 2.9 mgC/L neutral fraction with the base fraction <0.1 mgC/L. The groundwater also contained 2.1 mgC/L hydrophilic fraction, which consisted of 1.7, 0.1, and 0.3 mgC/L acid, neutral, and base fractions, respectively. The base fraction consisted of amino acids and other nitrogen-related compounds. Concentrations of DOC and associated acid, neutral, and base fractions decreased during characterization sampling at well R-22 as residual EZ-MUD® oxidized to inorganic carbon.

Approximately 35.5% of the humic and fulvic acids (hydrophobic acid fraction in the regional aquifer at 1273.5 ft) were calculated to form a complex with calcium (see Table 6.2-2). The majority of humic and fulvic acids were stable as noncomplexed anions. Formation of calcium-humate and/or calcium-fulvate complexes did not influence the stability of $CaCO_3$ (calcite) according to MINTEQA2 simulations. The origin of DOC in groundwater at well R-22 includes natural sources and/or residual fluids from drilling and/or well completion. The neutral and base fractions may consist of residual EZ-MUD® copolymer and aliphatic compounds.

A DOC concentration of 8.3 mgC/L was measured in a groundwater sample collected from screen #4 (Older basalt) at a depth of 1378.0 ft on March 8, 2001. This sample contained 5.8 mgC/L hydrophobic fraction consisting of 4.3 mgC/L acid fraction, 1.5 mgC/L neutral fraction, and <0.1 mgC/L base fraction. The groundwater also contained 2.5 mgC/L hydrophilic fraction, which consisted of 1.4, 0.6, and 0.5 mgC/L acid, neutral, and base fractions, respectively.

A DOC concentration of 5.6 mgC/L was measured in a groundwater sample collected from the regional aquifer at a depth of 1448.0 ft (screen #5, lower Puye Formation) on March 6, 2001. This sample contained 2.9 mgC/L hydrophobic fraction consisting of 1.2 mgC/L acid fraction and 1.7 mgC/L neutral fraction with the base fraction less than detection (<0.1 mgC/L). The groundwater also contained 2.7 mgC/L hydrophilic fraction, which consisted of 2.2 mgC/L acid fraction, 0.2 mgC/L neutral fraction, and 0.3 mgC/L base fraction.

### 5.2 Comparison to Wells R-9, R-12, and R-15

Wells R-9, R-12 (screen #3), and R-15 are completed at the regional water table and provide a comparison for water chemistry with well R-22. Wells R-9, R-12, R-15, and R-22 contain measurable tritium between 3 and 83 pCi/L in the regional aquifer (Longmire 2002, 72713; Longmire 2002, 72800; and Longmire 2002, 72714). The highest activities of tritium were measured in well R-12 and the lowest in R-15. The detection of tritium suggests that the groundwater at well R-22 has undergone recharge from the surface in the past 50 years, although the source of tritium is not known. Potential sources, however, may include a combination of atmospheric fallout and local sources. Elevated concentrations of natural iron and/or manganese that occur in wells R-9, R-12, and R-15 are caused by oxidation-reduction reactions involving residual drilling fluids. These wells, however, are re-equilibrating with groundwater, and concentrations of these constituents are generally decreasing during characterization sampling. Concentrations of other trace elements and trace metals observed at well R-22 were within the ranges for samples collected from wells R-9 (Longmire 2002, 72713), R-12 (Longmire 2002, 72800), and R-15 (Longmire 2002, 72614).

# 6.0 GROUNDWATER GEOCHEMICAL CALCULATIONS

## 6.1 Computer Program Selection

Results of geochemical calculations suggest that groundwater chemistry and mineral stability are evolving at well R-22 as residual drilling fluid breaks down. Equilibrium conditions should be re-established after the residual drilling fluid has been removed from the well. Geochemical calculations of groundwater samples collected from well R-22 (screens #2 and #3) were conducted to evaluate speciation of solutes (dissolved species) and to quantify the state of saturation of solid phases that control groundwater composition under equilibrium conditions. These calculations provide insight into processes that control water/rock interactions, including mineral precipitation and adsorption occurring in both natural and contaminated water. Geochemical calculations of water were conducted to evaluate geochemical processes influencing natural water composition, dissociation of residual drilling fluids, and contaminant chemistry and transport.

Calculations of solute speciation, $PCO_2$ gas, and solid-phase saturation indices were made using the computer program MINTEQA2 (Allison et al. 1991, 49930), with single-ion activity coefficients calculated using the Davies equation. MINTEQA2 was developed by Battelle Northwest for the EPA for use at RCRA and Superfund sites. The model is constrained by solute concentrations and involves silicate, glass, ferric oxide, and clay minerals identified by Ball et al. at well R-22 (2002, 71471). MINTEQA2 quantifies possible rock/water and water/atmosphere reactions, but modeling results should be interpreted with caution and are limited by the scope of our understanding of hydrologic flow conditions (saturated and unsaturated), possible reaction mechanisms, and kinetic constraints in a disequilibrium-dominated system. One source of error in using the computer program is the accuracy of the chemical thermodynamic data contained in the database. Errors are greater for trace solutes for which experimental data are inaccurate and/or incomplete, including thallium, beryllium, and cadmium. The uranium database contained in MINTEQA2 has been critically evaluated by Grenthe et al. (1992, 71511). Fewer errors are associated with the major ions and with solid phases consisting of carbonate, silicate, and ferric oxyhydroxide minerals (Langmuir 1997, 56037).

## 6.2 Speciation Calculations

Speciation calculations using the computer program MINTEQA2 (Allison et al. 1991, 49930) were performed to evaluate stable forms of dissolved solutes, which influence mineral precipitation and adsorption reactions occurring in natural and contaminated waters. Fate and transport of natural manganese and anthropogenic ammonium observed at well R-22 are controlled by both aqueous speciation and adsorption/desorption processes. Input files for the calculations are provided in Appendix B. Solutes of importance at well R-22 included major ions, TKN, ammonium, uranium, iron, and manganese. Results of the speciation calculations are provided in Tables 6.2-1 and 6.2-2.

Concentrations of dissolved iron at well R-22 (962.5 ft) were less than detection for the first, second, and fourth sampling rounds conducted on March 12, 2001, June 20, 2001, and February 28, 2002, respectively. When detected, iron(II) is predicted to be stable mainly as dissolved $Fe^{2+}$. The hydrolysis species $FeOH^{+}$ is a minor component (not shown in Tables 6.2-1 and 6.2-2). The free or uncomplexed $Fe^{2+}$ cation is available for adsorption and precipitation reactions. Concentrations of dissolved iron in the regional aquifer at well R-22 varied depending on the presence of chemical reductants such as TOC and DOC associated with residual drilling fluids (Tables 5.1-1, 5.1-4, and 5.1-5).

**Table 6.2-1**
**Results of Speciation Calculations Using MINTEQA2 for Well R-22 (Regional Aquifer, 962.5 ft)**

| Solute | Dominant Speciation | Percentage | Sample Date (mo/d/yr) |
|---|---|---|---|
| U(VI) | $UO_2(CO_3)_2^{2-}$ | 40.2 | 03/12/01 |
| U(VI) | $UO_2(CO_3)_3^{4-}$ | 53.3 | 03/12/01 |
| U(VI) | $UO_2CO_3^{0}$ | 0 | 03/12/01 |
| U(VI) | $UO_2(OH)_2^{0}$ | 3.6 | 03/12/01 |
| U(VI) | $UO_2(OH)_3^{-}$ | 2.5 | 03/12/01 |
| U(VI) | $UO_2(CO_3)_2^{2-}$ | 72.5 | 06/20/01 |
| U(VI) | $UO_2(CO_3)_3^{4-}$ | 15.7 | 06/20/01 |
| U(VI) | $UO_2CO_3^{0}$ | 3.1 | 06/20/01 |
| U(VI) | $UO_2(OH)_2^{0}$ | 7.9 | 06/20/01 |
| U(VI) | $UO_2(OH)_3^{-}$ | 0 | 06/20/01 |
| U(VI) | $UO_2(CO_3)_2^{2-}$ | 41.6 | 12/03/01 |
| U(VI) | $UO_2(CO_3)_3^{4-}$ | 51.2 | 12/03/01 |
| U(VI) | $UO_2CO_3^{0}$ | 0 | 12/03/01 |
| U(VI) | $UO_2(OH)_2^{0}$ | 4.1 | 12/03/01 |
| U(VI) | $UO_2(OH)_3^{-}$ | 2.3 | 12/03/01 |
| U(VI) | $UO_2(CO_3)_2^{2-}$ | 73.3 | 02/28/02 |
| U(VI) | $UO_2(CO_3)_3^{4-}$ | 5.3 | 02/28/02 |
| U(VI) | $UO_2CO_3^{0}$ | 12.4 | 02/28/02 |
| U(VI) | $UO_2(OH)_2^{0}$ | 5.8 | 02/28/02 |
| U(VI) | $UO_2PO_4^{-}$ | 2.4 | 02/28/02 |

**Table 6.2-2**
**Results of Speciation Calculations Using MINTEQA2 for Well R-22 (Regional Aquifer, 1273.5 ft)**

| Solute | Dominant Speciation | Percentage | Sample Date (mo/d/yr) |
|---|---|---|---|
| U(VI) | $UO_2(CO_3)_2^{2-}$ | 17.0 | 03/09/01 |
| U(VI) | $UO_2(CO_3)_3^{4-}$ | 82.8 | 03/09/01 |
| DOM[a] | DOM | 62.6 | 03/09/01 |
| DOM | Ca-DOM | 35.5 | 03/09/01 |
| DOM | Mg-DOM | 1.8 | 03/09/01 |
| U(VI) | $UO_2(CO_3)_2^{2-}$ | 15.4 | 06/21/01 |
| U(VI) | $UO_2(CO_3)_3^{4-}$ | 83.8 | 06/21/01 |
| U(VI) | $UO_2(CO_3)_2^{2-}$ | 6.8 | 12/04/01 |
| U(VI) | $UO_2(CO_3)_3^{4-}$ | 91.1 | 12/04/01 |
| U(VI) | $UO_2(OH)_3^{-}$ | 1.3 | 12/04/01 |
| U(VI) | $UO_2(CO_3)_2^{2-}$ | 20.9 | 03/04/02 |
| U(VI) | $UO_2(CO_3)_3^{4-}$ | 78.3 | 03/04/02 |

[a] DOM = dissolved organic matter.

Uranium(VI) is predicted to be stable as $UO_2(CO_3)_2^{2-}$ and $UO_2(CO_3)_3^{4-}$ under oxidizing conditions characteristic of the regional aquifer (screens #2 and #3). These conditions are indicated by low concentrations of iron and manganese. Uranyl carbonate complexes are poorly to semisorbing onto hydrous ferric oxide between a pH range of 5.0 and 7.0, depending upon carbonate concentration (Langmuir 1997, 56037). Concentrations of total and dissolved uranium were generally less than 1 µg/L at well R-22. Elevated concentrations of natural uranium, however, were observed in groundwater samples collected from screen #3 for several sampling rounds. The species $UO_2(CO_3)_3^{4-}$ is calculated to dominate and is consistent with the observed elevated concentrations of natural uranium at 1273.5 ft. This species is poorly adsorbing onto ferrihydrite because of its size and charge. Uranium(IV) is predicted to be stable as $U(OH)_4^0$ in the presence of TOC and DOC above 1 mgC/L and under sulfate-reducing conditions (sulfate concentrations less than detection) in screens #1, #4, and #5. In other portions of the regional aquifer at well R-22 (screens #2 and #3), U(VI) is believed to be stable in the absence of reductants such as DOC and hydrogen sulfide.

Manganese, predicted to be stable as $Mn^{2+}$, can undergo cation exchange with other divalent cations and surface complexation adsorption with metal (oxy)hydroxides (Langmuir 1997, 56037). At well R-22, concentrations of natural dissolved manganese in the regional aquifer ranged from 0.003 to 4.41 mg/L. The complex $MnHCO_3^+$ was calculated to be stable at concentrations less than 7% of total dissolved manganese species within the regional groundwater. Major ions consisting of $Ca^{2+}$, $Mg^{2+}$, $Na^+$, $K^+$, $SO_4^{2-}$, and $HCO_3^-$ and the trace solute $Sr^{2+}$ (not shown in Tables 6.2-1 and 6.2-2) were calculated to be stable as free or uncomplexed solutes.

Dissolved organic matter (DOM), consisting of humic and fulvic acids (hydrophobic acid fraction), was calculated by MINTEQA2 to include mainly noncomplexed solutes and a calcium-DOM complex (Table 6.2-2).

Results of speciation calculations showed that cationic trace metals (iron and manganese) were stable in groundwater. Iron and manganese as well as ammonium are potentially removed from solution by cation exchange and adsorption (surface complexation) under circumneutral pH conditions. Migration of reduced uranium [U(IV)] was calculated to be minimal, based on speciation calculations for well R-22 (screens #4 and #5). The hydrolysis species $U(OH)_4^0$ contributes to precipitation of $UO_2$, $UO_2$am, and $USiO_4$ (Langmuir 1997, 56037).

### 6.3 Saturation Index Calculations

Solid-solution phase calculations were performed with MINTEQA2 (Allison et al. 1991, 49930) using analytical results (screens #2 and #3) obtained from filtered (less than 0.45 µm membrane) groundwater samples collected. These calculations were used to assess the importance of precipitation reactions for controlling the transport of manganese, uranium, and other solutes at well R-22.

Figure 6.3-1 shows the values of the SI for several key phases for well R-22 in the Cerros del Rio lavas (962.5 ft). Groundwater samples collected from screen #2 were calculated to be undersaturated with respect to $BaSO_4$ (barite), $CaCO_3$ (calcite), $FeCO_3$ (siderite) [when iron(II) is present above IDL], $SrCO_3$ (strontianite), and amorphous silica precipitate (Figure 6.3-1). Groundwater was calculated to be in equilibrium or slightly oversaturated with respect to silica gel. Groundwater was calculated to be oversaturated with respect to $Ca(UO_2)_2(Si_2O_5)_3{\cdot}5H_2O$ (haiweeite) at a depth of 962.5 ft.

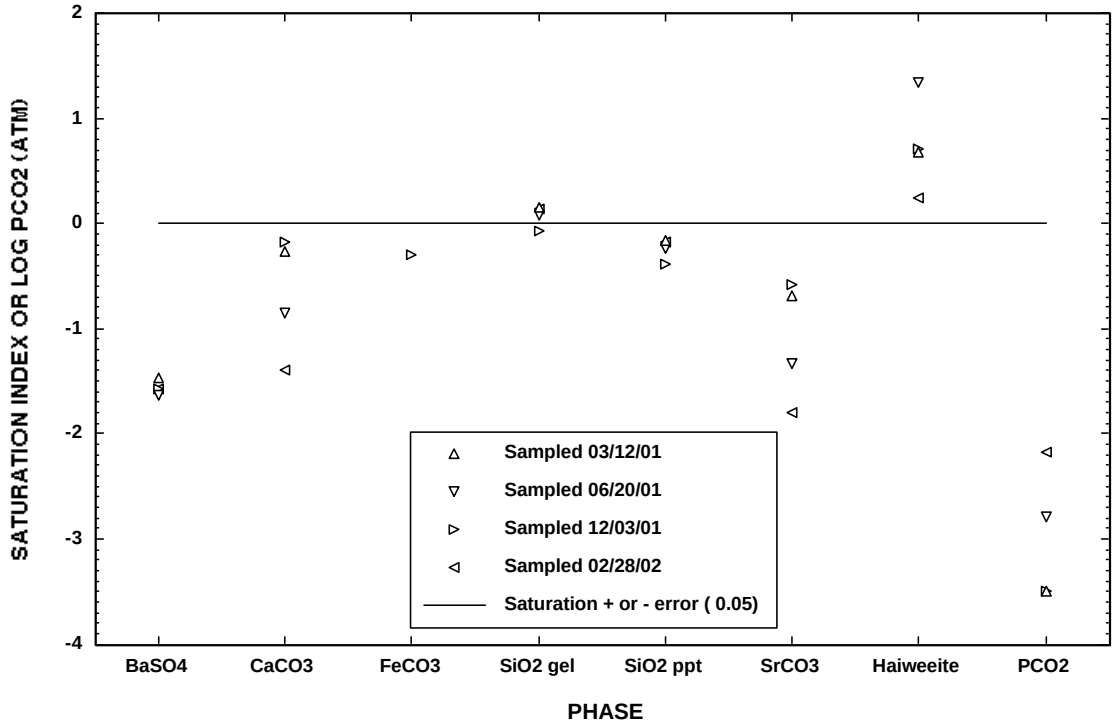



**Figure 6.3-1. Results of saturation index calculations using MINTEQA2 for well R-22 (regional aquifer, 962.5 ft)**

These results are generally consistent with observed mineralogy (i.e., the absence of strontium carbonate and the presence of silica glass) in the Cerros del Rio lavas at well R-22. Calculated $\log_{10}PCO_2$ gas varies from –3.50 to –2.17 atmosphere for R-22 groundwater (screen #2), which is controlled by pH and alkalinity (natural and oxidation of drilling fluids). Variation in the SI values for $FeCO_3$, $CaCO_3$, $SrCO_3$, and $PCO_2$ gas is the result of differing temperature, carbonate alkalinity, pH, and activities of iron, calcium, and strontium in the groundwater.

Results of mineral saturation calculations for well R-22 (regional aquifer, upper Puye Formation) are shown in Figure 6.3-2 using analytical results for groundwater samples collected at 1273.5 ft. The regional aquifer at well R-22 (1273.5 ft) was calculated to be oversaturated with respect to $CaCO_3$, $SrCO_3$, and $Ca(UO_2)_2(Si_2O_5)_3{\cdot}5H_2O$ (Figure 6.3-2). Groundwater was calculated to be undersaturated with respect to silica precipitate (Figure 6.3-3). Groundwater showed variable saturation with respect to silica gel and $BaSO_4$.

Because of varying pH, alkalinity, temperature, and concentrations of calcium, manganese, strontium, iron, and uranium, SIs for the above minerals vary by 4 orders of magnitude. Calculations suggest that well R-22 is continuously re-equilibrating with groundwater entering the well screens. Fewer variations in SIs and partial pressure of carbon dioxide gas are expected when equilibrium conditions are established and residual drilling fluid is removed from the well.

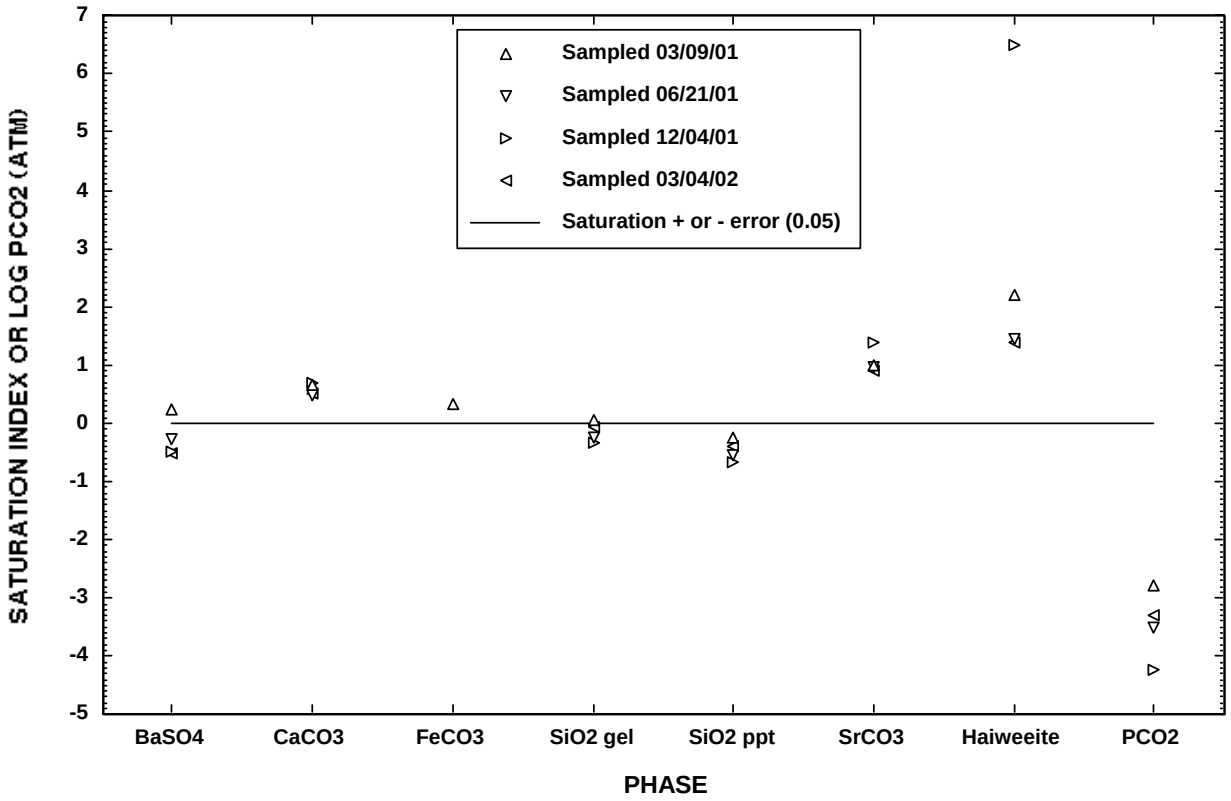



**Figure 6.3-2. Results of saturation index calculations using MINTEQA2 for well R-22 (regional aquifer, 1273.5 ft)**

## 7.0 CONCLUSIONS

Four rounds of groundwater characterization samples, collected at well R-22 at measurement depths of 907.0, 962.5, 1273.5, 1378.0, and 1448.0 ft, were chemically characterized for radionuclides, metals and trace elements, major ions, HE compounds, DOC, TOC, organic compounds, and stable isotopes. Technetium-99 was detected in the first sampling round at activities of 4.3 (screen #4) and 4.9 (screen #3) pCi/L just above the IDL using liquid scintillation. The presence of this isotope is not absolutely certain because of its low activity. Activities of tritium at well R-22 were generally less than detection (screens #2, #3, and #4), suggesting that the groundwater is between 3000 and 10,000 years old and predates the beginning of nuclear testing (based on the cosmogenic baseline of tritium of 1 pCi/L prior to testing). Other supply wells and springs where tritium was not detected have not received recharge from the surface for several thousand years (Blake et al. 1995, 49931). Tritium, however, was detected above 2 pCi/L in groundwater samples collected from screens #1, #2 (first sample round), and #5.

Americium-241, cesium-137, plutonium-238, plutonium-239,240, and strontium-90 were not detected in the groundwater samples collected from well R-22. Activities of uranium-234, uranium-235, and uranium-238 were generally detected only at concentrations less than 0.5 pCi/L, which are similar to activities of isotopic uranium measured in supply wells O-1, O-4, PM-1 through PM-5, and the Guaje well field (ESP 2002, 71301). Gross alpha and gross beta activities were less than 4 pCi/L in one groundwater sample collected from screen #1. A gross gamma activity of 251 pCi/L in the sample was attributed to isotopes within the natural uranium-238, uranium-235, and thorium-232 decay chains.

Analytical results for well R-22 show that solute concentrations within the regional aquifer, excluding manganese (EPA secondary standard for drinking water of 0.05 mg/L) and iron (EPA secondary standard for drinking water of 0.3 mg/L), were below standards established by the EPA and NMWQCC. Maximum

concentrations of dissolved iron and manganese detected in screen #1 (fourth sampling round) were 14.90 and 4.41 mg/L, respectively. Elevated concentrations of natural iron and manganese were the result of reductive dissolution of ferric (oxy)hydroxide and manganese dioxide in the presence of residual drilling fluid at well R-22. Concentrations of natural iron and manganese decreased during characterization sampling, suggesting that residual drilling fluids are breaking down or dissociating and the well is re-equilibrating with groundwater in the regional aquifer.

Groundwater within the regional aquifer ranged from a calcium-sodium-bicarbonate ionic composition within the Cerros del Rio lavas, Older basalt, and lower Puye Formation to a sodium-calcium-bicarbonate ionic composition within the upper Puye Formation. Calculated TDS in the Cerros del Rio lavas (screens #1 and #2) ranged from 145 to 484 mg/L and from 213 to 455 mg/L in the upper (screen #3) and lower (screen #5) Puye Formation. Calculated TDS in the Older basalt (screen #4) ranged from 417 to 464 mg/L. Variation in TDS within the different zones suggests that regional aquifer groundwater is still equilibrating because of the oxidation of residual drilling fluid to bicarbonate.

Average detectable concentrations of dissolved chloride, fluoride, nitrate plus nitrite (as N), and sulfate were 3.8, 0.4, 0.4, and 2.3 mg/L, respectively, within the Cerros del Rio lavas at depths of 907.0 and 962.5 ft. Average detectable concentrations of dissolved chloride, fluoride, nitrate plus nitrite (as N), and sulfate were 3.6, 0.5, 0.2, and 13.2 mg/L, respectively, within the upper and lower Puye Formation at depths of 1273.5 and 1448.0 ft. Within the Older basalt, average detectable concentrations of dissolved chloride, fluoride, nitrate plus nitrite (as N), and sulfate were 7.9, 0.6, 0.05 (single value), and 1.0 mg/L, respectively, at a depth of 1378.0 ft. Concentrations of alkalinity varied over time in the regional aquifer, probably the result of continued oxidation of residual drilling fluid (EZ-MUD®).

Stable isotope ratios of δD and $\delta^{18}O$ imply that the sampled groundwater at well R-22 was derived from a local meteoric source consisting of precipitation and surface water. Results of $\delta^{15}N_{AIR}$-$NO_3$ analyses suggest that fractionation of natural nitrate plus nitrite (as N) has occurred (–3.5 to +6.4‰). Ammonium and TKN within the regional aquifer is derived from residual drilling fluid (EZ-MUD®) ($\delta^{15}N_{AIR}$-$NH_3$ of +1.4 to +3.7‰).

