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Scientific Investigations Report 2015–5002

U.S. Department of the Interior
U.S. Geological Survey

Cover: U.S. Geological Survey scientists deploying water sample bottles into well USGS 134 at the Idaho National Laboratory, Idaho. (Photograph taken by Sara Smith, U.S. Geological Survey, September 3, 2008.)

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SALLY JEWELL, Secretary

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Conversion Factors

Inch/Pound to SI

Multiply	By	To obtain
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	259.0	hectare (ha)
foot squared per day (ft^2/d)	0.09290	meter squared per day (m^2/d)
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)
picocurie per liter (pCi/L)	0.037	becquerel per liter (Bq/L)
foot per day (ft/d)	0.3048	meter per day (m/d)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F = (1.8 \times °C) + 32.$$

Conversion Factors, Datums, and Abbreviations—Continued

Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25°C).

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter (µg/L).

Datums

Vertical coordinate information is referenced to National Geodetic Vertical Datum of 1929 (NGVD 29).

Horizontal coordinate information is referenced to North American Datum of 1927 (NAD 27).

Altitude, as used in this report, refers to distance above the vertical datum.

Abbreviations

BLS	below land surface
DOE	U.S. Department of Energy
E	estimate
ESRP	eastern Snake River Plain
H	hydrogen
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LRL	laboratory reporting levels
MDL	method detection limit
MP	multiport
NRF	Naval Reactors Facility
NWQL	National Water Quality Laboratory
O	oxygen
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RESL	Radiological and Environmental Sciences Laboratory
RPD	relative percent difference
ATR	Advanced Test Reactor Complex
RWMC	Radioactive Waste Management Complex
TAN	Test Area North
USGS	U.S. Geological Survey

Chemical Constituents in Groundwater from Multiple Zones in the Eastern Snake River Plain Aquifer, Idaho National Laboratory, Idaho, 2009–13

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Abstract

From 2009 to 2013, the U.S. Geological Survey's (USGS) Idaho National Laboratory (INL) Project office, in cooperation with the U.S. Department of Energy, collected water-quality samples from multiple water-bearing zones in the eastern Snake River Plain aquifer. Water samples were collected from 11 monitoring wells completed in about 250–750 feet of the upper part of the aquifer, and samples were analyzed for selected major ions, trace elements, nutrients, radiochemical constituents, and stable isotopes. Each well was equipped with a multilevel monitoring system containing four to seven sampling ports that were each isolated by permanent packer systems. The sampling ports were installed in aquifer zones that were highly transmissive and that represented the water chemistry of the top three to five model layers of a steady-state and transient groundwater-flow model. The groundwater-flow model and water chemistry are being used to better define movement of wastewater constituents in the aquifer.

The water-chemistry composition of all sampled zones for the five new multilevel wells is calcium plus magnesium bicarbonate. One of the zones in well USGS 131A has a slightly different chemistry from the rest of the zones and wells and the difference is attributed to more wastewater influence from the Idaho Nuclear Technology and Engineering Center. One well, USGS 135, was not influenced by wastewater disposal and consisted of mostly older water in all of its zones.

Tritium concentrations in relation to basaltic flow units indicate the presence of wastewater influence in multiple basalt flow groups; however, tritium is most abundant in the South Late Matuyama flow group in the southern boundary wells. The concentrations of wastewater constituents in deep zones in wells Middle 2051, USGS 132, USGS 105, and USGS 103 support the concept of groundwater flow deepening in the southwestern corner of the INL, as indicated by the INL groundwater-flow model.

Introduction

The Idaho National Laboratory (INL), encompassing about 890 mi^2 of the eastern Snake River Plain (ESRP) in southeastern Idaho (fig. 1), is operated by the U.S. Department of Energy (DOE). The INL was established in 1949 for the development of peacetime atomic energy applications, nuclear safety research, defense programs, environmental research, and advanced energy concepts. Wastewater disposal sites at Test Area North (TAN), the Naval Reactors Facility (NRF), the Advanced Test Reactor (ATR) Complex, and the Idaho Nuclear Technology and Engineering Center (INTEC) (fig. 1) have been principal sources of radioactive- and chemical-waste contaminants in water from the ESRP aquifer (Davis and others, 2013). These wastewater disposal sites have included lined evaporation ponds, unlined infiltration ponds and ditches, drain fields, and injection wells. Waste materials buried in shallow pits and trenches within the Subsurface Disposal Area at the Radioactive Waste Management Complex (RWMC) also have contributed contaminants to the groundwater.

Prior to 1984, most of the wastewater generated at the INTEC, which is located in the southwestern part of the INL, was injected directly to the ESRP aquifer through a 598-ft-deep disposal well (fig. 2). In February 1984, routine use of the disposal well was discontinued, and wastewater was then discharged to unlined infiltration ponds south of the INTEC until 2002 (when the unlined ponds were relocated to about 2 mi southwest of INTEC). Wastewater in the infiltration ponds percolate through about 450 ft of basalt and sediment to the aquifer.

Since 1952, wastewater generated at the ATR Complex has been discharged mostly to unlined ponds. Low-level radioactive wastewater was discharged to infiltration ponds until 1993; since then it has been discharged to evaporation ponds that are lined and do not allow infiltration. Nonradioactive wastewater was discharged to the aquifer through a disposal well from 1964 to 1982, and has been discharged to infiltration ponds since 1982 (Davis and others, 2013).

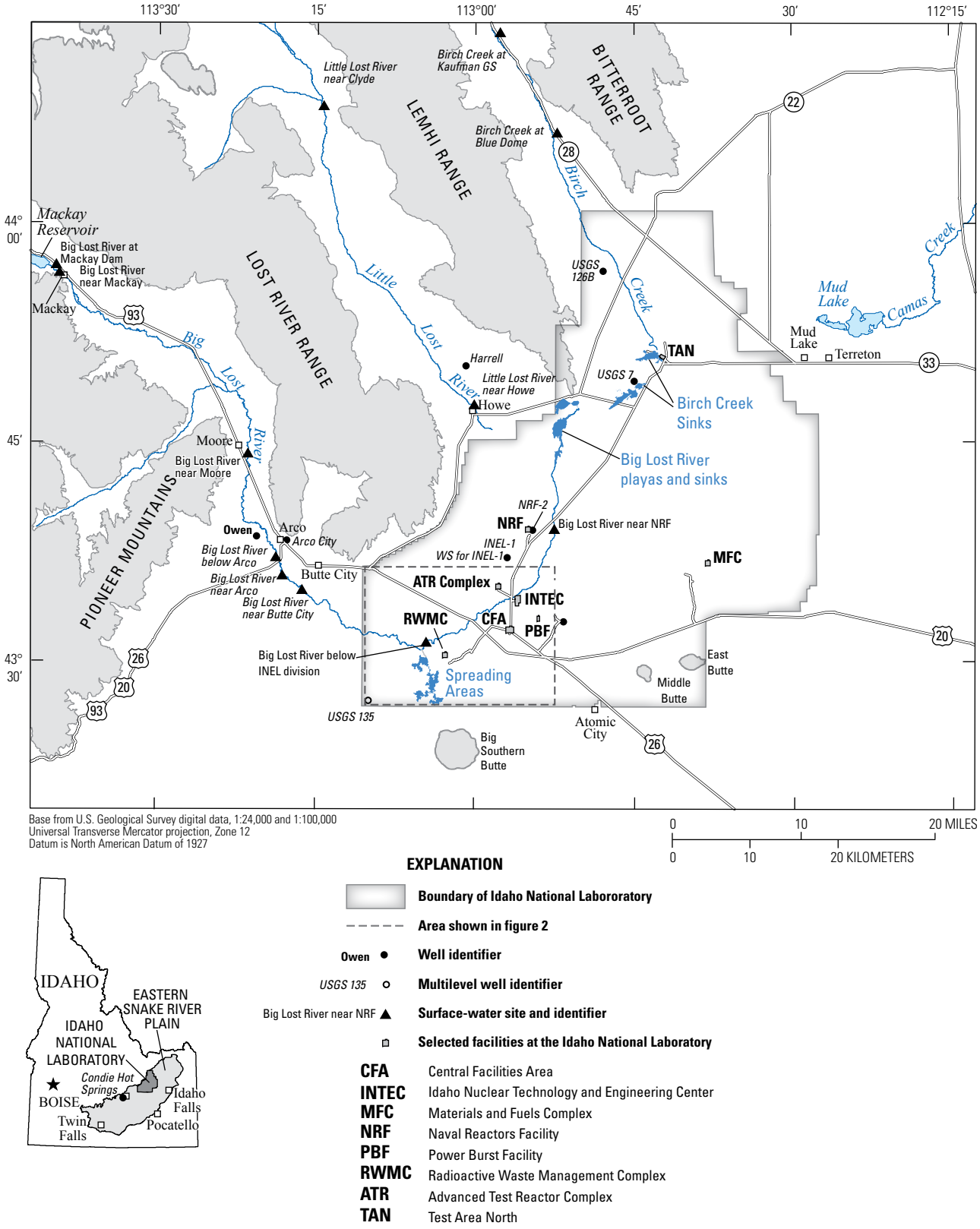


Figure 1. Location of the Idaho National Laboratory and selected sites, Idaho.

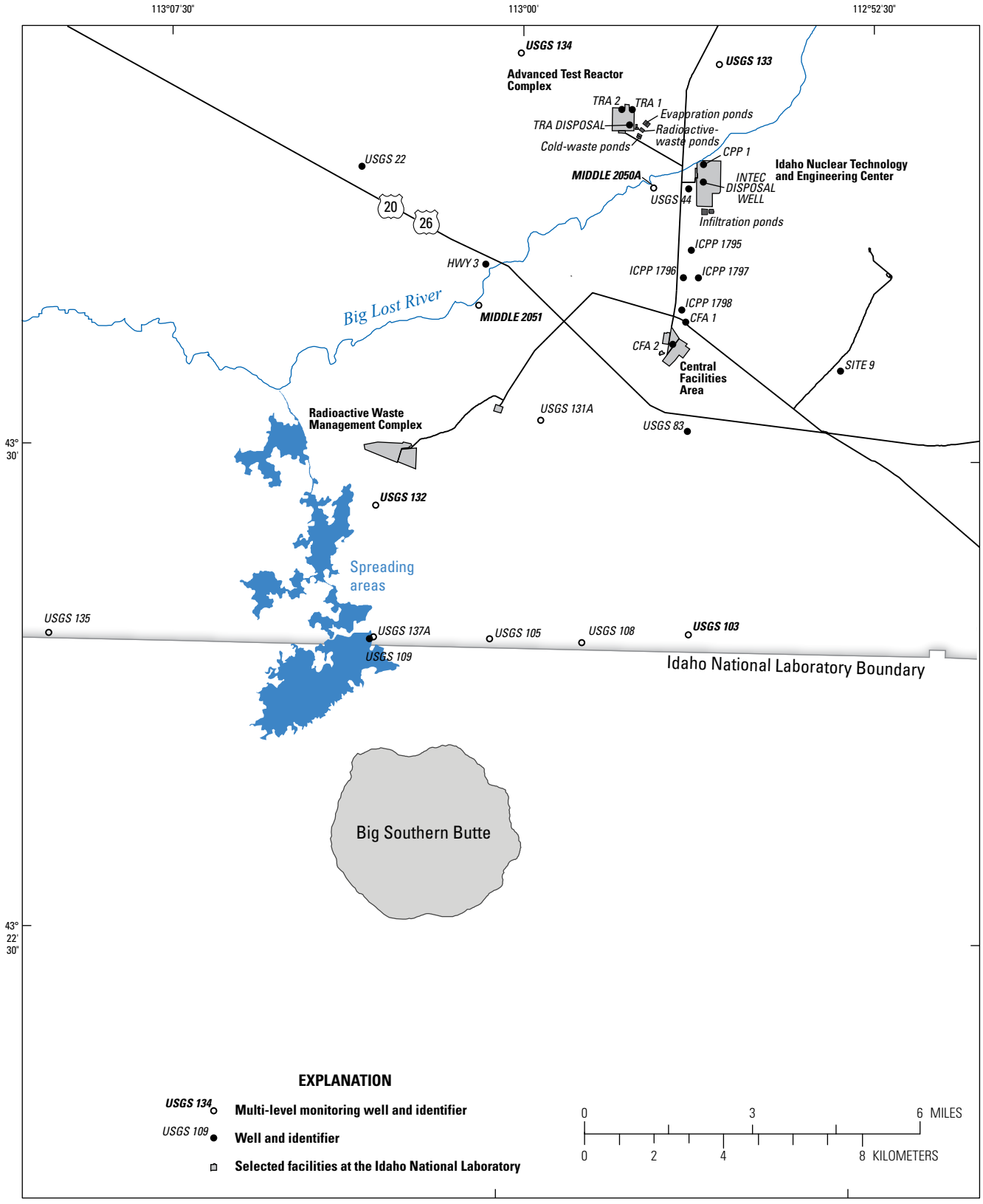


Figure 2. Location of wells in the southwestern area of Idaho National Laboratory, Idaho.

The U.S. Geological Survey (USGS) has maintained a water-quality monitoring program at the INL since 1949 to define (1) the quality and availability of water for human consumption, (2) the usability of the water for supporting construction of facilities and for industrial purposes such as cooling systems and diluting concentrated waste streams, (3) the location and movement of contaminants in the ESRP aquifer, (4) the sources of recharge to the aquifer, (5) an early detection network for contaminants moving past the INL boundaries, and (6) the processes controlling the origin and distribution of contaminants and naturally occurring constituents in the aquifer (Ackerman and others, 2010).

Since the inception of the monitoring program, a network that once numbered almost 200 wells has been sampled for various constituents including tritium, strontium-90, cesium-137, plutonium-238, plutonium-239, -240 (undivided), americium-241, gross alpha- and gross beta-radioactivity, iodine-129, chromium and other trace elements, sodium, chloride, sulfate, nitrate, fluoride, volatile organic compounds, and total organic carbon (Davis and others, 2013; Bartholomay, 2013). Most of the wells in this network were constructed as open-borehole wells, and many of the wells are open to the aquifer through their entire depth below the water table. This type of construction is good for maximum water-production rates, for identifying the time of arrival of contaminant plumes, and for delineating the horizontal extent of contaminants. However, it is not conducive to identifying either the vertical distribution of contaminants or pressure and temperature gradients.

To acquire water-chemistry data that describe the vertical distribution of constituents in the ESRP aquifer, the USGS collaborated with an INL contractor in 2005 to develop a multilevel monitoring network. The multilevel network allows for sampling of discrete zones of water versus sampling an open, mixed zone. The multilevel monitoring network was expanded by the USGS from 2006 to 2012. In 2005, 2006, and 2007, wells Middle 2050A, Middle 2051, USGS 103, USGS 132, USGS 133, and USGS 134 (fig. 2) were instrumented; from 2009 through 2012, wells USGS 135, 105, 108, 131A and 137A were instrumented with multilevel Westbay™ packer sampling systems to acquire water-quality samples and pressure and temperature measurements at isolated depths in each of the wells. These isolated depths coincide with the vertical location of groundwater model layers (table 1, fig. 3) in which particles are introduced to simulate groundwater flow paths (Ackerman and others, 2010).

Table 1. Well identifier, port depth, interval sampled, and groundwater model layer information from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.

[Well locations are shown in figure 2. Port depth and interval sampled in feet below land surface. **Model layer:** See Ackerman and others (2010) for more information. Layer 1 represents water from the upper 100 feet of the aquifer; layer 2 represents water from 100 to 200 feet below the top of the aquifer; layer 3 represents water from 200 to 300 feet below the top of the aquifer; layer 4 represents water from 300 to 500 feet below the top of the aquifer; layer 5 represents water from 500 to 800 feet below the top of the aquifer; and layer 6 represents water from greater than 800 feet below the top of the aquifer; none of the wells reach model layer 6]

Well name	Site identifier	Port depth	Interval sampled	Model layer
Middle 2050A				
Zone 15	433409112570515	517	465–539	1
Zone 12	433409112570512	644	643–703	2 and 3
Zone 9	433409112570509	791	790–807	4
Zone 6	433409112570506	999	999–1,041	5
Zone 3	433409112570503	1,180	1,180–1,227	5
Middle 2051				
Zone 12	433217113004912	603	562–609	1
Zone 9	433217113004909	749	748–771	2 and 3
Zone 6	433217113004906	827	826–876	3 and 4
Zone 3	433217113004903	1,091	1,090– 1,128	5
Zone 1	433217113004901	1,141	1,140–1,176	5
USGS 103				
Zone 17	432714112560723	680	670–691	1 and 2
Zone 15	432714112560720	802	767–832	2 and 3
Zone 12	432714112560716	909	892–920	4
Zone 9	432714112560712	993	958–1,014	4
Zone 6	432714112560708	1,087	1,063–1,098	4 and 5
Zone 3	432714112560704	1,210	1,184–1,240	5
Zone 1	432714112560702	1,258	1,257–1,279	5

Table 1. Well identifier, port depth, interval sampled, and groundwater model layer information from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

Well name	Site identifier	Port depth	Interval sampled	Model layer
USGS 105				
Zone 13	432703113001818	728	707–752	1
Zone 11	432703113001815	851	830–862	2
Zone 8	432703113001811	952	929–982	3 and 4
Zone 5	432703113001807	1,072	1,035–1,102	4
Zone 2	432703113001803	1,242	1,225–1,276	5
USGS 108				
Zone 11	432659112582616	661	642–679	1
Zone 9	432659112582613	809	791–830	2 and 3
Zone 7	432659112582610	888	872–904	3
Zone 4	432659112582606	1,029	1,018–1,060	5
Zone 1	432659112582602	1,172	1,161–1,194	5
USGS 131A				
Zone 12	433036112581815	616	562–632	1
Zone 8	433036112581810	812	795–842	3
Zone 5	433036112581806	981	956–1,058	4
Zone 3	433036112581803	1,137	1,120–1,157	5
USGS 132				
Zone 17	432906113025022	638	624–660	1
Zone 14	432906113025018	765	727–787	2
Zone 11	432906113025014	827	812–864	3
Zone 8	432906113025010	919	911–935	4
Zone 5	432906113025006	1,012	984–1,043	4
Zone 1	432906113025001	1,173	1,152–1,214	5
USGS 133				
Zone 10	433605112554312	469	448–480	1
Zone 7	433605112554308	570	556–591	2
Zone 4	433605112554305	686	686–696	3
Zone 1	433605112554301	746	725–766	4
USGS 134				
Zone 15	433611112595819	578	554–590	1
Zone 12	433611112595815	646	639–652	2
Zone 9	433611112595811	706	691–720	2 and 3
Zone 6	433611112595807	807	782–818	3 and 4
Zone 3	433611112595804	847	846–868	4
Zone 3	433611112595803	856	846–868	4
USGS 135				
Zone 10	432753113093613	738	727–762	1
Zone 7	432753113093609	837	823–861	2
Zone 4	432753113093605	988	968–1,008	3
Zone 1	432753113093601	1,116	1,106–1,137	4
USGS 137A				
Zone 5	432701113025807	662	640–718	1
Zone 4	432701113025805	747	721–784	2
Zone 3	432701113025803	841	787–862	2 and 3
Zone 1	432701113025801	876	875–895	3

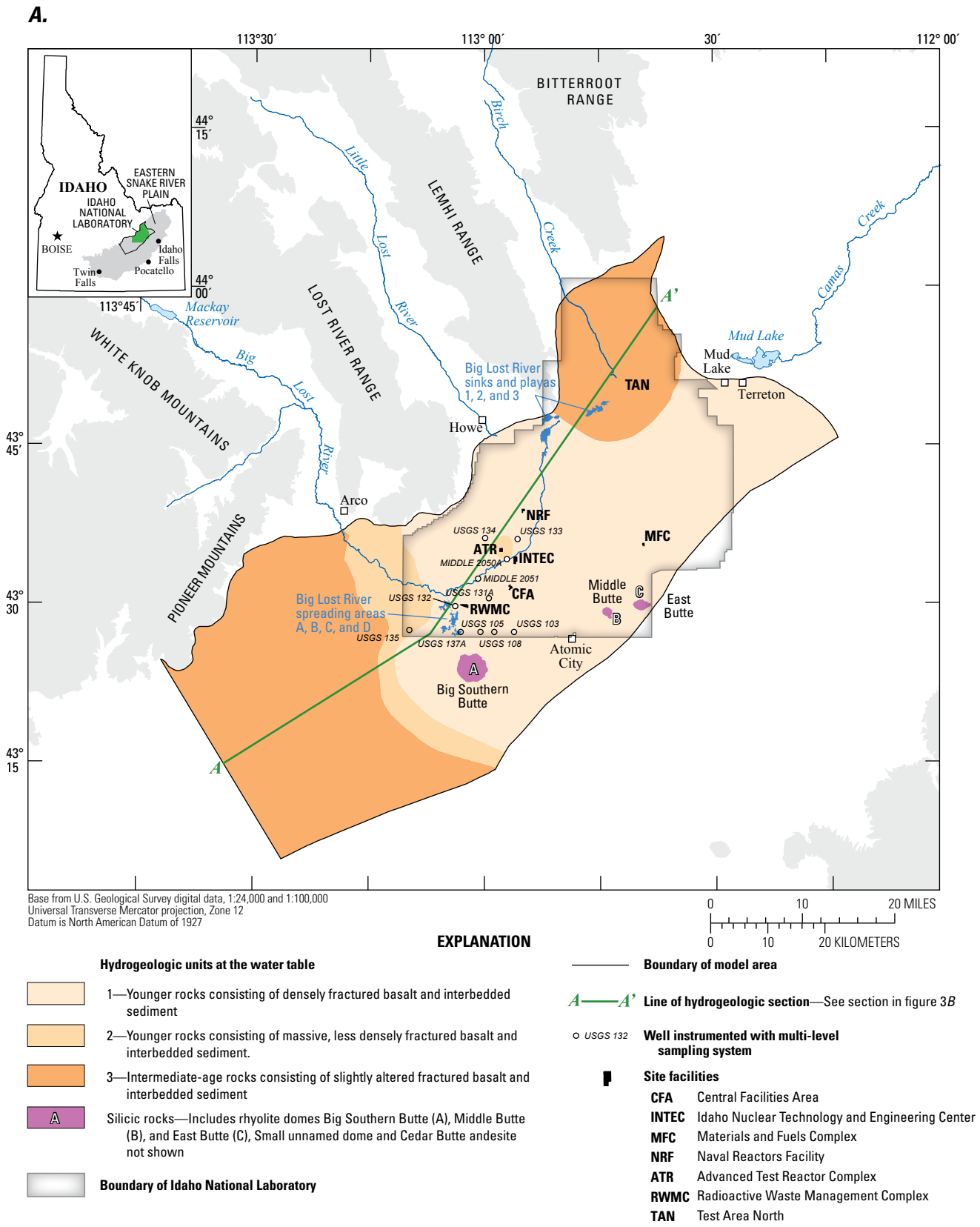
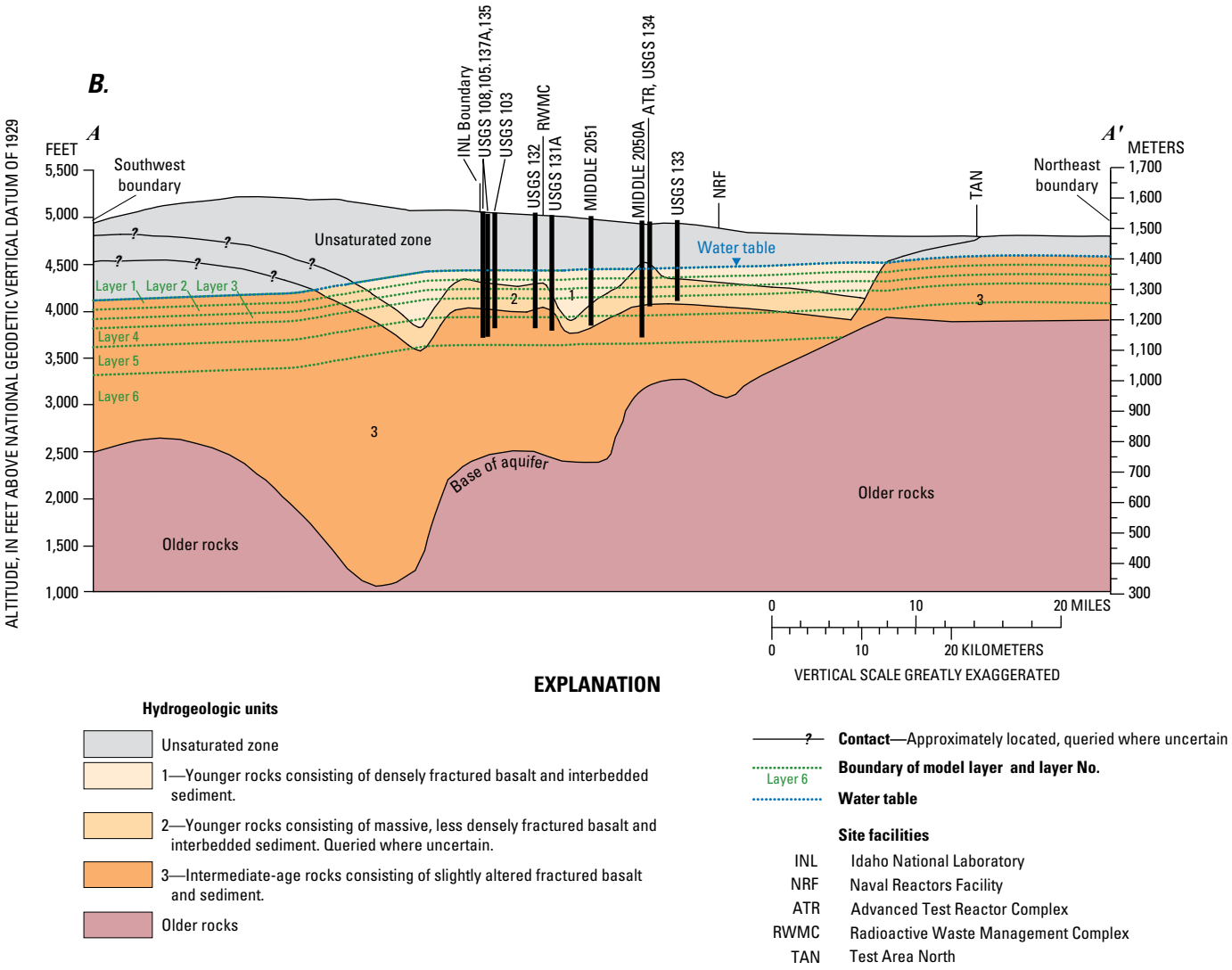


Figure 3. (*A*) Distribution of hydrogeologic units at the water table and (*B*) cross section showing borehole depth in relation to model layers and hydrogeologic units along section *A*–*A*′, Idaho National Laboratory and vicinity, Idaho.