Geochemical calculations using the computer program MINTEQA2 were performed to evaluate solute speciation and mineral equilibrium in assessing groundwater chemistry and refining the geochemical conceptual model for well R-22. Geochemical calculations show that well R-22 is re-equilibrating with groundwater entering the well screens because of the presence of residual drilling fluid. Uranium(IV) is calculated to be stable as $U(OH)_4^0$ under induced reducing conditions characterized by elevated TOC and DOC and the absence of sulfate in portions of the regional aquifer at well R-22. As oxidizing conditions become re-established during breakdown of drilling fluids, uranyl dicarbonate and uranyl tricarbonate complexes are calculated to be stable in the regional aquifer (screens #1 and #3) at well R-22. Groundwater in the Cerros del Rio lavas (screen #2) is calculated to be undersaturated with respect to $CaCO_3$ (calcite), $BaSO_4$, $FeCO_3$, $SrCO_3$, and amorphous silica precipitate. This groundwater is calculated to be oversaturated with respect to $Ca(UO_2)_2(Si_2O_5)_3 \cdot 5H_2O$. Groundwater in the upper Puye Formation (screen #3) at well R-22 is calculated to be undersaturated with respect to silica precipitate and oversaturated with respect to $CaCO_3$ (calcite), $SrCO_3$, and $Ca(UO_2)_2(Si_2O_5)_3 \cdot 5H_2O$. Groundwater samples collected from screen #3 are calculated to be in equilibrium with amorphous silica gel and show variable saturation with respect to $BaSO_4$.

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## 9.0 REFERENCES

Allison, J. D., D. S. Brown, and K. J. Novo-Gradac, March 1991. "MINTEQA2/PRODEFA2, A Geochemical Assessment Model for Environmental Systems: Version 3.0 User's Manual," EPA/600/3-91/021, Office of Research and Development, Athens, Georgia. (Allison et al. 1991, 49930)

Ball, T., M. Everett, P. Longmire, D. Vaniman, W. Stone, D. Larssen, K. Greene, N. Clayton, and S. McLin, February 2002. "Characterization Well R-22 Completion Report," Los Alamos National Laboratory Report LA-13893-MS, Los Alamos, New Mexico. (Ball et al. 2002, 71471)

Blake, W. D., F. Goff, A.I. Adams, and D. Counce, May 1995. "Environmental Geochemistry for Surface and Subsurface Waters in the Pajarito Plateau and Outlying Areas, New Mexico," Los Alamos National Laboratory Report LA-12912-MS, Los Alamos, New Mexico. (Blake et al. 1995, 49931)

Clark, I. D., and Fritz, P., 1997, *Environmental Isotopes in Hydrogeology*, Lewis Publishers, New York, New York. (Clark and Fritz 1997, 59168)

ESP (Environmental Surveillance Program), December 2000. "Environmental Surveillance at Los Alamos during 1999," Los Alamos National Laboratory Report LA-13775-ENV, Los Alamos, New Mexico. (ESP 2000, 68661)

ESP (Environmental Surveillance Program), January 2002. "Environmental Surveillance at Los Alamos during 2000," Los Alamos National Laboratory Report LA-13861-ENV, Los Alamos, New Mexico. (ESP 2002, 71301)

Grenthe, I. et al., eds, 1992. *Chemical Thermodynamics of Uranium*, Chemical Thermodynamics Ser., Amsterdam: Elsevier Science Publ., New York, New York, pp. 1–715. (Grenthe et al. 1992, 71511)

Langmuir, D., 1997. *Aqueous Environmental Geochemistry,* Prentice-Hall, Inc., Upper Saddle River, New Jersey. (Langmuir 1997, 56037)

LANL (Los Alamos National Laboratory), January 31, 1996. "Groundwater Protection Management Program Plan," Rev. 2.0, Los Alamos, New Mexico. (LANL 1996, 70215)

LANL (Los Alamos National Laboratory), May 22, 1998. "Hydrogeologic Workplan," Los Alamos, New Mexico. (LANL 1998, 59599)

Longmire, P., September 04, 2002. Personal Correspondence with D. Broxton. Los Alamos National Laboratory, Los Alamos, New Mexico. (Longmire 2002, 73455)

Longmire, P., June 2002. "Characterization Well R-19 Geochemistry Report," Los Alamos National Laboratory Report LA-13964-MS, Los Alamos, New Mexico. (Longmire 2002, 73282)

Longmire, P., June 2002. "Characterization Well R-12 Geochemistry Report," Los Alamos National Laboratory Report LA-13952-MS, Los Alamos, New Mexico. (Longmire 2002, 72800)

Longmire, P., April 2002. "Characterization Wells R-9 and R-9i Geochemistry Report," Los Alamos National Laboratory Report LA-13927-MS, Los Alamos, New Mexico. (Longmire 2002, 72713)

Longmire, P., March 2002. "Characterization Well R-15 Geochemistry Report," Los Alamos National Laboratory Report LA-13896-MS, Los Alamos, New Mexico. (Longmire 2002, 72614)

Thurman, E. M., 1985. *Organic Geochemistry of Natural Waters*, Martinus Nijhoff/Dr. W. Junk Publishers, Boston, Massachusetts, p. 14. (Thurman 1985, 71514)

Vilks, P., and D.B. Bachinski, 1996. "Characterization of Organics in Whiteshell Research Area Groundwater and the Implications for Radionuclide Transport," *Applied Geochemistry*, Vol. 11, No. 3, pp. 387–402. (Vilks and Bachinski 1996, 71515)

# Appendix A

*Groundwater Analytical Results*

## Table A-1
## Regional Well R-22 Screen 1 First Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 1 | 907 | 03/13/01 | NF[e] | 0 | 0 | —[f] | — | — | — | — | — |
| Dissolved Oxygen | 1 | 907 | 03/13/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 1 | 907 | 03/13/01 | NF | 1 | 1 | 7.21 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 1 | 907 | 03/13/01 | NF | 1 | 1 | 458 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 1 | 907 | 03/13/01 | NF | 1 | 1 | 19.6 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 1 | 907 | 03/13/01 | NF | 1 | 1 | 9.3 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 1 | 907 | 03/13/01 | F[h] | 1 | 1 | 230000 | — | — | — | — | — |
| Aluminum | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [7.7] | 50 | 0/1 | 5000 | 0/1 |
| Ammonia (as N) | 1 | 907 | 03/13/01 | F | 1 | 1 | 960 | — | — | — | — | — |
| Antimony | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.173] | 6 | 0/2 | — | — |
| Arsenic | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [1.5] | 50 | 0/1 | 100 | 0/1 |
| Barium | 1 | 907 | 03/13/01 | F | 1 | 1 | 130 | — | 2000 | 0/1 | 1000 | 0/1 |
| Beryllium | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.11] | 4 | 0/1 | — | — |
| Boron | 1 | 907 | 03/13/01 | F | 1 | 1 | 32 | — | — | — | 750 | 0/1 |
| Bromide | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [200] | — | — | — | — |
| Cadmium | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.066] | 5 | 0/2 | 10 | 0/2 |
| Calcium | 1 | 907 | 03/13/01 | F | 1 | 1 | 48000 | — | — | — | — | — |
| Chloride | 1 | 907 | 03/13/01 | F | 1 | 1 | 3800 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.34] | 100 | 0/1 | 50 | 0/1 |
| Cobalt | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.4] | — | — | 50 | 0/1 |
| Copper | 1 | 907 | 03/13/01 | F | 1 | 1 | 0.75 | — | 1300 | 0/1 | 1000 | 0/1 |

**Table A-1 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cyanide (total) | 1 | 907 | 03/13/01 | NF | 1 | 0 | — | [10] | — | — | — | — |
| Fluoride | 1 | 907 | 03/13/01 | F | 1 | 1 | 410 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 1 | 907 | 03/13/01 | F | 1 | 1 | 5000 | — | 300 | 1/1 | 1000 | 1/1 |
| Lead | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.65] | 15 | 0/1 | 50 | 0/1 |
| Magnesium | 1 | 907 | 03/13/01 | F | 1 | 1 | 12000 | — | — | — | — | — |
| Manganese | 1 | 907 | 03/13/01 | F | 1 | 1 | 2900 | — | 50 | 1/1 | 200 | 1/1 |
| Mercury | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.016] | 2 | 0/1 | — | — |
| Molybdenum | 1 | 907 | 03/13/01 | F | 1 | 1 | 40 | — | — | — | — | — |
| Nickel | 1 | 907 | 03/13/01 | F | 1 | 1 | 3.9 | — | 100 | 0/1 | 200 | 0/1 |
| Nitrate + Nitrite (as N) | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [50] | 10000 | 0/1 | — | — |
| Perchlorate | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (as P) | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Potassium | 1 | 907 | 03/13/01 | F | 1 | 1 | 3500 | — | — | — | — | — |
| Selenium | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [2.5] | 50 | 0/1 | 50 | 0/1 |
| Silica | 1 | 907 | 03/13/01 | F | 1 | 1 | 25680 | — | — | — | — | — |
| Silver | 1 | 907 | 03/13/01 | F | 1 | 1 | 1.1 | — | 100 | 0/1 | 50 | 0/1 |
| Sodium | 1 | 907 | 03/13/01 | F | 1 | 1 | 19000 | — | — | — | — | — |
| Strontium | 1 | 907 | 03/13/01 | F | 1 | 1 | 250 | — | — | — | — | — |
| Sulfate | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [1000] | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.077] | 2 | 0/2 | — | — |
| Total Kjeldahl Nitrogen | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [1200] | — | — | — | — |
| Uranium | 1 | 907 | 03/13/01 | F | 1 | 1 | 0.051 | — | 20 | 0/1 | 5000 | 0/1 |
| Vanadium | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.38] | — | — | — | — |
| Zinc | 1 | 907 | 03/13/01 | F | 1 | 1 | 8.1 | — | 5000 | 0/1 | 10000 | 0/1 |

## Table A-1 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 1 | 907 | 03/13/01 | NF | 1 | 1 | -78 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 1 | 907 | 03/13/01 | NF | 1 | 1 | +3.3 | — | — | — | — | — |
| $\delta^{18}O$ | 1 | 907 | 03/13/01 | NF | 1 | 1 | -11 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-2
## Regional Well R-22 Screen 2 First Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 2 | 962 | 03/12/01 | NF[e] | 1 | 1 | 65700 | —[f] | — | — | — | — |
| Dissolved Oxygen | 2 | 906 | 03/13/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 2 | 962 | 03/12/01 | NF | 1 | 1 | 8.35 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 2 | 962 | 03/12/01 | NF | 1 | 1 | 153 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 2 | 962 | 03/12/01 | NF | 1 | 1 | 17.0 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 2 | 962 | 03/12/01 | NF | 1 | 1 | 0.0 | — | — | 0/1 | — | 0/1 |
| Analyte | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 2 | 962 | 03/12/01 | F[h] | 1 | 1 | 71000 | — | — | — | — | — |
| Aluminum | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [7.7] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [7.7] | — | — | — | — |
| Ammonia (as N) | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Antimony | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.195] | 6 | 0/2 | — | — |
| Antimony | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.153] | — | — | — | — |
| Arsenic | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [1.5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [1.5] | — | — | — | — |
| Barium | 2 | 962 | 03/12/01 | F | 1 | 1 | 14 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 2 | 962 | 03/12/01 | NF | 1 | 1 | 14 | — | — | — | — | — |
| Beryllium | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.11] | 4 | 0/1 | — | — |
| Beryllium | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.11] | — | — | — | — |
| Boron | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [17] | — | — | 750 | 0/1 |
| Boron | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [17] | — | — | — | — |
| Bromide | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [200] | — | — | — | — |

**Table A-2 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.066] | 5 | 0/2 | 10 | 0/2 |
| Cadmium | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.066] | — | — | — | — |
| Calcium | 2 | 962 | 03/12/01 | F | 1 | 1 | 9300 | — | — | — | — | — |
| Calcium | 2 | 962 | 03/12/01 | NF | 1 | 1 | 9400 | — | — | — | — | — |
| Chloride | 2 | 962 | 03/12/01 | F | 1 | 1 | 3100 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 2 | 962 | 03/12/01 | F | 1 | 1 | 2 | — | 100 | 0/1 | 50 | 0/1 |
| Chromium | 2 | 962 | 03/12/01 | NF | 1 | 1 | 4.1 | — | — | — | — | — |
| Cobalt | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.4] | — | — | 50 | 0/1 |
| Cobalt | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.4] | — | — | — | — |
| Copper | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.34] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.34] | — | — | — | — |
| Cyanide (total) | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [10] | — | — | — | — |
| Fluoride | 2 | 962 | 03/12/01 | F | 1 | 1 | 290 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [51] | 300 | 0/1 | 1000 | 0/1 |
| Iron | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [59] | — | — | — | — |
| Lead | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.65] | 15 | 0/1 | 50 | 0/1 |
| Lead | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.65] | — | — | — | — |
| Magnesium | 2 | 962 | 03/12/01 | F | 1 | 1 | 4500 | — | — | — | — | — |
| Magnesium | 2 | 962 | 03/12/01 | NF | 1 | 1 | 4500 | — | — | — | — | — |
| Manganese | 2 | 962 | 03/12/01 | F | 1 | 1 | 3.3 | — | 50 | 0/1 | 200 | 0/1 |
| Manganese | 2 | 962 | 03/12/01 | NF | 1 | 1 | 3.7 | — | — | — | — | — |
| Mercury | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.016] | 2 | 0/1 | — | — |
| Mercury | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.016] | — | — | 2 | 0/1 |
| Molybdenum | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [4.5] | — | — | — | — |
| Molybdenum | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [4.5] | — | — | — | — |
| Nickel | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.6] | 100 | 0/1 | 200 | 0/1 |
| Nickel | 2 | 962 | 03/12/01 | NF | 1 | 1 | 1.3 | — | — | — | — | — |

**Table A-2 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate + Nitrite (as N) | 2 | 962 | 03/12/01 | F | 1 | 1 | 720 | — | 10000 | 0/1 | — | — |
| Perchlorate | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (as P) | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [16.1] | — | — | — | — |
| Potassium | 2 | 962 | 03/12/01 | F | 1 | 1 | 3100 | — | — | — | — | — |
| Potassium | 2 | 962 | 03/12/01 | NF | 1 | 1 | 3100 | — | — | — | — | — |
| Selenium | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [2.5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [2.5] | — | — | — | — |
| Silica | 2 | 962 | 03/12/01 | F | 1 | 1 | 68480 | — | — | — | — | — |
| Silica | 2 | 962 | 03/12/01 | NF | 1 | 1 | 66340 | — | — | — | — | — |
| Silver | 2 | 962 | 03/12/01 | F | 1 | 1 | 0.84 | — | 100 | 0/1 | 50 | 0/1 |
| Silver | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.48] | — | — | — | — |
| Sodium | 2 | 962 | 03/12/01 | F | 1 | 1 | 11000 | — | — | — | — | — |
| Sodium | 2 | 962 | 03/12/01 | NF | 1 | 1 | 11000 | — | — | — | — | — |
| Strontium | 2 | 962 | 03/12/01 | F | 1 | 1 | 45 | — | — | — | — | — |
| Strontium | 2 | 962 | 03/12/01 | NF | 1 | 1 | 45 | — | — | — | — | — |
| Sulfate | 2 | 962 | 03/12/01 | F | 1 | 1 | 3900 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 2 | 962 | 03/12/01 | F | 1 | 1 | 0.498 | — | 2 | 0/2 | — | — |
| Thallium | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.077] | — | — | — | — |
| Total Kjeldahl Nitrogen | 2 | 962 | 03/12/01 | F | 1 | 1 | 240 | — | — | — | — | — |
| Uranium | 2 | 962 | 03/12/01 | F | 1 | 1 | 0.478 | — | 20 | 0/1 | 5000 | 0/1 |
| Uranium | 2 | 962 | 03/12/01 | NF | 1 | 1 | 0.421 | — | — | — | — | — |
| Vanadium | 2 | 962 | 03/12/01 | F | 1 | 1 | 4.6 | — | — | — | — | — |
| Vanadium | 2 | 962 | 03/12/01 | NF | 1 | 1 | 4.7 | — | — | — | — | — |
| Zinc | 2 | 962 | 03/12/01 | F | 1 | 1 | 2.8 | — | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 2 | 962 | 03/12/01 | NF | 1 | 1 | 2.9 | — | — | — | — | — |

## Table A-2 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 2 | 962 | 03/12/01 | NF | 1 | 1 | -78 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 2 | 962 | 03/12/01 | NF | 1 | 1 | +2.6 | — | — | — | — | — |
| $\delta^{18}O$ | 2 | 962 | 03/12/01 | NF | 1 | 1 | -11.3 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-3
## Regional Well R-22 Screen 3 First Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 3 | 1273 | 03/09/01 | NF[e] | 1 | 1 | 248200 | —[f] | — | — | — | — |
| Dissolved Oxygen | 3 | 1273 | 03/09/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 8.21 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 478 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 19.5 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 3.8 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 3 | 1273 | 03/09/01 | F[h] | 1 | 1 | 250000 | — | — | — | — | — |
| Aluminum | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [7.7] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [7.7] | — | — | — | — |
| Ammonia (as N) | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [500] | — | — | — | — |
| Antimony | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0.594] | 6 | 0/2 | — | — |
| Antimony | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [0.331] | — | — | — | — |
| Arsenic | 3 | 1273 | 03/09/01 | F | 1 | 1 | 2.6 | — | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 4.8 | — | — | — | — | — |
| Barium | 3 | 1273 | 03/09/01 | F | 1 | 1 | 140 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 140 | — | — | — | — | — |
| Beryllium | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0.11] | 4 | 0/1 | — | — |
| Beryllium | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [0.11] | — | — | — | — |
| Boron | 3 | 1273 | 03/09/01 | F | 1 | 1 | 72 | — | — | — | 750 | 0/1 |
| Boron | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 78 | — | — | — | — | — |
| Bromide | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [200] | — | — | — | — |

**Table A-3 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0.066] | 5 | 0/2 | 10 | 0/2 |
| Cadmium | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [0.066] | — | — | — | — |
| Calcium | 3 | 1273 | 03/09/01 | F | 1 | 1 | 35000 | — | — | — | — | — |
| Calcium | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 33000 | — | — | — | — | — |
| Chloride | 3 | 1273 | 03/09/01 | F | 1 | 1 | 3900 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0.34] | 100 | 0/1 | 50 | 0/1 |
| Chromium | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 11 | — | — | — | — | — |
| Cobalt | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0.4] | — | — | 50 | 0/1 |
| Cobalt | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [0.4] | — | — | — | — |
| Copper | 3 | 1273 | 03/09/01 | F | 1 | 1 | 1.7 | — | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 2.2 | — | — | — | — | — |
| Cyanide (total) | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [10] | — | — | — | — |
| Fluoride | 3 | 1273 | 03/09/01 | F | 1 | 1 | 630 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 3 | 1273 | 03/09/01 | F | 1 | 1 | 200 | — | 300 | 0/1 | 1000 | 0/1 |
| Iron | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 230 | — | — | — | — | — |
| Lead | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0.65] | 15 | 0/1 | 50 | 0/1 |
| Lead | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [0.65] | — | — | — | — |
| Magnesium | 3 | 1273 | 03/09/01 | F | 1 | 1 | 11000 | — | — | — | — | — |
| Magnesium | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 11000 | — | — | — | — | — |
| Manganese | 3 | 1273 | 03/09/01 | F | 1 | 1 | 200 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 160 | — | — | — | — | — |
| Mercury | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0.016] | 2 | 0/1 | — | — |
| Mercury | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [0.016] | — | — | 2 | 0/1 |
| Molybdenum | 3 | 1273 | 03/09/01 | F | 1 | 1 | 11 | — | — | — | — | — |
| Molybdenum | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 17 | — | — | — | — | — |
| Nickel | 3 | 1273 | 03/09/01 | F | 1 | 1 | 1.4 | — | 100 | 0/1 | 200 | 0/1 |
| Nickel | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 8.5 | — | — | — | — | — |

**Table A-3 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate + Nitrite (as N) | 3 | 1273 | 03/09/01 | F | 1 | 1 | 400 | — | 10000 | 0/1 | — | — |
| Perchlorate | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (as P) | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Potassium | 3 | 1273 | 03/09/01 | F | 1 | 1 | 9700 | — | — | — | — | — |
| Potassium | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 10000 | — | — | — | — | — |
| Selenium | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [2.5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 2.8 | — | — | — | — | — |
| Silica | 3 | 1273 | 03/09/01 | F | 1 | 1 | 57780 | — | — | — | — | — |
| Silica | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 59920 | — | — | — | — | — |
| Silver | 3 | 1273 | 03/09/01 | F | 1 | 1 | 0.97 | — | 100 | 0/1 | 50 | 0/1 |
| Silver | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 0.86 | — | — | — | — | — |
| Sodium | 3 | 1273 | 03/09/01 | F | 1 | 1 | 54000 | — | — | — | — | — |
| Sodium | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 60000 | — | — | — | — | — |
| Strontium | 3 | 1273 | 03/09/01 | F | 1 | 1 | 940 | — | — | — | — | — |
| Strontium | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 1000 | — | — | — | — | — |
| Sulfate | 3 | 1273 | 03/09/01 | F | 1 | 1 | 31000 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0.18] | 2 | 0/2 | — | — |
| Thallium | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [0.277] | — | — | — | — |
| Total Kjeldahl Nitrogen | 3 | 1273 | 03/09/01 | F | 1 | 1 | 1700 | — | — | — | — | — |
| Uranium | 3 | 1273 | 03/09/01 | F | 1 | 1 | 15.2 | — | 20 | 0/1 | 5000 | 0/1 |
| Uranium | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 16 | — | — | — | — | — |
| Vanadium | 3 | 1273 | 03/09/01 | F | 1 | 1 | 2.5 | — | — | — | — | — |
| Vanadium | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 2.7 | — | — | — | — | — |
| Zinc | 3 | 1273 | 03/09/01 | F | 1 | 1 | 10 | — | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 18 | — | — | — | — | — |

**Table A-3 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 3 | 1273 | 03/09/01 | NF | 1 | 1 | -76 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 3 | 1273 | 03/09/01 | NF | 1 | 1 | -3.5 | — | — | — | — | — |
| $\delta^{18}O$ | 3 | 1273 | 03/09/01 | NF | 1 | 1 | -11.2 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-4
## Regional Well R-22 Screen 4 First Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 4 | 1378 | 03/08/01 | NF[e] | 1 | 1 | 258500 | —[f] | — | — | — | — |
| Dissolved Oxygen | 4 | 1378 | 03/08/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 4 | 1378 | 03/08/01 | NF | 1 | 1 | 7.21 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 4 | 1378 | 03/08/01 | NF | 1 | 1 | 533 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 4 | 1378 | 03/08/01 | NF | 1 | 1 | 16.7 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 4 | 1378 | 03/08/01 | NF | 1 | 1 | 12.8 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 4 | 1378 | 03/08/01 | F[h] | 1 | 1 | 280000 | — | — | — | — | — |
| Aluminum | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [7.7] | 50 | 0/1 | 5000 | 0/1 |
| Ammonia (as N) | 4 | 1378 | 03/08/01 | F | 1 | 1 | 1800 | — | — | — | — | — |
| Antimony | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.201] | 6 | 0/2 | — | — |
| Arsenic | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [1.5] | 50 | 0/1 | 100 | 0/1 |
| Barium | 4 | 1378 | 03/08/01 | F | 1 | 1 | 360 | — | 2000 | 0/1 | 1000 | 0/1 |
| Beryllium | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.11] | 4 | 0/1 | — | — |
| Boron | 4 | 1378 | 03/08/01 | F | 1 | 1 | 86 | — | — | — | 750 | 0/1 |
| Bromide | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [200] | — | — | — | — |
| Cadmium | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.162] | 5 | 0/2 | 10 | 0/2 |
| Calcium | 4 | 1378 | 03/08/01 | F | 1 | 1 | 61000 | — | — | — | — | — |
| Chloride | 4 | 1378 | 03/08/01 | F | 1 | 1 | 7800 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 4 | 1378 | 03/08/01 | F | 1 | 1 | 2.5 | — | 100 | 0/1 | 50 | 0/1 |
| Cobalt | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.4] | — | — | 50 | 0/1 |
| Copper | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.34] | 1300 | 0/1 | 1000 | 0/1 |

**Table A-4 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cyanide (total) | 4 | 1378 | 03/08/01 | NF | 1 | 0 | — | [10] | — | — | — | — |
| Fluoride | 4 | 1378 | 03/08/01 | F | 1 | 1 | 800 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 4 | 1378 | 03/08/01 | F | 1 | 1 | 4900 | — | 300 | 1/1 | 1000 | 1/1 |
| Lead | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.65] | 15 | 0/1 | 50 | 0/1 |
| Magnesium | 4 | 1378 | 03/08/01 | F | 1 | 1 | 15000 | — | — | — | — | — |
| Manganese | 4 | 1378 | 03/08/01 | F | 1 | 1 | 1600 | — | 50 | 1/1 | 200 | 1/1 |
| Mercury | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.016] | 2 | 0/1 | — | — |
| Molybdenum | 4 | 1378 | 03/08/01 | F | 1 | 1 | 42 | — | — | — | — | — |
| Nickel | 4 | 1378 | 03/08/01 | F | 1 | 1 | 3.5 | — | 100 | 0/1 | 200 | 0/1 |
| Nitrate + Nitrite (as N) | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [100] | 10000 | 0/1 | — | — |
| Perchlorate | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (as P) | 4 | 1378 | 03/08/01 | F | 1 | 1 | 93.38 | — | — | — | — | — |
| Potassium | 4 | 1378 | 03/08/01 | F | 1 | 1 | 5100 | — | — | — | — | — |
| Selenium | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [2.5] | 50 | 0/1 | 50 | 0/1 |
| Silica | 4 | 1378 | 03/08/01 | F | 1 | 1 | 34240 | — | — | — | — | — |
| Silver | 4 | 1378 | 03/08/01 | F | 1 | 1 | 0.64 | — | 100 | 0/1 | 50 | 0/1 |
| Sodium | 4 | 1378 | 03/08/01 | F | 1 | 1 | 23000 | — | — | — | — | — |
| Strontium | 4 | 1378 | 03/08/01 | F | 1 | 1 | 1100 | — | — | — | — | — |
| Sulfate | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [1000] | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.141] | 2 | 0/2 | — | — |
| Total Kjeldahl Nitrogen | 4 | 1378 | 03/08/01 | F | 1 | 1 | 2300 | — | — | — | — | — |
| Uranium | 4 | 1378 | 03/08/01 | F | 1 | 1 | 0.081 | — | 20 | 0/1 | 5000 | 0/1 |
| Vanadium | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.38] | — | — | — | — |
| Zinc | 4 | 1378 | 03/08/01 | F | 1 | 1 | 7.5 | — | 5000 | 0/1 | 10000 | 0/1 |

## Table A-4 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 4 | 1378 | 03/08/01 | NF | 1 | 1 | -76 | — | — | — | — | — |
| $\delta^{15}N$ ($NH_3$) | 4 | 1378 | 03/08/01 | NF | 1 | 1 | +3.1 | — | — | — | — | — |
| $\delta^{18}O$ | 4 | 1378 | 03/08/01 | NF | 1 | 1 | -11 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-5
## Regional Well R-22 Screen 5 First Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 5 | 1448 | 03/06/01 | NF[e] | 1 | 1 | 142700 | —[f] | — | — | — | — |
| Dissolved Oxygen | 5 | 1448 | 03/06/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 7.01 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 290 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 19.0 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 3.1 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 5 | 1448 | 03/06/01 | F[h] | 1 | 1 | 150000 | — | — | — | — | — |
| Aluminum | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [7.7] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [7.7] | — | — | — | — |
| Ammonia (as N) | 5 | 1448 | 03/06/01 | F | 1 | 1 | 1100 | — | — | — | — | — |
| Antimony | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.883] | 6 | 0/2 | — | — |
| Antimony | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [1.05] | — | — | — | — |
| Arsenic | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [1.5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [1.5] | — | — | — | — |
| Barium | 5 | 1448 | 03/06/01 | F | 1 | 1 | 120 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 120 | — | — | — | — | — |
| Beryllium | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.11] | 4 | 0/1 | — | — |
| Beryllium | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.11] | — | — | — | — |
| Boron | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [30] | — | — | 750 | 0/1 |
| Boron | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [27] | — | — | — | — |
| Bromide | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [200] | — | — | — | — |

**Table A-5 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.066] | 5 | 0/2 | 10 | 0/2 |
| Cadmium | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.066] | — | — | — | — |
| Calcium | 5 | 1448 | 03/06/01 | F | 1 | 1 | 33000 | — | — | — | — | — |
| Calcium | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 34000 | — | — | — | — | — |
| Chloride | 5 | 1448 | 03/06/01 | F | 1 | 1 | 4200 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 5 | 1448 | 03/06/01 | F | 1 | 1 | 0.82 | — | 100 | 0/1 | 50 | 0/1 |
| Chromium | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 8.8 | — | — | — | — | — |
| Cobalt | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.4] | — | — | 50 | 0/1 |
| Cobalt | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.4] | — | — | — | — |
| Copper | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.34] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 0.68 | — | — | — | — | — |
| Cyanide (total) | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [10] | — | — | — | — |
| Fluoride | 5 | 1448 | 03/06/01 | F | 1 | 1 | 410 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 5 | 1448 | 03/06/01 | F | 1 | 1 | 4300 | — | 300 | 1/1 | 1000 | 1/1 |
| Iron | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 4300 | — | — | — | — | — |
| Lead | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.65] | 15 | 0/1 | 50 | 0/1 |
| Lead | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.65] | — | — | — | — |
| Magnesium | 5 | 1448 | 03/06/01 | F | 1 | 1 | 5300 | — | — | — | — | — |
| Magnesium | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 5800 | — | — | — | — | — |
| Manganese | 5 | 1448 | 03/06/01 | F | 1 | 1 | 530 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 570 | — | — | — | — | — |
| Mercury | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.016] | 2 | 0/1 | — | — |
| Mercury | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.016] | — | — | 2 | 0/1 |
| Molybdenum | 5 | 1448 | 03/06/01 | F | 1 | 1 | 28 | — | — | — | — | — |
| Molybdenum | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 28 | — | — | — | — | — |
| Nickel | 5 | 1448 | 03/06/01 | F | 1 | 1 | 0.97 | — | 100 | 0/1 | 200 | 0/1 |
| Nickel | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 5.7 | — | — | — | — | — |

**Table A-5 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate + Nitrite (as N) | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [100] | 10000 | 0/1 | — | — |
| Perchlorate | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (as P) | 5 | 1448 | 03/06/01 | F | 1 | 1 | 38.64 | — | — | — | — | — |
| Potassium | 5 | 1448 | 03/06/01 | F | 1 | 1 | 3200 | — | — | — | — | — |
| Potassium | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 3300 | — | — | — | — | — |
| Selenium | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [2.5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [2.5] | — | — | — | — |
| Silica | 5 | 1448 | 03/06/01 | F | 1 | 1 | 49220 | — | — | — | — | — |
| Silica | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 47080 | — | — | — | — | — |
| Silver | 5 | 1448 | 03/06/01 | F | 1 | 1 | 0.7 | — | 100 | 0/1 | 50 | 0/1 |
| Silver | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 0.53 | — | — | — | — | — |
| Sodium | 5 | 1448 | 03/06/01 | F | 1 | 1 | 11000 | — | — | — | — | — |
| Sodium | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 12000 | — | — | — | — | — |
| Strontium | 5 | 1448 | 03/06/01 | F | 1 | 1 | 260 | — | — | — | — | — |
| Strontium | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 260 | — | — | — | — | — |
| Sulfate | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [1000] | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 5 | 1448 | 03/06/01 | F | 1 | 1 | 0.379 | — | 2 | 0/2 | — | — |
| Thallium | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 0.292 | — | — | — | — | — |
| Total Kjeldahl Nitrogen | 5 | 1448 | 03/06/01 | F | 1 | 1 | 1900 | — | — | — | — | — |
| Uranium | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.179] | 20 | 0/1 | 5000 | 0/1 |
| Uranium | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.21] | — | — | — | — |
| Vanadium | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.38] | — | — | — | — |
| Vanadium | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.38] | — | — | — | — |
| Zinc | 5 | 1448 | 03/06/01 | F | 1 | 1 | 2.8 | — | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 8.9 | — | — | — | — | — |

## Table A-5 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 5 | 1448 | 03/06/01 | NF | 1 | 1 | -76 | — | — | — | — | — |
| $\delta^{15}N$ ($NH_3$) | 5 | 1448 | 03/06/01 | NF | 1 | 1 | +2.1 | — | — | — | — | — |
| $\delta^{18}O$ | 5 | 1448 | 03/06/01 | NF | 1 | 1 | -11.2 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-6
## Regional Well R-22 Screen 1 First Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | 1 | 907 | 03/13/01 | NF[e] | 1 | 1 | 13 | —[f] | — | — | — | — |
| Benzoic Acid | 1 | 907 | 03/13/01 | NF | 1 | 1 | 3 | — | — | — | — | — |
| Dissolved Organic Carbon | 1 | 907 | 03/13/01 | F[g] | 1 | 1 | 8100 | — | — | — | — | — |
| Humic Substances, Hydrophilic Acids | 1 | 907 | 03/13/01 | F | 1 | 1 | 4200 | — | — | — | — | — |
| Humic Substances, Hydrophilic Bases | 1 | 907 | 03/13/01 | F | 1 | 1 | 400 | — | — | — | — | — |
| Humic Substances, Hydrophilic Neutrals | 1 | 907 | 03/13/01 | F | 1 | 1 | 400 | — | — | — | — | — |
| Humic Substances, Hydrophilic Total | 1 | 907 | 03/13/01 | F | 1 | 1 | 4900 | — | — | — | — | — |
| Humic Substances, Hydrophobic Acids | 1 | 907 | 03/13/01 | F | 1 | 1 | 1400 | — | — | — | — | — |
| Humic Substances, Hydrophobic Bases | 1 | 907 | 03/13/01 | F | 1 | 1 | 100 | — | — | — | — | — |
| Humic Substances, Hydrophobic Neutrals | 1 | 907 | 03/13/01 | F | 1 | 1 | 1600 | — | — | — | — | — |
| Humic Substances, Hydrophobic Total | 1 | 907 | 03/13/01 | F | 1 | 1 | 3200 | — | — | — | — | — |
| Methylphenol[4-] | 1 | 907 | 03/13/01 | NF | 1 | 1 | 44 | — | — | — | — | — |
| Total Organic Carbon | 1 | 907 | 03/13/01 | NF | 1 | 1 | 11000 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] F = Filtered.

## Table A-7
## Regional Well R-22 Screen 2 First Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Organic Carbon | 2 | 962 | 03/12/01 | F[e] | 1 | 1 | 290 | —[f] | — | — | — | — |
| Trinitrobenzene[1,3,5-] | 2 | 962 | 03/12/01 | NF[g] | 3 | 3 | 0.12 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] F = Filtered.

[f] — = Not available or not applicable.

[g] NF = Nonfiltered.

## Table A-8
## Regional Well R-22 Screen 3 First Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BHC[gamma-] | 3 | 1273 | 03/09/01 | NF[e] | 1 | 1 | 0.013 | —[f] | 0.2 | 0/1 | — | — |
| Bis(2-ethylhexyl)phthalate | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 3.9 | — | 6 | 0/1 | — | — |
| Chloroform | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 0.94 | — | 100 | 0/1 | 100 | 0/1 |
| Dissolved Organic Carbon | 3 | 1273 | 03/09/01 | F[g] | 1 | 1 | 6300 | — | — | — | — | — |
| Humic Substances, Hydrophilic Acids | 3 | 1273 | 03/09/01 | F | 1 | 1 | 1700 | — | — | — | — | — |
| Humic Substances, Hydrophilic Bases | 3 | 1273 | 03/09/01 | F | 1 | 1 | 300 | — | — | — | — | — |
| Humic Substances, Hydrophilic Neutrals | 3 | 1273 | 03/09/01 | F | 1 | 1 | 100 | — | — | — | — | — |
| Humic Substances, Hydrophilic Total | 3 | 1273 | 03/09/01 | F | 1 | 1 | 2100 | — | — | — | — | — |
| Humic Substances, Hydrophobic Acids | 3 | 1273 | 03/09/01 | F | 1 | 1 | 1300 | — | — | — | — | — |
| Humic Substances, Hydrophobic Bases | 3 | 1273 | 03/09/01 | F | 1 | 1 | 0 | — | — | — | — | — |
| Humic Substances, Hydrophobic Neutrals | 3 | 1273 | 03/09/01 | F | 1 | 1 | 2900 | — | — | — | — | — |
| Humic Substances, Hydrophobic Total | 3 | 1273 | 03/09/01 | F | 1 | 1 | 4200 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] F = Filtered.

## Table A-9
## Regional Well R-22 Screen 4 First Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | 4 | 1378 | 03/08/01 | NF[e] | 1 | 1 | 32 | —[f] | — | — | — | — |
| Benzoic Acid | 4 | 1378 | 03/08/01 | NF | 1 | 1 | 9.7 | — | — | — | — | — |
| Butanone[2-] | 4 | 1378 | 03/08/01 | NF | 1 | 1 | 6.9 | — | — | — | — | — |
| Dissolved Organic Carbon | 4 | 1378 | 03/08/01 | F[g] | 1 | 1 | 8300 | — | — | — | — | — |
| Humic Substances, Hydrophilic Acids | 4 | 1378 | 03/08/01 | F | 1 | 1 | 1400 | — | — | — | — | — |
| Humic Substances, Hydrophilic Bases | 4 | 1378 | 03/08/01 | F | 1 | 1 | 500 | — | — | — | — | — |
| Humic Substances, Hydrophilic Neutrals | 4 | 1378 | 03/08/01 | F | 1 | 1 | 600 | — | — | — | — | — |
| Humic Substances, Hydrophilic Total | 4 | 1378 | 03/08/01 | F | 1 | 1 | 2500 | — | — | — | — | — |
| Humic Substances, Hydrophobic Acids | 4 | 1378 | 03/08/01 | F | 1 | 1 | 4300 | — | — | — | — | — |
| Humic Substances, Hydrophobic Bases | 4 | 1378 | 03/08/01 | F | 1 | 1 | 0 | — | — | — | — | — |
| Humic Substances, Hydrophobic Neutrals | 4 | 1378 | 03/08/01 | F | 1 | 1 | 1500 | — | — | — | — | — |
| Humic Substances, Hydrophobic Total | 4 | 1378 | 03/08/01 | F | 1 | 1 | 5800 | — | — | — | — | — |
| Methylphenol[4-] | 4 | 1378 | 03/08/01 | NF | 1 | 1 | 210 | — | — | — | — | — |
| Phenol | 4 | 1378 | 03/08/01 | NF | 1 | 1 | 32 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] F = Filtered.

## Table A-10

## Regional Well R-22 Screen 5 First Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | 5 | 1448 | 03/06/01 | NF[e] | 1 | 1 | 15 | —[f] | — | — | — | — |
| Butanone[2-] | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 8.9 | — | — | — | — | — |
| Dissolved Organic Carbon | 5 | 1448 | 03/06/01 | F[g] | 1 | 1 | 5600 | — | — | — | — | — |
| Humic Substances, Hydrophilic Acids | 5 | 1448 | 03/06/01 | F | 1 | 1 | 2200 | — | — | — | — | — |
| Humic Substances, Hydrophilic Bases | 5 | 1448 | 03/06/01 | F | 1 | 1 | 300 | — | — | — | — | — |
| Humic Substances, Hydrophilic Neutrals | 5 | 1448 | 03/06/01 | F | 1 | 1 | 200 | — | — | — | — | — |
| Humic Substances, Hydrophilic Total | 5 | 1448 | 03/06/01 | F | 1 | 1 | 2700 | — | — | — | — | — |
| Humic Substances, Hydrophobic Acids | 5 | 1448 | 03/06/01 | F | 1 | 1 | 1200 | — | — | — | — | — |
| Humic Substances, Hydrophobic Bases | 5 | 1448 | 03/06/01 | F | 1 | 1 | 0 | — | — | — | — | — |
| Humic Substances, Hydrophobic Neutrals | 5 | 1448 | 03/06/01 | F | 1 | 1 | 1700 | — | — | — | — | — |
| Humic Substances, Hydrophobic Total | 5 | 1448 | 03/06/01 | F | 1 | 1 | 2900 | — | — | — | — | — |
| Methylphenol[4-] | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 60 | — | — | — | — | — |
| Phenol | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 19 | — | — | — | — | — |
| Total Organic Carbon | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 13000 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] F = Filtered.

## Table A-11
## Regional Well R-22 Screen 1 First Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 1 | 907 | 03/13/01 | F[c] | 1 | 0 | —[d] | [-0.005] | 15[e] | 0/1 |
| Cesium-134 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [-0.7] | — | — |
| Cesium-137 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.1] | — | — |
| Cobalt-60 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.5] | — | — |
| Europium-152 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [9] | — | — |
| Gross Alpha Radiation | 1 | 907 | 03/13/01 | NF[f] | 1 | 0 | — | [0.98] | — | — |
| Gross Beta Radiation | 1 | 907 | 03/13/01 | NF | 1 | 1 | 3.29 | — | — | — |
| Gross Gamma Radiation | 1 | 907 | 03/13/01 | NF | 1 | 1 | 251 | — | — | — |
| Iodine-129 | 1 | 907 | 03/13/01 | NF | 1 | 0 | — | [-3.98] | — | — |
| Plutonium-238 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [-0.002] | 15[e] | 0/1 |
| Plutonium-239,240 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.021] | 15[e] | 0/1 |
| Ruthenium-106 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [-9] | — | — |
| Sodium-22 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [-0.4] | — | — |
| Strontium-90 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.5] | 8 | 0/1 |
| Technetium-99 | 1 | 907 | 03/13/01 | NF | 1 | 0 | — | [2.3] | — | — |
| Tritium | 1 | 907 | 03/13/01 | NF | 1 | 1 | 2.01 | — | 20000 | 0/1 |
| Uranium-234 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.077] | — | — |
| Uranium-235 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [-0.001] | — | — |
| Uranium-238 | 1 | 907 | 03/13/01 | F | 1 | 0 | — | [0.046] | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] Based on an MCL of 15 pCi/L (including radium-226, but excluding radon and uranium).

[f] NF = Nonfiltered.

## Table A-12
## Regional Well R-22 Screen 2 First Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 2 | 962 | 03/12/01 | F[c] | 1 | 0 | —[d] | [0.012] | 15[e] | 0/1 |
| Americium-241 | 2 | 962 | 03/12/01 | NF[f] | 1 | 0 | — | [0.02] | — | — |
| Cesium-134 | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.3] | — | — |
| Cesium-134 | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.7] | — | — |
| Cesium-137 | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [1.3] | — | — |
| Cesium-137 | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [-0.7] | — | — |
| Cobalt-60 | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.4] | — | — |
| Cobalt-60 | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [-0.4] | — | — |
| Europium-152 | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [-0.2] | — | — |
| Europium-152 | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [-1.2] | — | — |
| Iodine-129 | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [-2.52] | — | — |
| Plutonium-238 | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [-0.001] | 15[e] | 0/1 |
| Plutonium-238 | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [-0.01] | — | — |
| Plutonium-239,240 | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.006] | 15[e] | 0/1 |
| Plutonium-239,240 | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.003] | — | — |
| Ruthenium-106 | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [5] | — | — |
| Ruthenium-106 | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [-31] | — | — |
| Sodium-22 | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [-0.1] | — | — |
| Sodium-22 | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [1.1] | — | — |
| Strontium-90 | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.7] | 8 | 0/1 |
| Strontium-90 | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [-0.5] | — | — |
| Technetium-99 | 2 | 962 | 03/12/01 | NF | 1 | 1 | 3.7 | — | — | — |
| Tritium | 2 | 962 | 03/12/01 | NF | 1 | 1 | 76.61 | — | 20000 | 0/1 |
| Uranium-234 | 2 | 962 | 03/12/01 | F | 1 | 1 | 0.29 | — | — | — |
| Uranium-234 | 2 | 962 | 03/12/01 | NF | 1 | 1 | 0.312 | — | — | — |
| Uranium-235 | 2 | 962 | 03/12/01 | F | 1 | 0 | — | [0.016] | — | — |
| Uranium-235 | 2 | 962 | 03/12/01 | NF | 1 | 0 | — | [0.001] | — | — |

**Table A-12 (continued)**

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Uranium-238 | 2 | 962 | 03/12/01 | F | 1 | 1 | 0.174 | — | — | — |
| Uranium-238 | 2 | 962 | 03/12/01 | NF | 1 | 1 | 0.158 | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] Based on an MCL of 15 pCi/L (including radium-226, but excluding radon and uranium).

[f] NF = Nonfiltered.

## Table A-13
## Regional Well R-22 Screen 3 First Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 3 | 1273 | 03/09/01 | F[c] | 1 | 0 | —[d] | [0.006] | 15[e] | 0/1 |
| Americium-241 | 3 | 1273 | 03/09/01 | NF[f] | 1 | 0 | — | [0.015] | — | — |
| Cesium-134 | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [-0.1] | — | — |
| Cesium-134 | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 1.8 | — | — | — |
| Cesium-137 | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [-1.7] | — | — |
| Cesium-137 | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [-0.4] | — | — |
| Cobalt-60 | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [-0.1] | — | — |
| Cobalt-60 | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [-0.7] | — | — |
| Europium-152 | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0.7] | — | — |
| Europium-152 | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [1] | — | — |
| Iodine-129 | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [18] | — | — |
| Plutonium-238 | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [-0.005] | 15[e] | 0/1 |
| Plutonium-238 | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [0.011] | — | — |
| Plutonium-239,240 | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0] | 15[e] | 0/1 |
| Plutonium-239,240 | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [0.008] | — | — |
| Ruthenium-106 | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0] | — | — |
| Ruthenium-106 | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [-2] | — | — |
| Sodium-22 | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [1] | — | — |
| Sodium-22 | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [-0.2] | — | — |
| Strontium-90 | 3 | 1273 | 03/09/01 | F | 1 | 0 | — | [0.9] | 8 | 0/1 |
| Strontium-90 | 3 | 1273 | 03/09/01 | NF | 1 | 0 | — | [0.2] | — | — |
| Technetium-99 | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 4.9 | — | — | — |
| Tritium | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 0.10 | — | 20000 | 0/1 |
| Uranium-234 | 3 | 1273 | 03/09/01 | F | 1 | 1 | 7.6 | — | — | — |
| Uranium-234 | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 7.8 | — | — | — |
| Uranium-235 | 3 | 1273 | 03/09/01 | F | 1 | 1 | 0.267 | — | — | — |
| Uranium-235 | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 0.287 | — | — | — |

**Table A-13 (continued)**

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Uranium-238 | 3 | 1273 | 03/09/01 | F | 1 | 1 | 4.92 | — | — | — |
| Uranium-238 | 3 | 1273 | 03/09/01 | NF | 1 | 1 | 5.31 | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] Based on an MCL of 15 pCi/L (including radium-226, but excluding radon and uranium).

[f] NF = Nonfiltered.

## Table A-14
## Regional Well R-22 Screen 4 First Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 4 | 1378 | 03/08/01 | F[c] | 1 | 0 | —[d] | [-0.001] | 15[e] | 0/1 |
| Cesium-134 | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0] | — | — |
| Cesium-137 | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.7] | — | — |
| Cobalt-60 | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [2.6] | — | — |
| Europium-152 | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [2.2] | — | — |
| Iodine-129 | 4 | 1378 | 03/08/01 | NF[f] | 1 | 0 | — | [-5.43] | — | — |
| Plutonium-238 | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [-0.002] | 15[e] | 0/1 |
| Plutonium-239,240 | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.008] | 15[e] | 0/1 |
| Ruthenium-106 | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [15] | — | — |
| Sodium-22 | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.4] | — | — |
| Strontium-90 | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.8] | 8 | 0/1 |
| Technetium-99 | 4 | 1378 | 03/08/01 | NF | 1 | 1 | 4.3 | — | — | — |
| Tritium | 4 | 1378 | 03/08/01 | NF | 1 | 1 | 0.45 | — | 20000 | 0/1 |
| Uranium-234 | 4 | 1378 | 03/08/01 | F | 1 | 1 | 0.108 | — | — | — |
| Uranium-235 | 4 | 1378 | 03/08/01 | F | 1 | 0 | — | [0.013] | — | — |
| Uranium-238 | 4 | 1378 | 03/08/01 | F | 1 | 1 | 0.065 | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] Based on an MCL of 15 pCi/L (including radium-226, but excluding radon and uranium).

[f] NF = Nonfiltered.

## Table A-15
## Regional Well R-22 Screen 5 First Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.011] | 15 | 0/1 |
| Americium-241 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.012] | — | — |
| Cesium-134 | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.3] | — | — |
| Cesium-134 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [-0.3] | — | — |
| Cesium-137 | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [-0.7] | — | — |
| Cesium-137 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0] | — | — |
| Cobalt-60 | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [-0.3] | — | — |
| Cobalt-60 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.1] | — | — |
| Europium-152 | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [1.2] | — | — |
| Europium-152 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [-0.9] | — | — |
| Plutonium-238 | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.003] | 15 | 0/1 |
| Plutonium-238 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.002] | — | — |
| Plutonium-239,240 | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.01] | 15 | 0/1 |
| Plutonium-239,240 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.011] | — | — |
| Ruthenium-106 | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [8] | — | — |
| Ruthenium-106 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0] | — | — |
| Sodium-22 | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [2] | — | — |
| Sodium-22 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [-0.8] | — | — |
| Strontium-90 | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.3] | 8 | 0/1 |
| Strontium-90 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [-0.8] | — | — |
| Tritium | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 3.54 | — | 20000 | 0/1 |
| Uranium-234 | 5 | 1448 | 03/06/01 | F | 1 | 1 | 0.069 | — | — | — |
| Uranium-234 | 5 | 1448 | 03/06/01 | NF | 1 | 1 | 0.115 | — | — | — |
| Uranium-235 | 5 | 1448 | 03/06/01 | F | 1 | 0 | — | [0.01] | — | — |
| Uranium-235 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [-0.005] | — | — |

**Table A-15 (continued)**

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Uranium-238 | 5 | 1448 | 03/06/01 | F | 1 | 1 | 0.062 | — | — | — |
| Uranium-238 | 5 | 1448 | 03/06/01 | NF | 1 | 0 | — | [0.045] | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] Based on an MCL of 15 pCi/L (including radium-226, but excluding radon and uranium).

[f] NF = Nonfiltered.