EXPLANATION

Hydrogeologic units

- Unsaturated zone
- 1—Younger rocks consisting of densely fractured basalt and interbedded sediment.
- 2—Younger rocks consisting of massive, less densely fractured basalt and interbedded sediment. Queried where uncertain.
- 3—Intermediate-age rocks consisting of slightly altered fractured basalt and sediment.
- Older rocks

Contact—Approximately located, queried where uncertain

Layer 6 **Boundary of model layer and layer No.**

Water table

Site facilities

INL	Idaho National Laboratory
NRF	Naval Reactors Facility
ATR	Advanced Test Reactor Complex
RWMC	Radioactive Waste Management Complex
TAN	Test Area North

Well USGS 103, 105, 108, 137A and 135 not projected perpendicular to cross-section trace; well depth based on total depth of well.

Figure 3.—Continued

Purpose and Scope

This report presents water-chemistry results from water samples collected between 2009 and 2013 from 11 wells equipped with multilevel monitoring systems (MLMS) completed in the upper 250–750 ft of the eastern Snake River Plain aquifer at the INL. Water chemistry is compared in different zones with water-source types throughout the INL. Two wells (Middle 2050A and Middle 2051), each with five sample zones, were instrumented in 2005; two wells (USGS 132 and USGS 134) with six and five sample zones, respectively, were instrumented in 2006; and two wells (USGS 103 and USGS 133) with seven and four sample zones, respectively, were instrumented in 2007; two wells (USGS 135 and USGS 105) with four and five sample zones, respectively, were instrumented in 2009; one well (USGS 108) with five sample zones was instrumented in 2010; and two wells (USGS 131A and USGS 137A) with four sample zones, each, were instrumented in 2012. The sample zones were installed in areas of the aquifer that were highly transmissive of groundwater and that represented the water chemistry of the top three to five layers of the USGS INL groundwater model for steady-state and transient groundwater flow (Ackerman and others, 2010).

The list of constituents that were sampled for during 2009–13 varied depending on the amount of time the well had been sampled. For new wells instrumented between 2009 and 2013, a more complete set of samples were collected for the first 2 years of sampling and then samples were analyzed for tritium; gross alpha, beta, and gamma analyses; chloride, sodium, chromium, nutrients, and total organic carbon (Knobel and others, 2008, app. A, schedule 19) for selected zones in subsequent years. In 2012, total organic carbon was discontinued for the routine sampling and sulfate was added. For the entire period of sampling, 16 replicate samples, 5 equipment blank samples, and 2 field blank samples were collected as a measure of quality assurance. Iodine-129 was collected from all 11 wells in 2012 and summarized in Bartholomay (2013).

Geohydrologic Setting

The INL is located on the west-central part of the ESRP. The ESRP is a northeast-trending structural basin about 200 mi long and 50–70 mi wide (fig. 1). The basin has been filled with basaltic-lava flows interbedded with terrestrial sediments. The basaltic rocks and sedimentary deposits combine to form the ESRP aquifer, which is the primary source of groundwater on the plain.

The ESRP aquifer is one of the most productive aquifers in the United States (U.S. Geological Survey, 1985, p. 193). Water in the aquifer generally moves from northeast to southwest and eventually discharges to springs along the Snake River downstream of Twin Falls, Idaho, about 100 mi southwest of the INL. Water moves horizontally through basalt interflow zones and vertically through joints and interfingering edges of interflow zones. Infiltration of surface water, heavy pumpage, geologic conditions, and seasonal fluxes of recharge and discharge locally affect the movement of groundwater (Garabedian, 1986). The ESRP aquifer is recharged primarily from infiltration of applied irrigation water, infiltration of streamflow, groundwater inflow from adjoining mountain drainage basins, and infiltration of precipitation.

At the INL, depth to water in wells completed in the ESRP aquifer ranges from about 200 ft in the northern part of the site to more than 900 ft in its southeastern part. A significant proportion of the groundwater moves through the upper 200–800 ft of basaltic rocks (Mann, 1986, p. 21). Ackerman (1991, p. 30) and Bartholomay and others (1997, table 3) reported a range of transmissivity of basalt in the upper part of the aquifer of 1.1–760,000 ft^2/d. The hydraulic gradient at the INL ranges from 2 to 10 ft/mi, with an average of 4 ft/mi (Davis and others, 2013, fig. 9). Horizontal flow velocities of about 2–26 ft/d have been calculated based on the movement of various constituents in different areas of the aquifer at and near the INL (Robertson and others, 1974; Mann and Beasley, 1994; Cecil and others, 2000; Plummer and others, 2000; Busenberg and others, 2001). These flow rates equate to a travel time of between 55 and 700 years for water beneath the INL to travel to springs that discharge at the terminus of the ESRP aquifer. Localized tracer tests at the INL have revealed vertical- and horizontal-transport rates as high as 60–150 ft/d (Nimmo and others, 2002; Duke and others, 2007).

Previous Investigations

Many investigations have evaluated the geology and hydrology of the ESRP aquifer at the INL. A comprehensive listing of publications by the USGS is available at http://id.water.usgs.gov/INL/Pubs/index.html.

Some of the previous investigations of water chemistry at different depths in the ESRP aquifer at the INL were documented in Peckham (1959), Jones (1961), Olmsted (1962), Mann (1986), Mann and Cecil (1990), Fromm and others (1994), U.S. Department of Energy (2004, 2007, and 2008), Bartholomay (2009), Bartholomay and Twining (2010), Davis (2010), Bartholomay (2013), Bartholomay and others (2013), and Davis and others (2013).

Peckham (1959) discussed the hydrology and chemical quality of groundwater in the INTEC area. Nearly 1,000 samples were collected with a thief sampler from different depths in 13 wells, mostly looking at variations in chloride concentrations. Rates of movement of groundwater from the injection well to the monitoring wells were estimated from fluctuations in the chloride concentration of the water.

Jones (1961) defined five principal aquifers that occur locally from 460 to 660 ft below land surface (BLS) near the INTEC. Sodium concentrations were determined from selected depths from samples collected with a thief sampler.

Comprehensive chemical analyses were conducted on samples collected from aquifers isolated during packer tests and by thief samples. These analyses included determinations of chromium, strontium, iodine, and other constituents. Dissolved-solids concentrations ranged from about 200 to 500 mg/L, and specific conductance ranged from about 350 to 880 µS/cm at 25 °C. The flow zone (called aquifer D) was isolated by packers to test water quality and movement. Data indicated that flow from this zone moved primarily to the west and that it did not seem to be influenced by regional flow.

Olmsted (1962) presented results of the chemical and physical properties of 148 groundwater samples collected at the INL and defined four major water types for the aquifer at the INL. As part of the sample collection, thief samples were collected from USGS 7 (fig. 1) from depths of 380, 440, 720, 780, and 825 ft BLS (Olmsted, 1962, table 1). Concentrations of calcium, bicarbonate, and sulfate were much smaller in the sample from the 380-ft depth than in samples from the other zones. The sulfate concentration in the sample from the 825-ft zone was more than double the values from the other zones. Olmsted (1962) also evaluated specific conductance variations in several wells at the INL at different depths and noted that, in most wells, the specific conductance was lower in the upper 50 ft of the aquifer than in the deeper zones. Olmsted (1962) interpreted the lower specific conductance water as being "fresher" water.

Mann (1986) presented results from water samples collected from four different intervals from well INEL-1 (fig. 1). Water samples were collected from intervals of 1,511–2,206; 3,559–3,713; 3,559–4,878; and 4,210–10,365 ft BLS, and the samples were analyzed for common ions and trace elements. An additional sample for comparison was collected from well Water Supply (WS) for INEL-1 (fig. 1) from the interval of 395–595 ft BLS. The dissolved solids and chemical composition of the water changed markedly with depth. Dissolved-solid concentrations changed from 381 mg/L in the 395–595 ft interval to 1,020 mg/L in the deepest interval. The water chemistry changed from a calcium-magnesium-bicarbonate water in the shallowest interval to a sodium-bicarbonate water in the deeper intervals. This change in chemistry coincides with the change from basaltic rocks in the upper interval to rhyolitic rocks in the deeper intervals.

Mann and Cecil (1990) presented tritium results for water samples collected with a thief sampler in 1983 from various depths in the aquifer from wells USGS 103, USGS 105, and USGS 108 along the southern boundary of the INL (fig. 2). The tritium concentration in one sample collected in July 1983 from USGS 103 was 800 ± 200 pCi/L. Tritium concentrations in 10 other samples collected from USGS 103 in October and November 1983 at depths from 588 to 750 ft BLS were less than the reporting level in all 10 samples. Tritium concentrations in nine water samples collected in October and November 1983 at depths from 670 to 795 ft BLS in USGS 105 ranged from less than the reporting level to 3,400 ± 200 pCi/L; concentrations in three of the nine samples exceeded the reporting level. Tritium concentrations in 11 water samples collected in October and November 1983 at depths from 610 to 755 ft BLS in USGS 108 were greater than the reporting level in all 11 samples; the concentrations ranged from 830 ± 90 to 3,400 ± 200 picocuries per liter (pCi/L). These tritium concentrations were used to estimate flow velocities in the aquifer based on first arrival at these sites.

Fromm and others (1994) presented results from water samples collected from six aquifer intervals isolated by a straddle packer system in USGS 44 (fig. 2). Water samples were analyzed for common ions, trace elements, nutrients, and selected radionuclides. Concentrations of tritium, iodine129, nitrate, and chloride were highest in the deepest sample interval (580–600 ft) .

The U.S. Department of Energy (2004) summarized data collected from four wells south of the INTEC (ICPP 1795–1798, fig. 2). Samples were collected from several different zones using an inflatable packer sampling system in the aquifer to determine concentrations above, within, and beneath the H-I interbed to support results of iodine-129 contaminant transport modeling. Water samples were analyzed for tritium, strontium-90, iodine-129, technecium-99, and gross alpha and gross beta radiation. Concentrations of iodine-129 in the northernmost well, ICPP-1795 (fig. 2), increased from 0.34 ± 0.04 pCi/L at a depth of 560 ft BLS to 0.43 ± 0.07 pCi/L at a depth of 620 ft BLS. Concentrations of iodine-129 in three wells farther to the south decreased with depth—concentrations in the upper zone ranged from 0.58 ± 0.1 to 0.88 ± 0.08 pCi/L and concentrations in the lower zone ranged from not detected to 0.33 ± 0.05 pCi/L. The highest strontium-90 concentration was 8.86 ± 1.18 pCi/L from ICPP-1796 at a depth of 485 ft BLS. The highest tritium concentration was 11,100 ± 317 pCi/L from ICPP-1795 at a depth of 560 ft BLS. The highest technicium-99 concentration was 39.4 ± 2.91 pCi/L from ICPP-1797 at a depth of 472–503 ft BLS.

The U.S. Department of Energy (2007) presented results for INL contractor data collected in 2005 and 2006 from five zones each from two wells (Middle 2050A and Middle 2051) equipped with Westbay™ multilevel monitoring systems. Samples were analyzed for volatile organic compounds, metals, anions, and radionuclides. Water from the upper zone from Middle 2051 was similar in chemical composition to water from well HWY 3 (fig. 2). Water from deeper zones indicated some influence of waste disposal at the ATR Complex. Concentrations of tritium, chloride, and sulfate in water samples from all five zones from Middle 2050A were less than detection limits or equal to background concentrations, which was interpreted by the authors that waste disposal at the INTEC and the ATR Complex had not influenced water from any of the five zones.

The U.S. Department of Energy (2007) also presented results from two packer samples collected from well USGS 105 at intervals of 676–704 ft and 769–790 ft BLS and from well USGS 108 at intervals of 613–627 ft and 657–760 ft BLS. Samples were analyzed for common ions and nitrate and compared to sample results from the wells when they

had pumps in them. Concentrations of chloride and sulfate were larger in the shallow sample from USGS 105; the authors attributed this to migration of water from the RWMC area. Chloride and sulfate concentrations in the deeper zone in USGS 105 were similar to background concentrations reported by Robertson and others (1974). Chloride and sulfate concentrations in both samples from USGS 108 were similar to the pumped sample.

The U.S. Department of Energy (2008) presented results for samples from three MLMS wells (Middle 2050A and Middle 2051 [five zones each], and USGS 132 [six zones]) collected in 2007 by the INL contractor. Samples were analyzed for volatile organic compounds, metals, anions, and radionuclides. Sulfate and chloride concentrations in water from the upper zone were much larger from USGS 132 than in the other five zones; these concentrations were similar to concentrations in samples from other wells south of the RWMC that generally indicate a high anion anomaly. Concentrations from the other five zones in USGS 132 were similar to two intervals sampled from Middle 2051.

Bartholomay (2009) evaluated iodine-129 concentrations collected at 31 zones from 6 MLMS wells at the INL during 2007 and determined that concentrations in all zones had concentrations above background levels. For three of the wells, concentrations of iodine-129 between zones varied one to two orders of magnitude. For two wells, concentrations varied for one zone by more than an order of magnitude from the other zones. Similar concentrations were measured in all five zones from one well. All the zones had concentrations several orders of magnitude less than the maximum contaminant level for drinking water.

Bartholomay and Twinning (2010) analyzed for chemical constituents from multiple zones from 2005 through 2008 at six MLMS wells at the INL (Middle 2050A, 2051, USGS 103, 132, 133, and 134). The wells were completed in the upper 350–700 ft of the aquifer from four to seven sample ports that were isolated by permanent packers. Results indicated that, in each of four separate wells (Middle 2050A, 2051, USGS 103 and 132), one zone of water differed markedly from the other zones in the well. In four wells, one zone to as many as five zones contained radiochemical constituents that originated from wastewater disposal from selected INL facilities.

Davis (2010) also summarized results from the same six wells as Bartholomay and Twining (2010) for data collected during 2006–08, mainly focusing on tritium, chromium, sodium, chloride, sulfate and nitrate concentrations in the wells.

Bartholomay (2013) evaluated iodine-129 concentrations from 25 zones from 11 MLMS wells at the INL in 2012 to help define the vertical distribution in the aquifer. Two new wells completed in 2012 showed variability of as much as one order of magnitude of concentrations among various zones. Two other wells showed similar concentrations in all three zones sampled. Concentrations of iodine-129 in all zones were less than the maximum contaminant level.

Bartholomay and others (2013) analyzed the effects of tracer concentration changes in 11 zones of the MLMS installed in USGS 108 at the INL. The tracer was added to drilling water used to core and deepen the well to determine if natural aquifer flow removed the tracer from the well. The tracer did not remain in zones completed in fractured basalts, but some minor concentrations remained in zones completed in dense basalt and in some zones with sedimentary interbeds. Based on the results from the tracer experiment, it was concluded that wastewater contaminated drill water used to drill four other wells at the INL probably did not affect the water chemistry in those wells.

Davis and others (2013) summarized results from the nine wells with MLMS systems at the INL from data collected from 2009 to 2011, mainly focusing on tritium, chromium, sodium, chloride, sulfate and nitrate concentrations in the wells.

Methods and Quality Assurance

Multilevel Monitoring System

The Westbay™ Multiport (MP) System was selected for multilevel groundwater monitoring at the INL. This system consists of a series of packers, measurement ports, magnetic collars, and variable-length sections of casing (fig. 4). The MLMS works to restore the initial pressure and chemical conditions in the borehole prior to drilling. The MLMS is completely enclosed with a bore plug at the bottom and casing sections (sealed with O-rings), which run the entire length of the borehole. Each casing joint is leak-proof tested during installation to form a continuous, rigid, sealed system that prohibits water from getting in or out. However, if a leak occurs at any joint, hydraulic isolation between the groundwater in the formation and any water inside the casing is maintained because the tubes connect only at the ports (Parker and others, 2006). The modular construction and varying lengths of polyvinyl chloride (PVC) sections allow ports and, therefore, monitoring intervals, to be placed at almost any desired depth within a hole, provided that the spacing between each interval is great enough to accommodate a sufficient seal.

Two specific MP systems were installed: the MP 38 and the MP 55. The MP 38 system is best suited for boreholes 3–4.5 in. in diameter, because the components are slightly smaller in diameter. The MP 38 system was purchased for well USGS 134 due to borehole diameter constraints that would not allow for the larger MP-55 system. The MP 55 system uses packers, ports, and casing segments similar to those of the MP 38, but they are larger in diameter and are thus better suited for 4.5–6 in. diameter boreholes. Another advantage of the MP 55 system is the ability to collect water samples of greater volume, approximately 2 L per run. MP 55

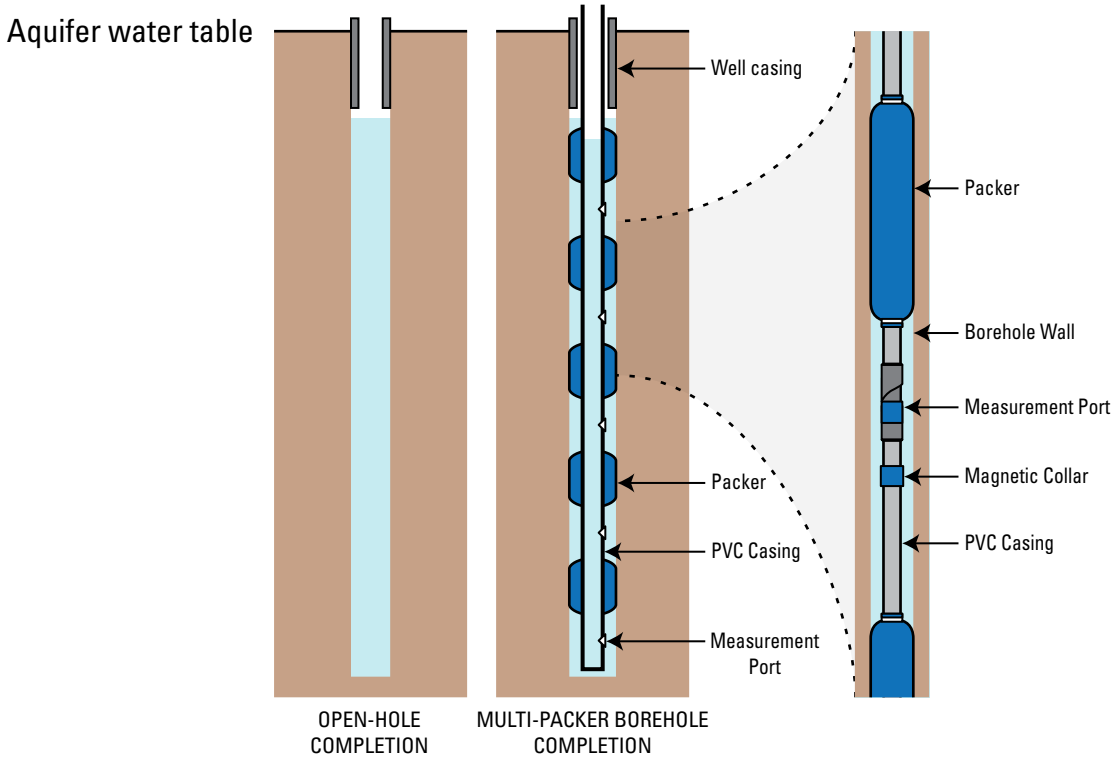


Figure 4. Components of the Westbay™ Multiport (MP) System for multilevel groundwater monitoring.

systems were installed in 10 of the 11 multiport boreholes (Middle 2050A, Middle 2051, USGS 103, USGS 105, USGS 108, USGS 131A, USGS 132, USGS 133, USGS 135, and USGS 137A).

Core material, borehole geophysics, and borehole video information were used to identify fractures, dense basalt, and sediment interbeds to determine the best locations for monitoring zones and packers. Core and lithologic information for the 11 MLMS systems are described in North Wind, Inc. (2006), Twining and others (2008), and Hodges and others (2012). The sample ports were installed in zones of the aquifer that were highly transmissive and that represented the water chemistry of the top three to five layers of the USGS INL groundwater model for steady-state and transient groundwater flow (Ackerman and others, 2010). Multiport packers extend about 5 ft, so it was important to find areas of massive basalt for placement to prevent vertical flow in the borehole. A more detailed description of the installation for each of the 11 wells is available in North Wind, Inc. (2006), Fisher and Twinning (2011), Twining and Fisher (2012), and Brian Twining, U.S. Geological Survey (written commun., September 16, 2014).

Sample Collection

Sample collection by the USGS at the INL generally followed guidelines established by the USGS that are documented in the USGS National Field Manual (U.S. Geological Survey, variously dated) and Knobel and others (2008). Water samples were collected from 11 wells each equipped with a dedicated MLMS. A list of sample port depths from a total of 55 sampling zones from the aquifer are shown in table 1.

Samples were collected using pre-cleaned, stainless-steel thief sampling bottles that were lowered to the zone to be sampled, connected to the sampling port, and filled with formation water. The stainless-steel bottles were then raised to the surface and emptied into a pre-cleaned container; the water was then processed to fill appropriate bottles for analyses. Field measurements also were taken from the pre-cleaned container for pH, specific conductance, water temperature, dissolved oxygen, alkalinity, and turbidity (table 2). Sample bottles were cleaned between each sample zone by washing them in a Liquinox® solution and rinsing them with deionized water.

Table 2. Field measurements of pH, specific conductance, water temperature, dissolved oxygen, alkalinity, turbidity, and sum of dissolved solids in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.

[Well locations are shown in figure 2. Port depth in feet below land surface. **Units:** pH, negative base-10 logarithm of hydrogen ion activity in moles per liter; specific conductance, microsiemens per centimeter at 25 degrees Celsius; water temperature, degrees Celsius; dissolved oxygen, milligrams per liter; alkalinity, reported as calcium carbonate ($CaCO_3$), in milligrams per liter; turbidity, nephlometric turbidity units. NS, not sampled. E, estimated; NA, not analyzed. **Remarks:** QAW, quality assurance Westbay™ replicate sample. Values for replicates are the same measurement as the primary sample]

Well name	Port depth	Date	Time	pH	Specific conductance	Water temperature	Dissolved oxygen	Alkalinity	Turbidity	Dissolved solids, sum (as $CaCO_3$)	Remarks
Middle 2050A											
Zone 15	517	08-19-09	1234	8.0	417	11.1	8.1	NA	1.4	NA	
		06-28-10	1438	8.0	408	11.1	6.9	NA	1.2	NA	
		06-27-11	1245	7.9	401	11.3	8.1	NA	NA	NA	
		06-19-12	0902	7.5	328	11.0	8.5	NA	NA	NA	
		07-10-13	1500	8.0	392	11.2	7.8	NA	NA	NA	
Zone 12	644	05-19-09	1140	8.0	356	11.5	8.3	NA	0.35	NA	
		06-28-09	1349	8.0	350	11.5	9.6	NA	1.8	NA	
Zone 9	791	08-19-09	1054	8.0	401	12.6	10.8	NA	0.60	NA	
		06-28-10	1258	8.0	398	12.7	10.3	NA	0.70	NA	
Zone 6	999	08-19-09	1000	7.9	386	14.0	10.5	NA	0.50	NA	
		06-28-10	1031	7.9	380	14.1	10.0	NA	0.70	NA	
Zone 3	1,180	08-19-09	0900	8.0	375	15.1	8.8	NA	1.6	NA	
		06-28-10	0930	8.0	366	15.2	8.8	NA	0.90	NA	
Middle 2051											
Zone 12	603	09-03-09	1342	7.8	352	10.4	7.7	NA	0.35	NA	
		07-01-10	1410	7.9	350	10.5	6.6	NA	0.70	NA	
Zone 9	749	09-03-09	1252	7.9	380	13.1	9.1	NA	0.75	NA	
		07-01-10	1315	8.0	381	13.1	7.9	NA	0.90	NA	
		06-28-11	1425	7.9	383	13.3	7.7	NA	NA	NA	
		06-20-12	1408	7.7	371	13.2	9.9	NA	NA	NA	
		06-20-13	1332	8.0	383	13.3	8.1	NA	NA	NA	
Zone 6	827	09-03-09	1202	7.9	388	13.4	9.4	NA	0.50	NA	
		07-01-10	1153	8.0	385	13.4	8.7	NA	0.40	NA	
		06-28-11	1325	7.9	389	13.7	9.4	NA	NA	NA	
		06-20-12	1300	7.7	383	13.5	9.0	NA	NA	NA	
		06-20-13	1238	7.9	387	13.5	9.8	NA	NA	NA	
Zone 3	1,091	09-03-09	1108	7.9	366	15.0	9.8	NA	0.65	NA	
		07-01-10	1053	7.9	367	15.0	9.2	NA	0.60	NA	
		06-28-11	1216	7.7	368	15.2	14.7	NA	NA	NA	
		06-20-12	1027	7.6	358	15.0	10.4	NA	NA	NA	
		06-20-13	1047	7.9	367	15.0	10.7	NA	NA	NA	
Zone 1	1,141	09-03-09	1006	7.7	366	15.1	8.9	NA	0.55	NA	
		07-01-10	0948	7.9	363	15.0	9.4	NA	1.6	NA	
		06-28-11	1107	7.6	366	15.2	9.4	NA	NA	NA	
		06-20-12	1154	7.7	360	15.1	11.2	NA	NA	NA	
		06-20-13	1149	8.0	365	15.0	11.1	NA	NA	NA	
USGS 103											
Zone 17	680	08-25-09	1336	8.4	316	13.1	5.5	NA	12	NA	
		06-24-10	0932	8.4	293	13.1	5.5	NA	5.2	NA	

Table 2. Field measurements of pH, specific conductance, water temperature, dissolved oxygen, alkalinity, turbidity, and sum of dissolved solids in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. **Units:** pH, negative base-10 logarithm of hydrogen ion activity in moles per liter; specific conductance, microsiemens per centimeter at 25 degrees Celsius; water temperature, degrees Celsius; dissolved oxygen, milligrams per liter; alkalinity, reported as calcium carbonate ($CaCO_3$), in milligrams per liter; turbidity, nephlometric turbidity units. NS, not sampled. E, estimated; NA, not analyzed. **Remarks:** QAW, quality assurance Westbay™ replicate sample. Values for replicates are the same measurement as the primary sample]