## Table A-16
## Regional Well R-22 Screen 1 Second Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 1 | 907 | 06/19/01 | NF[e] | 1 | 1 | 151000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 1 | 907 | 06/19/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 1 | 907 | 06/19/01 | NF | 1 | 1 | 6.93 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 1 | 907 | 06/19/01 | NF | 1 | 1 | 495 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 1 | 907 | 06/19/01 | NF | 1 | 1 | 23.0 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 1 | 907 | 06/19/01 | NF | 1 | 1 | 4.0 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 1 | 907 | 06/19/01 | F[h] | 1 | 1 | 250000 | — | — | — | — | — |
| Aluminum | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [7.6] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [7.6] | — | — | — | — |
| Ammonia (as N) | 1 | 907 | 06/19/01 | F | 1 | 1 | 700 | — | — | — | — | — |
| Antimony | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.153] | 6 | 0/1 | — | — |
| Antimony | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [0.153] | — | — | — | — |
| Arsenic | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [1.5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [1.5] | — | — | — | — |
| Barium | 1 | 907 | 06/19/01 | F | 1 | 1 | 160 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 1 | 907 | 06/19/01 | NF | 1 | 1 | 180 | — | — | — | — | — |
| Beryllium | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.012] | 4 | 0/1 | — | — |
| Beryllium | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [0.012] | — | — | — | — |
| Boron | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [33] | — | — | 750 | 0/1 |
| Boron | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [35] | — | — | — | — |
| Bromide | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [200] | — | — | — | — |
| Cadmium | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.066] | 5 | 0/1 | 10 | 0/1 |

**Table A-16 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [0.066] | — | — | — | — |
| Calcium | 1 | 907 | 06/19/01 | F | 1 | 1 | 55000 | — | — | — | — | — |
| Calcium | 1 | 907 | 06/19/01 | NF | 1 | 1 | 55000 | — | — | — | — | — |
| Chloride | 1 | 907 | 06/19/01 | F | 1 | 1 | 3900 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium (total) | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.21] | 100 | 0/1 | 50 | 0/1 |
| Chromium (total) | 1 | 907 | 06/19/01 | NF | 1 | 1 | 1.5 | — | — | — | — | — |
| Cobalt | 1 | 907 | 06/19/01 | F | 1 | 1 | 0.59 | — | — | — | 50 | 0/1 |
| Cobalt | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [0.37] | — | — | — | — |
| Copper | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.27] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [0.27] | — | — | — | — |
| Cyanide (total) | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [10] | — | — | — | — |
| Fluoride | 1 | 907 | 06/19/01 | F | 1 | 1 | 460 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 1 | 907 | 06/19/01 | F | 1 | 1 | 9100 | — | 300 | 1/1 | 1000 | 1/1 |
| Iron | 1 | 907 | 06/19/01 | NF | 1 | 1 | 16000 | — | — | — | — | — |
| Lead | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [1.1] | 15 | 0/1 | 50 | 0/1 |
| Lead | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [1.1] | — | — | — | — |
| Magnesium | 1 | 907 | 06/19/01 | F | 1 | 1 | 14000 | — | — | — | — | — |
| Magnesium | 1 | 907 | 06/19/01 | NF | 1 | 1 | 14000 | — | — | — | — | — |
| Manganese | 1 | 907 | 06/19/01 | F | 1 | 1 | 3100 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 1 | 907 | 06/19/01 | NF | 1 | 1 | 3100 | — | — | — | — | — |
| Mercury | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.033] | 2 | 0/1 | — | — |
| Mercury | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [0.033] | — | — | 2 | 0/1 |
| Molybdenum | 1 | 907 | 06/19/01 | F | 1 | 1 | 30 | — | — | — | — | — |
| Molybdenum | 1 | 907 | 06/19/01 | NF | 1 | 1 | 32 | — | — | — | — | — |
| Nickel | 1 | 907 | 06/19/01 | F | 1 | 1 | 1.3 | — | 100 | 0/1 | 200 | 0/1 |
| Nickel | 1 | 907 | 06/19/01 | NF | 1 | 1 | 3.1 | — | — | — | — | — |
| Nitrate + Nitrite (as N) | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [50] | 10000 | 0/1 | — | — |

**Table A-16 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Perchlorate | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (as P) | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Potassium | 1 | 907 | 06/19/01 | F | 1 | 1 | 4200 | — | — | — | — | — |
| Potassium | 1 | 907 | 06/19/01 | NF | 1 | 1 | 4200 | — | — | — | — | — |
| Selenium | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [1.9] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [1.9] | — | — | — | — |
| Silica | 1 | 907 | 06/19/01 | F | 1 | 1 | 34240 | — | — | — | — | — |
| Silica | 1 | 907 | 06/19/01 | NF | 1 | 1 | 34240 | — | — | — | — | — |
| Silver | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.57] | 100 | 0/1 | 50 | 0/1 |
| Silver | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [0.57] | — | — | — | — |
| Sodium | 1 | 907 | 06/19/01 | F | 1 | 1 | 22000 | — | — | — | — | — |
| Sodium | 1 | 907 | 06/19/01 | NF | 1 | 1 | 21000 | — | — | — | — | — |
| Strontium | 1 | 907 | 06/19/01 | F | 1 | 1 | 290 | — | — | — | — | — |
| Strontium | 1 | 907 | 06/19/01 | NF | 1 | 1 | 290 | — | — | — | — | — |
| Sulfate | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [1000] | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.077] | 2 | 0/1 | — | — |
| Thallium | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [0.077] | — | — | — | — |
| Total Kjeldahl Nitrogen | 1 | 907 | 06/19/01 | F | 1 | 1 | 950 | — | — | — | — | — |
| Uranium | 1 | 907 | 06/19/01 | F | 1 | 1 | 0.037 | — | — | — | — | — |
| Uranium | 1 | 907 | 06/19/01 | NF | 1 | 1 | 0.02 | — | — | — | — | — |
| Vanadium | 1 | 907 | 06/19/01 | F | 1 | 1 | 0.51 | — | — | — | — | — |
| Vanadium | 1 | 907 | 06/19/01 | NF | 1 | 1 | 0.51 | — | — | — | — | — |
| Zinc | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.31] | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 1 | 907 | 06/19/01 | NF | 1 | 1 | 3.9 | — | — | — | — | — |

## Table A-16 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 1 | 907 | 06/19/01 | NF | 1 | 1 | -76 | — | — | — | — | — |
| $\delta^{15}N$ ($NH_{3)}$ | 1 | 907 | 06/19/01 | NF | 1 | 1 | +1.6 | — | — | — | — | — |
| $\delta^{18}O$ | 1 | 907 | 06/19/01 | NF | 1 | 1 | -10.8 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-17
## Regional Well R-22 Screen 2 Second Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 2 | 962 | 06/20/01 | NF[e] | 1 | 1 | —[f] | — | — | — | — | — |
| Dissolved Oxygen | 2 | 962 | 06/20/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 2 | 962 | 06/20/01 | NF | 1 | 1 | 7.68 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 2 | 962 | 06/20/01 | NF | 1 | 1 | 148 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 2 | 962 | 06/20/01 | NF | 1 | 1 | 22.0 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 2 | 962 | 06/20/01 | NF | 1 | 1 | 0.6 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 2 | 962 | 06/20/01 | F[h] | 1 | 1 | 70000 | — | — | — | — | — |
| Aluminum | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [7.6] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 2 | 962 | 06/20/01 | NF | 1 | 1 | 11 | — | — | — | — | — |
| Ammonia (as N) | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [100] | — | — | — | — |
| Antimony | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.288] | 6 | 0/1 | — | — |
| Antimony | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [0.686] | — | — | — | — |
| Arsenic | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [1.5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [1.5] | — | — | — | — |
| Barium | 2 | 962 | 06/20/01 | F | 1 | 1 | 13 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 2 | 962 | 06/20/01 | NF | 1 | 1 | 13 | — | — | — | — | — |
| Beryllium | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.012] | 4 | 0/1 | — | — |
| Beryllium | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [0.012] | — | — | — | — |
| Boron | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [12] | — | — | 750 | 0/1 |
| Boron | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [14] | — | — | — | — |
| Bromide | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [2000] | — | — | — | — |
| Cadmium | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.066] | 5 | 0/1 | 10 | 0/1 |

**Table A-17 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [0.066] | — | — | — | — |
| Calcium | 2 | 962 | 06/20/01 | F | 1 | 1 | 9600 | — | — | — | — | — |
| Calcium | 2 | 962 | 06/20/01 | NF | 1 | 1 | 9700 | — | — | — | — | — |
| Chloride | 2 | 962 | 06/20/01 | F | 1 | 1 | 2600 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium (total) | 2 | 962 | 06/20/01 | F | 1 | 1 | 1.3 | — | 100 | 0/1 | 50 | 0/1 |
| Chromium (total) | 2 | 962 | 06/20/01 | NF | 1 | 1 | 6.3 | — | — | — | — | — |
| Cobalt | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.37] | — | — | 50 | 0/1 |
| Cobalt | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [0.37] | — | — | — | — |
| Copper | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.27] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [0.27] | — | — | — | — |
| Cyanide (total) | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [10] | — | — | — | — |
| Fluoride | 2 | 962 | 06/20/01 | F | 1 | 1 | 460 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [14] | 300 | 0/1 | 1000 | 0/1 |
| Iron | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [63] | — | — | — | — |
| Lead | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [1.1] | 15 | 0/1 | 50 | 0/1 |
| Lead | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [1.1] | — | — | — | — |
| Magnesium | 2 | 962 | 06/20/01 | F | 1 | 1 | 4700 | — | — | — | — | — |
| Magnesium | 2 | 962 | 06/20/01 | NF | 1 | 1 | 4800 | — | — | — | — | — |
| Manganese | 2 | 962 | 06/20/01 | F | 1 | 1 | 4 | — | 50 | 0/1 | 200 | 0/1 |
| Manganese | 2 | 962 | 06/20/01 | NF | 1 | 1 | 11 | — | — | — | — | — |
| Mercury | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.033] | 2 | 0/1 | — | — |
| Mercury | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [0.033] | — | — | 2 | 0/1 |
| Molybdenum | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [3.8] | — | — | — | — |
| Molybdenum | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [3.8] | — | — | — | — |
| Nickel | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.3] | 100 | 0/1 | 200 | 0/1 |
| Nickel | 2 | 962 | 06/20/01 | NF | 1 | 1 | 0.98 | — | — | — | — | — |
| Nitrate + Nitrite (as N) | 2 | 962 | 06/20/01 | F | 1 | 1 | 610 | — | 10000 | 0/1 | — | — |

**Table A-17 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Perchlorate | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (as P) | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Potassium | 2 | 962 | 06/20/01 | F | 1 | 1 | 3200 | — | — | — | — | — |
| Potassium | 2 | 962 | 06/20/01 | NF | 1 | 1 | 3200 | — | — | — | — | — |
| Selenium | 2 | 962 | 06/20/01 | F | 1 | 1 | 3.4 | — | 50 | 0/1 | 50 | 0/1 |
| Selenium | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [1.9] | — | — | — | — |
| Silica | 2 | 962 | 06/20/01 | F | 1 | 1 | 64200 | — | — | — | — | — |
| Silica | 2 | 962 | 06/20/01 | NF | 1 | 1 | 64200 | — | — | — | — | — |
| Silver | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.57] | 100 | 0/1 | 50 | 0/1 |
| Silver | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [0.57] | — | — | — | — |
| Sodium | 2 | 962 | 06/20/01 | F | 1 | 1 | 11000 | — | — | — | — | — |
| Sodium | 2 | 962 | 06/20/01 | NF | 1 | 1 | 11000 | — | — | — | — | — |
| Strontium | 2 | 962 | 06/20/01 | F | 1 | 1 | 43 | — | — | — | — | — |
| Strontium | 2 | 962 | 06/20/01 | NF | 1 | 1 | 44 | — | — | — | — | — |
| Sulfate | 2 | 962 | 06/20/01 | F | 1 | 1 | 3500 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.077] | 2 | 0/1 | — | — |
| Thallium | 2 | 962 | 06/20/01 | NF | 1 | 1 | 0.113 | — | — | — | — | — |
| Total Kjeldahl Nitrogen | 2 | 962 | 06/20/01 | F | 1 | 1 | 280 | — | — | — | — | — |
| Uranium | 2 | 962 | 06/20/01 | F | 1 | 1 | 0.419 | — | — | — | — | — |
| Uranium | 2 | 962 | 06/20/01 | NF | 1 | 1 | 0.402 | — | — | — | — | — |
| Vanadium | 2 | 962 | 06/20/01 | F | 1 | 1 | 5 | — | — | — | — | — |
| Vanadium | 2 | 962 | 06/20/01 | NF | 1 | 1 | 5.3 | — | — | — | — | — |
| Zinc | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.31] | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 2 | 962 | 06/20/01 | NF | 1 | 1 | 8.9 | — | — | — | — | — |

## Table A-17 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 2 | 962 | 06/20/01 | NF | 1 | 1 | -75 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 2 | 962 | 06/20/01 | NF | 1 | 1 | +0.6 | — | — | — | — | — |
| $\delta^{18}O$ | 2 | 962 | 06/20/01 | NF | 1 | 1 | -11.1 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-18
## Regional Well R-22 Screen 3 Second Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 3 | 1273 | 06/21/01 | NF[e] | 1 | 1 | 63000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 3 | 1273 | 06/21/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 8.73 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 316 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 24.2 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 1.7 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 3 | 1273 | 06/21/01 | F[h] | 1 | 1 | 140000 | — | — | — | — | — |
| Aluminum | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [5.7] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 25 | — | — | — | — | — |
| Ammonia (as N) | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [100] | — | — | — | — |
| Antimony | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [1.29] | 6 | 0/1 | — | — |
| Antimony | 3 | 1273 | 06/21/01 | NF | 1 | 0 | — | [0.752] | — | — | — | — |
| Arsenic | 3 | 1273 | 06/21/01 | F | 1 | 1 | 3.7 | — | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 4.1 | — | — | — | — | — |
| Barium | 3 | 1273 | 06/21/01 | F | 1 | 1 | 48 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 56 | — | — | — | — | — |
| Beryllium | 3 | 1273 | 06/21/01 | F | 1 | 1 | 0.022 | — | 4 | 0/1 | — | — |
| Beryllium | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 1.63 | — | — | — | — | — |
| Boron | 3 | 1273 | 06/21/01 | F | 1 | 1 | 46 | — | — | — | 750 | 0/1 |
| Boron | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 77 | — | — | — | — | — |
| Bromide | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [200] | — | — | — | — |
| Cadmium | 3 | 1273 | 06/21/01 | F | 1 | 1 | 1.18 | — | 5 | 0/1 | 10 | 0/1 |

**Table A-18 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 3 | 1273 | 06/21/01 | NF | 1 | 0 | — | [0.066] | — | — | — | — |
| Calcium | 3 | 1273 | 06/21/01 | F | 1 | 1 | 10000 | — | — | — | — | — |
| Calcium | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 13000 | — | — | — | — | — |
| Chloride | 3 | 1273 | 06/21/01 | F | 1 | 1 | 4000 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium (total) | 3 | 1273 | 06/21/01 | F | 1 | 1 | 0.62 | — | 100 | 0/1 | 50 | 0/1 |
| Chromium (total) | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 47 | — | — | — | — | — |
| Cobalt | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [0.29] | — | — | 50 | 0/1 |
| Cobalt | 3 | 1273 | 06/21/01 | NF | 1 | 0 | — | [0.37] | — | — | — | — |
| Copper | 3 | 1273 | 06/21/01 | F | 1 | 1 | 1.2 | — | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 1.1 | — | — | — | — | — |
| Cyanide (total) | 3 | 1273 | 06/21/01 | NF | 1 | 0 | — | [10] | — | — | — | — |
| Fluoride | 3 | 1273 | 06/21/01 | F | 1 | 1 | 660 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [86] | 300 | 0/1 | 1000 | 0/1 |
| Iron | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 320 | — | — | — | — | — |
| Lead | 3 | 1273 | 06/21/01 | F | 1 | 1 | 0.11 | — | 15 | 1/1 | 50 | 0/1 |
| Lead | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 19.7 | — | — | — | — | — |
| Magnesium | 3 | 1273 | 06/21/01 | F | 1 | 1 | 4500 | — | — | — | — | — |
| Magnesium | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 4600 | — | — | — | — | — |
| Manganese | 3 | 1273 | 06/21/01 | F | 1 | 1 | 18 | — | 50 | 0/1 | 200 | 0/1 |
| Manganese | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 34 | — | — | — | — | — |
| Mercury | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [0.033] | 2 | 0/1 | — | — |
| Mercury | 3 | 1273 | 06/21/01 | NF | 1 | 0 | — | [0.033] | — | — | 2 | 0/1 |
| Molybdenum | 3 | 1273 | 06/21/01 | F | 1 | 1 | 16 | — | — | — | — | — |
| Molybdenum | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 22 | — | — | — | — | — |
| Nickel | 3 | 1273 | 06/21/01 | F | 1 | 1 | 1.3 | — | 100 | 0/1 | 200 | 0/1 |
| Nickel | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 27 | — | — | — | — | — |
| Nitrate + Nitrite (as N) | 3 | 1273 | 06/21/01 | F | 1 | 1 | 230 | — | 10000 | 0/1 | — | — |

**Table A-18 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oxalate | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [190] | — | — | — | — |
| Perchlorate | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (as P) | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Potassium | 3 | 1273 | 06/21/01 | F | 1 | 1 | 7500 | — | — | — | — | — |
| Potassium | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 7300 | — | — | — | — | — |
| Selenium | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [2.1] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 3 | 1273 | 06/21/01 | NF | 1 | 0 | — | [1.9] | — | — | — | — |
| Silica | 3 | 1273 | 06/21/01 | F | 1 | 1 | 34240 | — | — | — | — | — |
| Silica | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 36380 | — | — | — | — | — |
| Silver | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [0.41] | 100 | 0/1 | 50 | 0/1 |
| Silver | 3 | 1273 | 06/21/01 | NF | 1 | 0 | — | [0.57] | — | — | — | — |
| Sodium | 3 | 1273 | 06/21/01 | F | 1 | 1 | 41000 | — | — | — | — | — |
| Sodium | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 39000 | — | — | — | — | — |
| Strontium | 3 | 1273 | 06/21/01 | F | 1 | 1 | 440 | — | — | — | — | — |
| Strontium | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 510 | — | — | — | — | — |
| Sulfate | 3 | 1273 | 06/21/01 | F | 1 | 1 | 27000 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 3 | 1273 | 06/21/01 | F | 1 | 1 | 0.43 | — | 2 | 0/1 | — | — |
| Thallium | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 0.506 | — | — | — | — | — |
| Total Kjeldahl Nitrogen | 3 | 1273 | 06/21/01 | F | 1 | 1 | 1000 | — | — | — | — | — |
| Uranium | 3 | 1273 | 06/21/01 | F | 1 | 1 | 2.45 | — | — | — | — | — |
| Uranium | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 8.44 | — | — | — | — | — |
| Uranium (TIMS) | 3 | 1273 | 06/21/01 | F | 2 | 2 | 2.94 | — | — | — | — | — |
| Uranium (TIMS) | 3 | 1273 | 06/21/01 | NF | 3 | 3 | 2.43 | — | — | — | — | — |
| Uranium-234/238 (TIMS isotopic ratio; n = 2) | 3 | 1273 | 06/21/01 | F | 2 | 2 | 9.21 ± 0.025 (E-05) | — | — | — | — | — |

**Table A-18 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uranium-234/238 (TIMS isotopic ratio; n = 3) | 3 | 1273 | 06/21/01 | NF | 3 | 3 | 9.10 ± 0.026 (E-05) | — | — | — | — | — |
| Uranium-238/233 (TIMS isotopic ratio; n = 2) | 3 | 1273 | 06/21/01 | F | 2 | 2 | 115.44 ± 0.16 | — | — | — | — | — |
| Uranium-238/233 (TIMS isotopic ratio; n = 3) | 3 | 1273 | 06/21/01 | NF | 3 | 3 | 99.06 ± 0.17 | — | — | — | — | — |
| Uranium-238/235 (TIMS isotopic ratio; n = 2) | 3 | 1273 | 06/21/01 | F | 2 | 2 | 137.83 ± 0.18 | — | — | — | — | — |
| Uranium-238/235 (TIMS isotopic ratio; n = 3) | 3 | 1273 | 06/21/01 | NF | 3 | 3 | 137.87 ± 0.25 | — | — | — | — | — |
| Vanadium | 3 | 1273 | 06/21/01 | F | 1 | 1 | 3.5 | — | — | — | — | — |
| Vanadium | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 4.7 | — | — | — | — | — |
| Zinc | 3 | 1273 | 06/21/01 | F | 1 | 1 | 4.5 | — | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 51 | — | — | — | — | — |
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 3 | 1273 | 06/21/01 | NF | 1 | 1 | -73 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 3 | 1273 | 06/21/01 | NF | 1 | 1 | +0.7 | — | — | — | — | — |
| $\delta^{18}O$ | 3 | 1273 | 06/21/01 | NF | 1 | 1 | -11 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-19
## Regional Well R-22 Screen 4 Second Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 4 | 1378 | 06/25/01 | NF[e] | 1 | 1 | 119000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 4 | 1378 | 06/25/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 7.03 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 523 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 23.7 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 4.0 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 4 | 1378 | 06/25/01 | F[h] | 1 | 1 | 270000 | — | — | — | — | — |
| Aluminum | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [7.6] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [7.6] | — | — | — | — |
| Ammonia (as N) | 4 | 1378 | 06/25/01 | F | 1 | 1 | 1000 | — | — | — | — | — |
| Antimony | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0.224] | 6 | 0/1 | — | — |
| Antimony | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [0.282] | — | — | — | — |
| Arsenic | 4 | 1378 | 06/25/01 | F | 1 | 1 | 3.6 | — | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 4.4 | — | — | — | — | — |
| Barium | 4 | 1378 | 06/25/01 | F | 1 | 1 | 320 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 360 | — | — | — | — | — |
| Beryllium | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0.012] | 4 | 0/1 | — | — |
| Beryllium | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 0.017 | — | — | — | — | — |
| Boron | 4 | 1378 | 06/25/01 | F | 1 | 1 | 100 | — | — | — | 750 | 0/1 |
| Boron | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 110 | — | — | — | — | — |
| Bromide | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [200] | — | — | — | — |
| Cadmium | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0.066] | 5 | 0/1 | 10 | 0/1 |

**Table A-19 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [0.066] | — | — | — | — |
| Calcium | 4 | 1378 | 06/25/01 | F | 1 | 1 | 54000 | — | — | — | — | — |
| Calcium | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 55000 | — | — | — | — | — |
| Chloride | 4 | 1378 | 06/25/01 | F | 1 | 1 | 8300 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium (total) | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0.21] | 100 | 0/1 | 50 | 0/1 |
| Chromium (total) | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [0.21] | — | — | — | — |
| Cobalt | 4 | 1378 | 06/25/01 | F | 1 | 1 | 3 | — | — | — | 50 | 0/1 |
| Cobalt | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 2 | — | — | — | — | — |
| Copper | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0.27] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [0.27] | — | — | — | — |
| Cyanide (total) | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [10] | — | — | — | — |
| Fluoride | 4 | 1378 | 06/25/01 | F | 1 | 1 | 510 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 4 | 1378 | 06/25/01 | F | 1 | 1 | 5700 | — | 300 | 1/1 | 1000 | 1/1 |
| Iron | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 8300 | — | — | — | — | — |
| Lead | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0.037] | 15 | 0/1 | 50 | 0/1 |
| Lead | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [0.037] | — | — | — | — |
| Magnesium | 4 | 1378 | 06/25/01 | F | 1 | 1 | 14000 | — | — | — | — | — |
| Magnesium | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 14000 | — | — | — | — | — |
| Manganese | 4 | 1378 | 06/25/01 | F | 1 | 1 | 1600 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 1600 | — | — | — | — | — |
| Mercury | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0.033] | 2 | 0/1 | — | — |
| Mercury | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [0.033] | — | — | 2 | 0/1 |
| Molybdenum | 4 | 1378 | 06/25/01 | F | 1 | 1 | 24 | — | — | — | — | — |
| Molybdenum | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 23 | — | — | — | — | — |
| Nickel | 4 | 1378 | 06/25/01 | F | 1 | 1 | 5.1 | — | 100 | 0/1 | 200 | 0/1 |
| Nickel | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 4.6 | — | — | — | — | — |
| Nitrate + Nitrite (as N) | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [50] | 10000 | 0/1 | — | — |

**Table A-19 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oxalate | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [190] | — | — | — | — |
| Perchlorate | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (as P) | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Potassium | 4 | 1378 | 06/25/01 | F | 1 | 1 | 5600 | — | — | — | — | — |
| Potassium | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 5700 | — | — | — | — | — |
| Selenium | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [1.9] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [1.9] | — | — | — | — |
| Silica | 4 | 1378 | 06/25/01 | F | 1 | 1 | 44940 | — | — | — | — | — |
| Silica | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 47080 | — | — | — | — | — |
| Silver | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0.57] | 100 | 0/1 | 50 | 0/1 |
| Silver | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [0.57] | — | — | — | — |
| Sodium | 4 | 1378 | 06/25/01 | F | 1 | 1 | 30000 | — | — | — | — | — |
| Sodium | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 31000 | — | — | — | — | — |
| Strontium | 4 | 1378 | 06/25/01 | F | 1 | 1 | 1000 | — | — | — | — | — |
| Strontium | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 1100 | — | — | — | — | — |
| Sulfate | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [1000] | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 4 | 1378 | 06/25/01 | F | 1 | 1 | 0.078 | — | 2 | 0/1 | — | — |
| Thallium | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 0.0194 | — | — | — | — | — |
| Total Kjeldahl Nitrogen | 4 | 1378 | 06/25/01 | F | 1 | 1 | 1500 | — | — | — | — | — |
| Uranium | 4 | 1378 | 06/25/01 | F | 1 | 1 | 0.079 | — | — | — | — | — |
| Uranium | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 0.09 | — | — | — | — | — |
| Vanadium | 4 | 1378 | 06/25/01 | F | 1 | 1 | 0.73 | — | — | — | — | — |
| Vanadium | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [0.38] | — | — | — | — |
| Zinc | 4 | 1378 | 06/25/01 | F | 1 | 1 | 1.7 | — | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 2.2 | — | — | — | — | — |

**Table A-19 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 4 | 1378 | 06/25/01 | NF | 1 | 1 | -78 | — | — | — | — | — |
| $\delta^{15}N$ ($NH_3$) | 4 | 1378 | 06/25/01 | NF | 1 | 1 | +2.1 | — | — | — | — | — |
| $\delta^{18}O$ | 4 | 1378 | 06/25/01 | NF | 1 | 1 | -10.8 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-20
## Regional Well R-22 Screen 5 Second Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 5 | 1448 | 06/26/01 | NF[e] | 1 | 1 | 150000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 5 | 1448 | 06/26/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 6.95 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 331 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 22.9 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 4.2 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 5 | 1448 | 06/26/01 | F[h] | 1 | 1 | 160000 | — | — | — | — | — |
| Aluminum | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [7.6] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [7.6] | — | — | — | — |
| Ammonia (as N) | 5 | 1448 | 06/26/01 | F | 1 | 1 | 660 | — | — | — | — | — |
| Antimony | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.481] | 6 | 0/1 | — | — |
| Antimony | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [1.51] | — | — | — | — |
| Arsenic | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [1.5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 2.5 | — | — | — | — | — |
| Barium | 5 | 1448 | 06/26/01 | F | 1 | 1 | 130 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 140 | — | — | — | — | — |
| Beryllium | 5 | 1448 | 06/26/01 | F | 1 | 1 | 0.015 | — | 4 | 0/1 | — | — |
| Beryllium | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [0.012] | — | — | — | — |
| Boron | 5 | 1448 | 06/26/01 | F | 1 | 1 | 29 | — | — | — | 750 | 0/1 |
| Boron | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 36 | — | — | — | — | — |
| Bromide | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [200] | — | — | — | — |
| Cadmium | 5 | 1448 | 06/26/01 | F | 1 | 1 | 0.07 | — | 5 | 0/1 | 10 | 0/1 |

**Table A-20 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [0.066] | — | — | — | — |
| Calcium | 5 | 1448 | 06/26/01 | F | 1 | 1 | 37000 | — | — | — | — | — |
| Calcium | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 39000 | — | — | — | — | — |
| Chloride | 5 | 1448 | 06/26/01 | F | 1 | 1 | 2500 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium (total) | 5 | 1448 | 06/26/01 | F | 1 | 1 | 0.35 | — | 100 | 0/1 | 50 | 0/1 |
| Chromium (total) | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 1.6 | — | — | — | — | — |
| Cobalt | 5 | 1448 | 06/26/01 | F | 1 | 1 | 0.83 | — | — | — | 50 | 0/1 |
| Cobalt | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 1.5 | — | — | — | — | — |
| Copper | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.27] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [0.27] | — | — | — | — |
| Cyanide (total) | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [10] | — | — | — | — |
| Fluoride | 5 | 1448 | 06/26/01 | F | 1 | 1 | 410 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 5 | 1448 | 06/26/01 | F | 1 | 1 | 2100 | — | 300 | 1/1 | 1000 | 1/1 |
| Iron | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 5200 | — | — | — | — | — |
| Lead | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.037] | 15 | 0/1 | 50 | 0/1 |
| Lead | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 0.223 | — | — | — | — | — |
| Magnesium | 5 | 1448 | 06/26/01 | F | 1 | 1 | 6100 | — | — | — | — | — |
| Magnesium | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 6000 | — | — | — | — | — |
| Manganese | 5 | 1448 | 06/26/01 | F | 1 | 1 | 630 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 650 | — | — | — | — | — |
| Mercury | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.033] | 2 | 0/1 | — | — |
| Mercury | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [0.033] | — | — | 2 | 0/1 |
| Molybdenum | 5 | 1448 | 06/26/01 | F | 1 | 1 | 23 | — | — | — | — | — |
| Molybdenum | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 24 | — | — | — | — | — |
| Nickel | 5 | 1448 | 06/26/01 | F | 1 | 1 | 0.89 | — | 100 | 0/1 | 200 | 0/1 |
| Nickel | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 1.5 | — | — | — | — | — |
| Nitrate + Nitrite (as N) | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [50] | 10000 | 0/1 | — | — |

**Table A-20 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oxalate | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [190] | — | — | — | — |
| Perchlorate | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (as P) | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Potassium | 5 | 1448 | 06/26/01 | F | 1 | 1 | 4000 | — | — | — | — | — |
| Potassium | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 4100 | — | — | — | — | — |
| Selenium | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [1.9] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [1.9] | — | — | — | — |
| Silica | 5 | 1448 | 06/26/01 | F | 1 | 1 | 49220 | — | — | — | — | — |
| Silica | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 53500 | — | — | — | — | — |
| Silver | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.57] | 100 | 0/1 | 50 | 0/1 |
| Silver | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [0.57] | — | — | — | — |
| Sodium | 5 | 1448 | 06/26/01 | F | 1 | 1 | 14000 | — | — | — | — | — |
| Sodium | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 14000 | — | — | — | — | — |
| Strontium | 5 | 1448 | 06/26/01 | F | 1 | 1 | 310 | — | — | — | — | — |
| Strontium | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 330 | — | — | — | — | — |
| Sulfate | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [1000] | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.077] | 2 | 0/1 | — | — |
| Thallium | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [0.077] | — | — | — | — |
| Total Kjeldahl Nitrogen | 5 | 1448 | 06/26/01 | F | 1 | 1 | 1200 | — | — | — | — | — |
| Uranium | 5 | 1448 | 06/26/01 | F | 1 | 1 | 0.061 | — | — | — | — | — |
| Uranium | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 0.076 | — | — | — | — | — |
| Vanadium | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.38] | — | — | — | — |
| Vanadium | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [0.38] | — | — | — | — |
| Zinc | 5 | 1448 | 06/26/01 | F | 1 | 1 | 1.3 | — | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 5.4 | — | — | — | — | — |

## Table A-20 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 5 | 1448 | 06/26/01 | NF | 1 | 1 | -80 | — | — | — | — | — |
| $\delta^{15}N$ ($NH_3$) | 5 | 1448 | 06/26/01 | NF | 1 | 1 | +2.5 | — | — | — | — | — |
| $\delta^{18}O$ | 5 | 1448 | 06/26/01 | NF | 1 | 1 | -11.2 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-21
## Regional Well R-22 Screen 1 Second Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Organic Carbon | 1 | 907 | 06/19/01 | NF[e] | 1 | 1 | 8300 | —[f] | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-22
## Regional Well R-22 Screen 2 Second Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Organic Detects | 2 | 962 | 06/20/01 | —[e] | — | — | — | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] — = Not available or not applicable.

## Table A-23

## Regional Well R-22 Screen 3 Second Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Organic Carbon | 3 | 1273 | 06/21/01 | NF[e] | 1 | 1 | 4900 | —[f] | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-24

## Regional Well R-22 Screen 4 Second Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | 4 | 1378 | 06/25/01 | NF[e] | 1 | 1 | 12 | —[f] | — | — | — | — |
| Total Organic Carbon | 4 | 1378 | 06/25/01 | NF | 1 | 1 | 23000 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-25

## Regional Well R-22 Screen 5 Second Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | 5 | 1448 | 06/26/01 | NF[e] | 1 | 1 | 16 | —[f] | — | — | — | — |
| Butanone[2-] | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 8.1 | — | — | — | — | — |
| Toluene | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 0.71 | | 1000 | 0/1 | 750 | 0/1 |
| Total Organic Carbon | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 6100 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-26
## Regional Well R-22 Screen 1 Second Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 1 | 907 | 06/19/01 | F[c] | 1 | 0 | —[d] | [-0.008] | — | — |
| Cesium-134 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [2.3] | — | — |
| Cesium-137 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [-1.5] | — | — |
| Cobalt-60 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [-3.4] | — | — |
| Europium-152 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [-39] | — | — |
| Iodine-129 | 1 | 907 | 06/19/01 | NF[e] | 1 | 0 | — | [1.1] | — | — |
| Plutonium-238 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.004] | — | — |
| Plutonium-239,240 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [-0.004] | — | — |
| Ruthenium-106 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [28] | — | — |
| Sodium-22 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.8] | — | — |
| Strontium-90 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0] | — | — |
| Technetium-99 | 1 | 907 | 06/19/01 | NF | 1 | 0 | — | [1.9] | — | — |
| Tritium | 1 | 907 | 06/19/01 | NF | 1 | 1 | 2.87 | — | 20000 | 0/1 |
| Uranium-234 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.072] | — | — |
| Uranium-235 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.008] | — | — |
| Uranium-238 | 1 | 907 | 06/19/01 | F | 1 | 0 | — | [0.062] | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-27
## Regional Well R-22 Screen 2 Second Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 2 | 962 | 06/20/01 | F[c] | 1 | 0 | —[d] | [0.004] | — | — |
| Cesium-134 | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.9] | — | — |
| Cesium-137 | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.4] | — | — |
| Cobalt-60 | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [2.5] | — | — |
| Europium-152 | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [20] | — | — |
| Iodine-129 | 2 | 962 | 06/20/01 | NF[e] | 1 | 0 | — | [1.3] | — | — |
| Plutonium-238 | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.003] | — | — |
| Plutonium-239,240 | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [-0.004] | — | — |
| Ruthenium-106 | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [-28] | — | — |
| Sodium-22 | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.8] | — | — |
| Strontium-90 | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [1.1] | — | — |
| Technetium-99 | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [-0.04] | — | — |
| Tritium | 2 | 962 | 06/20/01 | NF | 1 | 0 | — | [-0.10] | 20000 | 0/1 |
| Uranium-234 | 2 | 962 | 06/20/01 | F | 1 | 1 | 0.34 | — | — | — |
| Uranium-235 | 2 | 962 | 06/20/01 | F | 1 | 0 | — | [0.02] | — | — |
| Uranium-238 | 2 | 962 | 06/20/01 | F | 1 | 1 | 0.127 | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-28
## Regional Well R-22 Screen 3 Second Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 3 | 1273 | 06/21/01 | F[c] | 1 | 0 | —[d] | [0.009] | — | — |
| Cesium-134 | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [-1.6] | — | — |
| Cesium-137 | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [-1.3] | — | — |
| Cobalt-60 | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [5] | — | — |
| Europium-152 | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [4] | — | — |
| Iodine-129 | 3 | 1273 | 06/21/01 | NF[e] | 1 | 0 | — | [-3.57] | — | — |
| Plutonium-238 | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [-0.013] | — | — |
| Plutonium-239,240 | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [0] | — | — |
| Ruthenium-106 | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [-22] | — | — |
| Sodium-22 | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [1.1] | — | — |
| Strontium-90 | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [0.7] | — | — |
| Technetium-99 | 3 | 1273 | 06/21/01 | NF | 2 | 0 | — | [2] | — | — |
| Tritium | 3 | 1273 | 06/21/01 | NF | 1 | 1 | 0.89 | — | 20000 | 0/1 |
| Uranium-234 | 3 | 1273 | 06/21/01 | F | 1 | 1 | 1.68 | — | — | — |
| Uranium-235 | 3 | 1273 | 06/21/01 | F | 1 | 0 | — | [0.065] | — | — |
| Uranium-238 | 3 | 1273 | 06/21/01 | F | 1 | 1 | 0.89 | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-29
## Regional Well R-22 Screen 4 Second Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 4 | 1378 | 06/25/01 | F[c] | 1 | 0 | —[d] | [0.004] | — | — |
| Cesium-134 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [-1.6] | — | — |
| Cesium-137 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [2.5] | — | — |
| Cobalt-60 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [-0.7] | — | — |
| Europium-152 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [38] | — | — |
| Iodine-129 | 4 | 1378 | 06/25/01 | NF[e] | 1 | 0 | — | [0.12] | — | — |
| Plutonium-238 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [-0.003] | — | — |
| Plutonium-239,240 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0] | — | — |
| Ruthenium-106 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [-25] | — | — |
| Sodium-22 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0.9] | — | — |
| Strontium-90 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0] | — | — |
| Technetium-99 | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [1.1] | — | — |
| Tritium | 4 | 1378 | 06/25/01 | NF | 1 | 0 | — | [-0.13] | 20000 | 0/1 |
| Uranium-234 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0.068] | — | — |
| Uranium-235 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [-0.008] | — | — |
| Uranium-238 | 4 | 1378 | 06/25/01 | F | 1 | 0 | — | [0.093] | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-30
## Regional Well R-22 Screen 5 Second Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 5 | 1448 | 06/26/01 | F[c] | 1 | 0 | —[d] | [0.004] | — | — |
| Cesium-134 | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [-7.9] | — | — |
| Cesium-137 | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [-3.2] | — | — |
| Cobalt-60 | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [6.1] | — | — |
| Europium-152 | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [40] | — | — |
| Iodine-129 | 5 | 1448 | 06/26/01 | NF[e] | 1 | 0 | — | [-0.86] | — | — |
| Plutonium-238 | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.021] | — | — |
| Plutonium-239,240 | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.004] | — | — |
| Ruthenium-106 | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [27] | — | — |
| Sodium-22 | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0] | — | — |
| Strontium-90 | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.3] | — | — |
| Technetium-99 | 5 | 1448 | 06/26/01 | NF | 1 | 0 | — | [0.85] | — | — |
| Tritium | 5 | 1448 | 06/26/01 | NF | 1 | 1 | 14.24 | — | 20000 | 0/1 |
| Uranium-234 | 5 | 1448 | 06/26/01 | F | 1 | 1 | 0.148 | — | — | — |
| Uranium-235 | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.031] | — | — |
| Uranium-238 | 5 | 1448 | 06/26/01 | F | 1 | 0 | — | [0.041] | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-31
## Regional Well R-22 Screen 1 Third Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 1 | 907 | 11/30/01 | NF[e] | 1 | 1 | 243000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 1 | 907 | 11/30/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 1 | 907 | 11/30/01 | NF | 1 | 1 | 7.16 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 1 | 907 | 11/30/01 | NF | 1 | 1 | 558 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 1 | 907 | 11/30/01 | NF | 1 | 1 | 18.0 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 1 | 907 | 11/30/01 | NF | 1 | 1 | 39.5 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 1 | 907 | 11/30/01 | F[h] | 1 | 1 | 242000 | — | — | — | — | — |
| Aluminum | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [50] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [50] | — | — | — | — |
| Ammonia (as N) | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Antimony | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0.06] | 6 | 0/1 | — | — |
| Antimony | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [0.27] | — | — | — | — |
| Arsenic | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Barium | 1 | 907 | 11/30/01 | F | 1 | 1 | 181 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 1 | 907 | 11/30/01 | NF | 1 | 1 | 209 | — | — | — | — | — |
| Beryllium | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0.2] | 4 | 0/1 | — | — |
| Beryllium | 1 | 907 | 11/30/01 | NF | 1 | 1 | 0.01 | — | — | — | — | — |
| Boron | 1 | 907 | 11/30/01 | F | 1 | 1 | 20.1 | — | — | — | 750 | 0/1 |
| Boron | 1 | 907 | 11/30/01 | NF | 1 | 1 | 21.6 | — | — | — | — | — |
| Bromide | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Cadmium | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [1] | 5 | 0/1 | 10 | 0/1 |

**Table A-31 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [1] | — | — | — | — |
| Calcium | 1 | 907 | 11/30/01 | F | 1 | 1 | 60800 | — | — | — | — | — |
| Calcium | 1 | 907 | 11/30/01 | NF | 1 | 1 | 60300 | — | — | — | — | — |
| Chloride | 1 | 907 | 11/30/01 | F | 1 | 1 | 2850 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Chromium | 1 | 907 | 11/30/01 | NF | 1 | 1 | 0.755 | — | — | — | — | — |
| Cobalt | 1 | 907 | 11/30/01 | F | 1 | 1 | 1.03 | — | — | — | 50 | 0/1 |
| Cobalt | 1 | 907 | 11/30/01 | NF | 1 | 1 | 0.745 | — | — | — | — | — |
| Copper | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [5] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 1 | 907 | 11/30/01 | NF | 1 | 1 | 1.1 | — | — | — | — | — |
| Cyanide (total) | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Fluoride | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [50] | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 1 | 907 | 11/30/01 | F | 1 | 1 | 9460 | — | 300 | 1/1 | 1000 | 1/1 |
| Iron | 1 | 907 | 11/30/01 | NF | 1 | 1 | 16700 | — | — | — | — | — |
| Lead | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [2] | 15 | 0/1 | 50 | 0/1 |
| Lead | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [2] | — | — | — | — |
| Magnesium | 1 | 907 | 11/30/01 | F | 1 | 1 | 16500 | — | — | — | — | — |
| Magnesium | 1 | 907 | 11/30/01 | NF | 1 | 1 | 16200 | — | — | — | — | — |
| Manganese | 1 | 907 | 11/30/01 | F | 1 | 1 | 3410 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 1 | 907 | 11/30/01 | NF | 1 | 1 | 3800 | — | — | — | — | — |
| Mercury | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0.2] | 2 | 0/1 | — | — |
| Mercury | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [0.2] | — | — | 2 | 0/1 |
| Molybdenum | 1 | 907 | 11/30/01 | F | 1 | 1 | 25.2 | — | — | — | — | — |
| Molybdenum | 1 | 907 | 11/30/01 | NF | 1 | 1 | 27.9 | — | — | — | — | — |
| Nickel | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [11.9] | 100 | 0/1 | 200 | 0/1 |
| Nickel | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [11.2] | — | — | — | — |
| Nitrate + Nitrite (as N) | 1 | 907 | 11/30/01 | F | 1 | 1 | 60 | — | 10000 | 0/1 | — | — |

**Table A-31 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oxalate | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [600] | — | — | — | — |
| Perchlorate | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (total) | 1 | 907 | 11/30/01 | F | 1 | 1 | 160 | — | — | — | — | — |
| Potassium | 1 | 907 | 11/30/01 | F | 1 | 1 | 4160 | — | — | — | — | — |
| Potassium | 1 | 907 | 11/30/01 | NF | 1 | 1 | 4090 | — | — | — | — | — |
| Selenium | 1 | 907 | 11/30/01 | F | 1 | 1 | 4.36 | — | 50 | 0/1 | 50 | 0/1 |
| Selenium | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silver | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Silver | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silica | 1 | 907 | 11/30/01 | F | 1 | 1 | 44080 | — | — | — | — | — |
| Silica | 1 | 907 | 11/30/01 | NF | 1 | 1 | 43660 | — | — | — | — | — |
| Sodium | 1 | 907 | 11/30/01 | F | 1 | 1 | 24800 | — | — | — | — | — |
| Sodium | 1 | 907 | 11/30/01 | NF | 1 | 1 | 24600 | — | — | — | — | — |
| Strontium | 1 | 907 | 11/30/01 | F | 1 | 1 | 324 | — | — | — | — | — |
| Strontium | 1 | 907 | 11/30/01 | NF | 1 | 1 | 323 | — | — | — | — | — |
| Sulfate | 1 | 907 | 11/30/01 | F | 1 | 1 | 352 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0.5] | 2 | 0/1 | — | — |
| Thallium | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [0.5] | — | — | — | — |
| Total Kjeldahl Nitrogen | 1 | 907 | 11/30/01 | F | 1 | 1 | 1310 | — | — | — | — | — |
| Uranium | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0.2] | — | — | — | — |
| Vanadium | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [5] | — | — | — | — |
| Vanadium | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [0.623] | — | — | — | — |
| Zinc | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [2.94] | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [4.18] | — | — | — | — |

## Table A-31 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 1 | 907 | 11/30/01 | NF | 1 | 1 | -77 | — | — | — | — | — |
| $\delta^{15}N$ ($NH_3$) | 1 | 907 | 11/30/01 | NF | 1 | 1 | +1.4 | — | — | — | — | — |
| $\delta^{18}O$ | 1 | 907 | 11/30/01 | NF | 1 | 1 | -11 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-32
## Regional Well R-22 Screen 2 Third Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 2 | 962 | 12/03/01 | NF[e] | 1 | 1 | 65000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 2 | 962 | 12/03/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 2 | 962 | 12/03/01 | NF | 1 | 1 | 8.36 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 2 | 962 | 12/03/01 | NF | 1 | 1 | 153 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 2 | 962 | 12/03/01 | NF | 1 | 1 | 18.9 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 2 | 962 | 12/03/01 | NF | 1 | 1 | 0.95 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 2 | 962 | 12/03/01 | F[h] | 1 | 1 | 84700 | — | — | — | — | — |
| Aluminum | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [50] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [50] | — | — | — | — |
| Ammonia (as N) | 2 | 962 | 12/03/01 | F | 1 | 1 | 1020 | — | — | — | — | — |
| Antimony | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [0.08] | 6 | 0/1 | — | — |
| Antimony | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [0.13] | — | — | — | — |
| Arsenic | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Barium | 2 | 962 | 12/03/01 | F | 1 | 1 | 16.7 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 2 | 962 | 12/03/01 | NF | 1 | 1 | 171 | — | — | — | — | — |
| Beryllium | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [0.2] | 4 | 0/1 | — | — |
| Beryllium | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [0.2] | — | — | — | — |
| Boron | 2 | 962 | 12/03/01 | F | 1 | 1 | 19.5 | — | — | — | 750 | 0/1 |
| Boron | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [50] | — | — | — | — |
| Bromide | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Cadmium | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [1] | 5 | 0/1 | 10 | 0/1 |

**Table A-32 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [1] | — | — | — | — |
| Calcium | 2 | 962 | 12/03/01 | F | 1 | 1 | 10600 | — | — | — | — | — |
| Calcium | 2 | 962 | 12/03/01 | NF | 1 | 1 | 58800 | — | — | — | — | — |
| Chloride | 2 | 962 | 12/03/01 | F | 1 | 1 | 1860 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Chromium | 2 | 962 | 12/03/01 | NF | 1 | 1 | 20.1 | — | — | — | — | — |
| Cobalt | 2 | 962 | 12/03/01 | F | 1 | 1 | 0.868 | — | — | — | 50 | 0/1 |
| Cobalt | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Copper | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [5] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Cyanide (total) | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Fluoride | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [50] | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 2 | 962 | 12/03/01 | F | 1 | 1 | 114 | — | 300 | 1/1 | 1000 | 1/1 |
| Iron | 2 | 962 | 12/03/01 | NF | 1 | 1 | 7840 | — | — | — | — | — |
| Lead | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [2] | 15 | 0/1 | 50 | 0/1 |
| Lead | 2 | 962 | 12/03/01 | NF | 1 | 1 | 0.02 | — | — | — | — | — |
| Magnesium | 2 | 962 | 12/03/01 | F | 1 | 1 | 5070 | — | — | — | — | — |
| Magnesium | 2 | 962 | 12/03/01 | NF | 1 | 1 | 15900 | — | — | — | — | — |
| Manganese | 2 | 962 | 12/03/01 | F | 1 | 1 | 20.5 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 2 | 962 | 12/03/01 | NF | 1 | 1 | 3430 | — | — | — | — | — |
| Mercury | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [0.2] | 2 | 0/1 | — | — |
| Mercury | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [0.2] | — | — | 2 | 0/1 |
| Molybdenum | 2 | 962 | 12/03/01 | F | 1 | 1 | 1.75 | — | — | — | — | — |
| Molybdenum | 2 | 962 | 12/03/01 | NF | 1 | 1 | 24.8 | — | — | — | — | — |
| Nickel | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [11.8] | 100 | 0/1 | 200 | 0/1 |
| Nickel | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [11] | — | — | — | — |
| Nitrate + Nitrite (as N) | 2 | 962 | 12/03/01 | F | 1 | 1 | 580 | — | 10000 | 0/1 | — | — |

**Table A-32 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oxalate | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [600] | — | — | — | — |
| Perchlorate | 2 | 962 | 12/03/01 | F | 1 | 1 | — | [4] | — | — | — | — |
| Phosphorus (total) | 2 | 962 | 12/03/01 | F | 1 | 1 | 80 | — | — | — | — | — |
| Potassium | 2 | 962 | 12/03/01 | F | 1 | 1 | 3150 | — | — | — | — | — |
| Potassium | 2 | 962 | 12/03/01 | NF | 1 | 1 | 3990 | — | — | — | — | — |
| Selenium | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silver | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Silver | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silica | 2 | 962 | 12/03/01 | F | 1 | 1 | 68270 | — | — | — | — | — |
| Silica | 2 | 962 | 12/03/01 | NF | 1 | 1 | 42160 | — | — | — | — | — |
| Sodium | 2 | 962 | 12/03/01 | F | 1 | 1 | 12600 | — | — | — | — | — |
| Sodium | 2 | 962 | 12/03/01 | NF | 1 | 1 | 23900 | — | — | — | — | — |
| Strontium | 2 | 962 | 12/03/01 | F | 1 | 1 | 53.9 | — | — | — | — | — |
| Strontium | 2 | 962 | 12/03/01 | NF | 1 | 1 | 311 | — | — | — | — | — |
| Sulfate | 2 | 962 | 12/03/01 | F | 1 | 1 | 2810 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [0.5] | 2 | 0/1 | — | — |
| Thallium | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [0.5] | — | — | — | — |
| Total Kjeldahl Nitrogen | 2 | 962 | 12/03/01 | F | 1 | 1 | 180 | — | — | — | — | — |
| Uranium | 2 | 962 | 12/03/01 | F | 1 | 1 | 0.21 | — | — | — | — | — |
| Vanadium | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [5] | — | — | — | — |
| Vanadium | 2 | 962 | 12/03/01 | NF | 1 | 1 | 5.7 | — | — | — | — | — |
| Zinc | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [4.47] | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [4.72] | — | — | — | — |

**Table A-32 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 2 | 962 | 12/03/01 | NF | 1 | 1 | -77 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 2 | 962 | 12/03/01 | NF | 1 | 1 | +2.7 | — | — | — | — | — |
| $\delta^{18}O$ | 2 | 962 | 12/03/01 | NF | 1 | 1 | -11.2 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-33
## Regional Well R-22 Screen 3 Third Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 3 | 1273 | 12/04/01 | NF[e] | 1 | 1 | 108000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 3 | 1273 | 12/04/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 9.22 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 285 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 19.8 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 1.55 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 3 | 1273 | 12/04/01 | F[h] | 1 | 1 | 125000 | — | — | — | — | — |
| Aluminum | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [50] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [50] | — | — | — | — |
| Ammonia (as N) | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [50] | — | — | — | — |
| Antimony | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [0.19] | 6 | 0/1 | — | — |
| Antimony | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [0.21] | — | — | — | — |
| Arsenic | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Barium | 3 | 1273 | 12/04/01 | F | 1 | 1 | 50.6 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 84.8 | — | — | — | — | — |
| Beryllium | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [0.2] | 4 | 0/1 | — | — |
| Beryllium | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [0.2] | — | — | — | — |
| Boron | 3 | 1273 | 12/04/01 | F | 1 | 1 | 44.6 | — | — | — | 750 | 0/1 |
| Boron | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 50.5 | — | — | — | — | — |
| Bromide | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [100] | — | — | — | — |
| Cadmium | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [1] | 5 | 0/1 | 10 | 0/1 |

**Table A-33 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [1] | — | — | — | — |
| Calcium | 3 | 1273 | 12/04/01 | F | 1 | 1 | 9140 | — | — | — | — | — |
| Calcium | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 15100 | — | — | — | — | — |
| Chloride | 3 | 1273 | 12/04/01 | F | 1 | 1 | 4360 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 3 | 1273 | 12/04/01 | F | 1 | 1 | 1.08 | — | 100 | 0/1 | 50 | 0/1 |
| Chromium | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 3.42 | — | — | — | — | — |
| Cobalt | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [5] | — | — | 50 | 0/1 |
| Cobalt | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Copper | 3 | 1273 | 12/04/01 | F | 1 | 1 | 1.48 | — | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 1.02 | — | — | — | — | — |
| Cyanide (total) | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Fluoride | 3 | 1273 | 12/04/01 | F | 1 | 1 | 675 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [33.5] | 300 | 0/1 | 1000 | 0/1 |
| Iron | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [56.3] | — | — | — | — |
| Lead | 3 | 1273 | 12/04/01 | F | 1 | 1 | 0.09 | — | 15 | 0/1 | 50 | 0/1 |
| Lead | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 0.07 | — | — | — | — | — |
| Magnesium | 3 | 1273 | 12/04/01 | F | 1 | 1 | 3210 | — | — | — | — | — |
| Magnesium | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 4480 | — | — | — | — | — |
| Manganese | 3 | 1273 | 12/04/01 | F | 1 | 1 | 13.8 | — | 50 | 0/1 | 200 | 0/1 |
| Manganese | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 13.4 | — | — | — | — | — |
| Mercury | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [0.2] | 2 | 0/1 | — | — |
| Mercury | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [0.2] | — | — | 2 | 0/1 |
| Molybdenum | 3 | 1273 | 12/04/01 | F | 1 | 1 | 12.3 | — | — | — | — | — |
| Molybdenum | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 15.7 | — | — | — | — | — |
| Nickel | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [5] | 100 | 0/1 | 200 | 0/1 |
| Nickel | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 2.69 | — | — | — | — | — |
| Nitrate + Nitrite (as N) | 3 | 1273 | 12/04/01 | F | 1 | 1 | 250 | — | 10000 | 0/1 | — | — |