Well name	Port depth	Date	Time	pH	Specific conductance	Water temperature	Dissolved oxygen	Alkalinity	Turbidity	Dissolved solids, sum (as $CaCO_3$)	Remarks
USGS 103—Continued											
Zone 15	802	08-25-09	1245	8.0	343	12.8	9.7	NA	11	NA	
		06-23-10	1535	8.0	338	12.7	9.8	NA	13	NA	
Zone 12	909	08-25-09	1153	8.0	313	12.6	9.7	NA	0.75	NA	
		06-23-10	1446	8.0	304	12.6	9.1	NA	2.1	NA	
Zone 9	993	08-24-09	1550	8.0	347	12.4	9.7	NA	0.60	NA	
		06-23-10	1342	8.0	338	12.4	9.6	NA	3.1	NA	
		06-23-10	1347	8.0	338	12.4	9.6	NA	3.1	NA	QAW-18
		06-21-11	1153	7.9	338	12.6	7.3	NA	NA	NA	
		06-25-12	1622	7.8	351	12.5	9.5	NA	NA	NA	
		06-25-13	1532	8.0	353	12.5	9.0	NA	NA	NA	
Zone 6	1,087	08-24-09	1452	7.9	362	12.4	9.9	NA	0.40	NA	
		08-24-09	1457	7.9	362	12.4	9.9	NA	0.40	NA	QAW-15
		06-23-10	1200	8.0	356	12.4	10.1	NA	1.0	NA	
		06-21-11	1040	7.9	353	12.6	8.0	NA	NA	NA	
		06-25-12	1524	7.8	363	12.5	9.4	NA	NA	NA	
		06-25-13	1406	8.0	362	12.5	9.2	NA	NA	NA	
Zone 3	1,210	08-24-09	1312	7.9	366	12.5	9.6	NA	1.1	NA	
		06-23-10	1018	7.9	356	12.5	10.6	NA	2.9	NA	
		06-21-11	0924	7.6	367	12.7	8.9	NA	NA	NA	
		06-25-12	1421	7.9	364	12.5	10.9	NA	NA	NA	
		06-25-13	1307	8.0	364	12.6	9.7	NA	NA	NA	
Zone 1	1,258	08-25-09	1054	7.9	362	12.6	8.8	NA	0.70	NA	
		06-24-10	1116	8.0	362	12.6	9.9	NA	1.3	NA	
		06-20-11	1635	7.8	357	12.8	9.1	NA	NA	NA	
		06-25-12	1322	7.9	362	12.6	11.6	NA	NA	NA	
		06-25-13	1204	8.0	360	12.6	8.7	NA	NA	NA	
USGS 105											
Zone 13	728	09-18-09	1312	7.9	355	12.6	5.9	140	1.0	E 216	
		09-16-10	1324	7.9	357	12.8	6.7	136	1.9	E 213	
Zone 11	851	09-18-09	1108	7.9	362	12.6	8.7	141	0.45	E 218	
		09-16-10	1154	7.9	362	12.8	8.8	144	0.90	E 218	
		09-16-10	1159	7.9	362	12.8	8.8	144	0.90	E 221	QAW-21
		07-13-11	1036	7.4	360	12.9	8.8	NA	NA	NA	
		06-28-12	1447	7.9	364	12.7	7.8	NA	NA	NA	
		06-27-13	1228	8.1	362	12.9	7.5	NA	NA	NA	
Zone 8	952	09-17-09	1452	8.0	368	12.9	7.6	140	3.1	E 220	
		09-15-10	1342	8.0	363	13.1	10.1	141	4.8	E 220	
		07-11-11	1426	8.0	371	13.1	8.2	NA	NA	NA	
		07-11-11	1431	8.0	371	13.1	8.2	NA	NA	NA	QAW-27
		06-28-12	1343	7.9	371	13.0	8.1	NA	NA	NA	
		06-27-13	1131	8.1	364	13.0	8.6	NA	NA	NA	

Table 2. Field measurements of pH, specific conductance, water temperature, dissolved oxygen, alkalinity, turbidity, and sum of dissolved solids in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. **Units:** pH, negative base-10 logarithm of hydrogen ion activity in moles per liter; specific conductance, microsiemens per centimeter at 25 degrees Celsius; water temperature, degrees Celsius; dissolved oxygen, milligrams per liter; alkalinity, reported as calcium carbonate ($CaCO_3$), in milligrams per liter; turbidity, nephlometric turbidity units. NS, not sampled. E, estimated; NA, not analyzed. **Remarks:** QAW, quality assurance Westbay™ replicate sample. Values for replicates are the same measurement as the primary sample]

Well name	Port depth	Date	Time	pH	Specific conductance	Water temperature	Dissolved oxygen	Alkalinity	Turbidity	Dissolved solids, sum (as $CaCO_3$)	Remarks
USGS 105—Continued											
Zone 5	1,072	09-17-09	1246	8.0	361	12.9	8.4	142	3.3	E 221	
		09-17-09	1251	8.0	361	12.9	8.4	142	3.3	E 219	QAW-16
		09-15-10	1200	7.9	359	13.0	9.6	140	0.50	E 218	
		07-11-11	1238	7.9	365	13.0	8.3	NA	NA	NA	
		06-28-12	1245	7.9	363	13.0	7.8	NA	NA	NA	
		06-28-12	1250	7.9	363	13.0	7.8	NA	NA	NA	QAW-32
		06-27-13	1039	8.0	363	12.5	8.6	NA	NA	NA	
Zone 2	1,242	09-16-29	1534	8.0	359	12.4	9.2	142	0.75	E 216	
		09-15-10	1018	7.9	357	12.6	11.4	144	0.70	E 218	
USGS 108											
Zone 11	661	09-21-10	1234	7.8	352	12.5	7.8	130	3.0	E 214	
		06-23-11	1435	7.9	356	12.4	5.9	140	1.8	222	
Zone 9	809	09-21-10	1028	7.7	383	13.1	9.4	148	1.6	E 231	
		06-23-11	1252	7.9	379	12.6	7.2	144	0.85	228	
Zone 7	888	09-20-10	1542	8.1	404	13.1	7.5	152	2.5	E 238	
		06-23-11	1026	7.8	392	12.7	8.6	156	2.1	237	
		06-23-11	1031	7.8	392	12.7	8.6	156	2.1	238	QAW-24
		06-26-12	1207	8.7	398	12.5	8.7	NA	NA	NA	
		06-26-13	1402	7.9	401	12.5	9.0	NA	NA	NA	
Zone 4	1,029	09-22-10	1212	7.8	405	12.7	8.6	158	1.4	E 244	
		09-22-10	1217	7.8	405	12.7	8.6	158	1.4	E 244	QAW-22
		06-22-11	1425	7.8	402	12.7	7.4	154	0.60	243	
		06-26-12	1417	8.6	409	12.6	7.3	NA	NA	NA	
		06-26-13	1303	7.9	410	12.6	8.5	NA	NA	NA	
		06-26-13	1308	7.9	410	12.6	8.5	NA	NA	NA	QAW-39
Zone 1	1,172	09-20-10	1252	7.9	431	12.9	8.0	164	1.9	E 247	
		06-22-11	1105	7.5	408	12.9	9.4	163	1.0	246	
		06-26-12	1312	8.5	412	12.7	9.3	NA	NA	NA	
		06-26-13	1143	7.8	416	12.7	10.3	NA	NA	NA	
USGS 131A											
Zone 12	616	10-29-12	1455	7.6	375	11.5	7.5	140	2.9	E 222	
		07-17-13	1115	8.0	365	11.5	7.9	139	1.4	220	
		07-17-13	1120	8.0	365	11.5	7.9	139	1.4	224	QAW-41
Zone 8	812	10-29-12	1300	7.5	435	12.5	8.4	148	1.2	E 257	
		07-16-13	1513	7.9	435	12.4	8.7	148	0.40	255	
Zone 5	981	10-29-12	1110	7.6	397	13.4	7.5	164	5.5	E 240	
		07-16-13	1355	8.0	401	13.4	8.4	161	9.6	239	
Zone 3	1,137	10-24-12	1615	7.6	398	13.4	8.3	166	1.3	241	
		07-16-13	1224	8.0	399	13.4	8.7	167	1.5	NA	

Table 2. Field measurements of pH, specific conductance, water temperature, dissolved oxygen, alkalinity, turbidity, and sum of dissolved solids in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. **Units:** pH, negative base-10 logarithm of hydrogen ion activity in moles per liter; specific conductance, microsiemens per centimeter at 25 degrees Celsius; water temperature, degrees Celsius; dissolved oxygen, milligrams per liter; alkalinity, reported as calcium carbonate ($CaCO_3$), in milligrams per liter; turbidity, nephlometric turbidity units. NS, not sampled. E, estimated; NA, not analyzed. **Remarks:** QAW, quality assurance Westbay™ replicate sample. Values for replicates are the same measurement as the primary sample]

Well name	Port depth	Date	Time	pH	Specific conductance	Water temperature	Dissolved oxygen	Alkalinity	Turbidity	Dissolved solids, sum (as $CaCO_3$)	Remarks
USGS 132											
Zone 17	638	08-27-09	1356	8.1	420	11.6	7.2	NA	0.35	NA	
		06-30-10	0938	8.0	409	11.6	6.9	NA	1.5	NA	
		07-06-11	1413	8.0	409	11.8	7.1	NA	NA	NA	
Zone 14	765	08-27-09	1300	8.0	362	12.4	8.3	NA	1.0	NA	
		06-30-10	1608	8.1	357	12.4	7.7	NA	1.0	NA	
		07-06-11	1220	7.9	364	12.6	7.6	NA	NA	NA	
		06-19-12	1408	7.6	354	12.5	8.2	NA	NA	NA	
		06-19-13	1240	8.1	364	12.6	8.3	NA	NA	NA	
Zone 11	827	08-27-09	1158	8.0	354	12.5	8.3	NA	1.7	NA	
		06-30-10	1515	8.1	351	12.5	6.8	NA	5.3	NA	
Zone 8	919	08-27-09	1102	8.0	354	12.3	9.2	NA	0.65	NA	
		06-30-10	1422	8.1	355	12.3	7.4	NA	1.8	NA	
Zone 5	1,012	08-27-09	1005	7.9	358	11.8	8.8	NA	2.7	NA	
		06-30-10	1324	8.0	353	11.7	9.4	NA	1.4	NA	
Zone 1	1,173	08-26-09	1510	7.9	367	10.8	9.3	NA	0.75	NA	
		06-30-10	1205	8.0	366	10.6	8.8	NA	0.40	NA	
USGS 133											
Zone 10	469	08-20-09	1258	7.9	339	11.0	7.4	NA	0.85	NA	
		08-20-09	1303	7.9	339	11.0	7.4	NA	0.85	NA	QAW-14
		08-05-10	1428	7.9	330	11.8	7.0	NA	0.00	NA	
		08-05-10	1433	7.9	330	11.8	7.0	NA	0.00	NA	QAW-19
		06-27-11	1620	7.7	329	11.2	8.8	NA	NA	NA	
		06-21-12	0920	8.7	326	11.3	8.0	NA	NA	NA	
		06-21-12	0925	8.7	326	11.3	8.0	NA	NA	NA	QAW-29
		06-24-13	1447	8.1	327	11.2	9.0	NA	NA	NA	
Zone 7	570	08-20-09	1104	7.9	357	11.4	9.3	NA	0.25	NA	
		08-05-10	1308	7.9	354	11.4	8.0	NA	0.00	NA	
Zone 4	686	08-20-09	0955	7.8	354	11.8	9.4	NA	0.95	NA	
		08-05-10	1212	7.8	408	11.8	8.4	NA	0.00	NA	
Zone 1	746	08-20-09	0858	7.9	442	12.2	9.3	NA	1.3	NA	
		08-05-10	1057	7.8	433	12.3	9.4	NA	0.10	NA	
USGS 134											
Zone 15	578	08-18-09	1250	8.0	315	12.9	9.1	NA	4.2	NA	
		06-22-10	1147	8.0	311	12.8	9.4	NA	0.40	NA	
		06-29-11	1540	8.0	315	13.1	9.8	NA	NA	NA	
		06-29-11	1545	8.0	315	13.1	9.8	NA	NA	NA	QAW-26
Zone 12	646	08-18-09	0950	7.6	384	13.2	9.6	NA	1.0	NA	
		06-22-10	1034	7.7	372	13.2	6.6	NA	5.0	NA	
		06-29-11	1253	7.6	367	13.4	7.7	NA	NA	NA	

Table 2. Field measurements of pH, specific conductance, water temperature, dissolved oxygen, alkalinity, turbidity, and sum of dissolved solids in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. **Units:** pH, negative base-10 logarithm of hydrogen ion activity in moles per liter; specific conductance, microsiemens per centimeter at 25 degrees Celsius; water temperature, degrees Celsius; dissolved oxygen, milligrams per liter; alkalinity, reported as calcium carbonate ($CaCO_3$), in milligrams per liter; turbidity, nephlometric turbidity units. NS, not sampled. E, estimated; NA, not analyzed. **Remarks:** QAW, quality assurance Westbay™ replicate sample. Values for replicates are the same measurement as the primary sample]

Well name	Port depth	Date	Time	pH	Specific conductance	Water temperature	Dissolved oxygen	Alkalinity	Turbidity	Dissolved solids, sum (as $CaCO_3$)	Remarks
USGS 134—Continued											
Zone 9	706	08-18-09	1125	8.0	303	13.6	11.9	NA	0.96	NA	
		06-21-10	1614	8.0	300	13.7	11.8	NA	5.4	NA	
		06-21-10	1619	8.0	300	13.7	11.8	NA	5.4	NA	QAW-17
		06-18-12	1244	7.8	298	14.0	13.5	NA	NA	NA	
		07-10-13	1118	7.8	304	13.8	10.6	NA	NA	NA	
Zone 6	807	08-17-09	1455	7.9	329	14.2	9.2	NA	1.7	NA	
		06-21-10	1432	7.9	323	14.3	9.7	NA	4.6	NA	
Zone 3	847	08-17-09	1320	7.2	392	14.6	9.7	NA	2.2	NA	
		06-21-10	1316	7.2	423	14.6	8.4	NA	4.4	NA	
USGS 135											
Zone 10	738	09-15-09	1620	8.0	331	11.5	6.7	137	0.66	E 197	
		09-14-10	1230	7.9	330	11.6	6.6	136	0.40	E 196	
Zone 7	837	09-15-09	1340	7.8	321	11.5	8.2	132	13	E 192	
		09-14-10	1052	7.7	291	11.6	10.3	116	1.7	E 178	
		07-07-11	1156	7.8	292	11.7	8.4	NA	NA	NA	
		06-21-12	1337	8.8	294	11.5	8.1	NA	NA	NA	
		06-24-13	1123	8.0	290	11.5	8.7	NA	NA	NA	
		06-24-13	1128	8.0	290	11.5	8.7	NA	NA	NA	QAW-40
Zone 4	988	09-15-09	1155	7.8	330	11.5	12.0	138	2.7	E 200	
		09-13-10	1450	7.8	325	11.6	11.3	140	1.2	E 199	
Zone 1	1,116	09-14-09	1614	7.8	326	11.6	10.5	130	1.6	E 191	
		09-13-10	1308	7.7	319	11.9	10.3	136	0.90	E 192	
USGS 137A											
Zone 5	662	10-24-12	1124	7.7	364	12.8	7.5	143	1.4	E 222	
		07-15-13	1508	8.1	367	12.8	7.6	142	0.65	229	
Zone 4	747	10-23-12	1606	7.7	355	12.8	8.3	142	2.8	222	
		07-15-13	1348	8.1	362	12.8	8.6	142	2.9	220	
Zone 3	841	10-23-12	1423	7.7	355	12.6	8.5	142	1.7	218	
		07-15-13	1227	8.1	360	12.7	8.9	145	5.1	222	
Zone 1	876	10-23-12	1218	7.6	354	12.7	10.5	145	0.61	E 221	
		07-15-13	1102	8.1	358	12.9	8.6	144	0.58	221	

Field processing of samples differed depending on the constituents for which analyses were requested. Samples analyzed by the USGS National Water Quality Laboratory (NWQL) were placed in containers and preserved in accordance with laboratory requirements specified by Timme (1995) and Knobel and others (2008, app. A). Containers and preservatives used for this study were supplied by the NWQL and had undergone a rigorous quality-control procedure (Pritt, 1989, p. 75) to minimize sample contamination. Samples requiring filtration consisted of filtering the water through a disposable 0.45-µm filter cartridge that had been pre-rinsed with at least 1 L of deionized water. Constituent concentrations obtained from analysis of the 0.45-µm filtrate are referred to as "dissolved" concentrations in this report. Samples analyzed by the Radiological and Environmental Sciences Laboratory (RESL) at the INL were placed in containers and preserved in accordance with laboratory requirements specified by Bodnar and Percival (1982) and Knobel and others (2008, app. A).

Analytical Methods

Analytical methods used by the USGS NWQL for selected organic, inorganic, and radionuclide constituents are described by Goerlitz and Brown (1972), Thatcher and others (1977), Wershaw and others (1987), Fishman and Friedman (1989), Faires (1993), Fishman (1993), Rose and Schroeder (1995), and McCurdy and others (2008). A discussion of procedures used by the DOE RESL for the analysis of radionuclides in water is provided by Bodnar and Percival (1982), Sill and Sill (1994), and U.S. Department of Energy (1995).

Guidelines for Interpretation of Analytical Results

Concentrations of radionuclides are reported with an estimated sample standard deviation, *s*, which is obtained by propagating sources of analytical uncertainty in measurements. McCurdy and others (2008) provide details on interpreting radiological data used by the USGS. The guidelines for interpreting analytical results are based on an extension of a method proposed by Currie (1984) and discussed in Davis and others (2013). In this report, radionuclide concentrations less than 3*s* are considered to be less than a "reporting level." The reporting level should not be confused with the analytical method detection limit (MDL), which is based on laboratory procedures.

Concentrations of inorganic and organic constituents are reported with reference to long term method detection levels (LT-MDL), laboratory report levels (LRL), and interim reporting levels (IRLs), or with reference to minimum reporting levels (MRLs). Childress and others (1999) provide details about the approach used by the USGS regarding detection levels and reporting levels. USGS Office of Water Quality Technical Memorandum 2010.07 (U.S. Geological Survey, 2010) outlines changes to data reporting by the NWQL for the inorganic and organic constituents. The primary change was that the reporting level for most inorganic constituents was set at the LT-MDL. The method detection limit is the minimum concentration of a substance that can be measured and reported with 99-percent confidence that the concentration is greater than zero. The LRL is the concentration at which the false negative error rate is minimized to be no more than 1 percent of the reported results. The MRL uses a censor-limit based reporting level below which no data are reported and is set at a concentration greater than the detection limit of the analyte. The LRL generally is equal to twice the yearly determined LT-MDL, which is a detection level derived by determining the standard deviation of a minimum of 24 MDL spike-sample measurements over an extended time. These reporting levels may be described as preliminary IRLs for a developmental method if the levels have been based on a small number of analytical results. These levels also may vary from sample to sample for the same constituent and the same method, if matrix effects or other factors arise that interfere with the analysis. Concentrations measured between the LT-MDL and the LRL may be described as estimated values and are considered a "qualitatively detected analyte" (Childress and others, 1999, p. 7). For most of the constituents in this report, concentrations generally are greater than the LT-MDLs, LRLs, or MRLs, but some concentrations are given as less than the LT-MDL or LRL, and some concentrations are estimated.

As a matter of convention, concentrations of stable isotopes are reported as relative isotopic ratios (Toran, 1982). Knobel and others (1999) described stable-isotope data in more detail.

Quality Assurance/Quality Control

The overall quality-assurance (QA) and detailed descriptions of internal quality-control (QC) practices used by the NWQL are provided by Friedman and Erdmann (1982), Jones (1987), and Pritt and Raese (1995). The overall QA and detailed descriptions of internal QC practices used by the RESL are provided in Bodnar and Percival (1982) and U.S. Department of Energy (1995). Water samples were collected in accordance with a quality assurance plan for quality-of-water activities conducted by personnel assigned to the USGS INL project office; the plan was revised in 2008 (Knobel and others, 2008). Additional quality assurance was assessed with QC replicates, blanks, and samples of water used in the drilling and Westbay™ installation process. Fifteen QC replicate samples were collected during 2009–13; 5 equipment blanks were collected at wells USGS 133 (QAW-13), USGS 132 (QAW-20 and 28), USGS 108 (QAW-31), and USGS 134 (QAW-38) and consisted of inorganic and organic-free water obtained from the NWQL. Two field blanks were collected at sites USGS 134 (QAW-38) and USGS 135 (QAW-30). Concentrations of major ions

and metals in equipment blank samples were nearly equal to or less than the reporting levels, suggesting no background contamination from field equipment or source water.

The statistical equivalency of radiochemical-constituent concentrations in sample replicate pairs was determined following a method defined by Volk (1969) and described in more detail by Williams (1996). In this method, statistical equivalence is determined within a specified confidence level. A value for the standard deviate, Z, is calculated, and then the level of significance of the result is evaluated (evaluation of the level of significance assumes that the sample population is distributed normally). For this report, concentrations of individual constituents in sample pairs (constituent pairs) were considered to be equivalent when the results were within two standard deviations of each other. At this confidence level (95-percent), the level of significance, determined from a standard normal probability curve, was 0.05 for a two-tailed test, and it corresponded to a Z-value of 1.96.

The equation used to determine Z was adapted from Volk (1969):

$$Z = \frac{|x - y|}{\sqrt{(s_x)^2 + (s_y)^2}} \qquad (1)$$

where

x is the concentration of a constituent in the routine sample,
y is the concentration of the same constituent in the sequential replicate sample,
s_x is the standard deviation of x, and
s_y is the standard deviation of y.

When the population is not distributed normally, which is often the case with radiochemical results (L. DeWayne Cecil, U.S. Geological Survey, written commun., January 4, 2009), or an approximation of the standard deviation is used, a Z-value less than 1.96 must be considered as a guide when testing for equivalence. Constituent concentrations in sample pairs were considered to be statistically equivalent when the calculated Z-value was less than or equal to 1.96.

The use of equation 1 is a guide for determining if the results of radionuclide analyses of a replicate pair of samples were equivalent. The results and reported standard deviations for the analyses of replicate pairs and the Z-values are shown in tables 7–9 (at back of report). Z-values were less than 1.96 for 100 of the 104 replicate pairs (96 percent) and can be considered statistically equivalent. Two replicate pairs for gross alpha (QAW-19, QAW-40, table 7) and two replicate pairs for gross beta (QAW-17 and QAW-24, table 7) were not considered equivalent with this statistical test.

If the uncertainty of the result is not readily available, which is often the case for most of the inorganic and organic constituents, the relative percent difference (RPD) can be used to compare equivalency of replicate pairs. The RPD is calculated based on the formula:

$$RPD = ((ABS(X1\text{-}X2)) / ((X1+X2)/2)) * 100 \qquad (2)$$

where

RPD is the relative percent difference,
ABS is the absolute value,
$X1$ is the result for primary environmental sample, and
$X2$ is the result for field-replicate sample.

A typical data-quality objective for field-replicate samples is a maximum RPD of 20 percent (Taylor, 1987). Using equation 2, RPDs were less than 20 percent for 264 out of the 276 samples (96 percent), and can be considered statistically equivalent using this statistical test. One replicate pair each for total organic carbon, aluminum, iron, lead, and zinc; two replicate pairs for antimony and manganese; and three replicate pairs for cobalt were not in statistical agreement using this test (tables 4–6, at back of report). Results from the NWQL Blind Sample Program using double-blind, quality-control samples indicated that the laboratory had some bias and higher than expected variability for aluminum, cobalt, iron, lead, manganese, and zinc at some time during the sample periods for these analyses (USGS Inorganic Blind Sample Project, accessed March 12, 2014, at http://bqs.usgs.gov/ibsp/qadata.shtml). Results of replicate samples generally indicated that the sample collection and laboratory procedures used were appropriate for the data obtained.

Water Chemistry of Recharge to the Eastern Snake River Plain Aquifer

Several sources recharge water to the ESRP aquifer at the INL and an understanding of the chemical composition of these water sources is needed to help validate interpretations of groundwater flow based on groundwater model predictions. Ackerman and others (2010) modeled the ESRP aquifer at the INL as consisting of various amounts of inflow from sources and Fisher and others (2012, table 1) revised model input sources to include: precipitation recharge (3.3 percent); streamflow infiltration (7.1 percent); industrial wastewater return (0.3 percent); irrigation infiltration (1.0 percent); underflow from the Big Lost River (17.1 percent), Little Lost River (10.5 percent), and Birch Creek (2.9 percent) drainage basins; and underflow from the ESRP aquifer northeast of the INL (57.8 percent). Groundwater upwelling from below the base of the ESRP aquifer also probably occurs, but was considered small and insignificant and modeled as a no-flow boundary (Ackerman and others, 2010, p. 26).

Fisher and others (2012) compared model estimates with source area chemistry and groundwater velocities and determined that the eastern movement of tributary valley underflow and stream-infiltration recharge is overestimated in the north-central part of the model area and underestimated in the central part of the model. Fisher and others (2012) also

compared model results to a 5 µg/L lithium concentration line that was interpreted to represent the transition from a water type that is primarily composed of tributary valley underflow and streamflow-infiltration recharge to a water type composed of regional aquifer water. Of the 11 wells sampled for this study, all but USGS 103 are in the area modeled by Fisher and others (2012) to be composed of tributary underflow and streamflow infiltration recharge; USGS 103 shows both water types.

Several studies have described the water chemistry at the INL, and appendix A lists chemical concentrations from some of the studies for possible source waters that eventually recharge the ESRP aquifer following geochemical processes that may occur. Knobel and others (1997) indicate that most of the water chemistry from wells at the INL are a calcium-magnesium bicarbonate water type. Anion and cation concentrations in precipitation samples generally are very small; chemical concentrations at three different locations in the southwestern part of the INL are shown in appendix A.

Chemical concentrations in water from the Big Lost River, Little Lost River, and Birch Creek at and near the INL are shown in appendix A. The concentrations indicate variable chemical input from the rivers depending on the time of year sampled and the location. Most flow in the Big Lost River at the INL probably comes from runoff events because flow does not occur on the site except during years of high discharge for the river (Davis and others, 2013, fig. 8), and the chemistry of the water probably is best represented by water from the Big Lost River below the INEL diversion and near NRF (appendix A). Flow from the Little Lost River and Birch Creek generally infiltrates near the site boundaries and water chemistry is probably best represented by their most downstream reach (Little Lost River near Howe and Birch Creek at Blue Dome, appendix A).

Wastewater chemistry consists of the chemistry of the water from the production wells along with the additive concentrations of sodium, chloride, sulfate, nitrate, purgeable organic compounds, tritium, strontium-90, and other radionuclides that were discharged during the history of wastewater disposal at the INL. Robertson and others (1974), Orr and others (1991), and Knobel and others (1992) estimated background concentrations believed to be unaffected by wastewater. The three primary facilities that discharged wastewater that probably is affecting the multilevel monitoring wells sampled in this study are the NRF, the INTEC, and the ATR Complex. The chemistry of some of the production wells (CPP-1, NRF-2, TRA-1, and TRA-2) at these three facilities is shown in appendix A.

Fisher and others (2012) estimated that underflow from the tributary valleys contributed most of the recharge to the northwest boundary of the INL groundwater-flow model. Carkeet and others (2001) determined that two wells farthest downgradient in the Big Lost River system could be chemically modeled from upgradient wells, and that the water chemistry of both wells could be used to represent shallower (Owen well) and deeper (Arco City well) underflow water from the Big Lost River system (appendix A). Swanson and others (2002) indicated that several wells in the Little Lost River system were highly influenced by agricultural practices. The farthest downgradient well that could be modeled from wells upgradient was the Harrell well (appendix A). Although Swanson and others (2002) concluded that more wells were needed to fully characterize the natural geochemistry of the Little Lost River system, the Harrell well probably best represents the chemistry of the underflow from all the wells that have been sampled in the Little Lost River Basin. Swanson and others (2003) indicated that water chemistry from well USGS 126B (appendix A) best represents the chemistry of water recharging the ESRP aquifer as underflow from the Birch Creek valley.

Concentrations of Chemical Constituents in Groundwater

Cations, Anions, and Silica

Water samples were analyzed for concentrations of dissolved cations (calcium, magnesium, sodium, and potassium), dissolved silica, and dissolved anions (chloride, sulfate, and fluoride) by the NWQL for five new MLMS wells installed since 2008 (USGS 105, 108, 131A, 135, and 137A) (tables 3 and 4, at back of report). Bicarbonate concentrations (table 4) were calculated from field alkalinity measurements (table 2) according to Hem (1989, p. 57). Complete water chemistry for all the six older MLMS wells (Middle 2050A, Middle 2051, USGS 103, 132, 133, and 134) was presented in Bartholomay and Twining (2010). Water chemistry for the six older wells for selected zones and selected constituents for data collected during 2009–13 are presented in tables 3–9.

Well USGS 105.—Cation and anion concentrations for USGS 105 indicated a calcium plus magnesium-bicarbonate water type for all five zones (fig. 5). A water type is considered calcium plus magnesium bicarbonate when calcium plus magnesium make up greater than 50 percent of the cations (calcium generally predominates over magnesium), and bicarbonate makes up greater than 50 percent of the anions (Knobel and others, 1998). Figure 6 shows that all five zones had similar cation and anion water chemistry and the concentrations of chloride, sodium, and sulfate were near their estimated background concentrations of 10–15 mg/L for sodium and chloride, and around 20 mg/L for sulfate (Robertson and others, 1974). Water in all zones from this well probably represents mostly natural geochemical processes with only minimal effect from waste disposal.

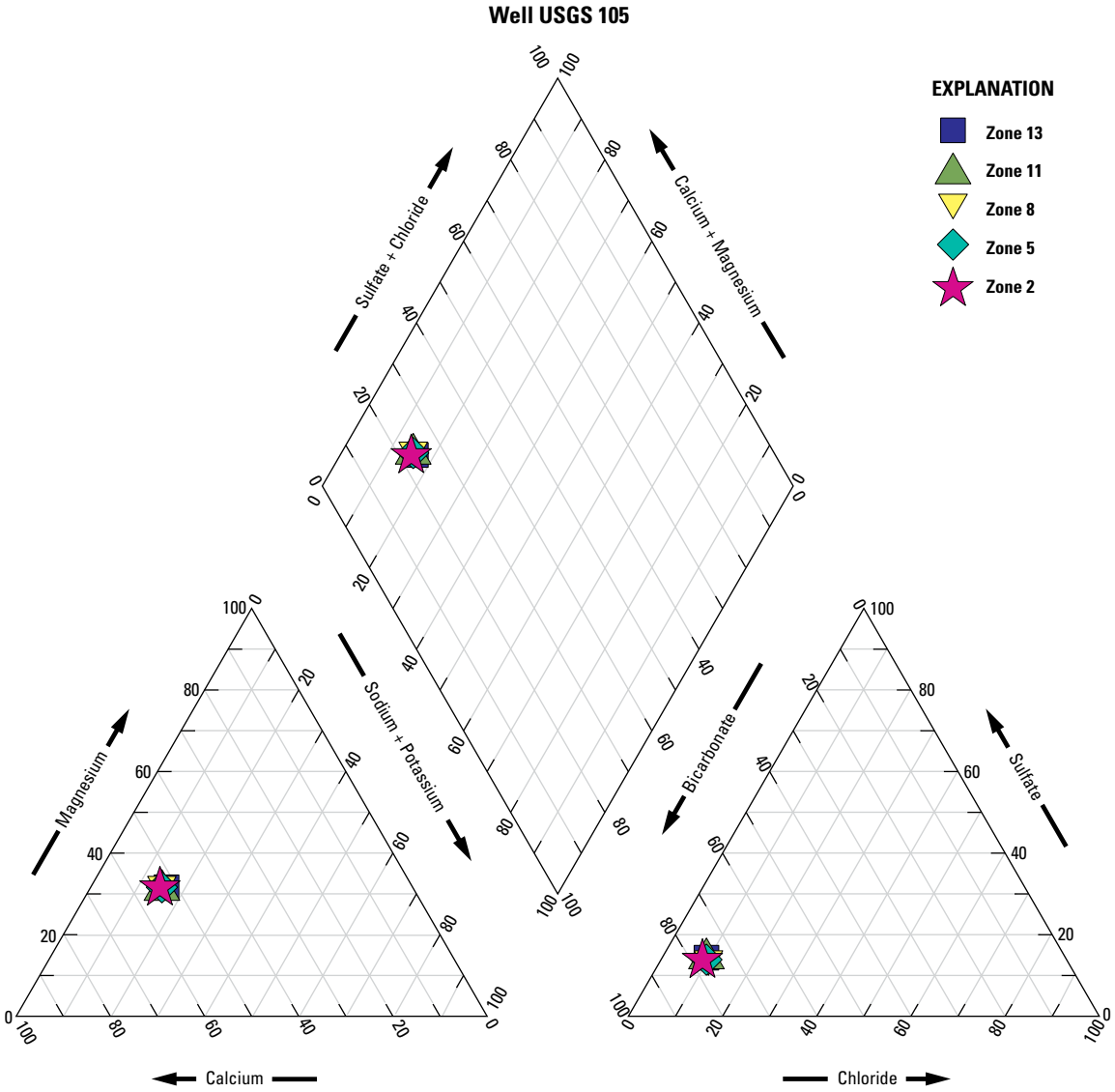


Figure 5. Average major-ion composition of water from well USGS 105, Idaho National Laboratory, Idaho, 2009–10.

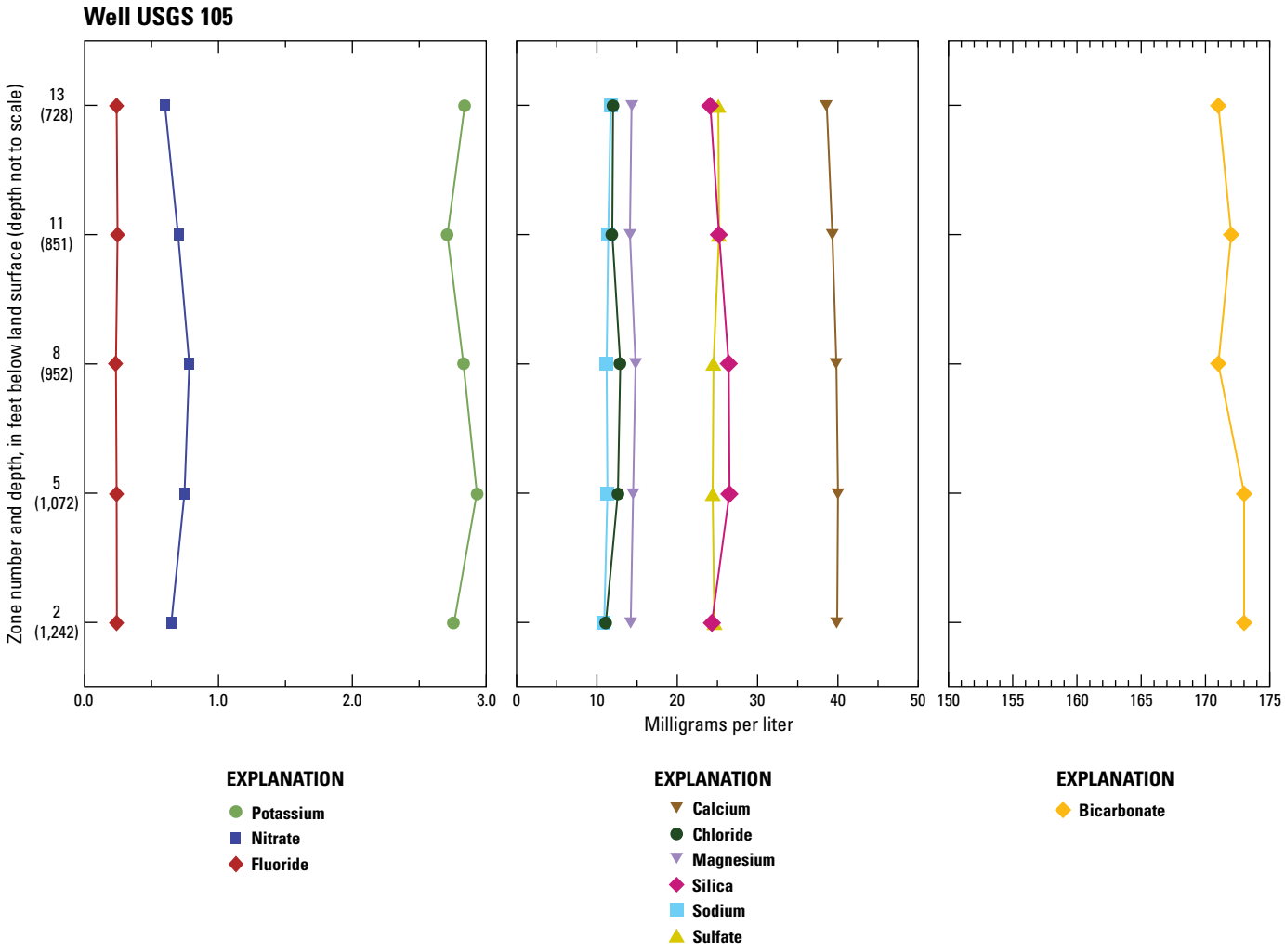


Figure 6. Average concentrations of selected ions and silica from well USGS 105, Idaho National Laboratory, Idaho, 2009–10.

Well USGS 108.—Cation and anion concentrations for USGS 108 indicated a calcium plus magnesium bicarbonate water type for all five zones (fig. 7). Sodium and fluoride concentrations were slightly larger and calcium, magnesium, and chloride were slightly smaller in the zone of water in the upper part of the aquifer (zone 11, port depth 661 ft BLS) than in the other four zones of water (fig. 8). The water chemistry in the other four zones was similar in composition; however, calcium and bicarbonate show a pattern of increased concentration with depth (fig. 8).

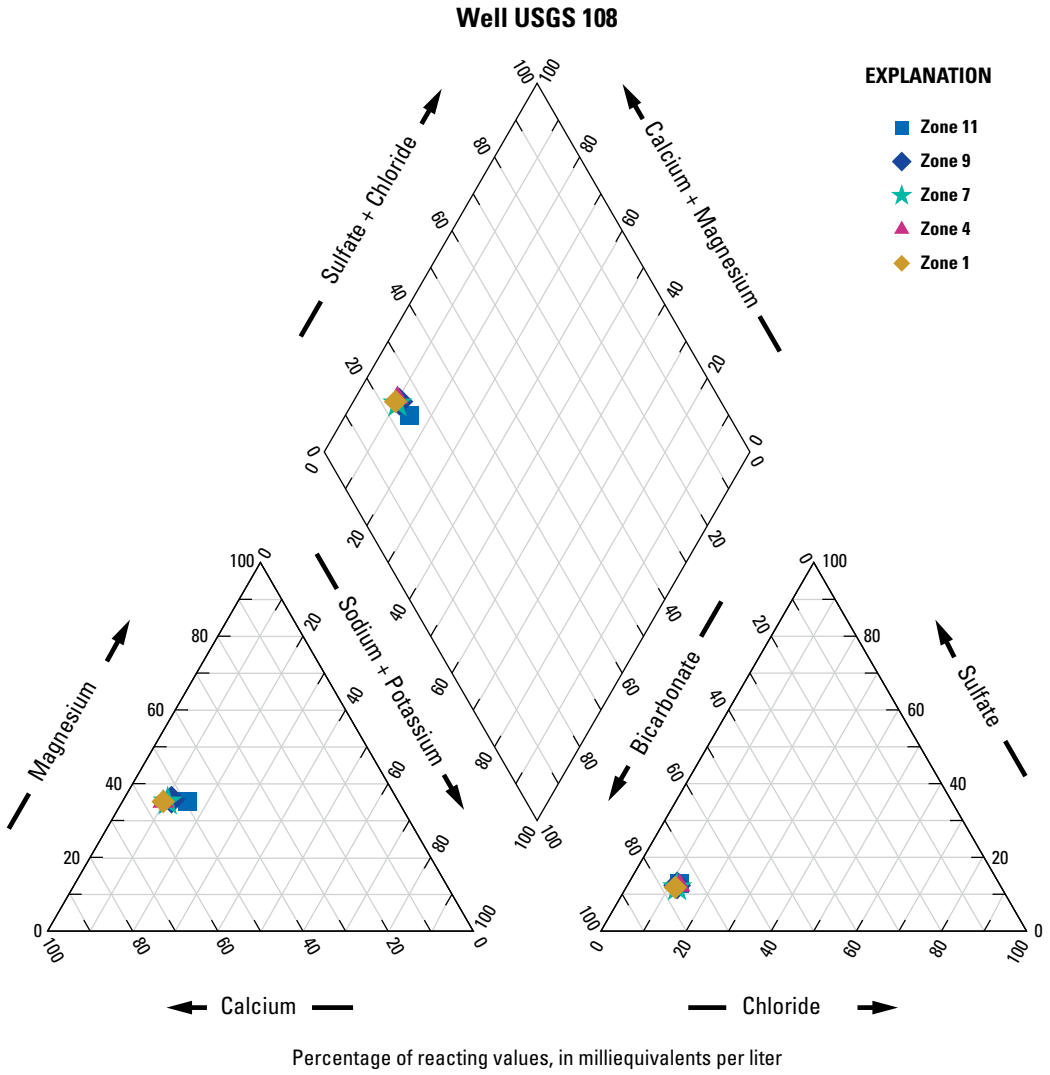


Figure 7. Average major-ion composition of water from well USGS 108, Idaho National Laboratory, Idaho, 2010–11.

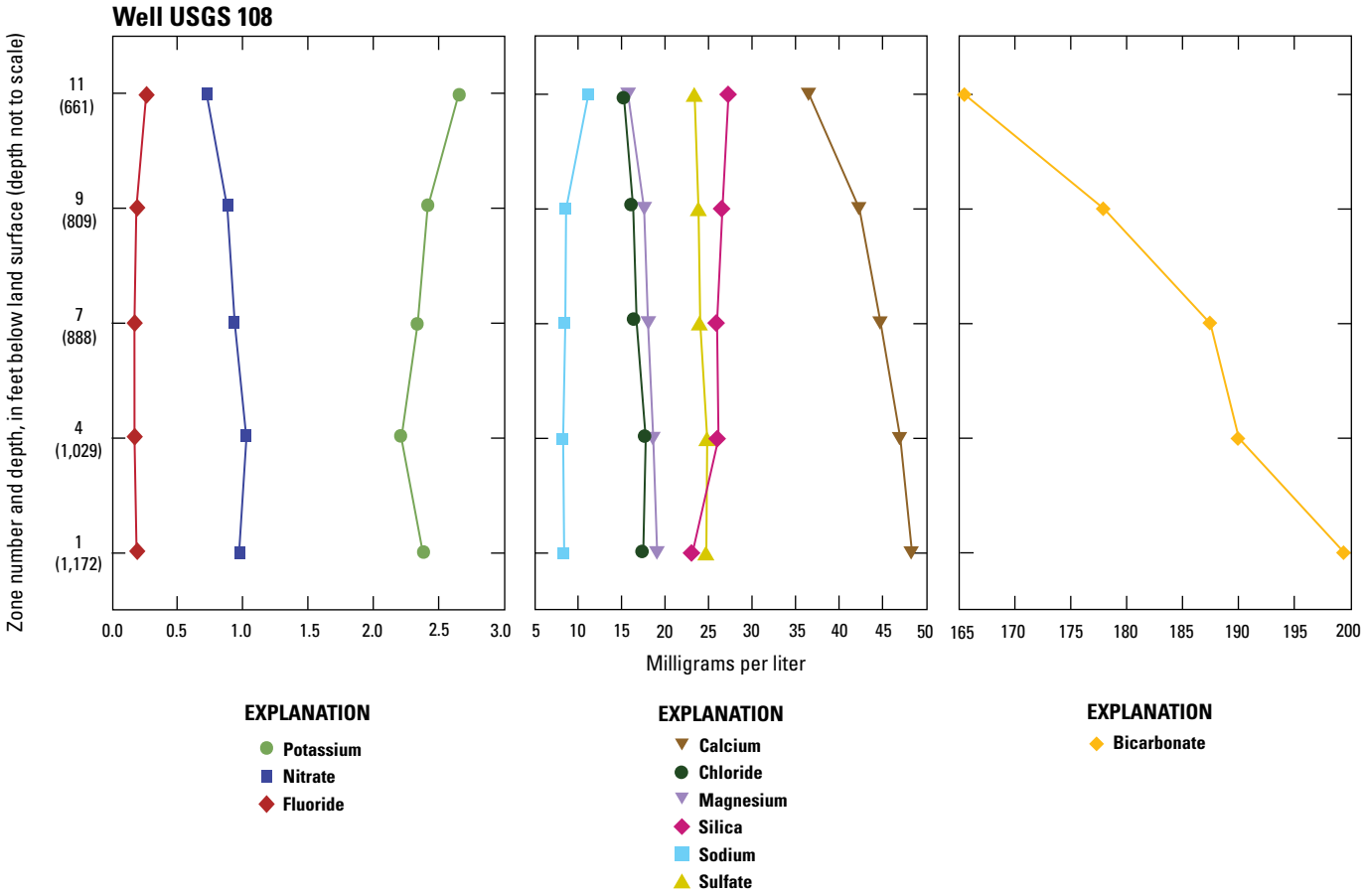


Figure 8. Average concentrations of selected ions and silica from well USGS 108, Idaho National Laboratory, Idaho, 2010–11.

Well USGS 131A.—Cation and anion concentrations for USGS 131A indicated a calcium plus magnesium-bicarbonate water type (fig. 9) for all four zones; however, zone 8 is more enriched with calcium, chloride, nitrate, potassium, and sulfate (fig. 10) than the other zones. The elevated chloride, nitrate, and sulfate concentrations indicate more affect from wastewater disposal practices upgradient than water in the other zones. Average calcium (44.3 mg/L) and magnesium (15.3 mg/L) concentrations in the upper zone (zone 12) were less than in the other three zones combined (49.8 and 18.0 mg/L, respectively) (fig. 10). The chloride concentration in zone 12 was greater than the concentrations in the two deepest zones (table 4, fig. 10). Bicarbonate concentrations increased with depth (fig. 10).

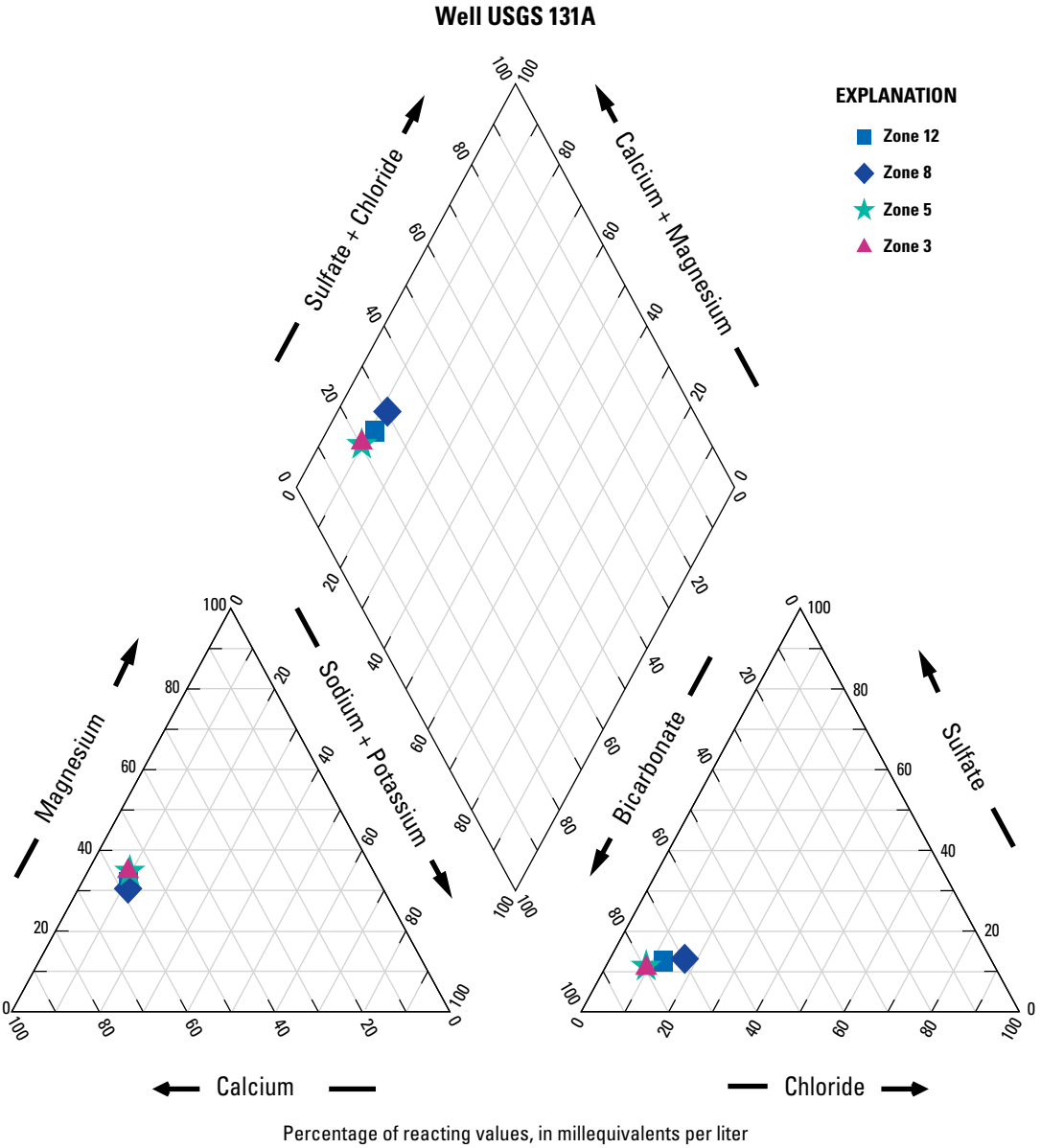


Figure 9. Average major-ion composition of water from well USGS 131A, Idaho National Laboratory, Idaho, 2012–13.

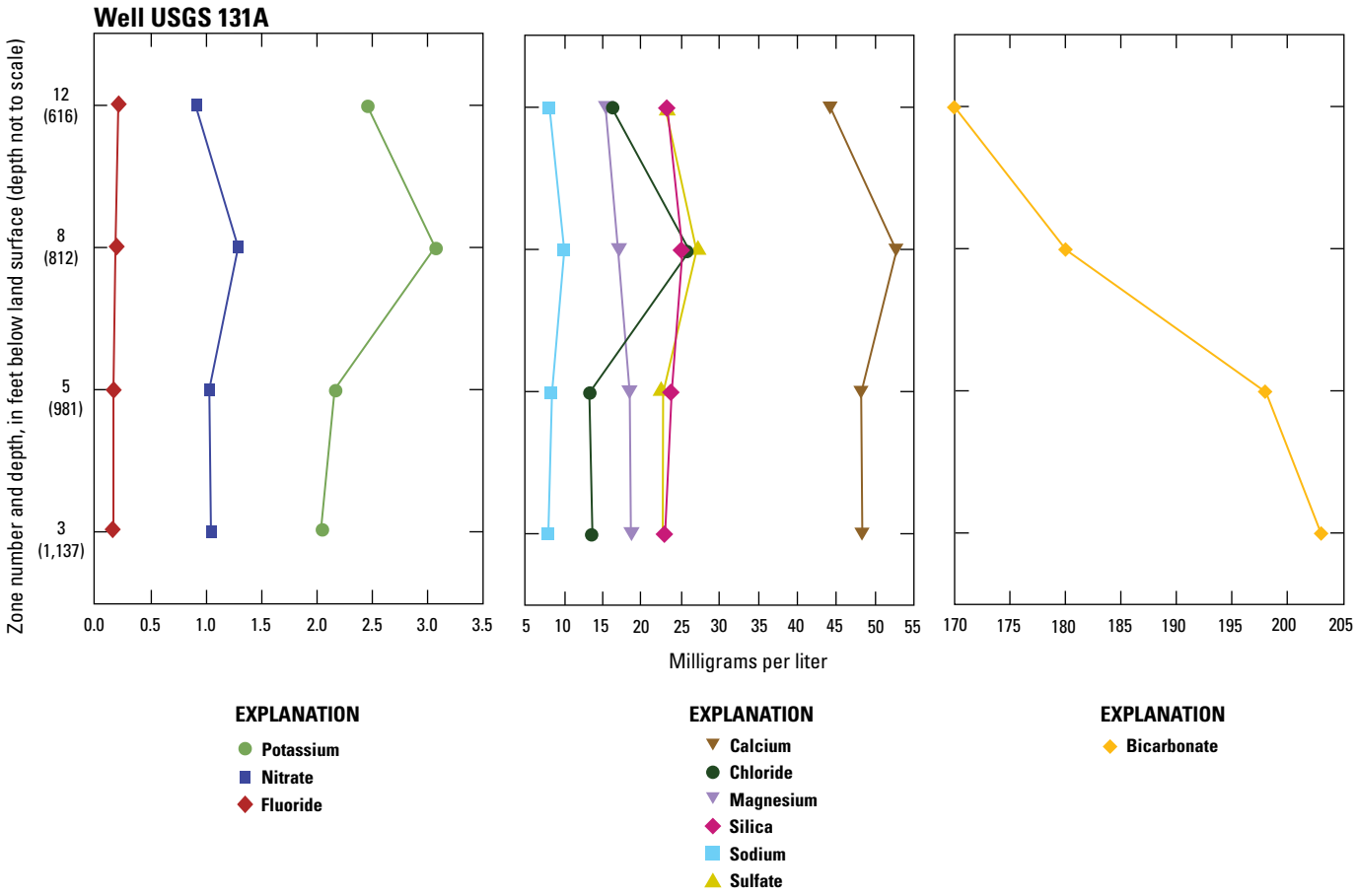


Figure 10. Average concentrations of selected ions and silica from well USGS 131A, Idaho National Laboratory, Idaho, 2012–13.