**Table A-33 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oxalate | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [600] | — | — | — | — |
| Perchlorate | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus (total) | 3 | 1273 | 12/04/01 | F | 1 | 1 | 120 | — | — | — | — | — |
| Potassium | 3 | 1273 | 12/04/01 | F | 1 | 1 | 7220 | — | — | — | — | — |
| Potassium | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 6350 | — | — | — | — | — |
| Selenium | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silver | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Silver | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silica | 3 | 1273 | 12/04/01 | F | 1 | 1 | 26750 | — | — | — | — | — |
| Silica | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 36000 | — | — | — | — | — |
| Sodium | 3 | 1273 | 12/04/01 | F | 1 | 1 | 39100 | — | — | — | — | — |
| Sodium | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 42000 | — | — | — | — | — |
| Strontium | 3 | 1273 | 12/04/01 | F | 1 | 1 | 578 | — | — | — | — | — |
| Strontium | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 433 | — | — | — | — | — |
| Sulfate | 3 | 1273 | 12/04/01 | F | 1 | 1 | 12900 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [0.5] | 2 | 0/1 | — | — |
| Thallium | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 0.03 | — | — | — | — | — |
| Total Kjeldahl Nitrogen | 3 | 1273 | 12/04/01 | F | 1 | 1 | 1150 | — | — | — | — | — |
| Uranium | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 1.92 | — | — | — | — | — |
| Uranium (TIMS isotopic ratio) | 3 | 1273 | 12/04/01 | F | 1 | 1 | 2.264 | — | — | — | — | — |
| Uranium (TIMS isotopic ratio) | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 2.173 | — | — | — | — | — |
| Uranium-234/238 (TIMS isotopic ratio) | 3 | 1273 | 12/04/01 | F | 1 | 1 | 9.4 ± 0.24 (E-05) | — | — | — | — | — |

**Table A-33 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uranium-234/238 (TIMS isotopic ratio) | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 9.39 ± 0.21 (E-05) | — | — | — | — | — |
| Uranium-238/233 (TIMS isotopic ratio) | 3 | 1273 | 12/04/01 | F | 1 | 1 | 123.63 | — | — | — | — | — |
| Uranium-238/233 (TIMS isotopic ratio) | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 157.47 | — | — | — | — | — |
| Uranium-238/235 (TIMS isotopic ratio) | 3 | 1273 | 12/04/01 | F | 1 | 1 | 137.97 | — | — | — | — | — |
| Uranium-238/235 (TIMS isotopic ratio) | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 137.79 | — | — | — | — | — |
| Vanadium | 3 | 1273 | 12/04/01 | F | 1 | 1 | 3.28 | — | — | — | — | — |
| Vanadium | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 2.43 | — | — | — | — | — |
| Zinc | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [5.96] | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [6.08] | — | — | — | — |
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 3 | 1273 | 12/04/01 | NF | 1 | 1 | -73 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 3 | 1273 | 12/04/01 | NF | 1 | 1 | +1.2 | — | — | — | — | — |
| $\delta^{18}O$ | 3 | 1273 | 12/04/01 | NF | 1 | 1 | -10.9 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-34
## Regional Well R-22 Screen 4 Third Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 4 | 1378 | 12/05/01 | NF[e] | 1 | 1 | 255000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 4 | 1378 | 12/05/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 7.18 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 509 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 20.3 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 14.4 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 4 | 1378 | 12/05/01 | F[h] | 1 | 1 | 304000 | — | — | — | — | — |
| Aluminum | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [50] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [50] | — | — | — | — |
| Ammonia (as N) | 4 | 1378 | 12/05/01 | F | 1 | 1 | 990 | — | — | — | — | — |
| Antimony | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [0.23] | 6 | 0/1 | — | — |
| Antimony | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [0.76] | — | — | — | — |
| Arsenic | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Barium | 4 | 1378 | 12/05/01 | F | 1 | 1 | 310 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 359 | — | — | — | — | — |
| Beryllium | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [0.2] | 4 | 0/1 | — | — |
| Beryllium | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [0.2] | — | — | — | — |
| Boron | 4 | 1378 | 12/05/01 | F | 1 | 1 | 91.3 | — | — | — | 750 | 0/1 |
| Boron | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 94.9 | — | — | — | — | — |
| Bromide | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [100] | — | — | — | — |
| Cadmium | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [1] | 5 | 0/1 | 10 | 0/1 |

**Table A-34 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [1] | — | — | — | — |
| Calcium | 4 | 1378 | 12/05/01 | F | 1 | 1 | 48500 | — | — | — | — | — |
| Calcium | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 50300 | — | — | — | — | — |
| Chloride | 4 | 1378 | 12/05/01 | F | 1 | 1 | 8100 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Chromium | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 0.953 | — | — | — | — | — |
| Cobalt | 4 | 1378 | 12/05/01 | F | 1 | 1 | 2.17 | — | — | — | 50 | 0/1 |
| Cobalt | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 1.65 | — | — | — | — | — |
| Copper | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [5] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Cyanide (total) | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Fluoride | 4 | 1378 | 12/05/01 | F | 1 | 1 | 634 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 4 | 1378 | 12/05/01 | F | 1 | 1 | 3230 | — | 300 | 1/1 | 1000 | 1/1 |
| Iron | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 7070 | — | — | — | — | — |
| Lead | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [2] | 15 | 0/1 | 50 | 0/1 |
| Lead | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [2] | — | — | — | — |
| Magnesium | 4 | 1378 | 12/05/01 | F | 1 | 1 | 12900 | — | — | — | — | — |
| Magnesium | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 13300 | — | — | — | — | — |
| Manganese | 4 | 1378 | 12/05/01 | F | 1 | 1 | 1180 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 1210 | — | — | — | — | — |
| Mercury | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [0.2] | 2 | 0/1 | — | — |
| Mercury | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [0.2] | — | — | 2 | 0/1 |
| Molybdenum | 4 | 1378 | 12/05/01 | F | 1 | 1 | 12.6 | — | — | — | — | — |
| Molybdenum | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 12.9 | — | — | — | — | — |
| Nickel | 4 | 1378 | 12/05/01 | F | 1 | 1 | 3.73 | — | 100 | 0/1 | 200 | 0/1 |
| Nickel | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 5.39 | — | — | — | — | — |
| Nitrate + Nitrite (as N) | 4 | 1378 | 12/05/01 | F | 1 | 1 | 50 | — | 10000 | 0/1 | — | — |

**Table A-34 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oxalate | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [600] | — | — | — | — |
| Perchlorate | 4 | 1378 | 12/05/01 | F | 1 | 1 | — | [4] | — | — | — | — |
| Phosphorus (total) | 4 | 1378 | 12/05/01 | F | 1 | 1 | 140 | — | — | — | — | — |
| Potassium | 4 | 1378 | 12/05/01 | F | 1 | 1 | 4880 | — | — | — | — | — |
| Potassium | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 5140 | — | — | — | — | — |
| Selenium | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [25] | — | — | — | — |
| Silver | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Silver | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silica | 4 | 1378 | 12/05/01 | F | 1 | 1 | 47720 | — | — | — | — | — |
| Silica | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 48360 | — | — | — | — | — |
| Sodium | 4 | 1378 | 12/05/01 | F | 1 | 1 | 42500 | — | — | — | — | — |
| Sodium | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 44600 | — | — | — | — | — |
| Strontium | 4 | 1378 | 12/05/01 | F | 1 | 1 | 973 | — | — | — | — | — |
| Strontium | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 1020 | — | — | — | — | — |
| Sulfate | 4 | 1378 | 12/05/01 | F | 1 | 1 | 892 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 4 | 1378 | 12/05/01 | F | 1 | 1 | 0.03 | — | 2 | 0/1 | — | — |
| Thallium | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 0.12 | — | — | — | — | — |
| Total Kjeldahl Nitrogen | 4 | 1378 | 12/05/01 | F | 1 | 1 | 1170 | — | — | — | — | — |
| Uranium | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 0.02 | — | — | — | — | — |
| Vanadium | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [5] | — | — | — | — |
| Vanadium | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Zinc | 4 | 1378 | 12/05/01 | F | 1 | 0 | — | [2.6] | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 4 | 1378 | 12/05/01 | NF | 1 | 0 | — | [7.97] | — | — | — | — |

## Table A-34 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 4 | 1378 | 12/05/01 | NF | 1 | 1 | -72 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 4 | 1378 | 12/05/01 | NF | 1 | 1 | +5.5 | — | — | — | — | — |
| $\delta^{18}O$ | 4 | 1378 | 12/05/01 | NF | 1 | 1 | -10.5 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-35
## Regional Well R-22 Screen 5 Third Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 5 | 1448 | 12/10/01 | NF[e] | 1 | 1 | 147000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 5 | 1448 | 12/10/01 | NF | 0 | 0 | — | — | — | — | — | — |
| pH | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 7.36 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 317 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 19.8 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 1.21 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 5 | 1448 | 12/10/01 | F[h] | 1 | 1 | 179000 | — | — | — | — | — |
| Aluminum | 5 | 1448 | 12/10/01 | F | 1 | 1 | [50] | — | 50 | 1/1 | 5000 | 0/1 |
| Aluminum | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | 175 | — | — | — | — |
| Ammonia (as N) | 5 | 1448 | 12/10/01 | F | 1 | 1 | 630 | — | — | — | — | — |
| Antimony | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [0.14] | 6 | 0/1 | — | — |
| Antimony | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [0.36] | — | — | — | — |
| Arsenic | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Barium | 5 | 1448 | 12/10/01 | F | 1 | 1 | 144 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 141 | — | — | — | — | — |
| Beryllium | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [0.2] | 4 | 0/1 | — | — |
| Beryllium | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [0.2] | — | — | — | — |
| Boron | 5 | 1448 | 12/10/01 | F | 1 | 1 | 20.5 | — | — | — | 750 | 0/1 |
| Boron | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 21.2 | — | — | — | — | — |
| Bromide | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [100] | — | — | — | — |
| Cadmium | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [1] | 5 | 0/1 | 10 | 0/1 |

**Table A-35 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.09 | — | — | — | — | — |
| Calcium | 5 | 1448 | 12/10/01 | F | 1 | 1 | 37600 | — | — | — | — | — |
| Calcium | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 36600 | — | — | — | — | — |
| Chloride | 5 | 1448 | 12/10/01 | F | 1 | 1 | 2690 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 5 | 1448 | 12/10/01 | F | 1 | 1 | 2.78 | — | 100 | 0/1 | 50 | 0/1 |
| Chromium | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Cobalt | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [5] | — | — | 50 | 0/1 |
| Cobalt | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Copper | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [5] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Cyanide (total) | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Fluoride | 5 | 1448 | 12/10/01 | F | 1 | 1 | 405 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 5 | 1448 | 12/10/01 | F | 1 | 1 | 2210 | — | 300 | 1/1 | 1000 | 1/1 |
| Iron | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 2340 | — | — | — | — | — |
| Lead | 5 | 1448 | 12/10/01 | F | 1 | 1 | 0.06 | — | 15 | 0/1 | 50 | 0/1 |
| Lead | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.03 | — | — | — | — | — |
| Magnesium | 5 | 1448 | 12/10/01 | F | 1 | 1 | 5710 | — | — | — | — | — |
| Magnesium | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 7260 | — | — | — | — | — |
| Manganese | 5 | 1448 | 12/10/01 | F | 1 | 1 | 546 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 461 | — | — | — | — | — |
| Mercury | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [0.2] | 2 | 0/1 | — | — |
| Mercury | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [0.2] | — | — | 2 | 0/1 |
| Molybdenum | 5 | 1448 | 12/10/01 | F | 1 | 1 | 30.8 | — | — | — | — | — |
| Molybdenum | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 26.9 | — | — | — | — | — |
| Nickel | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [5] | 100 | 0/1 | 200 | 0/1 |
| Nickel | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 1.48 | — | — | — | — | — |
| Nitrate + Nitrite (as N) | 5 | 1448 | 12/10/01 | F | 1 | 1 | 10 | — | 10000 | 0/1 | — | — |

**Table A-35 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oxalate | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [600] | — | — | — | — |
| Perchlorate | 5 | 1448 | 12/10/01 | F | 1 | 1 | — | [4] | — | — | — | — |
| Phosphorus (total) | 5 | 1448 | 12/10/01 | F | 1 | 1 | 190 | — | — | — | — | — |
| Potassium | 5 | 1448 | 12/10/01 | F | 1 | 1 | 4430 | — | — | — | — | — |
| Potassium | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 4820 | — | — | — | — | — |
| Selenium | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silver | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Silver | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silica | 5 | 1448 | 12/10/01 | F | 1 | 1 | 46870 | — | — | — | — | — |
| Silica | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 48150 | — | — | — | — | — |
| Sodium | 5 | 1448 | 12/10/01 | F | 1 | 1 | 18200 | — | — | — | — | — |
| Sodium | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 19000 | — | — | — | — | — |
| Strontium | 5 | 1448 | 12/10/01 | F | 1 | 1 | 312 | — | — | — | — | — |
| Strontium | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 321 | — | — | — | — | — |
| Sulfate | 5 | 1448 | 12/10/01 | F | 1 | 1 | 527 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [0.5] | 2 | 0/1 | — | — |
| Thallium | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [0.5] | — | — | — | — |
| Total Kjeldahl Nitrogen | 5 | 1448 | 12/10/01 | F | 1 | 1 | 1220 | — | — | — | — | — |
| Uranium | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.07 | — | — | — | — | — |
| Vanadium | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [5] | — | — | — | — |
| Vanadium | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Zinc | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [3.99] | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [7.11] | — | — | — | — |

**Table A-35 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 5 | 1448 | 12/10/01 | NF | 1 | 1 | -74 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 5 | 1448 | 12/10/01 | NF | 1 | 1 | +4.2 | — | — | — | — | — |
| $\delta^{18}O$ | 5 | 1448 | 12/10/01 | NF | 1 | 1 | -10.7 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-36
## Regional Well R-22 Screen 1 Third Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DDT[4,4'-] | 1 | 907 | 11/30/01 | NF[e] | 1 | 1 | 0.02 | —[f] | — | — | — | — |
| Isopropylbenzene | 1 | 907 | 11/30/01 | NF | 1 | 1 | 0.54 | — | — | — | — | — |
| Total Organic Carbon | 1 | 907 | 11/30/01 | NF | 1 | 1 | 6200 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-37
## Regional Well R-22 Screen 2 Third Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DDT[4,4'-] | 2 | 962 | 12/03/01 | NF[e] | 1 | 1 | 0.008 | —[f] | — | — | — | — |
| Methylene Chloride | 2 | 962 | 12/03/01 | NF | 1 | 1 | 0.62 | — | 5 | 0/1 | 100 | 0/1 |
| Total Organic Carbon | 2 | 962 | 12/03/01 | NF | 1 | 1 | 890 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-38

## Regional Well R-22 Screen 3 Third Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DDT[4,4'-] | 3 | 1273 | 12/04/01 | NF[e] | 1 | 1 | 0.017 | —[f] | — | — | — | — |
| Total Organic Carbon | 3 | 1273 | 12/04/01 | NF | 1 | 1 | 4110 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-39

## Regional Well R-22 Screen 4 Third Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | 4 | 1378 | 12/05/01 | NF[e] | 2 | 2 | 12.4 | —[f] | — | — | — | — |
| DDT[4,4'-] | 4 | 1378 | 12/05/01 | NF | 2 | 2 | 0.02 | — | — | — | — | — |
| 1,3,5,7-tetranitro-1,3,5,7-tetrazocine | 4 | 1378 | 12/05/01 | NF | 1 | 1 | 1.3 | — | — | — | — | — |
| Toluene | 4 | 1378 | 12/05/01 | NF | 2 | 2 | 0.2 | — | 1000 | 0/2 | 750 | 0/2 |
| Total Organic Carbon | 4 | 1378 | 12/05/01 | NF | 2 | 2 | 20100 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-40
## Regional Well R-22 Screen 5 Third Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acenaphthene | 5 | 1448 | 12/10/01 | NF[e] | 1 | 1 | 0.42 | —[f] | — | — | — | — |
| Acenaphthylene | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.4 | — | — | — | — | — |
| Anthracene | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.36 | — | — | — | — | — |
| Benzo(a)pyrene | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.24 | — | 0.2 | 1/1 | 0.7 | 0/1 |
| Benzo(b)fluoranthene | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.41 | — | — | — | — | — |
| Benzo(k)fluoranthene | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.38 | — | — | — | — | — |
| Bis(2-ethylhexyl)phthalate | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 1 | — | 6 | 0/1 | — | — |
| Chloronaphthalene[2-] | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.46 | — | — | — | — | — |
| DDT[4,4'-] | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.024 | — | — | — | — | — |
| Diethylphthalate | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 1.3 | — | — | — | — | — |
| Fluoranthene | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.38 | — | — | — | — | — |
| Fluorene | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.42 | — | — | — | — | — |
| Methylnaphthalene[2-] | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.42 | — | — | — | — | — |
| Pentachlorophenol | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 6.2 | — | 1 | 1/1 | — | — |
| Phenanthrene | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.4 | — | — | — | — | — |
| Pyrene | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.49 | — | — | — | — | — |
| Toluene | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 0.76 | — | 1000 | 0/1 | 750 | 0/1 |
| Total Organic Carbon | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 4880 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-41
## Regional Well R-22 Screen 1 Third Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 1 | 907 | 11/30/01 | F[c] | 1 | 0 | —[d] | [0.022] | — | — |
| Cesium-134 | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0.352] | — | — |
| Cesium-137 | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0.504] | — | — |
| Cobalt-60 | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [-0.984] | — | — |
| Europium-152 | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [-5.58] | — | — |
| Iodine-129 | 1 | 907 | 11/30/01 | NF | 1 | 0 | — | [-0.0136] | — | — |
| Plutonium-238 | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0] | — | — |
| Plutonium-239,240 | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0.0201] | — | — |
| Ruthenium-106 | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [2.79] | — | — |
| Sodium-22 | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [-0.961] | — | — |
| Strontium-90 | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0.001] | — | — |
| Technetium-99 | 1 | 907 | 11/30/01 | NF[e] | 1 | 0 | — | [-1.15] | — | — |
| Tritium | 1 | 907 | 11/30/01 | NF | 1 | 1 | 2.30 | — | 20000 | 0/1 |
| Uranium-234 | 1 | 907 | 11/30/01 | F | 1 | 1 | 0.0332 | — | — | — |
| Uranium-235 | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0.00392] | — | — |
| Uranium-238 | 1 | 907 | 11/30/01 | F | 1 | 0 | — | [0.0156] | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-42
## Regional Well R-22 Screen 2 Third Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 2 | 962 | 12/03/01 | F[c] | 1 | 0 | —[d] | [0.0125] | — | — |
| Cesium-134 | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [-1.05] | — | — |
| Cesium-137 | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [1.02] | — | — |
| Cobalt-60 | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [0.311] | — | — |
| Europium-152 | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [1.2] | — | — |
| Plutonium-238 | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [0] | — | — |
| Plutonium-239,240 | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [0.00797] | — | — |
| Ruthenium-106 | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [-9.48] | — | — |
| Sodium-22 | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [0.245] | — | — |
| Strontium-90 | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [0.009] | — | — |
| Technetium-99 | 2 | 962 | 12/03/01 | NF[e] | 1 | 0 | — | [1.04] | — | — |
| Tritium | 2 | 962 | 12/03/01 | NF | 1 | 0 | — | [-0.3192] | 20000 | 0/1 |
| Uranium-234 | 2 | 962 | 12/03/01 | F | 1 | 1 | 0.268 | — | — | — |
| Uranium-235 | 2 | 962 | 12/03/01 | F | 1 | 0 | — | [0.0096] | — | — |
| Uranium-238 | 2 | 962 | 12/03/01 | F | 1 | 1 | 0.115 | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-43
## Regional Well R-22 Screen 3 Third Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 3 | 1273 | 12/04/01 | F[c] | 1 | 1 | 0.0325 | —[d] | — | — |
| Cesium-134 | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [-0.743] | — | — |
| Cesium-137 | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [0.29] | — | — |
| Cobalt-60 | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [0.599] | — | — |
| Europium-152 | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [-1.46] | — | — |
| Iodine-129 | 3 | 1273 | 12/04/01 | NF[e] | 1 | 0 | — | [0.512] | — | — |
| Plutonium-238 | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [0.0025] | — | — |
| Plutonium-239,240 | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [0.0025] | — | — |
| Ruthenium-106 | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [-8.2] | — | — |
| Sodium-22 | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [0.125] | — | — |
| Strontium-90 | 3 | 1273 | 12/04/01 | F | 1 | 0 | — | [0.052] | — | — |
| Technetium-99 | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [-0.919] | — | — |
| Tritium | 3 | 1273 | 12/04/01 | NF | 1 | 0 | — | [0.22] | 20000 | 0/1 |
| Uranium-234 | 3 | 1273 | 12/04/01 | F | 1 | 1 | 0.994 | — | — | — |
| Uranium-235 | 3 | 1273 | 12/04/01 | F | 1 | 1 | 0.0405 | — | — | — |
| Uranium-238 | 3 | 1273 | 12/04/01 | F | 1 | 1 | 0.616 | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-44
## Regional Well R-22 Screen 4 Third Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 4 | 1379 | 12/5/2001 | F[c] | 1 | 0 | —[d] | [0.0118] | — | — |
| Cesium-134 | 4 | 1379 | 12/5/2001 | F | 1 | 0 | — | [0.254] | — | — |
| Cesium-137 | 4 | 1379 | 12/5/2001 | F | 1 | 0 | — | [0.232] | — | — |
| Cobalt-60 | 4 | 1379 | 12/5/2001 | F | 1 | 0 | — | [0.76] | — | — |
| Europium-152 | 4 | 1379 | 12/5/2001 | F | 1 | 0 | — | [-1.72] | — | — |
| Iodine-129 | 4 | 1379 | 12/5/2001 | NF[e] | 1 | 0 | — | [0.26] | — | — |
| Plutonium-238 | 4 | 1379 | 12/5/2001 | F | 1 | 0 | — | [-0.002] | — | — |
| Plutonium-239,240 | 4 | 1379 | 12/5/2001 | F | 1 | 0 | — | [0.00399] | — | — |
| Ruthenium-106 | 4 | 1379 | 12/5/2001 | F | 1 | 0 | — | [3.1] | — | — |
| Sodium-22 | 4 | 1379 | 12/5/2001 | F | 1 | 0 | — | [-0.51] | — | — |
| Strontium-90 | 4 | 1379 | 12/5/2001 | F | 1 | 0 | — | [0.0152] | — | — |
| Technetium-99 | 4 | 1379 | 12/5/2001 | NF | 1 | 0 | — | [-0.112] | — | — |
| Tritium | 4 | 1379 | 12/5/2001 | NF | 1 | 0 | — | [0.26] | 20000 | 0/1 |
| Uranium-234 | 4 | 1379 | 12/5/2001 | F | 1 | 1 | 0.072 | — | — | — |
| Uranium-235 | 4 | 1379 | 12/5/2001 | F | 1 | 0 | — | [0.022] | — | — |
| Uranium-238 | 4 | 1379 | 12/5/2001 | F | 1 | 0 | — | [0.0375] | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-45
## Regional Well R-22 Screen 5 Third Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 5 | 1448 | 12/10/01 | F[c] | 1 | 0 | —[d] | [0.0139] | — | — |
| Cesium-134 | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [0.866] | — | — |
| Cesium-137 | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [-1.67] | — | — |
| Cobalt-60 | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [-0.447] | — | — |
| Europium-152 | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [-3.14] | — | — |
| Iodine-129 | 5 | 1448 | 12/10/01 | NF[e] | 1 | 0 | — | [0.378] | — | — |
| Plutonium-238 | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [0.0138] | — | — |
| Plutonium-239,240 | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [0.0277] | — | — |
| Ruthenium-106 | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [4.84] | — | — |
| Sodium-22 | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [1.06] | — | — |
| Strontium-90 | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [-0.0455] | — | — |
| Technetium-99 | 5 | 1448 | 12/10/01 | NF | 1 | 0 | — | [0.0898] | — | — |
| Tritium | 5 | 1448 | 12/10/01 | NF | 1 | 1 | 18.45 | — | 20000 | 0/1 |
| Uranium-234 | 5 | 1448 | 12/10/01 | F | 1 | 1 | 0.069 | — | — | — |
| Uranium-235 | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [0.0154] | — | — |
| Uranium-238 | 5 | 1448 | 12/10/01 | F | 1 | 0 | — | [0.023] | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-46
## Regional Well R-22 Screen 1 Fourth Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 1 | 907 | 02/27/02 | NF[e] | 1 | 1 | 344000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 1 | 907 | 02/27/02 | NF | 1 | 1 | 2000 | — | — | — | — | — |
| pH | 1 | 907 | 02/27/02 | NF | 1 | 1 | 7.08 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 1 | 907 | 02/27/02 | NF | 1 | 1 | 549 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 1 | 907 | 02/27/02 | NF | 1 | 1 | 19.3 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 1 | 907 | 02/27/02 | NF | 1 | 1 | 23.7 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 1 | 907 | 02/27/02 | F[h] | 1 | 1 | 291000 | — | — | — | — | — |
| Aluminum | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [50] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [50] | — | — | — | — |
| Ammonia (as N) | 1 | 907 | 02/27/02 | F | 1 | 1 | 1060 | — | — | — | — | — |
| Antimony | 1 | 907 | 02/27/02 | F | 1 | 1 | 0.13 | — | 6 | 0/1 | — | — |
| Antimony | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [2] | — | — | — | — |
| Arsenic | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Barium | 1 | 907 | 02/27/02 | F | 1 | 1 | 190 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 1 | 907 | 02/27/02 | NF | 1 | 1 | 214 | — | — | — | — | — |
| Beryllium | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [0.2] | 4 | 0/1 | — | — |
| Beryllium | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [0.2] | — | — | — | — |
| Boron | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [22.7] | — | — | 750 | 0/1 |
| Boron | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [23.3] | — | — | — | — |
| Bromide | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [200] | — | — | — | — |

**Table A-46 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [1] | 5 | 0/1 | 10 | 0/1 |
| Cadmium | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [1] | — | — | — | — |
| Calcium | 1 | 907 | 02/27/02 | F | 1 | 1 | 63300 | — | — | — | — | — |
| Calcium | 1 | 907 | 02/27/02 | NF | 1 | 1 | 62900 | — | — | — | — | — |
| Chloride | 1 | 907 | 02/27/02 | F | 1 | 1 | 10200 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Chromium | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Cobalt | 1 | 907 | 02/27/02 | F | 1 | 1 | 0.771 | — | — | — | 50 | 0/1 |
| Cobalt | 1 | 907 | 02/27/02 | NF | 1 | 1 | 1.14 | — | — | — | — | — |
| Copper | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [5] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Cyanide (total) | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Fluoride | 1 | 907 | 02/27/02 | F | 1 | 1 | 624 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 1 | 907 | 02/27/02 | F | 1 | 1 | 14900 | — | 300 | 1/1 | 1000 | 1/1 |
| Iron | 1 | 907 | 02/27/02 | NF | 1 | 1 | 19300 | — | — | — | — | — |
| Lead | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [2] | 15 | 0/1 | 50 | 0/1 |
| Lead | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [2] | — | — | — | — |
| Magnesium | 1 | 907 | 02/27/02 | F | 1 | 1 | 17400 | — | — | — | — | — |
| Magnesium | 1 | 907 | 02/27/02 | NF | 1 | 1 | 17100 | — | — | — | — | — |
| Manganese | 1 | 907 | 02/27/02 | F | 1 | 1 | 4410 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 1 | 907 | 02/27/02 | NF | 1 | 1 | 4320 | — | — | — | — | — |
| Mercury | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [0.2] | 2 | 0/1 | — | — |
| Mercury | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [0.2] | — | — | 2 | 0/1 |
| Molybdenum | 1 | 907 | 02/27/02 | F | 1 | 1 | 26.2 | — | — | — | — | — |
| Molybdenum | 1 | 907 | 02/27/02 | NF | 1 | 1 | 25.1 | — | — | — | — | — |
| Nickel | 1 | 907 | 02/27/02 | F | 1 | 1 | 10 | — | 100 | 0/1 | 200 | 0/1 |
| Nickel | 1 | 907 | 02/27/02 | NF | 1 | 1 | 10.9 | — | — | — | — | — |