Well USGS 135.—Cation and anion concentrations for USGS 135 indicated a calcium plus magnesium-bicarbonate water type for all four zones (fig. 11). All four zones (fig. 12) had similar cation and anion water chemistry and the concentrations of chloride, sodium, and sulfate have concentrations less than their estimated background concentrations of 10–15 mg/L for sodium and chloride, and about 20 mg/L for sulfate (Robertson and others, 1974). The concentrations of cations and anions in this well probably represent natural geochemical processes with no affect from waste disposal.

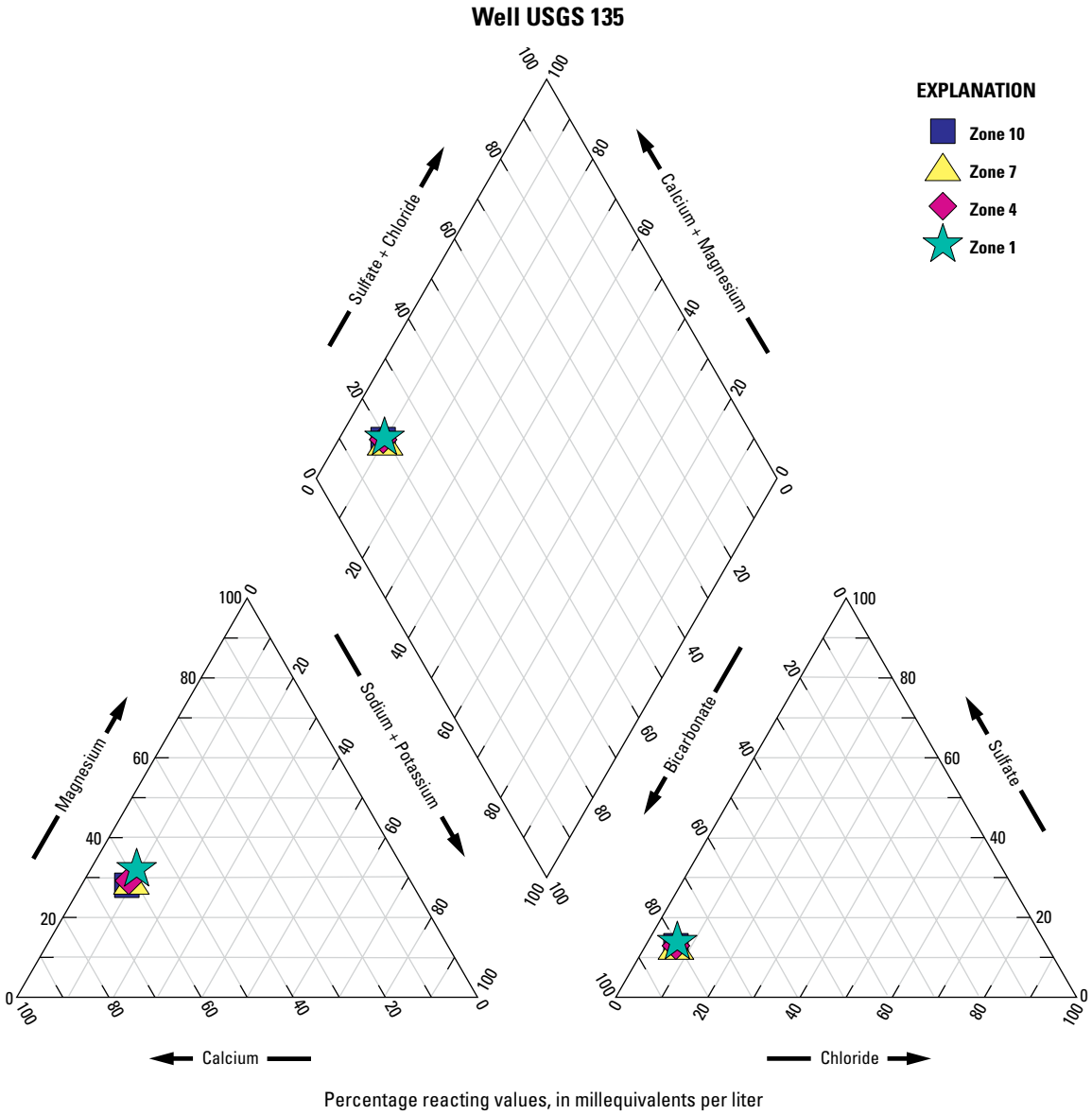


Figure 11. Average major-ion composition of water from well USGS 135, Idaho National Laboratory, Idaho, 2009–2010.

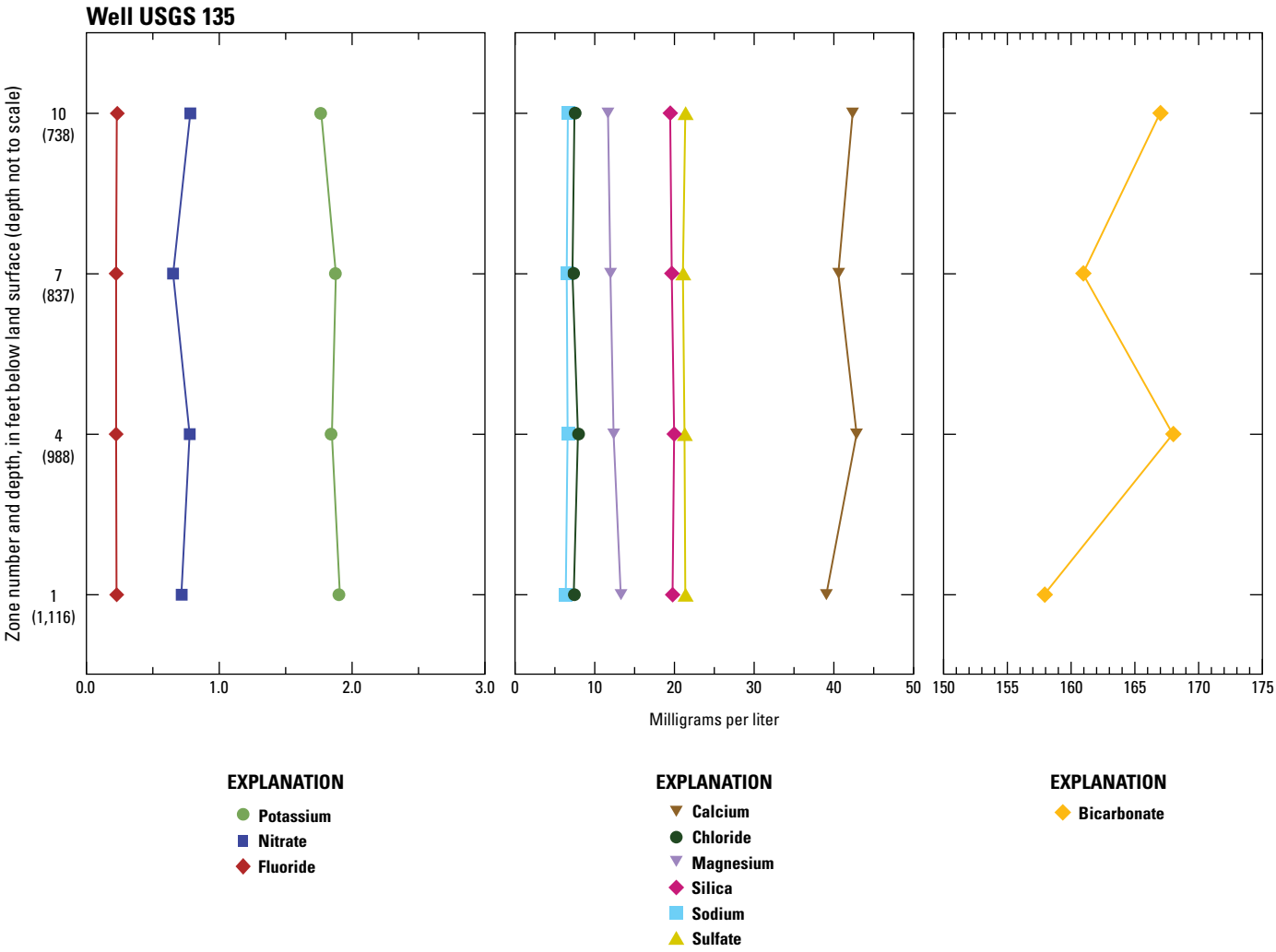


Figure 12. Average concentrations of selected ions and silica from well USGS 135, Idaho National Laboratory, Idaho, 2009–10.

Well USGS 137A.—Cation and anion concentrations for USGS 137A indicated a calcium plus magnesium-bicarbonate water type for all four zones (fig. 13). Concentrations of all the cations were similar in all four zones. Average chloride concentrations in samples from the upper zone were slightly higher (14.0 mg/L) than the other three zones combined (11.6 mg/L) (fig. 14), and Bartholomay (2013) attributed the higher chloride concentrations in the upper zone to more influence of wastewater disposal from INTEC than in the other zones.

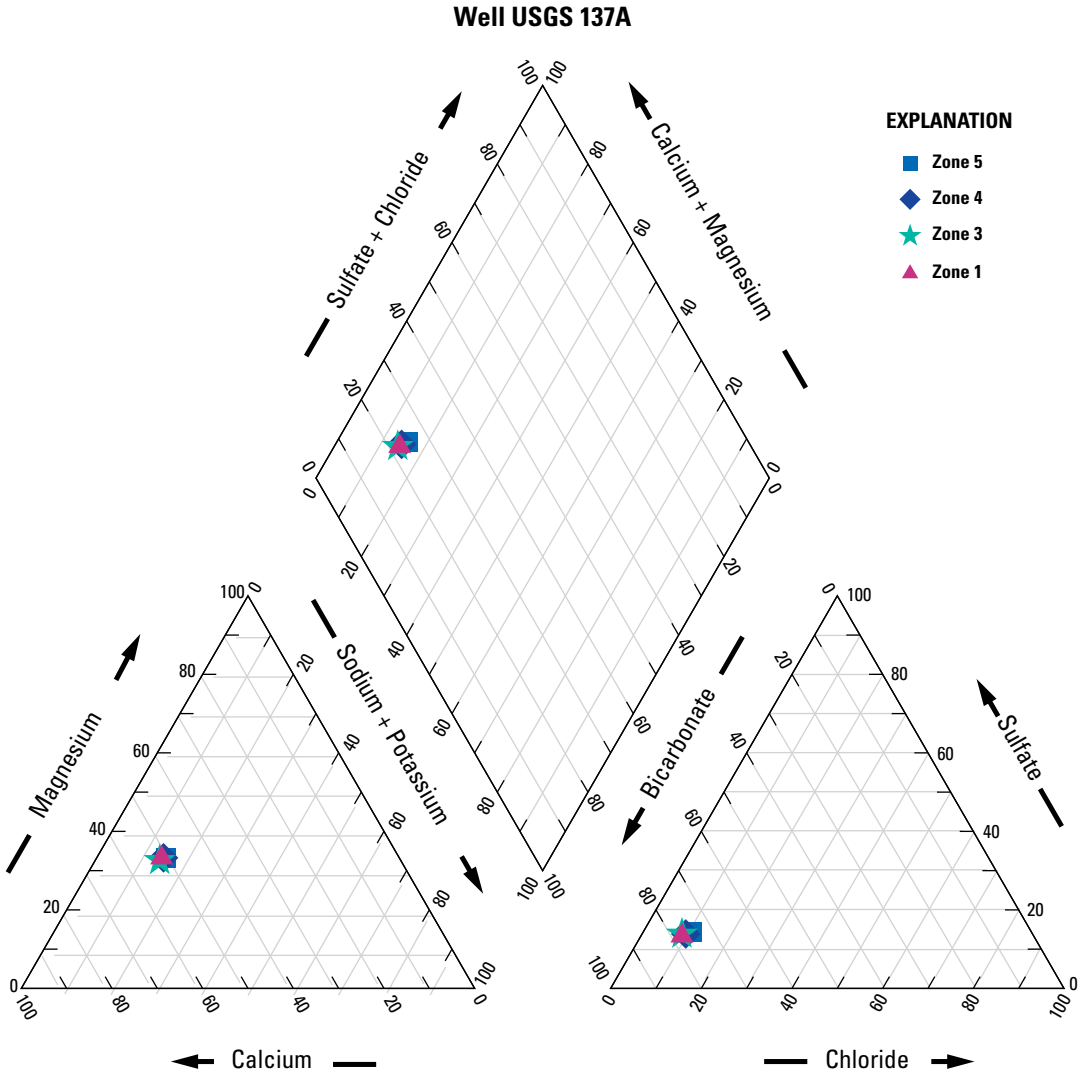


Figure 13. Average major-ion composition of water from well USGS 137A, Idaho National Laboratory, Idaho, 2012–13.

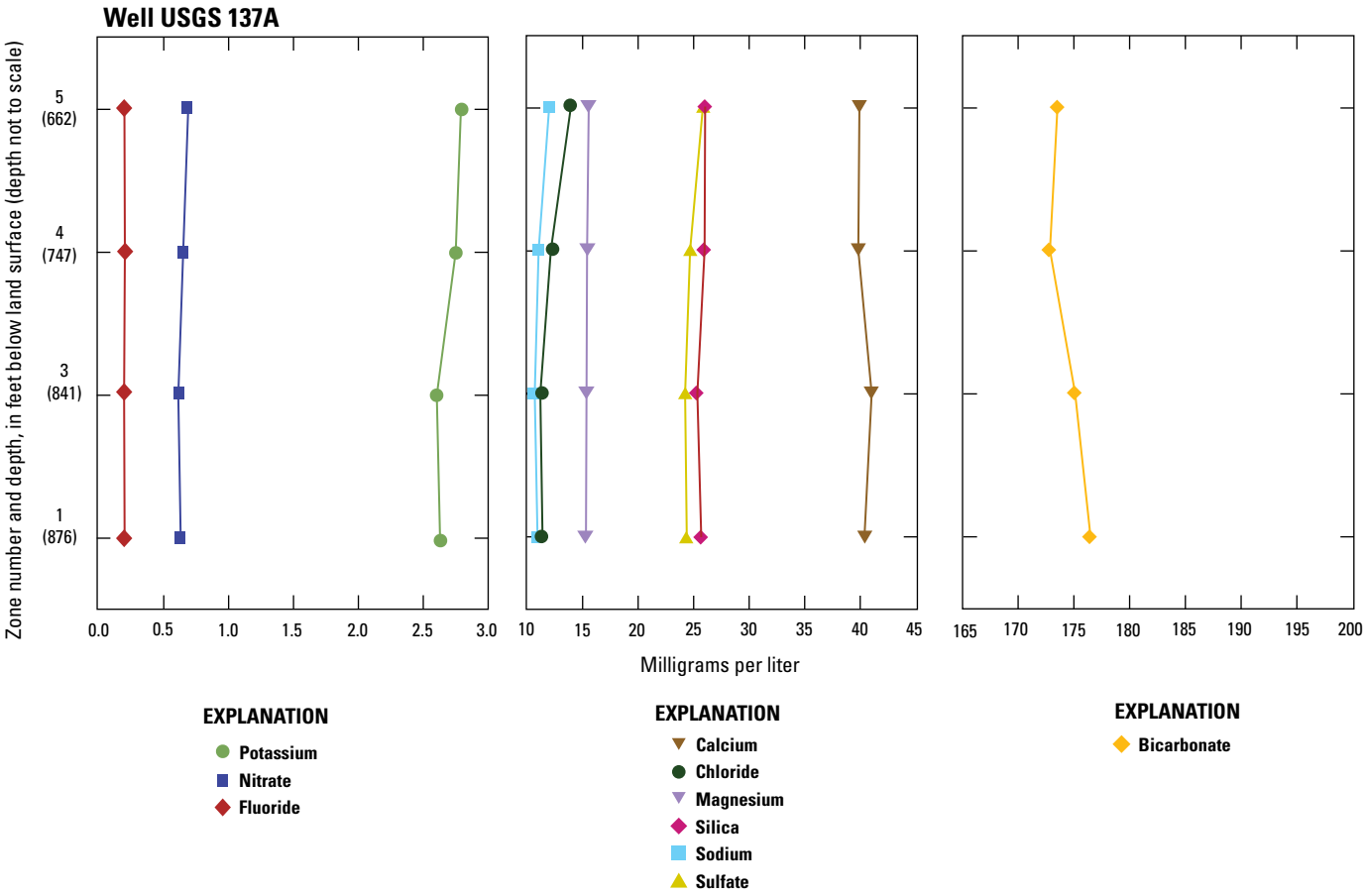


Figure 14. Average concentrations of selected ions and silica in water from well USGS 137A, Idaho National Laboratory, Idaho, 2012–13.

Selected Inorganic Constituents

Water samples were collected and analyzed for dissolved concentrations of aluminum, antimony, arsenic, barium, beryllium, bromide, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tungsten, uranium, vanadium, and zinc at the NWQL for five of the newer MLMS (USGS 105, 108, 131A, 135, 137A) (table 5, at back of report). Additionally, some data for selected constituents is also given in table 5 for wells Middle 2050A, Middle 2051, USGS 103, 132, 133, and 134.

Well USGS 105.—Most of the concentrations of minor inorganic constituents were similar in all five zones in USGS 105 (table 5). Average concentrations from all sample periods of chromium were smaller in the upper zone of the aquifer (zone 13, 5.7 µg/L) than in the other four zones (7.5 µg/L). Concentrations of manganese were larger in the upper zone compared with the other zones (table 5).

Well USGS 108.—Most of the concentrations of minor inorganic constituents were similar in all five zones in USGS 108 (table 5). Average concentrations of chromium and strontium were smaller in the upper zone of the aquifer (zone 11, 1.94, and 194 µg/L, respectively) than in the other four zones combined (5.6 and 221 µg/L, respectively). Barium concentrations were smaller in zones 11 and 9 than in the other zones. Iron concentrations were larger in zone 11 than in the other zones. Manganese concentrations were larger in the upper (zone 11) and lower (zone 1) zones than in the rest of the aquifer. Vanadium was smaller in the deepest zone (zone 1) than in the other zones (table 5).

Well USGS 131A.—Most of the concentrations of minor inorganic constituents were similar in all four zones in USGS 131A (table 5). Concentrations of aluminum were lower and concentrations of chromium were higher in the upper two zones (zone 12 and 8) than the two deepest zones (zones 5 and 3). Strontium was higher in zone 8 than in the other zones. Tungsten was higher in zone 12 than in the other zones (table 5).

Well USGS 135.—Most of the concentrations of minor inorganic constituents were similar in all four zones in USGS 135 (table 5). The concentration of aluminum in the upper part of the aquifer (zone 10) was larger than in the other zones. Strontium was lower in zone 7 than in the other zones.

Well USGS 137A.—Almost all of the concentrations of minor inorganic constituents were similar in all four zones in USGS 137A (table 5). Tungsten was slightly larger in the deepest zone (zone 1) than in the other zones.

Nutrients

Water samples were collected and analyzed at the NWQL for dissolved concentrations of ammonia as nitrogen, nitrite as nitrogen, nitrite plus nitrate as nitrogen, and orthophosphate as phosphorus for all 11 wells (table 6, at back of report).

Well Middle 2050A.—Nutrient concentrations in various zones stayed consistent with concentrations from earlier sampling by Bartholomay and Twining (2010). Concentrations of ammonia as nitrogen were larger in samples collected from the deepest zone (zone 3, port depth 1,180 ft BLS) than in the other zones (table 6). Average nitrite plus nitrate as nitrogen concentrations were smaller in zone 3 (<0.04 mg/L) and zone 12 (0.394 mg/L) than in the other three zones combined (average of 0.859 mg/L) (table 6).

Well Middle 2051.—Nutrient concentrations in various zones stayed consistent with concentrations from earlier sampling by Bartholomay and Twining (2010). Concentrations of most nutrients were similar in all five zones in Middle 2051, with the exception of nitrite plus nitrate in the upper zone. Average nitrite plus nitrate concentrations in the upper part of the aquifer (zone 12, port depth 603 ft BLS) were smaller (0.374 mg/L) than in the other four zones combined (0.873 mg/L) (table 6).

Well USGS 103.—Nutrient concentrations in various zones stayed consistent with concentrations from earlier sampling by Bartholomay and Twining (2010). Concentrations of most nutrients were similar in the six deepest zones. Concentrations of ammonia were larger and nitrite plus nitrate and orthophosphate were smaller in the upper part of the aquifer (zone 17) than in the other six zones (table 6).

Well USGS 105.—Concentrations of most of the nutrients were similar in all five zones (table 6). Concentrations of nitrite plus nitrate were slightly smaller in the upper and lower zones (13 and 2) (average concentration of 0.641 mg/L) than in the three middle zones (average concentration of 0.738 mg/L) (table 6).

Well USGS 108.—Concentrations of most of the nutrients were similar in all five zones (table 6). Concentrations of nitrite were larger in the deepest zone (zone 1) and concentrations of nitrite plus nitrate in the upper zone (zone 11) were smaller than concentrations in the other zones (table 6).

Well USGS 131A.—Concentrations of most of the nutrients were similar in all four zones (table 6). Nitrite plus nitrate in the upper zone (zone 12) were smaller and concentrations in zone 8 were larger than in the two lowest zones (table 6).

Well USGS 132.—Nutrient concentrations in various zones stayed consistent with concentrations from earlier sampling by Bartholomay and Twining (2010). Concentrations of most of the nutrients were similar in all six zones in USGS 132 (table 6). Average concentrations of nitrite plus nitrate were slightly larger (0.875 mg/L) in the upper part of the aquifer (zone 17) than in the other five zones (0.707 mg/L (table 6).

Well USGS 133.—Nutrient concentrations in various zones stayed consistent with concentrations from earlier sampling by Bartholomay and Twining (2010). Concentrations of most of the nutrients were similar in all four zones in USGS 133 (table 6). Orthophosphate concentrations were

smaller in the zone of water in the upper part of the aquifer (zone 10, port depth 469 ft BLS) than in the other three zones. Nitrite plus nitrate concentrations were larger in the deepest zone (zone 1) than the other three zones (table 6).

Well USGS 134.—Nutrient concentrations in various zones stayed consistent with concentrations from earlier sampling by Bartholomay and Twining (2010).The nutrient concentrations were variable between some of the zones for orthophosphate. Orthophosphate concentrations were elevated in most samples because a phosphoric-acid solution was used to clean bacterial buildup in the well; therefore, the data are not representative of natural aquifer conditions. Nitrite plus nitrate concentrations were smaller in zones 3 (port depths 847) and 9 (port depth 706 ft BLS) than in zones 6, 12, and 15 (table 6).

Well USGS 135.—Concentrations of most of the nutrients were similar in all four zones (table 6). Nitrite plus nitrate in the zone 7 (port depth 837 ft BLS) were smaller than in the other three zones (table 6).

Well USGS 137A.—Concentrations of all the nutrients were similar in all four zones (table 6).

Total Organic Carbon

Water samples were collected and analyzed at the NWQL for concentrations of total organic carbon through the 2011 sample season when sampling was discontinued because of poor reproducibility and cuts to program funding (table 6). Concentrations varied between each zone sampled and between each well. Well name and range-zone summary of total organic carbon, in milligrams per liter, for data from 2009 to 2011 follows:

Well	Range
Middle 2050A	<0.6 in zone 15 to 1.87 in zone 3
Middle 2051	<0.3 in zones 6 and 9 to 0.505 in zone 1
USGS103	<0.3 in several zones to 1.6 in zone 9
USGS 105	0.350E in zone 8 to 1.02E in zone 2
USGS 108	<0.3 in zone 4 to 0.688 in zone 1
USGS 132	<0.3 in zone 14 to 1.56 in zone 5
USGS 133	<0.3 mg/L in zone 10 to 0.977 in zone 7
USGS 134	0.307E in zone 15 to 1.26 in zone 9
USGS 135	<0.3 in zone 7 to 0.607 in zone 10

Gross Alpha- and Gross Beta-Particle Radioactivity

Water samples were collected and analyzed at the RESL for concentrations of gross alpha- and gross beta-particle radioactivity (table 7). Gross alpha- and beta-particle radioactivity is a measure of the total radioactivity given off as alpha and beta particles during the radioactive decay process. For convenience, laboratories report the radioactivity as if it were given off by one radionuclide. Radioactive decay of particles occurs from the decay of the natural elements in aquifer materials and the decay of radioactive particles in wastewater. In 2008, the RESL increased the sensitivity of the analyses for gross alpha- and gross-beta radioactivity, and they also switched the radionuclide reported from plutonium-239 to thorium-230 for gross alpha and from cesium-137 to strontium-90/yttrium-90 for gross beta (Guy Backstrom, U.S. Department of Energy, written commun., July 8, 2009). The minimum detectable activity went from about 1.6 to 1.5 pCi/L for gross alpha and from about 6.4 to 3.4 pCi/L for gross beta (Guy Backstrom, U.S. Department of Energy, written commun., July 7, 2009). The increased sensitivity allowed for increased detectable concentrations for the 2009–13 data.

Concentrations of gross alpha-particle radioactivity for all but eight samples collected and analyzed during 2009–13 were less than the reporting level, the concentrations greater than the reporting level were not specific to any well or any zone in any well. The positive results for the eight samples may be due to statistical fluctuations because the data are close to the reporting levels of 3*s*. Concentrations for gross beta-particle radioactivity were greater than the reporting level for most of the samples collected in 2009–13 (table 7). The increase in detectable concentrations is probably due to the increase in the sensitivity of the analyses because most of the concentrations were less than the reporting level in 2005–07 data (Bartholomay and Twining 2010).

Strontium-90

Strontium-90 does not occur naturally, with the exception of natural reactors, such as Oklo, in which nuclear fission reactions have occurred in a uranium-enriched deposit (Kuroda, 1982, p. 48–49; Durrance, 1986, p. 90). This radionuclide is present in groundwater as a fission product of nuclear-weapons tests and as a result of disposal practices in the nuclear industry (Orr and others, 1991). Water samples were analyzed for concentrations of strontium-90 at the RESL in five wells that were installed during 2009–13 (USGS 105, 108, 131A, 135, and 137A). Concentrations were less than the reporting level for all samples (table 7). Strontium-90 has the chemical affinity to exchange with sediment in the unsaturated zone and in the aquifer, and historically has not moved much past INTEC (Davis and others, 2013), which is probably the reason it is not detected in these wells.

Tritium

Tritium, a radioactive isotope of hydrogen, is formed in nature by interactions of cosmic rays with gases in the upper atmosphere. Tritium also is produced in thermonuclear detonations and is a waste product of the nuclear-power industry (Orr and others, 1991). Tritium has been the

predominant radioactive constituent discharged in wastewater at the INL and about 31,810 Ci of tritium was discharged in wastewater to ponds and wells at the ATR Complex and INTEC from 1952 through 2000 (Davis, 2006). Water samples were collected and analyzed for concentrations of tritium at the RESL; samples also were analyzed at the USGS Menlo Park Research Laboratory (Menlo Park) using a lower MDL during the second year of sampling for the five new wells installed between 2009 and 2012. The MDL for tritium analyzed at the RESL is about 200 pCi/L, and the MDL for tritium analyzed at Menlo Park is 5.7 pCi/L. Background concentrations of tritium assumed to not be influenced by wastewater disposal were estimated to be between 75 and 150 pCi/L by Orr and others (1991). Background concentrations for groundwater estimated by Knobel and others (1992) from mean data downgradient from the INL were considered to be between about 0 and 40 pCi/L. Given that these background concentrations were estimated from data in the late 1980s, it seems reasonable to assume concentrations above 75 pCi/L probably have some influence from wastewater disposal.

Well USGS 105.—Tritium concentrations in samples collected from 2009 to 2013 from three zones of water in the middle part of the aquifer (zones 5, 8, and 11) were mostly greater than the reporting level of three times the sample standard deviation when analyzed at the RESL (table 7). One sample from the deepest zone (zone 2) was greater than the reporting level, but the other sample was less than the reporting level. Concentrations were less than the reporting level for both samples from the upper zone (zone 13) analyzed by the RESL. Tritium analyzed at Menlo Park indicated larger concentrations in the four upper zones than in the deepest zone (fig. 15). Based on Menlo Park results, the four upper zones all had concentrations greater than background and are probably influenced by wastewater disposal at the INL.

Well USGS 108.—Tritium concentrations in samples collected during 2009–13 from three zones (zones 1, 4, and 9) had one sample each greater than the reporting level of three times the sample standard deviation when analyzed at the RESL; all the other samples were less than the reporting level (table 7). Tritium analyzed at Menlo Park indicated the largest concentration was in zone 9 (809 ft BLS) (119±3 pCi/L) (fig. 15), and all the concentrations were within the range of the background concentrations of 75–150 pCi/L.

Well USGS 131A.—Tritium concentrations were larger in the two upper zones of the aquifer than in the two lower zones (fig. 15, table 7). Concentrations were greater than the reporting level for all samples collected in the upper two zones (zones 8 and 12); these zones are influenced by recharge from wastewater disposal. The samples analyzed at Menlo Park for the two deeper zones indicate concentrations are near or slightly below the upper background concentration of 150 pCi/L for the ESRP aquifer and probably have some wastewater disposal influence.

Well USGS 135.—Tritium concentrations analyzed by the RESL were all less than the reporting level for this well (table 7). Tritium concentrations analyzed at Menlo Park indicated all zones were similar and concentrations were all less than what would be expected as background in the ESRP aquifer (fig. 15). The low concentrations of tritium in this well suggest older groundwater (>50 years) that has not been influenced by wastewater disposal.

Well USGS 137A.— Tritium concentrations in samples collected from all four zones and analyzed by RESL were all less than the reporting level of three times the sample standard deviation except for one sample collected from zone 4 in 2013 (table 7). Tritium analyzed at the Menlo Park Research Laboratory indicated the largest concentration was in the upper zone (zone 5) (106±3.83 pCi/L) (fig. 15), and the two upper zones had concentrations within the estimated range of background concentrations of 75–150 pCi/L. The concentrations in the two deepest zones were less than the background levels reported by Orr and others (1991).

Cesium-137

Cesium-137 is not naturally occurring; however, it can be present in groundwater as a fission product from nuclear facilities and weapons tests (Orr and others, 1991). Water samples were analyzed for concentrations of cesium-137 at the RESL using gamma spectrometry. Cesium-137 concentrations in all but six samples were less than the reporting level (table 7); and the concentrations greater than the reporting level were not specific to any well or any zone in any well. The positive results for the six samples may be due to statistical fluctuations because the data are close to the reporting levels of 3*s*.

Uranium Isotopes

Uranium is a widely distributed element with three naturally occurring radioactive isotopes: uranium-234, uranium-235, and uranium-238. Uranium-238 (99.27 percent) is the most naturally abundant of the three isotopes. These isotopes undergo a complex series of radioactive decay that results in their ultimate conversion to stable isotopes of lead (Haglund, 1972). Estimated background concentrations in the eastern Snake River Plain aquifer range from 0 to 9 pCi/L (Orr and others, 1991). Water samples were analyzed from five wells (USGS 105, USGS 108, USGS 131A, USGS 135, and USGS 137A) for concentrations of uranium-233, -234 (undivided), uranium-235, and uranium-238 at the NWQL (table 8). Concentrations of uranium-233, -234 (undivided) were greater than the reporting level in all samples, and ranged from 0.98 ± 0.098 pCi/L in USGS 108 (zone 1) to 1.9 ± 0.11 pCi/L in USGS 135 (zone 10) (table 8).

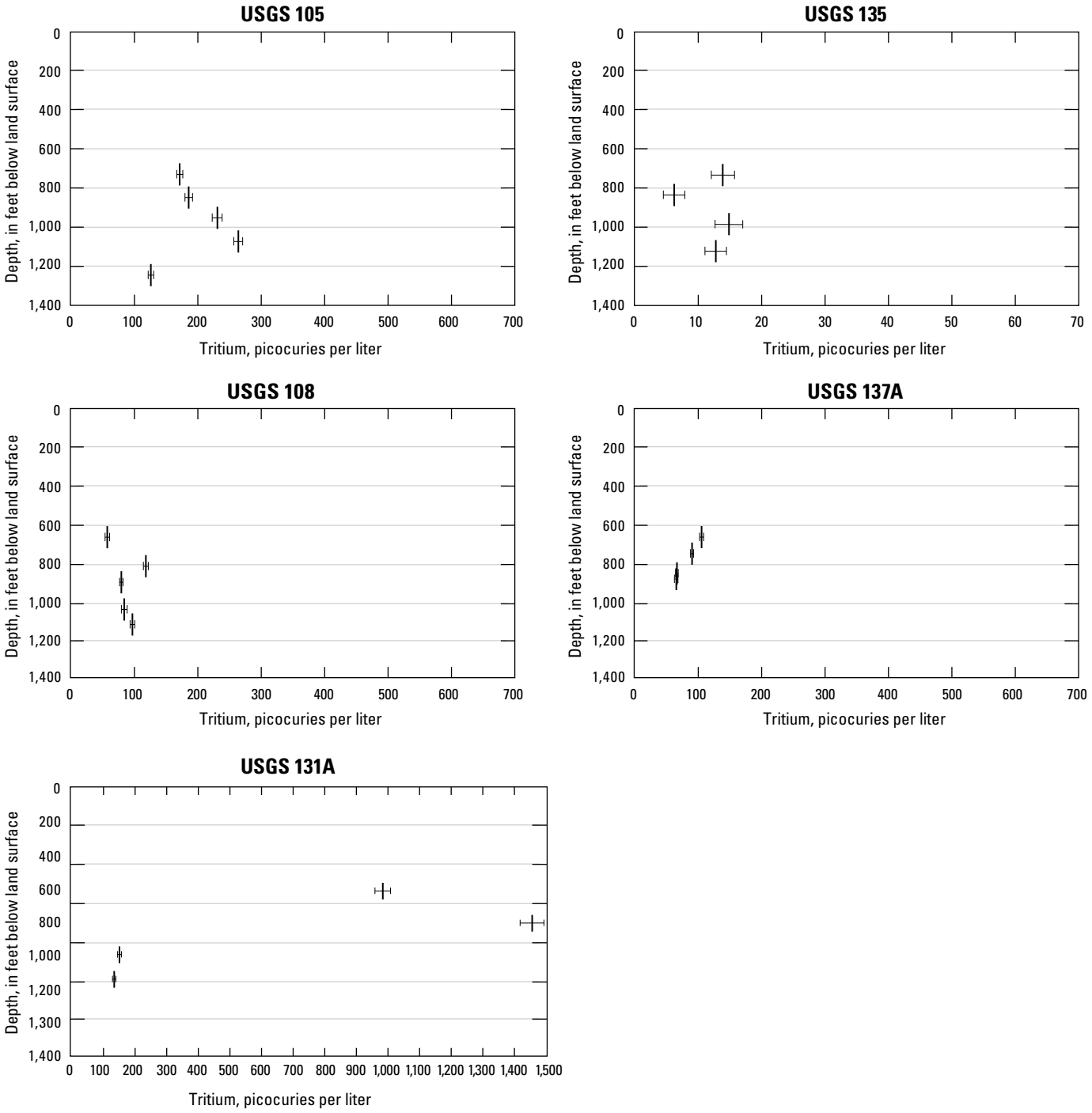


Figure 15. Concentrations of tritium analyzed at the Menlo Park Research Laboratory in wells USGS 105, 108, 131A, 135, and 137A, Idaho National Laboratory, Idaho.

Uranium-235 concentrations were less than the reporting level in all sample zones from USGS 108 and USGS 135. Uranium-235 concentrations were greater than the reporting level (table 8) from zones 2, 5, and 11 in USGS 105; zone 8 in USGS 131A and zone 4 in USGS 137A.

Uranium-238 concentrations were greater than the reporting level in all samples and ranged from 0.324 ± 0.051 pCi/L in USGS 108 (zone 7) to 0.67 ± 0.057 pCi/L in a replicate from USGS 105 (zone 2) (table 8).

Transuranic Elements

Some transuranic elements can be produced in nature because of the availability of neutrons that can be captured by uranium isotopes (Orr and others, 1991, p. 16), but concentrations are much less than the detection level used for analyses at the RESL. Some transuranic elements also are produced as by-products of the nuclear industry (Wampler, 1972, p. 6–7). Water samples were analyzed for concentrations of plutonium-238, plutonium-239, 240 (undivided), and americium-241 at the RESL. Concentrations in all samples were less than the reporting level (table 8).

Stable Isotopes

Water samples were analyzed for relative concentrations of stable isotopes of hydrogen (H), oxygen (O), and carbon (C). Because the absolute measurement of isotopic ratios is analytically difficult, relative isotopic ratios are measured instead (Toran, 1982). For example, $^{18}O/^{16}O$ of a sample is compared with $^{18}O/^{16}O$ of a standard:

$$\delta^{18}O = \left(R_{sample} / R_{standard} - 1\right) \times 1{,}000 \quad (3)$$

where

$\delta^{18}O$ is the relative concentration, in units of parts per thousand (per mil),

R_{sample} is the $^{18}O/^{16}O$ ratio in the sample, and

$R_{standard}$ is the $^{18}O/^{16}O$ ratio in the standard.

The delta notation ($\delta^{18}O$) is the value reported by isotopic laboratories for stable isotope analysis. In a similar manner, $^{2}H/^{1}H$ and $^{13}C/^{12}C$ are defined with the respective ratios replacing $^{18}O/^{16}O$ in R_{sample} and $R_{standard}$. The standard used for determining $\delta^{18}O$ and $\delta^{2}H$ in water is standard mean ocean water as defined by Craig (1961). The standard used for determining $\delta^{13}C$ in water is the PeeDee Belemnite reference standard (Timme, 1995, p. 71). Relative concentrations of stable isotopes are shown in table 9.

Well USGS 105.—Concentrations of $\delta^{2}H$, $\delta^{18}O$, and $\delta^{13}C$ were relatively consistent among all five zones (table 9). The $\delta^{2}H$ concentrations ranged from -138.0 to -136.3 per mil, but the variability in the range was not consistent with any particular zone. Concentrations of $\delta^{18}O$ ranged from -18.0 to -17.8 per mil, and $\delta^{13}C$ ranged from -9.41 to -9.01 per mil.

Well USGS 108.—Concentrations of $\delta^{2}H$, $\delta^{18}O$, and $\delta^{13}C$ were relatively consistent among all five zones (table 9). The $\delta^{2}H$ concentrations ranged from -137.7 to -136.0 per mil, but the variability in the range was not consistent with any particular zone. Concentrations of $\delta^{18}O$ ranged from -17.98 to -17.79 per mil; $\delta^{13}C$ ranged from -9.17 to -9.0 per mil.

Well USGS 131A.—Concentrations of $\delta^{2}H$ and $\delta^{18}O$ were relatively consistent among all four zones (table 9). The $\delta^{2}H$ concentrations ranged from -138.5 to -136.2 per mil, but the variability in the range was not consistent with any particular zone. Concentrations of $\delta^{18}O$ ranged from -18.07 to -17.81 per mil; $\delta^{13}C$ was not sampled.

Well USGS 135.—Concentrations of $\delta^{2}H$, $\delta^{18}O$, and $\delta^{13}C$ were relatively consistent among all four zones (table 9). The $\delta^{2}H$ concentrations ranged from -137.8 to -136.6, but the variability in the range was not consistent with any particular zone. Concentrations of $\delta^{18}O$ ranged from -18.02 to -17.90; $\delta^{13}C$ ranged from -9.36 to -8.87.

USGS 137A.—Concentrations of $\delta^{2}H$ and $\delta^{18}O$ were relatively consistent among all four zones (table 9). The $\delta^{2}H$ concentrations ranged from -137.9 to -136.4, but the variability in the range was not consistent with any particular zone. Concentrations of $\delta^{18}O$ ranged from -17.89 to -17.81; $\delta^{13}C$ was not sampled.

Chemical Comparison of Groundwater from Multiple Zones

The hydrochemical facies or trilinear diagrams (figs. 5, 7, 9, 11, and 13) are based on a data visualization technique developed by Piper (1944) that is a useful tool for displaying the chemical character of water. Trilinear diagrams also can be used to test groups of water analyses to determine whether a particular water may be a simple mixture of others for which analyses are available or whether it is affected by solution or precipitation of a single salt (Hem, 1989, p. 178). A plot of the hydrochemical facies for wells USGS 105, 108, 131A, 135, and 137A (fig. 16) indicates that water in all of the zones is similar and is calcium magnesium-bicarbonate in content. Percentages of chloride compared with sulfate and bicarbonate were larger in water from USGS 131A (zone 8) than in all other samples. This zone has the largest chloride concentration of any zone and is probably most influenced by wastewater disposal.

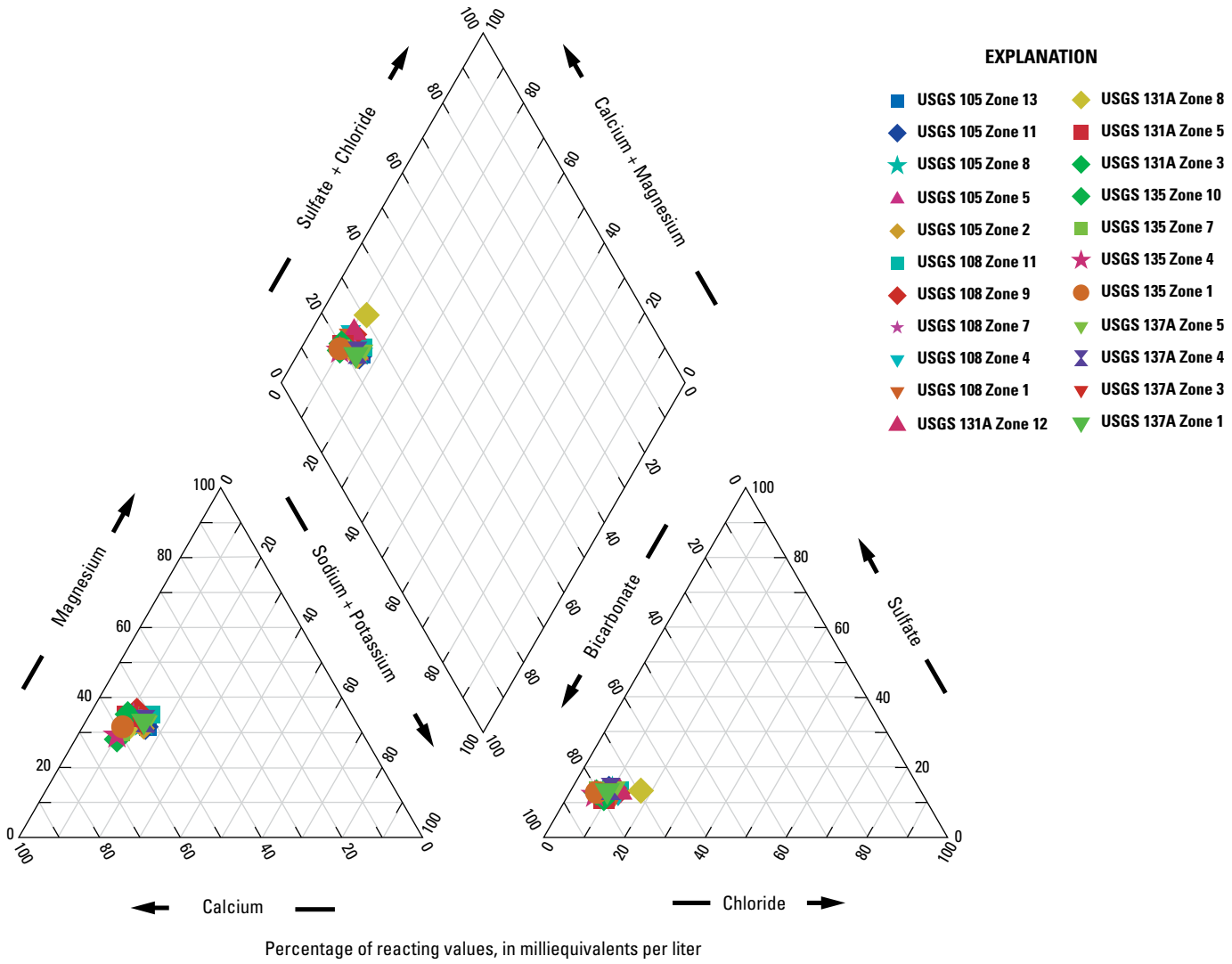


Figure 16. Major-ion composition of water from wells USGS 105, USGS 108, USGS 131A, USGS 135, and USGS 137A, Idaho National Laboratory, Idaho.

Other chemical, radiochemical, and isotope species also indicate some chemical variability among different zones of water. In USGS 105, the water chemistry plots between water types representing Big Lost River streamflow and underflow from the Big Lost River (Arco City well and Owen well), Little Lost River (Harrell well), and Birch Creek (USGS 126 B) (fig. 17). Manganese and chromium vary in the upper zone (zone 13) compared with concentrations in the other four zones (table 5). Nitrite plus nitrate concentrations were slightly smaller in the upper and lower zones (average concentration of 0.641 mg/L) than in the three middle zones (average concentration of 0.738 mg/L) (table 6). Tritium is present at concentrations that probably represent wastewater sources in the upper four zones (zones 5, 8, 11, and 13; table 7, fig. 15), so water in USGS 105 probably derives from a variable combination of some minor wastewater disposal and a mixture of water derived from streamflow infiltration and underflow from Big Lost River, Little Lost River, and Birch Creek.

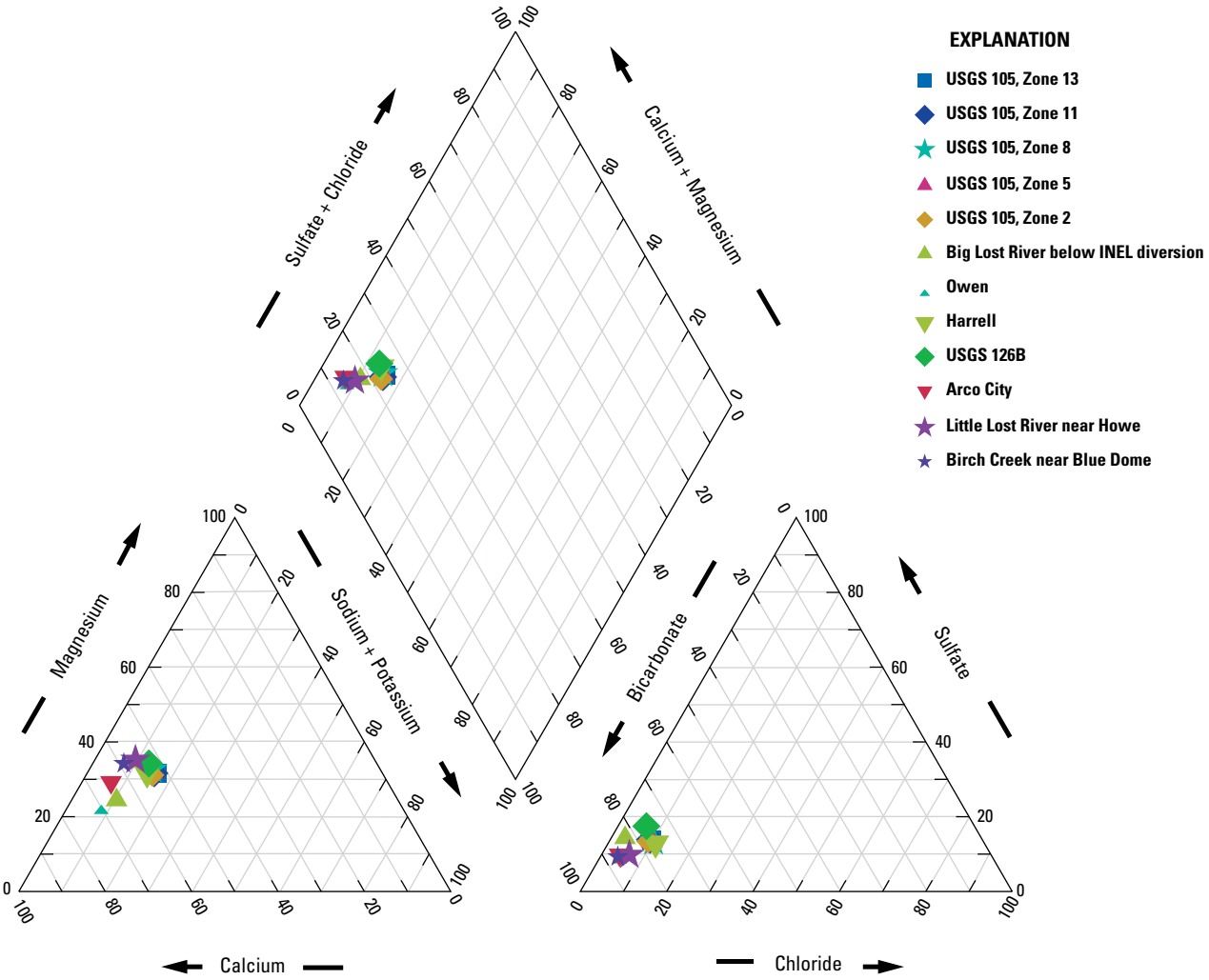


Figure 17. Major-ion composition of water from wells USGS 105, Big Lost River below INEL diversion, Owen, Harrell, USGS 126B, and Arco City, Idaho National Laboratory, Idaho.

In USGS 108, some minor inorganic constituents (chromium, barium, iron, manganese, and strontium) are more variable in the upper zone (zone 11) as compared with concentrations in the other zones (table 5). Nitrite plus nitrate had smaller average concentrations in the upper zone (zone 11) as compared with concentrations in the other four zones (fig. 8). Tritium concentrations were larger in zone 9 as compared with concentrations in the other four zones, and all had concentrations within the background concentration range of 75 to 150 pCi/L except for the upper zone (zone 11), which was less than background (fig. 15); however, tritium concentrations did exceed the reporting level in the upper part of the aquifer during 1983–85 (prior to when the well had an MLMS) (Pittman and others, 1988, p. 51; Mann and Cecil, 1990, p. 27). Chloride concentrations were similar in all the zones, but were higher than the concentrations in the other multilevel wells along the southern boundary (USGS 103, 105, 135 and 137A) (table 4), so contamination from wastewater disposal is a possibility even though tritium samples are not conclusive. The water from this well probably consists of a mixture of water derived from streamflow infiltration and underflow from Big Lost River, Little Lost River, and Birch Creek, along with a periodic wastewater signature.

Calcium, chloride, nitrate, and sulfate concentrations were much higher in zone 8 in USGS 131A than in the other three zones (fig. 10). Iodine-129 was also higher in this zone relative to the other zones sampled (Bartholomay, 2013). Tritium concentrations were largest in the upper two zones and were smallest in the deepest two zones (fig. 15); the upper two zones show strong influence from wastewater disposal; but the larger concentrations of iodine-129, nitrate, and chloride in zone 8 may indicate stronger influence of recharge from INTEC in this zone of water than in the upper zone. The upper two zones include a variable combination of wastewater disposal and a mixture of water derived from streamflow infiltration and underflow from Big Lost River, Little Lost River, and Birch Creek. The two deepest zones are similar in source water with less influence from wastewater disposal than the upper two zones.