**Table A-46 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate + Nitrite (as N) | 1 | 907 | 02/27/02 | F | 1 | 1 | 20 | — | 10000 | 0/1 | — | — |
| Oxalate | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [600] | — | — | — | — |
| Perchlorate | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [50] | — | — | — | — |
| Potassium | 1 | 907 | 02/27/02 | F | 1 | 1 | 4680 | — | — | — | — | — |
| Potassium | 1 | 907 | 02/27/02 | NF | 1 | 1 | 4660 | — | — | — | — | — |
| Selenium | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 1 | 907 | 02/27/02 | NF | 1 | 1 | 4.97 | — | — | — | — | — |
| Silica | 1 | 907 | 02/27/02 | F | 1 | 1 | 47510 | — | — | — | — | — |
| Silica | 1 | 907 | 02/27/02 | NF | 1 | 1 | 47720 | — | — | — | — | — |
| Silver | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Silver | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Sodium | 1 | 907 | 02/27/02 | F | 1 | 1 | 25900 | — | — | — | — | — |
| Sodium | 1 | 907 | 02/27/02 | NF | 1 | 1 | 25700 | — | — | — | — | — |
| Strontium | 1 | 907 | 02/27/02 | F | 1 | 1 | 336 | — | — | — | — | — |
| Strontium | 1 | 907 | 02/27/02 | NF | 1 | 1 | 337 | — | — | — | — | — |
| Sulfate | 1 | 907 | 02/27/02 | F | 1 | 1 | 257 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [0.5] | 2 | 0/1 | — | — |
| Thallium | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [0.5] | — | — | — | — |
| Total Kjeldahl Nitrogen | 1 | 907 | 02/27/02 | F | 1 | 1 | 1620 | — | — | — | — | — |
| Uranium | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [0.2] | 20 | 0/1 | 5000 | 0/1 |
| Uranium | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [0.2] | — | — | — | — |
| Vanadium | 1 | 907 | 02/27/02 | F | 1 | 1 | 1.16 | — | — | — | — | — |
| Vanadium | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Zinc | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [5] | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [5] | — | — | — | — |

**Table A-46 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 1 | 907 | 02/27/02 | NF | 1 | 1 | -79 | — | — | — | — | — |
| $\delta^{15}N$ ($NH_3$) | 1 | 907 | 02/27/02 | NF | 1 | 1 | +3.3 | — | — | — | — | — |
| $\delta^{18}O$ | 1 | 907 | 02/27/02 | NF | 1 | 1 | -10.8 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-47
## Regional Well R-22 Screen 2 Fourth Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 2 | 962 | 02/28/02 | NF[e] | 1 | 1 | 71000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 2 | 962 | 02/28/02 | NF | 1 | 1 | 6400 | — | — | — | — | — |
| pH | 2 | 962 | 02/28/02 | NF | 1 | 1 | 8.13 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 2 | 962 | 02/28/02 | NF | 1 | 1 | 149 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 2 | 962 | 02/28/02 | NF | 1 | 1 | 18.1 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 2 | 962 | 02/28/02 | NF | 1 | 1 | 0.33 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 2 | 962 | 02/28/02 | F[h] | 1 | 1 | 78800 | — | — | — | — | — |
| Aluminum | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [50] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [50] | — | — | — | — |
| Ammonia (as N) | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [50] | — | — | — | — |
| Antimony | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [0.169] | 6 | 0/1 | — | — |
| Antimony | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [2] | — | — | — | — |
| Arsenic | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Barium | 2 | 962 | 02/28/02 | F | 1 | 1 | 15.4 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 2 | 962 | 02/28/02 | NF | 1 | 1 | 15.7 | — | — | — | — | — |
| Beryllium | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [0.2] | 4 | 0/1 | — | — |
| Beryllium | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [0.2] | — | — | — | — |
| Boron | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [50] | — | — | 750 | 0/1 |
| Boron | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [50] | — | — | — | — |
| Bromide | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [200] | — | — | — | — |

**Table A-47 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [0.08] | 5 | 0/1 | 10 | 0/1 |
| Cadmium | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [0.14] | — | — | — | — |
| Calcium | 2 | 962 | 02/28/02 | F | 1 | 1 | 10800 | — | — | — | — | — |
| Calcium | 2 | 962 | 02/28/02 | NF | 1 | 1 | 10800 | — | — | — | — | — |
| Chloride | 2 | 962 | 02/28/02 | F | 1 | 1 | 2420 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Chromium | 2 | 962 | 02/28/02 | NF | 1 | 1 | 2.88 | — | — | — | — | — |
| Cobalt | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [5] | — | — | 50 | 0/1 |
| Cobalt | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Copper | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [5] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Cyanide (total) | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Fluoride | 2 | 962 | 02/28/02 | F | 1 | 1 | 364 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [50] | 300 | 0/1 | 1000 | 0/1 |
| Iron | 2 | 962 | 02/28/02 | NF | 1 | 1 | 23.5 | — | — | — | — | — |
| Lead | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [0.023] | 15 | 0/1 | 50 | 0/1 |
| Lead | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [0.037] | — | — | — | — |
| Magnesium | 2 | 962 | 02/28/02 | F | 1 | 1 | 5130 | — | — | — | — | — |
| Magnesium | 2 | 962 | 02/28/02 | NF | 1 | 1 | 5130 | — | — | — | — | — |
| Manganese | 2 | 962 | 02/28/02 | F | 1 | 1 | 4.6 | — | 50 | 0/1 | 200 | 0/1 |
| Manganese | 2 | 962 | 02/28/02 | NF | 1 | 1 | 6.99 | — | — | — | — | — |
| Mercury | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [0.097] | 2 | 0/1 | — | — |
| Mercury | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [0.105] | — | — | 2 | 0/1 |
| Molybdenum | 2 | 962 | 02/28/02 | F | 1 | 1 | 1.3 | — | — | — | — | — |
| Molybdenum | 2 | 962 | 02/28/02 | NF | 1 | 1 | 1.9 | — | — | — | — | — |
| Nickel | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 200 | 0/1 |
| Nickel | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [5] | — | — | — | — |

**Table A-47 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate + Nitrite (as N) | 2 | 962 | 02/28/02 | F | 1 | 1 | 580 | — | 10000 | 0/1 | — | — |
| Oxalate | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [600] | — | — | — | — |
| Perchlorate | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus | 2 | 962 | 02/28/02 | F | 1 | 1 | 40 | — | — | — | — | — |
| Potassium | 2 | 962 | 02/28/02 | F | 1 | 1 | 3190 | — | — | — | — | — |
| Potassium | 2 | 962 | 02/28/02 | NF | 1 | 1 | 3170 | — | — | — | — | — |
| Selenium | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silica | 2 | 962 | 02/28/02 | F | 1 | 1 | 67840 | — | — | — | — | — |
| Silica | 2 | 962 | 02/28/02 | NF | 1 | 1 | 66980 | — | — | — | — | — |
| Silver | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Silver | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Sodium | 2 | 962 | 02/28/02 | F | 1 | 1 | 12200 | — | — | — | — | — |
| Sodium | 2 | 962 | 02/28/02 | NF | 1 | 1 | 12300 | — | — | — | — | — |
| Strontium | 2 | 962 | 02/28/02 | F | 1 | 1 | 54.7 | — | — | — | — | — |
| Strontium | 2 | 962 | 02/28/02 | NF | 1 | 1 | 55.5 | — | — | — | — | — |
| Sulfate | 2 | 962 | 02/28/02 | F | 1 | 1 | 3220 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [0.5] | 2 | 0/1 | — | — |
| Thallium | 2 | 962 | 02/28/02 | NF | 1 | 1 | 0.249 | — | — | — | — | — |
| Total Kjeldahl Nitrogen | 2 | 962 | 02/28/02 | F | 1 | 1 | 160 | — | — | — | — | — |
| Uranium | 2 | 962 | 02/28/02 | F | 1 | 1 | 0.393 | — | 20 | 0/1 | 5000 | 0/1 |
| Uranium | 2 | 962 | 02/28/02 | NF | 1 | 1 | 0.395 | — | — | — | — | — |
| Vanadium | 2 | 962 | 02/28/02 | F | 1 | 1 | 5.29 | — | — | — | — | — |
| Vanadium | 2 | 962 | 02/28/02 | NF | 1 | 1 | 5.69 | — | — | — | — | — |
| Zinc | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [5] | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 2 | 962 | 02/28/02 | NF | 1 | 1 | 4.16 | — | — | — | — | — |

## Table A-47 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 2 | 962 | 02/28/02 | NF | 1 | 1 | -77 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 2 | 962 | 02/28/02 | NF | 1 | 1 | +5.6 | — | — | — | — | — |
| $\delta^{18}O$ | 2 | 962 | 02/28/02 | NF | 1 | 1 | -11 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-48
## Regional Well R-22 Screen 3 Fourth Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 3 | 1273 | 03/04/02 | NF[e] | 1 | 1 | 142000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 3 | 1273 | 03/04/02 | NF | 0 | 0 | 7600 | — | — | — | — | — |
| pH | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 8.50 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 264 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 21.6 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 0.92 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 3 | 1273 | 03/04/02 | F[h] | 1 | 1 | 128000 | — | — | — | — | — |
| Aluminum | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [50] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 3 | 1273 | 03/04/02 | NF | 1 | 0 | — | [50] | — | — | — | — |
| Ammonia (as N) | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [50] | — | — | — | — |
| Antimony | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [2] | 6 | 0/1 | — | — |
| Antimony | 3 | 1273 | 03/04/02 | NF | 1 | 0 | — | [0.155] | — | — | — | — |
| Arsenic | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 3 | 1273 | 03/04/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Barium | 3 | 1273 | 03/04/02 | F | 1 | 1 | 98.6 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 108 | — | — | — | — | — |
| Beryllium | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [0.2] | 4 | 0/1 | — | — |
| Beryllium | 3 | 1273 | 03/04/02 | NF | 1 | 0 | — | [0.2] | — | — | — | — |
| Boron | 3 | 1273 | 03/04/02 | F | 1 | 1 | 32.3 | — | — | — | 750 | 0/1 |
| Boron | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 31 | — | — | — | — | — |
| Bromide | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [200] | — | — | — | — |

**Table A-48 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [0.16] | 5 | 0/1 | 10 | 0/1 |
| Cadmium | 3 | 1273 | 03/04/02 | NF | 1 | 0 | — | [0.19] | — | — | — | — |
| Calcium | 3 | 1273 | 03/04/02 | F | 1 | 1 | 17700 | — | — | — | — | — |
| Calcium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 19800 | — | — | — | — | — |
| Chloride | 3 | 1273 | 03/04/02 | F | 1 | 1 | 4270 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Chromium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 7.13 | — | — | — | — | — |
| Cobalt | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [5] | — | — | 50 | 0/1 |
| Cobalt | 3 | 1273 | 03/04/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Copper | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [5] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 3 | 1273 | 03/04/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Cyanide (total) | 3 | 1273 | 03/04/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Fluoride | 3 | 1273 | 03/04/02 | F | 1 | 1 | 582 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [50] | 300 | 0/1 | 1000 | 0/1 |
| Iron | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 42 | — | — | — | — | — |
| Lead | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [2] | 15 | 0/1 | 50 | 0/1 |
| Lead | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 0.149 | — | — | — | — | — |
| Magnesium | 3 | 1273 | 03/04/02 | F | 1 | 1 | 4920 | — | — | — | — | — |
| Magnesium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 5200 | — | — | — | — | — |
| Manganese | 3 | 1273 | 03/04/02 | F | 1 | 1 | 21.5 | — | 50 | 0/1 | 200 | 0/1 |
| Manganese | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 30.5 | — | — | — | — | — |
| Mercury | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [0.098] | 2 | 0/1 | — | — |
| Mercury | 3 | 1273 | 03/04/02 | NF | 1 | 0 | — | [0.101] | — | — | 2 | 0/1 |
| Molybdenum | 3 | 1273 | 03/04/02 | F | 1 | 1 | 9.39 | — | — | — | — | — |
| Molybdenum | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 10.5 | — | — | — | — | — |
| Nickel | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 200 | 0/1 |
| Nickel | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 3.2 | — | — | — | — | — |

**Table A-48 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate + Nitrite (as N) | 3 | 1273 | 03/04/02 | F | 1 | 1 | 180 | — | 10000 | 0/1 | — | — |
| Oxalate | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [600] | — | — | — | — |
| Perchlorate | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus | 3 | 1273 | 03/04/02 | F | 1 | 1 | 20 | — | — | — | — | — |
| Potassium | 3 | 1273 | 03/04/02 | F | 1 | 1 | 7070 | — | — | — | — | — |
| Potassium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 6990 | — | — | — | — | — |
| Selenium | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 3.23 | — | — | — | — | — |
| Silica | 3 | 1273 | 03/04/02 | F | 1 | 1 | 45800 | — | — | — | — | — |
| Silica | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 46870 | — | — | — | — | — |
| Silver | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Silver | 3 | 1273 | 03/04/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Sodium | 3 | 1273 | 03/04/02 | F | 1 | 1 | 31100 | — | — | — | — | — |
| Sodium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 29900 | — | — | — | — | — |
| Strontium | 3 | 1273 | 03/04/02 | F | 1 | 1 | 584 | — | — | — | — | — |
| Strontium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 595 | — | — | — | — | — |
| Sulfate | 3 | 1273 | 03/04/02 | F | 1 | 1 | 7020 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 3 | 1273 | 03/04/02 | F | 1 | 1 | 0.04 | — | 2 | 0/1 | — | — |
| Thallium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 0.07 | — | — | — | — | — |
| Total Kjeldahl Nitrogen | 3 | 1273 | 03/04/02 | F | 1 | 1 | 680 | — | — | — | — | — |
| Uranium | 3 | 1273 | 03/04/02 | F | 1 | 1 | 2.48 | — | 20 | 0/1 | 5000 | 0/1 |
| Uranium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 2.77 | — | — | — | — | — |
| Vanadium | 3 | 1273 | 03/04/02 | F | 1 | 1 | 2.71 | — | — | — | — | — |
| Vanadium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 3.39 | — | — | — | — | — |
| Zinc | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [5] | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 3.96 | — | — | — | — | — |

## Table A-48 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 3 | 1273 | 03/04/02 | NF | 1 | 1 | -78 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 3 | 1273 | 03/04/02 | NF | 1 | 1 | +6.4 | — | — | — | — | — |
| $\delta^{18}O$ | 3 | 1273 | 03/04/02 | NF | 1 | 1 | -10.7 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-49
## Regional Well R-22 Screen 4 Fourth Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 4 | 1378 | 03/05/02 | NF[e] | 1 | 1 | 285000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 4 | 1378 | 03/05/02 | NF | 0 | 0 | 3600 | — | — | — | — | — |
| pH | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 7.22 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 456 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 22.9 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 11.7 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 4 | 1378 | 03/05/02 | F[h] | 1 | 1 | 300000 | — | — | — | — | — |
| Aluminum | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [50] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [50] | — | — | — | — |
| Ammonia (as N) | 4 | 1378 | 03/05/02 | F | 1 | 1 | 760 | — | — | — | — | — |
| Antimony | 4 | 1378 | 03/05/02 | F | 1 | 1 | 0.19 | — | 6 | 0/1 | — | — |
| Antimony | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 0.14 | — | — | — | — | — |
| Arsenic | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Barium | 4 | 1378 | 03/05/02 | F | 1 | 1 | 314 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 335 | — | — | — | — | — |
| Beryllium | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [0.2] | 4 | 0/1 | — | — |
| Beryllium | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [0.2] | — | — | — | — |
| Boron | 4 | 1378 | 03/05/02 | F | 1 | 1 | 96.6 | — | — | — | 750 | 0/1 |
| Boron | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 99.2 | — | — | — | — | — |
| Bromide | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [200] | — | — | — | — |

**Table A-49 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [0.11] | 5 | 0/1 | 10 | 0/1 |
| Cadmium | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [0.19] | — | — | — | — |
| Calcium | 4 | 1378 | 03/05/02 | F | 1 | 1 | 44800 | — | — | — | — | — |
| Calcium | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 43100 | — | — | — | — | — |
| Chloride | 4 | 1378 | 03/05/02 | F | 1 | 1 | 7520 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Chromium | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 2.15 | — | — | — | — | — |
| Cobalt | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [5] | — | — | 50 | 0/1 |
| Cobalt | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 0.322 | — | — | — | — | — |
| Copper | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [5] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Cyanide (total) | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Fluoride | 4 | 1378 | 03/05/02 | F | 1 | 1 | 617 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 4 | 1378 | 03/05/02 | F | 1 | 1 | 2470 | — | 300 | 1/1 | 1000 | 1/1 |
| Iron | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 4810 | — | — | — | — | — |
| Lead | 4 | 1378 | 03/05/02 | F | 1 | 1 | 0.09 | — | 15 | 0/1 | 50 | 0/1 |
| Lead | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [2] | — | — | — | — |
| Magnesium | 4 | 1378 | 03/05/02 | F | 1 | 1 | 12000 | — | — | — | — | — |
| Magnesium | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 11400 | — | — | — | — | — |
| Manganese | 4 | 1378 | 03/05/02 | F | 1 | 1 | 1200 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 1060 | — | — | — | — | — |
| Mercury | 4 | 1378 | 03/05/02 | F | 1 | 1 | 0.084 | — | 2 | 0/1 | — | — |
| Mercury | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 0.088 | — | — | — | 2 | 0/1 |
| Molybdenum | 4 | 1378 | 03/05/02 | F | 1 | 1 | 10.2 | — | — | — | — | — |
| Molybdenum | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 10.6 | — | — | — | — | — |
| Nickel | 4 | 1378 | 03/05/02 | F | 1 | 1 | 2.87 | — | 100 | 0/1 | 200 | 0/1 |
| Nickel | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 5.22 | — | — | — | — | — |

**Table A-49 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate + Nitrite (as N) | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [50] | 10000 | 0/1 | — | — |
| Oxalate | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [600] | — | — | — | — |
| Perchlorate | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorus | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [50] | — | — | — | — |
| Potassium | 4 | 1378 | 03/05/02 | F | 1 | 1 | 4730 | — | — | — | — | — |
| Potassium | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 4570 | — | — | — | — | — |
| Selenium | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silica | 4 | 1378 | 03/05/02 | F | 1 | 1 | 55640 | — | — | — | — | — |
| Silica | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 56280 | — | — | — | — | — |
| Silver | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Silver | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Sodium | 4 | 1378 | 03/05/02 | F | 1 | 1 | 44900 | — | — | — | — | — |
| Sodium | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 42500 | — | — | — | — | — |
| Strontium | 4 | 1378 | 03/05/02 | F | 1 | 1 | 958 | — | — | — | — | — |
| Strontium | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 925 | — | — | — | — | — |
| Sulfate | 4 | 1378 | 03/05/02 | F | 1 | 1 | 1120 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [0.12] | 2 | 0/1 | — | — |
| Thallium | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [0.28] | — | — | — | — |
| Total Kjeldahl Nitrogen | 4 | 1378 | 03/05/02 | F | 1 | 1 | 1170 | — | — | — | — | — |
| Uranium | 4 | 1378 | 03/05/02 | F | 1 | 1 | 0.29 | — | 20 | 0/1 | 5000 | 0/1 |
| Uranium | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 0.26 | — | — | — | — | — |
| Vanadium | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [5] | — | — | — | — |
| Vanadium | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Zinc | 4 | 1378 | 03/05/02 | F | 1 | 1 | 3.37 | — | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 4.95 | — | — | — | — | — |

## Table A-49 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 4 | 1378 | 03/05/02 | NF | 1 | 1 | -74 | — | — | — | — | — |
| $\delta^{15}N$ ($NH_3$) | 4 | 1378 | 03/05/02 | NF | 1 | 1 | +3.7 | — | — | — | — | — |
| $\delta^{18}O$ | 4 | 1378 | 03/05/02 | NF | 1 | 1 | -10.5 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

## Table A-50
## Regional Well R-22 Screen 5 Fourth Round Sample Results: Data Summary for Inorganic Chemicals

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameter** | | | | | | | | | | | | |
| Field Alkalinity (total as $CaCO_3$) | 5 | 1448 | 03/07/02 | NF[e] | 1 | 1 | 185000 | —[f] | — | — | — | — |
| Dissolved Oxygen | 5 | 1448 | 03/07/02 | NF | 0 | 0 | 5900 | — | — | — | — | — |
| pH | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 7.23 | — | >6 & <9 | 0/1 | >6 & <9 | 0/1 |
| Specific Conductance (µS/cm) | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 311 | — | — | 0/1 | — | 0/1 |
| Temperature (°C) | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 22.1 | — | — | 0/1 | — | 0/1 |
| Turbidity (NTU[g]) | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 5.9 | — | — | 0/1 | — | 0/1 |
| **Analyte** | | | | | | | | | | | | |
| Lab Alkalinity (total as $CaCO_3$) | 5 | 1448 | 03/07/02 | F[h] | 1 | 1 | 163000 | — | — | — | — | — |
| Aluminum | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [50] | 50 | 0/1 | 5000 | 0/1 |
| Aluminum | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [50] | — | — | — | — |
| Ammonia (as N) | 5 | 1448 | 03/07/02 | F | 1 | 1 | 520 | — | — | — | — | — |
| Antimony | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [2] | 6 | 0/1 | — | — |
| Antimony | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [2] | — | — | — | — |
| Arsenic | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [5] | 50 | 0/1 | 100 | 0/1 |
| Arsenic | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Barium | 5 | 1448 | 03/07/02 | F | 1 | 1 | 137 | — | 2000 | 0/1 | 1000 | 0/1 |
| Barium | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 136 | — | — | — | — | — |
| Beryllium | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [0.2] | 4 | 0/1 | — | — |
| Beryllium | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [0.2] | — | — | — | — |
| Boron | 5 | 1448 | 03/07/02 | F | 1 | 1 | 18.7 | — | — | — | 750 | 0/1 |
| Boron | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 18.5 | — | — | — | — | — |
| Bromide | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [200] | — | — | — | — |

**Table A-50 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [0.13] | 5 | 0/1 | 10 | 0/1 |
| Cadmium | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [0.16] | — | — | — | — |
| Calcium | 5 | 1448 | 03/07/02 | F | 1 | 1 | 36600 | — | — | — | — | — |
| Calcium | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 36300 | — | — | — | — | — |
| Chloride | 5 | 1448 | 03/07/02 | F | 1 | 1 | 2500 | — | 250000 | 0/1 | 250000 | 0/1 |
| Chromium | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Chromium | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 1.16 | — | — | — | — | — |
| Cobalt | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [5] | — | — | 50 | 0/1 |
| Cobalt | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Copper | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [5] | 1300 | 0/1 | 1000 | 0/1 |
| Copper | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Cyanide (total) | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Fluoride | 5 | 1448 | 03/07/02 | F | 1 | 1 | 408 | — | 4000 | 0/1 | 1600 | 0/1 |
| Iron | 5 | 1448 | 03/07/02 | F | 1 | 1 | 1530 | — | 300 | 1/1 | 1000 | 1/1 |
| Iron | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 1630 | — | — | — | — | — |
| Lead | 5 | 1448 | 03/07/02 | F | 1 | 1 | 0.12 | — | 15 | 0/1 | 50 | 0/1 |
| Lead | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 0.21 | — | — | — | — | — |
| Magnesium | 5 | 1448 | 03/07/02 | F | 1 | 1 | 6590 | — | — | — | — | — |
| Magnesium | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 6370 | — | — | — | — | — |
| Manganese | 5 | 1448 | 03/07/02 | F | 1 | 1 | 540 | — | 50 | 1/1 | 200 | 1/1 |
| Manganese | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 505 | — | — | — | — | — |
| Mercury | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [0.2] | 2 | 0/1 | — | — |
| Mercury | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [0.2] | — | — | 2 | 0/1 |
| Molybdenum | 5 | 1448 | 03/07/02 | F | 1 | 1 | 26.9 | — | — | — | — | — |
| Molybdenum | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 26.2 | — | — | — | — | — |
| Nickel | 5 | 1448 | 03/07/02 | F | 1 | 1 | 1.26 | — | 100 | 0/1 | 200 | 0/1 |
| Nickel | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 1.79 | — | — | — | — | — |

**Table A-50 (continued)**

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate + Nitrite (as N) | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [50] | 10000 | 0/1 | — | — |
| Oxalate | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [600] | — | — | — | — |
| Perchlorate | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [4] | — | — | — | — |
| Phosphorous | 5 | 1448 | 03/07/02 | F | 1 | 1 | 20 | — | — | — | — | — |
| Potassium | 5 | 1448 | 03/07/02 | F | 1 | 1 | 4750 | — | — | — | — | — |
| Potassium | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 4710 | — | — | — | — | — |
| Selenium | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [5] | 50 | 0/1 | 50 | 0/1 |
| Selenium | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Silica | 5 | 1448 | 03/07/02 | F | 1 | 1 | 53500 | — | — | — | — | — |
| Silica | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 53930 | — | — | — | — | — |
| Silver | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [5] | 100 | 0/1 | 50 | 0/1 |
| Silver | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Sodium | 5 | 1448 | 03/07/02 | F | 1 | 1 | 20700 | — | — | — | — | — |
| Sodium | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 20400 | — | — | — | — | — |
| Strontium | 5 | 1448 | 03/07/02 | F | 1 | 1 | 306 | — | — | — | — | — |
| Strontium | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 306 | — | — | — | — | — |
| Sulfate | 5 | 1448 | 03/07/02 | F | 1 | 1 | 513 | — | 250000 | 0/1 | 600000 | 0/1 |
| Thallium | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [0.07] | 2 | 0/1 | — | — |
| Thallium | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [0.1] | — | — | — | — |
| Total Kjeldahl Nitrogen | 5 | 1448 | 03/07/02 | F | 1 | 1 | 980 | — | — | — | — | — |
| Uranium | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [0.2] | 20 | 0/1 | 5000 | 0/1 |
| Uranium | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [0.22] | — | — | — | — |
| Vanadium | 5 | 1448 | 03/07/02 | F | 1 | 0 | — | [5] | — | — | — | — |
| Vanadium | 5 | 1448 | 03/07/02 | NF | 1 | 0 | — | [5] | — | — | — | — |
| Zinc | 5 | 1448 | 03/07/02 | F | 1 | 1 | 3.9 | — | 5000 | 0/1 | 10000 | 0/1 |
| Zinc | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 5.29 | — | — | — | — | — |

## Table A-50 (continued)

| Parameter and Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Stable Isotope (‰)*** | | | | | | | | | | | | |
| δD | 5 | 1448 | 03/07/02 | NF | 1 | 1 | -77 | — | — | — | — | — |
| $\delta^{15}N$ ($NO_3$) | 5 | 1448 | 03/07/02 | NF | 1 | 1 | ISV[i] | — | — | — | — | — |
| $\delta^{18}O$ | 5 | 1448 | 03/07/02 | NF | 1 | 1 | -11.3 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

[i] ISV = Insufficient sample volume.