Concentrations of inorganic constituents were similar in all four zones in USGS 135, the only exceptions being slightly larger aluminum concentrations in the upper part of the aquifer (zone 10) than in the other zones and strontium and nitrate concentrations were slightly lower in zone 7 than in the other zones. Uranium-233,234 (undivided) concentrations were larger in zone 4 and 10 than in the other two zones (table 8). Tritium concentrations in all four zones were similar and all less than background. Figure 18 indicates that water in this well has chemistry between the Big Lost River surface water and underflow influence, and underflow from the Little Lost River and Birch Creek. The amount of tritium indicates most of the water in this well is older and the well probably represents recharge from Big Lost River surface-water infiltration and underflow that has undergone chemical interaction with the aquifer materials.

Tritium concentrations in the upper two zones in USGS 137A were larger than in the two deepest zones, and concentrations in the upper zones are within the range considered to be background for the aquifer. The water chemistry is similar in all four zones, except that average chloride concentrations in samples from the upper zone were slightly larger (14.0 mg/L) than the other three zones (11.6 mg/L), which may indicate that the upper zone has more wastewater influence. The water in this well probably consists of a mixture of water derived from precipitation and underflow from Big Lost River, Little Lost River, and Birch Creek along with a periodic wastewater signature at least in the upper part of the aquifer.

Recent mapping of basalt flows at the INL using paleomagnetic inclination data (Champion and others, 2011; 2013) has led to a better understanding and correlation of stratigraphic sequences at the INL. Champion and others (2011, pl. 1) indicated that the basalt lava flows at the upper 150 ft of the top of the aquifer at INTEC (depth of the INTEC Disposal well where wastewater was presumably discharged) consisted of the CFA Buried Vent flow group and the AEC Butte flow group. At the ATR Complex, where wastewater would presumably pond on the surface of the water table, the CFA Buried Vent flow group is the primary stratigraphic unit (Champion and others, 2011, pl. 1). Figures 19 and 20 show Menlo Park tritium concentrations (table 7, Bartholomay and Twining, 2010) in relation to basalt flow groups identified in the wells with multilevel monitoring systems. Values shown in bold are concentrations greater than the lower estimated background concentration of 75 pCi/L (Orr and others, 1991) and likely have been influenced by wastewater disposal at the INL. In the wells closer to areas of wastewater disposal, well Middle 2050A shows wastewater presence in the CFA Buried Vent flow group and in the AEC Butte and Jaramillo flow groups (fig. 19). Well USGS 131A also shows wastewater influence in the CFA buried vents flow group along with evidence in the Early Basal Brunhes and Jaramillo flow groups. Well Middle 2051 shows wastewater influence in the Matuyama and Jaramillo flow groups, while USGS 132 shows wastewater influence in the Middle Basal Brunhes flow groups, South Late Matuyama, and the Matuyama flow group (fig. 19). Figure 20 indicates that basalt flows that show some wastewater influence along the southern boundary are in the Middle and Early Basal Brunhes flow groups, the South Late Matuyama flow group and the Matuyama flow group; however, the strongest influence appears to be in the South Late Matuyama flow group (fig. 20). The concentrations of wastewater constituents such as tritium in deeper zones in wells Middle 2051, USGS 132, USGS 105, and USGS 103 support the concept of groundwater flow deepening in the southwestern part of the INL. The presence of tritium in multiple flow groups may suggest that groundwater is more evenly dispersed where interconnected fractures are present.

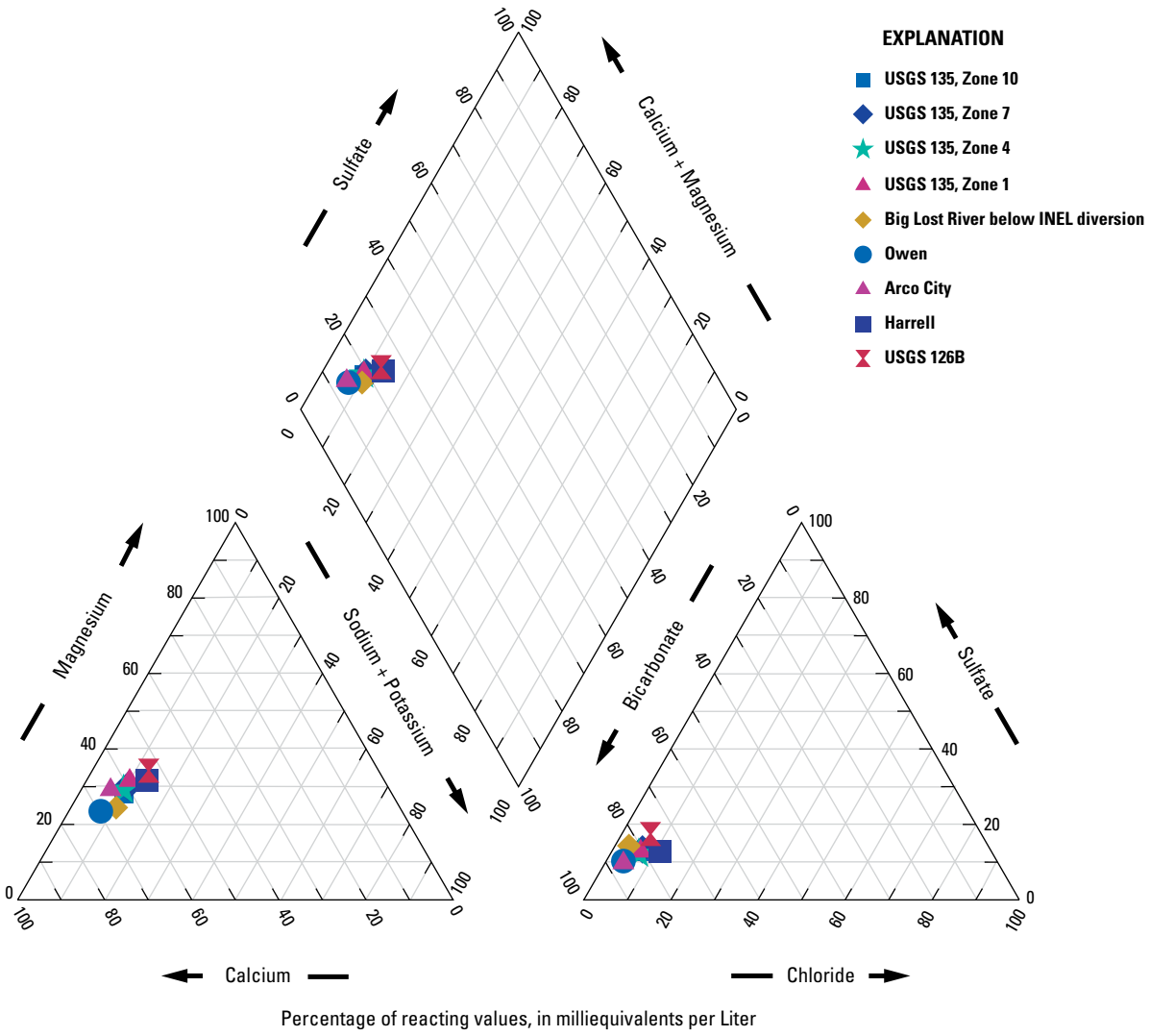


Figure 18. Major-ion composition of water from wells USGS 135, Big Lost River below INEL diversion, Owen, Arco City, Harrell, and USGS 126B, Idaho National Laboratory, Idaho.

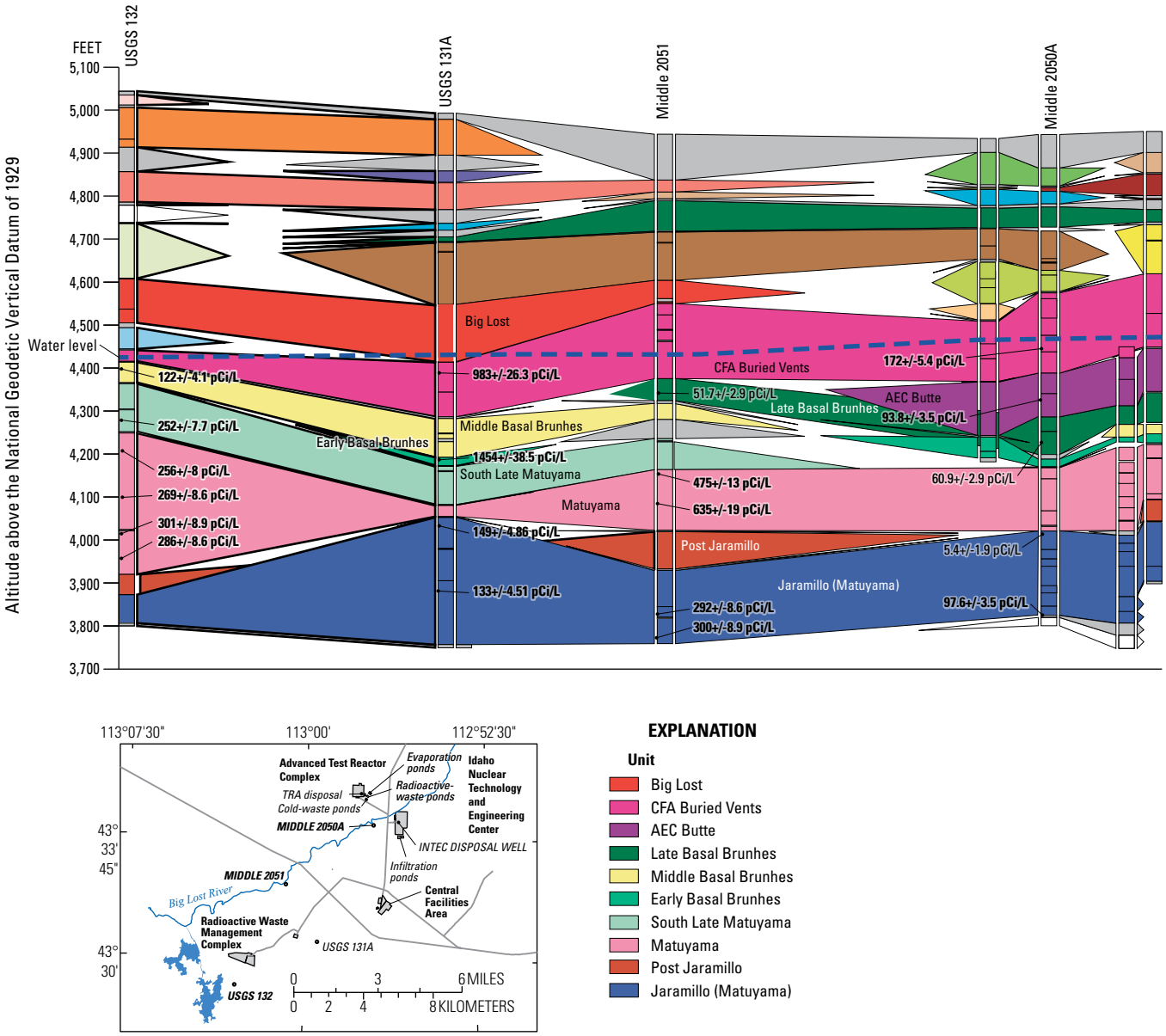


Figure 19. Tritium concentrations in relation to basalt flows from wells Middle 2050A, Middle 2051, USGS 131A, and USGS 132, Idaho National Laboratory, Idaho, 2008–13. Map shows locations of wells in diagram.

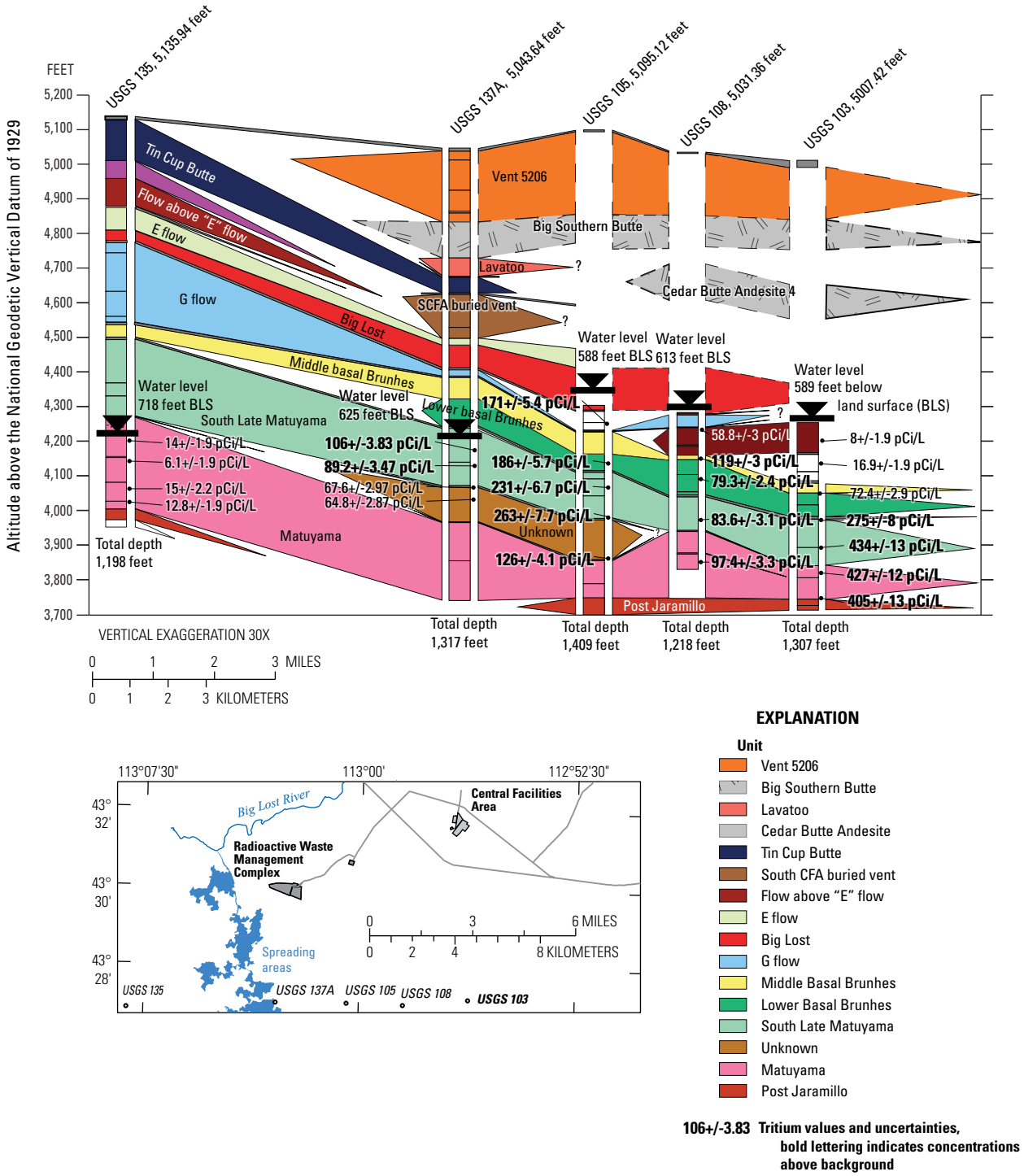


Figure 20. Tritium concentrations in relation to basalt flows from multilevel wells along the southern boundary of the Idaho National Laboratory, Idaho, 2008–13. Map shows locations of wells in diagram.

Summary

Radiochemical and chemical wastewater discharged to infiltration ponds and disposal wells since the early 1950s at the Idaho National Laboratory (INL) has affected the water quality of the eastern Snake River Plain aquifer. In 1949, the U.S. Geological Survey (USGS) initiated an ongoing monitoring program to determine the horizontal movement of selected constituents within the aquifer. In 2005, the USGS, in cooperation with the U.S. Department of Energy, added a multilevel well-monitoring program to begin describing the vertical distribution of these chemical constituents.

Between 2009 and 2013, water samples were collected from four to seven discrete sampling zones, isolated by packers, in the upper 250–750 ft of the aquifer from 11 wells: Middle 2050A, Middle 2051, USGS 103, USGS 105, USGS 108, USGS 131A, USGS 132, USGS 133, USGS 134, USGS 135, and USGS 137A. Samples from five of the newer wells (USGS 105, 108, 131A, 135, and 137A) were analyzed by the USGS National Water Quality Laboratory and (or) the Radiological and Environmental Sciences Laboratory for the following chemical constituents: dissolved cations and anions; trace elements; nutrients; isotopes of oxygen, hydrogen and carbon; total organic carbon; uranium isotopes; tritium; strontium-90; plutonium and americium isotopes; and gross alpha, beta, and gamma radioactivity; and the other six MLMS wells were analyzed for a less inclusive suite of chemicals. The water chemistry of these samples was compared with that of recharge sources throughout the INL, and the results will be used in the future to determine the geochemical evolution of the aquifer and determine if model-simulated source areas and travel times are consistent with field evidence.

Fifteen quality control replicate samples were collected during 2009–13 as a measure of quality assurance; five equipment blanks and two field blanks were collected and consisted of inorganic and organic-free water obtained from the NWQL. Concentrations of major ions and metals in equipment blank samples were near or less than the reporting levels, suggesting no background contamination from field equipment or source water. About 96 percent of the replicate pairs for radionuclide and isotope results were statistically comparable, and about 96 percent of the replicate pairs for the inorganic and organic constituents were statistically comparable. These results indicate that the sample collection and laboratory procedures used were appropriate for the data collected.

The water-chemistry composition of all sampled zones for the five new MLMS is calcium plus magnesium bicarbonate. One of the zones in well USGS 131A does have a slightly different chemistry from the rest of the zones and wells, and the difference is attributed to more wastewater influence from INTEC than the other zones and wells. One well, USGS 135, did not appear to show any influence from wastewater disposal and consisted of mostly older water in all of its zones.

Tritium concentrations plotted in relation to basaltic flow groups indicate the presence of wastewater influence in multiple basalt flow groups; however, tritium is most abundant in the South Late Matuyama flow group in the southern boundary wells. The concentrations of wastewater constituents in deeper zones in wells Middle 2051, USGS 132, USGS 105, and USGS 103 support the concept of groundwater flow deepening in the southwestern corner of the INL as indicated by the INL groundwater-flow model.

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Table 3. Concentrations of dissolved major cations and silica in water from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter (mg/L). NA, not applicable. NS, not sampled. **Remarks:** QAW, quality assurance Westbay™ sample. RPD, Relative percent difference in percent. <, less than]

Well name	Port depth	Date	Calcium		Magnesium		Sodium		Potassium		Silica as SiO_2		Remarks
			mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	
Middle 2050A													
Zone 15	517	08-19-09	NS	NA	NS	NA	8.52	NA	NS	NA	NS	NA	
		06-28-10	NS	NA	NS	NA	8.16	NA	NS	NA	NS	NA	
		06-27-11	NS	NA	NS	NA	8.26	NA	NS	NA	NS	NA	
		06-19-12	NS	NA	NS	NA	6.57	NA	NS	NA	NS	NA	
Zone 16	518	07-10-13	NS	NA	NS	NA	8.04	NA	NS	NA	NS	NA	
Zone 12	644	05-19-09	NS	NA	NS	NA	6.32	NA	NS	NA	NS	NA	
		06-28-09	NS	NA	NS	NA	6.50	NA	NS	NA	NS	NA	
Zone 9	791	08-19-09	NS	NA	NS	NA	7.73	NA	NS	NA	NS	NA	
		06-28-10	NS	NA	NS	NA	8.38	NA	NS	NA	NS	NA	
Zone 6	999	08-19-09	NS	NA	NS	NA	7.60	NA	NS	NA	NS	NA	
		06-28-10	NS	NA	NS	NA	7.89	NA	NS	NA	NS	NA	
Zone 3	1,180	08-19-09	NS	NA	NS	NA	11.6	NA	NS	NA	NS	NA	
		06-28-10	NS	NA	NS	NA	11.6	NA	NS	NA	NS	NA	
Middle 2051													
Zone 12	603	09-03-09	NS	NA	NS	NA	5.60	NA	NS	NA	NS	NA	
		07-01-10	NS	NA	NS	NA	6.03	NA	NS	NA	NS	NA	
Zone 9	749	09-03-09	NS	NA	NS	NA	8.00	NA	NS	NA	NS	NA	
		07-01-10	NS	NA	NS	NA	8.54	NA	NS	NA	NS	NA	
		06-28-11	NS	NA	NS	NA	8.20	NA	NS	NA	NS	NA	
		06-20-12	NS	NA	NS	NA	8.30	NA	NS	NA	NS	NA	
		06-20-13	NS	NA	NS	NA	8.42	NA	NS	NA	NS	NA	
Zone 6	827	09-03-09	NS	NA	NS	NA	8.20	NA	NS	NA	NS	NA	
		07-01-10	NS	NA	NS	NA	8.37	NA	NS	NA	NS	NA	
		06-28-11	NS	NA	NS	NA	8.36	NA	NS	NA	NS	NA	
		06-20-12	NS	NA	NS	NA	8.73	NA	NS	NA	NS	NA	
		06-20-13	NS	NA	NS	NA	8.51	NA	NS	NA	NS	NA	
Zone 3	1,091	09-03-09	NS	NA	NS	NA	7.27	NA	NS	NA	NS	NA	
		07-01-10	NS	NA	NS	NA	5.69	NA	NS	NA	NS	NA	
		06-28-11	NS	NA	NS	NA	7.57	NA	NS	NA	NS	NA	
		06-20-11	NS	NA	NS	NA	7.95	NA	NS	NA	NS	NA	
		06-20-13	NS	NA	NS	NA	7.76	NA	NS	NA	NS	NA	
Zone 1	1,141	09-03-09	NS	NA	NS	NA	7.52	NA	NS	NA	NS	NA	
		07-01-10	NS	NA	NS	NA	7.46	NA	NS	NA	NS	NA	
		06-28-11	NS	NA	NS	NA	7.72	NA	NS	NA	NS	NA	
		06-20-12	NS	NA	NS	NA	7.93	NA	NS	NA	NS	NA	
		06-20-13	NS	NA	NS	NA	7.79	NA	NS	NA	NS	NA	
USGS 103													
Zone 17	680	08-25-09	NS	NA	NS	NA	13.5	NA	NS	NA	NS	NA	
		06-24-10	NS	NA	NS	NA	10.9	NA	NS	NA	NS	NA	
Zone 15	802	08-25-09	NS	NA	NS	NA	11.9	NA	NS	NA	NS	NA	
		06-23-10	NS	NA	NS	NA	12.8	NA	NS	NA	NS	NA	
Zone 12	909	08-25-09	NS	NA	NS	NA	8.72	NA	NS	NA	NS	NA	
		06-23-10	NS	NA	NS	NA	9.40	NA	NS	NA	NS	NA	

Table 3. Concentrations of dissolved major cations and silica in water from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter (mg/L). NA, not applicable. NS, not sampled. **Remarks:** QAW, quality assurance Westbay™ sample. RPD, Relative percent difference in percent. <, less than]

Well name	Port depth	Date	Calcium		Magnesium		Sodium		Potassium		Silica as SiO_2		Remarks
			mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	
USGS 103—Continued													
Zone 9	993	08-24-09	NS	NA	NS	NA	8.19	NA	NS	NA	NS	NA	
		06-23-10	NS	NA	NS	NA	8.81	NA	NS	NA	NS	NA	
	994	06-23-10	NS	NA	NS	NA	8.87	0.7	NS	NA	NS	NA	QAW-18
	993	06-21-11	NS	NA	NS	NA	8.57	NA	NS	NA	NS	NA	
		06-25-12	NS	NA	NS	NA	8.85	NA	NS	NA	NS	NA	
		06-25-13	NS	NA	NS	NA	8.58	NA	NS	NA	NS	NA	
Zone 6	1,087	08-24-09	NS	NA	NS	NA	8.27	NA	NS	NA	NS	NA	
		08-24-09	NS	NA	NS	NA	7.92	4.3	NS	NA	NS	NA	QAW-15
		06-23-10	NS	NA	NS	NA	8.78	NA	NS	NA	NS	NA	
		06-21-11	NS	NA	NS	NA	8.66	NA	NS	NA	NS	NA	
		06-25-12	NS	NA	NS	NA	8.94	NA	NS	NA	NS	NA	
		06-25-13	NS	NA	NS	NA	8.94	NA	NS	NA	NS	NA	
Zone 3	1,210	08-24-09	NS	NA	NS	NA	7.90	NA	NS	NA	NS	NA	
		06-23-10	NS	NA	NS	NA	8.82	NA	NS	NA	NS	NA	
		06-21-11	NS	NA	NS	NA	8.47	NA	NS	NA	NS	NA	
		06-25-12	NS	NA	NS	NA	9.40	NA	NS	NA	NS	NA	
		06-25-13	NS	NA	NS	NA	8.32	NA	NS	NA	NS	NA	
Zone 1	1,258	08-25-09	NS	NA	NS	NA	8.07	NA	NS	NA	NS	NA	
		06-24-10	NS	NA	NS	NA	8.84	NA	NS	NA	NS	NA	
		06-20-11	NS	NA	NS	NA	8.59	NA	NS	NA	NS	NA	
		06-25-12	NS	NA	NS	NA	9.05	NA	NS	NA	NS	NA	
		06-25-13	NS	NA	NS	NA	8.69	NA	NS	NA	NS	NA	
USGS 105													
Zone 13	728	09-18-09	38.6	NA	14.3	NA	11.7	NA	2.8	NA	24.1	NA	
		09-16-10	39.2	NA	14.4	NA	11.5	NA	2.8	NA	23.8	NA	
Zone 11	851	09-18-09	39.3	NA	14.1	NA	11.4	NA	2.7	NA	25.2	NA	
		09-16-10	39.1	NA	14.2	NA	11.6	NA	2.7	NA	24.4	NA	
		09-16-10	40.5	3.5	14.6	3.0	11.9	2.9	2.7	1.9	24.7	1.1	QAW-21
		07-13-11	NS	NA	NS	NA	11.6	NA	NS	NA	NS	NA	
		06-28-12	NS	NA	NS	NA	11.5	NA	NS	NA	NS	NA	
		06-27-13	NS	NA	NS	NA	11.7	NA	NS	NA	NS	NA	
Zone 8	952	09-17-09	39.8	NA	14.8	NA	11.2	NA	2.83	NA	26.4	NA	
		09-15-10	40.2	NA	15.2	NA	11.1	NA	2.78	NA	25.4	NA	
		07-11-11	NS	NA	NS	NA	11.1	NA	NS	NA	NS	NA	
		07-11-11	NS	NA	NS	NA	10.8	2.5	NS	NA	NS	NA	QAW-27
		06-28-12	NS	NA	NS	NA	10.9	NA	NS	NA	NS	NA	
		06-27-13	NS	NA	NS	NA	10.8	NA	NS	NA	NS	NA	
Zone 5	1,072	09-17-09	40.0	NA	14.5	NA	11.3	NA	2.93	NA	26.5	NA	
		09-17-09	38.4	3.9	14.2	2.5	11.1	2.4	2.92	0.3	26.4	0.2	QAW-16
		09-15-10	39.5	NA	14.5	NA	10.9	NA	2.86	NA	25.8	NA	
		07-11-11	NS	NA	NS	NA	11.0	NA	NS	NA	NS	NA	
		06-28-12	NS	NA	NS	NA	11.4	NA	NS	NA	NS	NA	
		06-28-12	NS	NA	NS	NA	11.5	1.4	NS	NA	NS	NA	QAW-32
		06-27-13	NS	NA	NS	NA	11.5	NA	NS	NA	NS	NA	
Zone 2	1,242	09-16-09	39.9	NA	14.2	NA	10.9	NA	2.8	NA	24.3	NA	
		09-15-10	40.7	NA	14.4	NA	11.7	NA	2.7	NA	24.0	NA	