## Table A-51
## Regional Well R-22 Screen 1 Fourth Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Amino-2,6-dinitrotoluene[4-] | 1 | 907 | 02/27/02 | NF[e] | 1 | 1 | 0.42 | —[f] | — | — | — | — |
| Amino-4,6-dinitrotoluene[2-] | 1 | 907 | 02/27/02 | NF | 1 | 1 | 0.51 | — | — | — | — | — |
| Benzoic Acid | 1 | 907 | 02/27/02 | NF | 1 | 1 | 12.5 | — | — | — | — | — |
| Isopropylbenzene | 1 | 907 | 02/27/02 | NF | 1 | 1 | 0.54 | — | — | — | — | — |
| Methylene Chloride | 1 | 907 | 02/27/02 | NF | 1 | 1 | 2.2 | — | 5 | 0/1 | 100 | 0/1 |
| Total Organic Carbon | 1 | 907 | 02/27/02 | NF | 1 | 1 | 6550 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-52
## Regional Well R-22 Screen 2 Fourth Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dichlorobenzene[1,4-] | 2 | 962 | 02/28/02 | NF[e] | 1 | 1 | 0.23 | —[f] | 75 | 0/2 | — | — |
| Total Organic Carbon | 2 | 962 | 02/28/02 | NF | 1 | 1 | 297 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-53

## Regional Well R-22 Screen 3 Fourth Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | 3 | 1273 | 03/04/02 | NF[e] | 1 | 1 | 2.5 | —[f] | — | — | — | — |
| Bis(2-ethylhexyl)phthalate | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 0.23 | — | 6 | 0/1 | — | — |
| DDT[4,4'-] | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 0.0088 | — | — | — | — | — |
| Dichlorobenzene[1,4-] | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 0.21 | — | 75 | 0/2 | — | — |
| Phenanthrene | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 0.14 | — | — | — | — | — |
| Total Organic Carbon | 3 | 1273 | 03/04/02 | NF | 1 | 1 | 2910 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-54
## Regional Well R-22 Screen 4 Fourth Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | 4 | 1378 | 03/05/02 | NF[e] | 1 | 1 | 5.6 | —[f] | — | — | — | — |
| Dichlorobenzene[1,4-] | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 0.16 | — | 75 | 0/2 | — | — |
| Total Organic Carbon | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 18000 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-55

## Regional Well R-22 Screen 5 Fourth Round Sample Results: Data Summary for Detected Organic Chemicals

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (µg/L) | Non-detected Value (µg/L) | Drinking Water MCL[b] (µg/L) | Frequency of Detects > Drinking Water MCL | NMED[c] Groundwater Standard[d] (µg/L) | Frequency of Detects > NMED Groundwater Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | 5 | 1448 | 03/07/02 | NF[e] | 1 | 1 | 4.2 | —[f] | — | — | — | — |
| Butylbenzylphthalate | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 9.8 | — | — | — | — | — |
| Isopropylbenzene | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 0.16 | — | — | — | — | — |
| Hexahydro-1,3,5-trinitro-1,3,5-triazine | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 0.34 | — | — | — | — | — |
| Toluene | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 0.6 | — | 1000 | 0/1 | 750 | 0/1 |
| Total Organic Carbon | 5 | 1448 | 03/07/02 | NF | 1 | 1 | 3660 | — | — | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

## Table A-56
## Regional Well R-22 Screen 1 Fourth Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 1 | 907 | 02/27/02 | F[c] | 1 | 0 | —[d] | [0.0105] | — | — |
| Cesium-134 | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [-0.00796] | — | — |
| Cesium-137 | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [-0.393] | — | — |
| Cobalt-60 | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [1] | — | — |
| Europium-152 | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [0.778] | — | — |
| Iodine-129 | 1 | 907 | 02/27/02 | NF[e] | 1 | 0 | — | [0.0658] | — | — |
| Plutonium-238 | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [-0.002] | — | — |
| Plutonium-239,240 | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [-0.0115] | — | — |
| Ruthenium-106 | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [1.56] | — | — |
| Sodium-22 | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [0.442] | — | — |
| Strontium-90 | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [0.0001] | — | — |
| Technetium-99 | 1 | 907 | 02/27/02 | NF | 1 | 0 | — | [-2.53] | — | — |
| Tritium | 1 | 907 | 02/27/02 | NF | 1 | 1 | 2.33 | — | 20000 | 0/1 |
| Uranium-234 | 1 | 907 | 02/27/02 | F | 1 | 1 | 0.0427 | — | — | — |
| Uranium-235 | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [-0.0033] | — | — |
| Uranium-238 | 1 | 907 | 02/27/02 | F | 1 | 0 | — | [0.00986] | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-57
## Regional Well R-22 Screen 2 Fourth Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 2 | 962 | 02/28/02 | F[c] | 1 | 0 | —[d] | [0.0122] | — | — |
| Cesium-134 | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [-0.544] | — | — |
| Cesium-137 | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [0.324] | — | — |
| Cobalt-60 | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [-0.0486] | — | — |
| Europium-152 | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [-1.05] | — | — |
| Iodine-129 | 2 | 962 | 02/28/02 | NF[e] | 1 | 0 | — | [0.196] | — | — |
| Plutonium-238 | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [-0.0066] | — | — |
| Plutonium-239,240 | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [0.0044] | — | — |
| Ruthenium-106 | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [8.39] | — | — |
| Sodium-22 | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [0.918] | — | — |
| Strontium-90 | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [-0.0042] | — | — |
| Technetium-99 | 2 | 962 | 02/28/02 | NF | 1 | 0 | — | [-0.13] | — | — |
| Tritium | 2 | 962 | 02/28/02 | NF | 1 | 1 | — | [-0.16] | 20000 | 0/1 |
| Uranium-234 | 2 | 962 | 02/28/02 | F | 1 | 1 | 0.271 | — | — | — |
| Uranium-235 | 2 | 962 | 02/28/02 | F | 1 | 0 | — | [8.67] | — | — |
| Uranium-238 | 2 | 962 | 02/28/02 | F | 1 | 1 | 0.108 | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-58
## Regional Well R-22 Screen 3 Fourth Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 3 | 1273 | 03/04/02 | F[c] | 1 | 0 | —[d] | [0.0119] | — | — |
| Cesium-134 | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [0.0241] | — | — |
| Cesium-137 | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [0.807] | — | — |
| Cobalt-60 | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [-0.754] | — | — |
| Europium-152 | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [-1.16] | — | — |
| Iodine-129 | 3 | 1273 | 03/04/02 | NF[e] | 1 | 0 | — | [-0.00588] | — | — |
| Plutonium-238 | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [0.00295] | — | — |
| Plutonium-239,240 | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [-0.0001] | — | — |
| Ruthenium-106 | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [0.825] | — | — |
| Sodium-22 | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [1.35] | — | — |
| Strontium-90 | 3 | 1273 | 03/04/02 | F | 1 | 0 | — | [-0.01] | — | — |
| Technetium-99 | 3 | 1273 | 03/04/02 | NF | 1 | 0 | — | [0.0215] | — | — |
| Tritium | 3 | 1273 | 03/04/02 | NF | 1 | 1 | — | [-0.06] | 20000 | 0/1 |
| Uranium-234 | 3 | 1273 | 03/04/02 | F | 1 | 1 | 1.39 | — | — | — |
| Uranium-235 | 3 | 1273 | 03/04/02 | F | 1 | 1 | 0.0412 | — | — | — |
| Uranium-238 | 3 | 1273 | 03/04/02 | F | 1 | 1 | 0.829 | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-59
## Regional Well R-22 Screen 4 Fourth Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 4 | 1378 | 03/05/02 | F[c] | 1 | 1 | 0.0254 | —[d] | — | — |
| Cesium-134 | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [0.0347] | — | — |
| Cesium-137 | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [-0.528] | — | — |
| Cobalt-60 | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [-0.753] | — | — |
| Europium-152 | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [0.493] | — | — |
| Iodine-129 | 4 | 1378 | 03/05/02 | NF[e] | 1 | 0 | — | [0.383] | — | — |
| Plutonium-238 | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [0.0123] | — | — |
| Plutonium-239 | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [0.0123] | — | — |
| Ruthenium-106 | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [-3.27] | — | — |
| Sodium-22 | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [-0.127] | — | — |
| Strontium-90 | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [0.0377] | — | — |
| Technetium-99 | 4 | 1378 | 03/05/02 | NF | 1 | 0 | — | [-1.51] | — | — |
| Tritium | 4 | 1378 | 03/05/02 | NF | 1 | 1 | 0.26 | — | 20000 | 0/1 |
| Uranium-234 | 4 | 1378 | 03/05/02 | F | 1 | 1 | 0.0973 | — | — | — |
| Uranium-235 | 4 | 1378 | 03/05/02 | F | 1 | 0 | — | [0.005] | — | — |
| Uranium-238 | 4 | 1378 | 03/05/02 | F | 1 | 1 | 0.0497 | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

## Table A-60
## Regional Well R-22 Screen 5 Fourth Round Sample Results: Data Summary for Radionuclides

| Analyte | Screen | Depth (ft)[a] | Collection Date | Field Preparation | Number of Analyses | Number of Detects | Detected Value (pCi/L) | Nondetected Value (pCi/L) | Drinking Water MCL[b] (pCi/L) | Frequency of Detects > Drinking Water MCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | 5 | 1449 | 03/07/02 | F[c] | 1 | 0 | —[d] | [0.00297] | — | — |
| Cesium-134 | 5 | 1449 | 03/07/02 | F | 1 | 0 | — | [-0.00929] | — | — |
| Cesium-137 | 5 | 1449 | 03/07/02 | F | 1 | 0 | — | [-0.241] | — | — |
| Cobalt-60 | 5 | 1449 | 03/07/02 | F | 1 | 0 | — | [0.226] | — | — |
| Europium-152 | 5 | 1449 | 03/07/02 | F | 1 | 0 | — | [0.595] | — | — |
| Iodine-129 | 5 | 1449 | 03/07/02 | NF[e] | 1 | 0 | — | [0.0765] | — | — |
| Plutonium-238 | 5 | 1449 | 03/07/02 | F | 1 | 0 | — | [0.00758] | — | — |
| Plutonium-239,240 | 5 | 1449 | 03/07/02 | F | 1 | 0 | — | [0.0151] | — | — |
| Ruthenium-106 | 5 | 1449 | 03/07/02 | F | 1 | 0 | — | [3.51] | — | — |
| Sodium-22 | 5 | 1449 | 03/07/02 | F | 1 | 0 | — | [0.193] | — | — |
| Strontium-90 | 5 | 1449 | 03/07/02 | F | 1 | 0 | — | [-0.0279] | — | — |
| Technetium-99 | 5 | 1449 | 03/07/02 | NF | 1 | 0 | — | [-0.298] | — | — |
| Tritium | 5 | 1449 | 03/07/02 | NF | 1 | 1 | 15.23 | — | 20000 | 0/1 |
| Uranium-234 | 5 | 1449 | 03/07/02 | F | 1 | 1 | 0.0823 | — | — | — |
| Uranium-235 | 5 | 1449 | 03/07/02 | F | 1 | 0 | — | [0.0075] | — | — |
| Uranium-238 | 5 | 1449 | 03/07/02 | F | 1 | 1 | 0.0524 | — | — | — |

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] F = Filtered.

[d] — = Not available or not applicable.

[e] NF = Nonfiltered.

Langmuir, D., 1997. *Aqueous Environmental Geochemistry,* Prentice-Hall, Inc., Upper Saddle River, New Jersey. (Langmuir 1997, 56037)

LANL (Los Alamos National Laboratory), January 31, 1996. "Groundwater Protection Management Program Plan," Rev. 2.0, Los Alamos, New Mexico. (LANL 1996, 70215)

LANL (Los Alamos National Laboratory), May 22, 1998. "Hydrogeologic Workplan," Los Alamos, New Mexico. (LANL 1998, 59599)

Longmire, P., September 04, 2002. Personal Correspondence with D. Broxton. Los Alamos National Laboratory, Los Alamos, New Mexico. (Longmire 2002, 73455)

Longmire, P., June 2002. "Characterization Well R-19 Geochemistry Report," Los Alamos National Laboratory Report LA-13964-MS, Los Alamos, New Mexico. (Longmire 2002, 73282)

Longmire, P., June 2002. "Characterization Well R-12 Geochemistry Report," Los Alamos National Laboratory Report LA-13952-MS, Los Alamos, New Mexico. (Longmire 2002, 72800)

Longmire, P., April 2002. "Characterization Wells R-9 and R-9i Geochemistry Report," Los Alamos National Laboratory Report LA-13927-MS, Los Alamos, New Mexico. (Longmire 2002, 72713)

Longmire, P., March 2002. "Characterization Well R-15 Geochemistry Report," Los Alamos National Laboratory Report LA-13896-MS, Los Alamos, New Mexico. (Longmire 2002, 72614)

Thurman, E. M., 1985. *Organic Geochemistry of Natural Waters*, Martinus Nijhoff/Dr. W. Junk Publishers, Boston, Massachusetts, p. 14. (Thurman 1985, 71514)

Vilks, P., and D.B. Bachinski, 1996. "Characterization of Organics in Whiteshell Research Area Groundwater and the Implications for Radionuclide Transport," *Applied Geochemistry*, Vol. 11, No. 3, pp. 387–402. (Vilks and Bachinski 1996, 71515)

# Appendix B

*Geochemical Calculations*
*(Input Files for the Computer Program MINTEQA2)*

## APPENDIX B. GEOCHEMICAL CALCULATIONS (INPUT FILES FOR THE COMPUTER PROGRAM MINTEQA2)

A description of the input file for the computer program MINTEQA2 (Allison et al. 1991, 49930) is provided below.

Rows one and two (blank) consist of the title for the calculations.

Row three consists of temperature, units of concentration, and calculation of ionic strength.

Row four is blank.

Row five consists of query for charge balance termination (> 30%); alkalinity or inorganic carbon as carbonate; query for oversaturated solids that are not allowed to precipitate excluding infinite and finite phases; maximum number of iterations (40, 100, and 200); selection for calculating activity coefficient (Davies equation); level of output; pH; Eh or pe; and a query for choosing a different file to modify or return to output filename prompt.

Row six is blank.

Row seven contains zeros (not specific to input file).

Row eight is blank.

Rows nine through 25 contains species number, concentration, log base 10 activity, a prompt (y) for refining calculation of activity for each species, and the chemical symbol for each species.

Row 26 is blank.

Row 27 consists of pH input (measured)

Row 28 consists of pH including its species number, pH value, and chemical symbol.

Row 29 includes excluded species for calculation

Row 30 consists of excluded species identification number, log base 10 association constant (K) and delta H (enthalpy) for association constant. Species $U(OH)_5^-$ was excluded from calculations because spectroscopic data did not confirm its occurrence in aqueous solution (Langmuir 1997, 56037).

```
GEOCHEMICAL CALCULATIONS FOR R-22, SCREEN #2.
SAMPLED ON 03/12/01.
17.00 MG/L        0.000  0.00000E-01

1 0 1 0 3 0 0 0 1 1 0 0 0

0          0          0

      330  0.000E-01     -8.35 y          /H+1

      140  3.939E+01     -19.86 y         /Total CO3-2 alkali

      150  9.300E+00     -3.63 y          /Ca+2

      460  4.500E+00     -3.73 y          /Mg+2

      500  1.100E+01     -3.32 y          /Na+1

      410  3.100E+00     -4.10 y          /K+1

      180  3.100E+00     -4.06 y          /Cl-1

      770  1.096E+02     -2.94 y          /H4SiO4

      732  3.900E+00     -4.39 y          /SO4-2

      100  1.400E-02     -6.99 y          /Ba+2

      270  2.900E-01     -4.82 y          /F-1

      470  3.000E-03     -7.26 y          /Mn+2

      800  4.500E-02     -6.29 y          /Sr+2

      891  4.780E-04     -8.70 y          /U+4

      893  5.400E-05     -9.70 y           /UO2+2


 3         1

      33            8.3500 0.0000          /H+1

 6         1

8913304                    -13.120030.2450       /U(OH)5 -1
```

```
GEOCHEMICAL CALCULATIONS FOR R-22, SCREEN #2.
SAMPLED ON 06/20/01.
22.00 MG/L        0.000  0.00000E-01

1 0 1 0 3 0 0 0 1 1 0 0 0

0          0          0

      330  0.000E-01    -7.68 y          /H+1

      140  3.837E+01    -19.88 y         /Total CO3-2 alkali

      150  9.600E+00    -3.62 y          /Ca+2

      460  4.700E+00    -3.71 y          /Mg+2

      500  1.100E+01    -3.32 y          /Na+1

      410  3.200E+00    -4.09 y          /K+1

      180  2.600E+00    -4.13 y          /Cl-1

      770  1.027E+02    -2.97 y          /H4SiO4

      732  3.500E+00    -4.44 y          /SO4-2

      100  1.300E-02    -7.02 y          /Ba+2

      270  4.600E-01    -4.62 y          /F-1

      470  4.000E-03    -7.14 y          /Mn+2

      800  4.300E-02    -6.31 y          /Sr+2

      893  4.750E-04    -8.75 y          /UO2+2

      891  4.200E-03    -7.75            /U+4


 3         1

                        330 7.6800 0.0000     /H+1

 6         1

8913304                 -13.120030.2450       /U(OH)5 -1
```

```
GEOCHEMICAL CALCULATIONS FOR R-22, SCREEN #2.
SAMPLED ON 12/03/01.
18.90 MG/L        0.000  0.00000E-01

1 0 1 0 3 0 0 0 1 1 0 0 0

0          0          0

      330  0.000E-01     -8.36 y          /H+1

      140  3.897E+01  -19.87 y            /Total CO3-2 alkali

      150  1.060E+01     -3.58 y          /Ca+2

      460  5.100E+00     -3.68 y          /Mg+2

      500  1.260E+01     -3.26 y          /Na+1

      410  3.100E+00     -4.10 y          /K+1

      180  1.900E+00     -4.27 y          /Cl-1

      770  6.750E+01     -3.15 y          /H4SiO4

      732  2.800E+00     -4.54 y          /SO4-2

      100  1.700E-02     -6.91 y          /Ba+2

      280  1.100E-01     -5.71 y          /Fe+2

      470  2.000E-02     -6.44 y          /Mn+2

      800  5.400E-02     -6.21 y          /Sr+2

      580  2.500E-01     -5.58 y          /PO4-3

      891  2.100E-04     -9.05 y          /U+4

      893  2.370E-04     -9.06 y          /UO2+2


  3        1

  330 8.3600 0.0000                      /H+1

  6        1

8913304-13.120030.2450              /U(OH)5 -1
```

```
GEOCHEMICAL CALCULATIONS FOR R-22, SCREEN #2.
SAMPLED ON 02/28/02.
19.30 MG/L        0.000  0.00000E-01

1 0 1 0 3 0 0 0 1 1 0 0 0

0          0          0

      330  0.000E-01     -7.08 y          /H+1

      140  4.257E+01  -19.83 y          /Total CO3-2 alkali

      150  1.080E+01     -3.57 y          /Ca+2

      460  5.100E+00     -3.68 y          /Mg+2

      500  1.220E+01     -3.28 y          /Na+1

      410  3.200E+00     -4.09 y          /K+1

      180  2.400E+00     -4.17 y          /Cl-1

      770  1.085E+02     -2.95 y          /H4SiO4

      732  3.200E+00     -4.48 y          /SO4-2

      100  1.500E-02     -6.96 y          /Ba+2

      270  3.600E-01     -4.72 y          /F-1

      470  5.000E-03     -7.04 y          /Mn+2

      800  5.500E-02     -6.20 y          /Sr+2

      580  1.200E-01     -5.90 y          /PO4-3

      891  3.900E-04     -8.79 y          /U+4

      893  4.400E-04     -8.79 y          /UO2+2


 3         1

  330   7.0800 0.0000                    /H+1

 6         1

8913304  -13.1200   30.2450             /U(OH)5 -1
```

```
GEOCHEMICAL CALCULATIONS FOR R-22, SCREEN #3.
SAMPLED ON 03/09/01.
19.50 MG/L        0.000  0.00000E-01

1 0 1 0 3 0 0 0 1 1 0 0 0

0          0          0

      330  0.000E-01     -8.21 y          /H+1

      140  1.487E+02  -19.29 y          /Total CO3-2 alkali

      150  3.500E+01     -3.06 y          /Ca+2

      460  1.100E+01     -3.34 y          /Mg+2

      500  5.400E+01     -2.63 y          /Na+1

      410  9.700E+00     -3.61 y          /K+1

      180  3.900E+00     -3.96 y          /Cl-1

      770  9.250E+01     -3.02 y          /H4SiO4

      732  3.100E+01     -3.49 y          /SO4-2

      100  1.400E-01     -5.99 y          /Ba+2

      270  6.300E-01     -4.48 y          /F-1

      280  2.000E-01     -5.45 y          /Fe+2

      470  2.000E-01     -5.44 y          /Mn+2

      800  9.400E-01     -4.97 y          /Sr+2

      893  1.720E-02     -7.20 y          /UO2+2

      864  4.800E-07  -11.53 y          /TcO4-1

      145  6.600E-07     -6.18             /DOM


3   1

  330   8.2100   0.0000                  /H+1
```

GEOCHEMICAL CALCULATIONS FOR R-22, SCREEN #3.
SAMPLED ON 06/21/01.
24.20 MG/L 0.000 0.00000E-01

1 0 1 0 3 0 0 0 1 1 0 0 0

0 0 0

| | | | |
|---|---|---|---|
| 330 | 0.000E-01 | -8.73 y | /H+1 |
| 150 | 1.000E+01 | -3.60 y | /Ca+2 |
| 460 | 4.500E+00 | -3.73 y | /Mg+2 |
| 500 | 4.100E+01 | -2.75 y | /Na+1 |
| 410 | 7.500E+00 | -3.72 y | /K+1 |
| 180 | 4.000E+00 | -3.95 y | /Cl-1 |
| 770 | 5.470E+01 | -3.24 y | /H4SiO4 |
| 732 | 2.700E+01 | -3.55 y | /SO4-2 |
| 100 | 4.800E-02 | -6.46 y | /Ba+2 |
| 270 | 6.600E-01 | -4.46 y | /F-1 |
| 470 | 1.800E-02 | -6.48 y | /Mn+2 |
| 800 | 4.400E-01 | -5.30 y | /Sr+2 |
| 893 | 9.500E-03 | -7.45 y | /UO2+2 |
| 140 | 8.393E+01 | -4.47 y | /Total CO3-2 alkali |

3 1

330 8.7300 0.0000 /H+1

GEOCHEMICAL CALCULATIONS FOR R-22, SCREEN #3.
SAMPLED ON 12/04/01.
19.80 MG/L 0.000 0.00000E-01

1 0 1 0 3 0 0 0 1 1 0 0 0

0 0 0

| | | | |
|---|---|---|---|
| 330 | 0.000E-01 | -9.22 y | /H+1 |
| 140 | 6.475E+01 | -19.65 y | /Total CO3-2 alkali |
| 150 | 9.100E+00 | -3.64 y | /Ca+2 |
| 460 | 3.200E+00 | -3.88 y | /Mg+2 |
| 500 | 3.910E+01 | -2.77 y | /Na+1 |
| 410 | 7.200E+00 | -3.73 y | /K+1 |
| 180 | 4.400E+00 | -3.91 y | /Cl-1 |
| 770 | 4.270E+01 | -3.35 y | /H4SiO4 |
| 732 | 1.290E+01 | -3.87 y | /SO4-2 |
| 100 | 5.100E-02 | -6.43 y | /Ba+2 |
| 270 | 6.700E-01 | -4.45 y | /F-1 |
| 470 | 1.400E-02 | -6.59 y | /Mn+2 |
| 800 | 5.780E-01 | -5.18 y | /Sr+2 |
| 580 | 3.700E-01 | -5.41 y | /PO4-3 |
| 893 | 2.170E+00 | -5.09 y | /UO2+2 |

3 1

330 9.2200 0.0000 /H+1

GEOCHEMICAL CALCULATIONS FOR R-22, SCREEN #3.
SAMPLED ON 03/04/02.
21.60 MG/L 0.000 0.00000E-01

1 0 1 0 3 0 0 0 1 1 0 0 0

0 0 0

| | | | |
|---|---|---|---|
| 330 | 0.000E-01 | -8.50 y | /H+1 |
| 150 | 1.770E+01 | -3.35 y | /Ca+2 |
| 460 | 4.900E+00 | -3.70 y | /Mg+2 |
| 500 | 3.110E+01 | -2.87 y | /Na+1 |
| 410 | 7.100E+00 | -3.74 y | /K+1 |
| 770 | 7.330E+01 | -3.12 y | /H4SiO4 |
| 732 | 7.000E+00 | -4.14 y | /SO4-2 |
| 100 | 9.900E-02 | -6.14 y | /Ba+2 |
| 270 | 5.800E-01 | -4.52 y | /F-1 |
| 470 | 2.100E-02 | -6.42 y | /Mn+2 |
| 800 | 5.840E-01 | -5.18 y | /Sr+2 |
| 893 | 2.800E-03 | -7.98 y | /UO2+2 |
| 140 | 8.513E+01 | -4.69 y | /Total CO3-2 alkali |

3 1

330 8.5000 0.0000 /H+1


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