Table 3. Concentrations of dissolved major cations and silica in water from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter (mg/L). NA, not applicable. NS, not sampled. **Remarks:** QAW, quality assurance Westbay™ sample. RPD, Relative percent difference in percent. <, less than]

Well name	Port depth	Date	Calcium		Magnesium		Sodium		Potassium		Silica as SiO_2		Remarks
			mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	
USGS 108													
Zone 11	661	09-21-10	37.6	NA	15.6	NA	11.0	NA	2.58	NA	26.4	NA	
		06-23-11	35.5	NA	15.9	NA	11.4	NA	2.73	NA	28.2	NA	
Zone 9	809	09-21-10	44.5	NA	17.4	NA	8.56	NA	2.42	NA	25.7	NA	
		06-23-11	40.2	NA	17.8	NA	8.70	NA	2.41	NA	27.5	NA	
Zone 7	888	09-20-10	46.8	NA	18.1	NA	8.74	NA	2.37	NA	25.5	NA	
		06-23-11	42.8	NA	18.0	NA	8.34	NA	2.31	NA	26.4	NA	
		06-23-11	42.6	0.4	18.1	0.6	8.59	3.0	2.37	2.6	26.4	0.0	QAW-24
		06-26-12	NS	NA	NS	NA	8.59	NA	NS	NA	NS	NA	
		06-26-13	NS	NA	NS	NA	8.61	NA	NS	NA	NS	NA	
Zone 4	1,029	09-22-10	47.7	NA	18.5	NA	8.42	NA	2.21	NA	24.9	NA	
		09-22-10	47.4	0.5	18.6	0.9	8.44	0.2	2.30	4.0	24.9	0.2	QAW-22
		06-23-11	46.4	NA	18.8	NA	8.16	NA	2.22	NA	26.5	NA	
		06-26-12	NS	NA	NS	NA	8.23	NA	NS	NA	NS	NA	
		06-26-13	NS	NA	NS	NA	8.03	NA	NS	NA	NS	NA	
		06-26-13	NS	NA	NS	NA	7.72	3.9	NS	NA	NS	NA	QAW-39
Zone 1	1,172	09-20-10	50.6	NA	18.9	NA	8.56	NA	2.36	NA	21.6	NA	
		06-22-11	46.2	NA	19.3	NA	8.26	NA	2.40	NA	24.7	NA	
		06-26-12	NS	NA	NS	NA	7.99	NA	NS	NA	NS	NA	
		06-12-13	NS	NA	NS	NA	7.93	NA	NS	NA	NS	NA	
USGS 131A													
Zone 12	616	10-29-12	45.9	NA	15.4	NA	8.30	NA	2.48	NA	22.2	NA	
		07-17-13	42.7	NA	15.2	NA	7.87	NA	2.41	NA	24.3	NA	
		07-17-13	44.0	3.0	15.2	0.1	8.18	3.9	2.58	6.8	27.0	10.4	QAW-41
Zone 8	812	10-29-12	53.7	NA	17.0	NA	10.3	NA	3.42	NA	24.8	NA	
		07-16-13	51.8	NA	16.8	NA	9.64	NA	2.70	NA	25.6	NA	
Zone 5	981	10-29-12	47.9	NA	18.4	NA	8.33	NA	2.13	NA	23.4	NA	
		07-16-13	48.5	NA	18.4	NA	8.45	NA	2.18	NA	24.2	NA	
Zone 3	1,137	10-24-12	48.4	NA	18.5	NA	7.87	NA	2.04	NA	23.5	NA	
		07-16-13	48.3	NA	18.6	NA	7.96	NA	2.02	NA	22.4	NA	
USGS 132													
Zone 17	638	08-27-09	NS	NA	NS	NA	24.1	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	24.9	NA	NS	NA	NS	NA	
		07-06-11	NS	NA	NS	NA	20.8	NA	NS	NA	NS	NA	
Zone 14	765	08-27-09	NS	NA	NS	NA	9.98	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	10.5	NA	NS	NA	NS	NA	
		07-06-11	NS	NA	NS	NA	9.99	NA	NS	NA	NS	NA	
		06-19-12	NS	NA	NS	NA	10.0	NA	NS	NA	NS	NA	
		06-19-13	NS	NA	NS	NA	10.4	NA	NS	NA	NS	NA	
Zone 11	827	08-27-09	NS	NA	NS	NA	8.45	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	8.90	NA	NS	NA	NS	NA	
Zone 8	919	08-27-09	NS	NA	NS	NA	8.57	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	8.85	NA	NS	NA	NS	NA	

Table 3. Concentrations of dissolved major cations and silica in water from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter (mg/L). NA, not applicable. NS, not sampled. **Remarks:** QAW, quality assurance Westbay™ sample. RPD, Relative percent difference in percent. <, less than]

Well name	Port depth	Date	Calcium		Magnesium		Sodium		Potassium		Silica as SiO_2		Remarks
			mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	
USGS 132—Continued													
Zone 5	1,012	08-27-09	NS	NA	NS	NA	8.72	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	9.01	NA	NS	NA	NS	NA	
Zone 1	1,173	08-26-09	NS	NA	NS	NA	11.0	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	11.6	NA	NS	NA	NS	NA	
USGS 133													
Zone 10	469	08-20-09	NS	NA	NS	NA	8.17	NA	NS	NA	NS	NA	
		08-20-09	NS	NA	NS	NA	8.31	1.7	NS	NA	NS	NA	QAW-14
		08-05-10	NS	NA	NS	NA	8.57	NA	NS	NA	NS	NA	
		08-05-10	NS	NA	NS	NA	8.38	2.2	NS	NA	NS	NA	QAW-19
		06-27-11	NS	NA	NS	NA	8.30	NA	NS	NA	NS	NA	
		06-21-12	NS	NA	NS	NA	8.34	NA	NS	NA	NS	NA	
		06-21-12	NS	NA	NS	NA	8.43	1.1	NS	NA	NS	NA	QAW-29
		06-24-13	NS	NA	NS	NA	8.45	NA	NS	NA	NS	NA	
Zone 7	570	08-20-09	NS	NA	NS	NA	7.07	NA	NS	NA	NS	NA	
		08-05-10	NS	NA	NS	NA	7.50	NA	NS	NA	NS	NA	
Zone 4	686	08-20-09	NS	NA	NS	NA	6.77	NA	NS	NA	NS	NA	
		08-05-10	NS	NA	NS	NA	8.07	NA	NS	NA	NS	NA	
Zone 1	746	08-20-09	NS	NA	NS	NA	8.30	NA	NS	NA	NS	NA	
		08-05-10	NS	NA	NS	NA	8.70	NA	NS	NA	NS	NA	
USGS 134													
Zone 15	578	08-18-09	NS	NA	NS	NA	7.88	NA	NS	NA	NS	NA	
		06-22-10	NS	NA	NS	NA	8.07	NA	NS	NA	NS	NA	
		06-29-11	NS	NA	NS	NA	7.50	NA	NS	NA	NS	NA	
		06-29-11	NS	NA	NS	NA	7.57	0.9	NS	NA	NS	NA	QAW-26
Zone 12	646	08-18-09	NS	NA	NS	NA	8.42	NA	NS	NA	NS	NA	
		06-22-10	NS	NA	NS	NA	9.31	NA	NS	NA	NS	NA	
		06-29-11	NS	NA	NS	NA	8.67	NA	NS	NA	NS	NA	
Zone 9	706	08-18-09	26.9	NA	16.0	NA	6.96	NA	2.1	NA	31.7	NA	
		06-21-10	NS	NA	NS	NA	7.59	NA	NS	NA	NS	NA	
		06-21-10	NS	NA	NS	NA	7.96	4.8	NS	NA	NS	NA	QAW-17
		06-18-12	NS	NA	NS	NA	7.80	NA	NS	NA	NS	NA	
		07-10-13	NS	NA	NS	NA	7.24	NA	NS	NA	NS	NA	
Zone 6	807	08-17-09	NS	NA	NS	NA	7.00	NA	NS	NA	NS	NA	
		06-21-10	NS	NA	NS	NA	7.77	NA	NS	NA	NS	NA	
Zone 3	847	08-17-09	NS	NA	NS	NA	8.27	NA	NS	NA	NS	NA	
		06-21-10	NS	NA	NS	NA	10.3	NA	NS	NA	NS	NA	

Table 3. Concentrations of dissolved major cations and silica in water from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter (mg/L). NA, not applicable. NS, not sampled. **Remarks:** QAW, quality assurance Westbay™ sample. RPD, Relative percent difference in percent. <, less than]

Well name	Port depth	Date	Calcium		Magnesium		Sodium		Potassium		Silica as SiO_2		Remarks
			mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	
USGS 135													
Zone 10	738	09-15-09	42.4	NA	11.7	NA	6.66	NA	1.76	NA	19.5	NA	
		09-14-10	42.8	NA	11.9	NA	6.99	NA	1.74	NA	19.1	NA	
Zone 7	837	09-15-09	40.6	NA	12.0	NA	6.52	NA	1.88	NA	19.7	NA	
		09-14-10	36.6	NA	11.5	NA	6.42	NA	1.87	NA	21.9	NA	
		07-07-11	NS	NA	NS	NA	6.34	NA	NS	NA	NS	NA	
		06-21-12	NS	NA	NS	NA	6.18	NA	NS	NA	NS	NA	
		06-24-13	NS	NA	NS	NA	5.99	NA	NS	NA	NS	NA	
		06-24-13	NS	NA	NS	NA	6.27	4.6	NS	NA	NS	NA	QAW-40
Zone 4	988	09-15-09	42.9	NA	12.4	NA	6.63	NA	1.85	NA	20.0	NA	
		09-13-10	42.9	NA	12.2	NA	6.77	NA	1.78	NA	19.5	NA	
Zone 1	1,116	09-14-09	39.1	NA	13.3	NA	6.41	NA	1.91	NA	19.8	NA	
		09-13-10	39.2	NA	12.7	NA	6.55	NA	1.85	NA	18.6	NA	
USGS 137A													
Zone 5	662	10-24-12	38.6	NA	14.9	NA	11.4	NA	2.61	NA	24.8	NA	
		07-15-13	41.2	NA	16.3	NA	12.7	NA	2.97	NA	27.3	NA	
Zone 4	747	10-23-12	40.9	NA	15.5	NA	11.1	NA	2.70	NA	25.9	NA	
		07-15-13	38.7	NA	15.4	NA	11.1	NA	2.80	NA	26.1	NA	
Zone 3	841	10-23-12	41.2	NA	15.3	NA	10.6	NA	2.57	NA	24.8	NA	
		07-15-13	40.8	NA	15.5	NA	10.9	NA	2.64	NA	25.9	NA	
Zone 1	876	10-23-12	41.0	NA	15.4	NA	10.6	NA	2.56	NA	25.2	NA	
		07-15-13	39.7	NA	15.3	NA	11.4	NA	2.70	NA	26.2	NA	
QAW-13	NA	08-20-09	NS	NA	NS	NA	<0.12	NA	NS	NA	NS	NA	Equipment Blank at USGS 133
QAW-20	NA	06-30-10	NS	NA	NS	NA	<0.1	NA	NS	NA	NS	NA	Equipment Blank at USGS 132
QAW-28	NA	07-06-11	NS	NA	NS	NA	<0.06	NA	NS	NA	NS	NA	Equipment Blank at USGS 132
QAW-30	NA	06-21-12	NS	NA	NS	NA	<0.06	NA	NS	NA	NS	NA	Field Blank at USGS 135
QAW-31	NA	06-26-12	NS	NA	NS	NA	<0.06	NA	NS	NA	NS	NA	Equipment Blank at USGS 108
QAW-37	NA	07-10-13	NS	NA	NS	NA	<0.06	NA	NS	NA	NS	NA	Field Blank at USGS 134
QAW-38	NA	07-10-13	NS	NA	NS	NA	<0.06	NA	NS	NA	NS	NA	Equipment Blank at USGS 134

Table 4. Concentrations of dissolved major anions in water from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter (mg/L). Bicarbonate data were calculated from field measurements shown in table 2; alkalinity (as calcium carbonate) was divided by 0.8202 (Hem, 1989, p. 57). NS, not sampled. NA, not applicable. **Remarks:** QAW, quality assurance Westbay™ sample. RPD, relative percent difference in percent. <, less than]

Well name	Port depth	Date	Chloride		Sulfate		Bicarbonate		Fluoride		Remarks
			mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	
Middle 2050A											
Zone 15	517	08-19-09	15.8	NA	NS	NA	NS	NA	NS	NA	
		06-28-10	15.0	NA	NS	NA	NS	NA	NS	NA	
		06-27-11	14.8	NA	NS	NA	NS	NA	NS	NA	
		06-19-12	5.51	NA	19.9	NA	NS	NA	NS	NA	
		07-10-13	12.7	NA	22.4	NA	NS	NA	NS	NA	
Zone 12	644	05-19-09	11.7	NA	NS	NA	NS	NA	NS	NA	
		06-28-09	11.6	NA	NS	NA	NS	NA	NS	NA	
Zone 9	791	08-19-09	11.1	NA	NS	NA	NS	NA	NS	NA	
		06-28-10	11.5	NA	NS	NA	NS	NA	NS	NA	
Zone 6	999	08-19-09	10.8	NA	NS	NA	NS	NA	NS	NA	
		06-28-10	10.6	NA	NS	NA	NS	NA	NS	NA	
Zone 3	1,180	08-19-09	14.9	NA	NS	NA	NS	NA	NS	NA	
		06-28-10	14.8	NA	NS	NA	NS	NA	NS	NA	
Middle 2051											
Zone 12	603	09-03-09	5.8	NA	NS	NA	NS	NA	NS	NA	
		07-01-10	5.9	NA	NS	NA	NS	NA	NS	NA	
Zone 9	749	09-03-09	11.0	NA	NS	NA	NS	NA	NS	NA	
		07-01-10	11.2	NA	NS	NA	NS	NA	NS	NA	
		06-28-11	11.5	NA	NS	NA	NS	NA	NS	NA	
		06-20-12	10.9	NA	24.9	NA	NS	NA	NS	NA	
		06-20-13	10.7	NA	25.9	NA	NS	NA	NS	NA	
Zone 6	827	09-03-09	11.3	NA	NS	NA	NS	NA	NS	NA	
		07-01-10	8.8	NA	NS	NA	NS	NA	NS	NA	
		06-28-11	11.8	NA	NS	NA	NS	NA	NS	NA	
		06-20-12	11.3	NA	25.8	NA	NS	NA	NS	NA	
		06-20-13	11.1	NA	27.1	NA	NS	NA	NS	NA	
Zone 3	1,091	09-03-09	12.2	NA	NS	NA	NS	NA	NS	NA	
		07-01-10	12.5	NA	NS	NA	NS	NA	NS	NA	
		06-28-11	12.7	NA	NS	NA	NS	NA	NS	NA	
		06-20-12	12.2	NA	22.8	NA	NS	NA	NS	NA	
		06-20-13	12.0	NA	23.5	NA	NS	NA	NS	NA	
Zone 1	1,141	09-03-09	12.3	NA	NS	NA	NS	NA	NS	NA	
		07-01-10	12.5	NA	NS	NA	NS	NA	NS	NA	
		06-28-11	12.8	NA	NS	NA	NS	NA	NS	NA	
		06-20-12	12.1	NA	22.7	NA	NS	NA	NS	NA	
		06-20-13	11.9	NA	23.5	NA	NS	NA	NS	NA	
USGS 103											
Zone 17	680	08-25-09	18.7	NA	NS	NA	NS	NA	NS	NA	
		06-24-10	18.7	NA	NS	NA	NS	NA	NS	NA	
Zone 15	802	08-25-09	14.5	NA	NS	NA	NS	NA	NS	NA	
		06-23-10	14.7	NA	NS	NA	NS	NA	NS	NA	
Zone 12	909	08-25-09	10.1	NA	NS	NA	NS	NA	NS	NA	
		06-23-10	10.3	NA	NS	NA	NS	NA	NS	NA	

Table 4. Concentrations of dissolved major anions in water from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter (mg/L). Bicarbonate data were calculated from field measurements shown in table 2; alkalinity (as calcium carbonate) was divided by 0.8202 (Hem, 1989, p. 57). NS, not sampled. NA, not applicable. **Remarks:** QAW, quality assurance Westbay™ sample. RPD, relative percent difference in percent. <, less than]

Well name	Port depth	Date	Chloride		Sulfate		Bicarbonate		Fluoride		Remarks
			mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	
USGS 103—Continued											
Zone 9	993	08-24-09	12.4	NA	NS	NA	NS	NA	NS	NA	
		06-23-10	12.8	NA	NS	NA	NS	NA	NS	NA	
		06-23-10	12.9	0.78	NS	NA	NS	NA	NS	NA	QAW-18
		06-21-11	12.7	NA	NS	NA	NS	NA	NS	NA	
		06-25-12	13.3	NA	20.4	NA	NS	NA	NS	NA	
		06-25-13	12.6	NA	20.6	NA	NS	NA	NS	NA	
Zone 6	1,087	08-24-09	14.3	NA	NS	NA	NS	NA	NS	NA	
		08-24-09	14.2	0.70	NS	NA	NS	NA	NS	NA	QAW-15
		06-23-10	14.8	NA	NS	NA	NS	NA	NS	NA	
		06-21-11	14.6	NA	NS	NA	NS	NA	NS	NA	
		06-25-12	14.6	NA	21.1	NA	NS	NA	NS	NA	
		06-25-13	14.1	NA	22.0	NA	NS	NA	NS	NA	
Zone 3	1,210	08-24-09	14.1	NA	NS	NA	NS	NA	NS	NA	
		06-23-10	14.9	NA	NS	NA	NS	NA	NS	NA	
		06-21-11	14.7	NA	NS	NA	NS	NA	NS	NA	
		06-25-12	14.6	NA	21.4	NA	NS	NA	NS	NA	
		06-25-13	14.0	NA	21.8	NA	NS	NA	NS	NA	
Zone 1	1,258	08-25-09	14.4	NA	NS	NA	NS	NA	NS	NA	
		06-24-10	14.8	NA	NS	NA	NS	NA	NS	NA	
		06-20-11	14.8	NA	NS	NA	NS	NA	NS	NA	
		06-25-12	14.5	NA	22.2	NA	NS	NA	NS	NA	
		06-25-13	14.0	NA	21.9	NA	NS	NA	NS	NA	
USGS 105											
Zone 13	728	09-18-09	12.0	NA	25.1	NA	171	NA	0.239	NA	
		09-16-10	12.4	NA	23.6	NA	166	NA	0.216	NA	
Zone 11	851	09-18-09	11.9	NA	25.2	NA	172	NA	0.246	NA	
		09-16-10	12.3	NA	23.8	NA	176	NA	0.222	NA	
		09-16-10	12.3	0.00	23.8	0.00	176	0	0.226	1.8	QAW-21
		07-13-11	12.7	NA	NS	NA	NS	NA	NS	NA	
		06-28-12	12.1	NA	23.1	NA	NS	NA	NS	NA	
		06-27-13	11.7	NA	24.3	NA	NS	NA	NS	NA	
Zone 8	952	09-17-09	12.9	NA	24.5	NA	171	NA	0.234	NA	
		09-15-10	13.1	NA	23.2	NA	172	NA	0.229	NA	
		07-11-11	13.6	NA	NS	NA	NS	NA	NS	NA	
		07-11-11	13.7	0.73	NS	NA	NS	NA	NS	NA	QAW-27
		06-28-12	13.0	NA	23.7	NA	NS	NA	NS	NA	
		06-27-13	12.4	NA	23.5	NA	NS	NA	NS	NA	
Zone 5	1,072	09-17-09	12.6	NA	24.4	NA	173	NA	0.239	NA	
		09-17-09	12.5	0.8	24.4	0	173	0	0.227	5.2	QAW-16
		09-15-10	12.9	NA	23.2	NA	171	NA	0.237	NA	
		07-11-11	13.4	NA	NS	NA	NS	NA	NS	NA	
		06-28-12	13.2	NA	24.2	NA	NS	NA	NS	NA	
		06-28-12	12.8	3.08	23.7	2.1	NS	NA	NS	NA	QAW-32
		06-27-13	12.4	NA	23.9	NA	NS	NA	NS	NA	
Zone 2	1,242	09-16-09	11.1	NA	24.6	NA	173	NA	0.241	NA	
		09-15-10	11.4	NA	23.6	NA	176	NA	0.252	NA	

Table 4. Concentrations of dissolved major anions in water from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter (mg/L). Bicarbonate data were calculated from field measurements shown in table 2; alkalinity (as calcium carbonate) was divided by 0.8202 (Hem, 1989, p. 57). NS, not sampled. NA, not applicable. **Remarks:** QAW, quality assurance Westbay™ sample. RPD, relative percent difference in percent. <, less than]

Well name	Port depth	Date	Chloride		Sulfate		Bicarbonate		Fluoride		Remarks
			mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	
USGS 108											
Zone 11	661	09-21-10	15.9	NA	23.2	NA	158	NA	0.266	NA	
		06-23-11	16.4	NA	23.6	NA	171	NA	0.264	NA	
Zone 9	809	09-21-10	16.1	NA	23.4	NA	180	NA	0.192	NA	
		06-23-11	16.6	NA	24.3	NA	176	NA	0.185	NA	
Zone 7	888	09-20-10	16.7	NA	23.9	NA	185	NA	0.178	NA	
		06-23-11	16.8	NA	24.2	NA	190	NA	0.170	NA	
		06-23-11	16.9	0.59	24.3	0.41	190	0	0.169	0.6	QAW-24
		06-26-12	16.7	NA	23.4	NA	NS	NA	NS	NA	
		06-26-13	16.6	NA	24.3	NA	NS	NA	NS	NA	
Zone 4	1,029	09-22-10	17.7	NA	24.5	NA	193	NA	0.181	NA	
		09-22-10	17.7	0.00	24.5	0.00	193	0	0.174	3.9	QAW-22
		06-22-11	18.0	NA	25.2	NA	188	NA	0.168	NA	
		06-26-12	17.4	NA	24.5	NA	NS	NA	NS	NA	
		06-26-13	17.4	NA	24.5	NA	NS	NA	NS	NA	
		06-26-13	17.4	0.00	24.5	0.00	NS	NA	NS	NA	QAW-39
Zone 1	1,172	09-20-10	17.3	NA	24.5	NA	200	NA	0.196	NA	
		06-22-11	17.7	NA	25.0	NA	199	NA	0.185	NA	
		06-26-12	17.1	NA	24.5	NA	NS	NA	NS	NA	
		06-12-13	17.1	NA	24.5	NA	NS	NA	NS	NA	
USGS 131A											
Zone 12	616	10-29-12	16.1	NA	22.9	NA	171	NA	0.196	NA	
		07-17-13	16.2	NA	23.1	NA	169	NA	0.213	NA	
		07-17-13	16.1	0.62	23.1	0.00	169	0	0.209	1.9	QAW-41
Zone 8	812	10-29-12	26.0	NA	26.6	NA	180	NA	0.177	NA	
		07-16-13	26.2	NA	27.4	NA	180	NA	0.181	NA	
Zone 5	981	10-29-12	13.5	NA	22.5	NA	200	NA	0.150	NA	
		07-16-13	12.9	NA	22.9	NA	196	NA	0.172	NA	
Zone 3	1,137	10-24-12	14.0	NA	22.4	NA	202	NA	0.149	NA	
		07-16-13	13.2	NA	22.9	NA	204	NA	0.173	NA	
USGS 132											
Zone 17	638	08-27-09	19.7	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	16.5	NA	NS	NA	NS	NA	NS	NA	
		07-06-11	17.2	NA	NS	NA	NS	NA	NS	NA	
Zone 14	765	08-27-09	11.3	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	11.0	NA	NS	NA	NS	NA	NS	NA	
		07-06-11	11.8	NA	NS	NA	NS	NA	NS	NA	
		06-19-12	11.4	NA	25.1	NA	NS	NA	NS	NA	
		06-19-13	11.2	NA	26.2	NA	NS	NA	NS	NA	
Zone 11	827	08-27-09	10.4	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	10.2	NA	NS	NA	NS	NA	NS	NA	
Zone 8	919	08-27-09	10.3	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	10.3	NA	NS	NA	NS	NA	NS	NA	
Zone 5	1,012	08-27-09	10.5	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	10.3	NA	NS	NA	NS	NA	NS	NA	

Table 4. Concentrations of dissolved major anions in water from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter (mg/L). Bicarbonate data were calculated from field measurements shown in table 2; alkalinity (as calcium carbonate) was divided by 0.8202 (Hem, 1989, p. 57). NS, not sampled. NA, not applicable. **Remarks:** QAW, quality assurance Westbay™ sample. RPD, relative percent difference in percent. <, less than]

Well name	Port depth	Date	Chloride		Sulfate		Bicarbonate		Fluoride		Remarks
			mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	
USGS 132—Continued											
Zone 1	1,173	08-26-09	10.8	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	10.6	NA	NS	NA	NS	NA	NS	NA	
USGS 133											
Zone 10	469	08-20-09	13.5	NA	NS	NA	NS	NA	NS	NA	
		08-20-09	13.5	0.00	NS	NA	NS	NA	NS	NA	QAW-14
		08-05-10	12.8	NA	NS	NA	NS	NA	NS	NA	
		08-05-10	12.7	0.78	NS	NA	NS	NA	NS	NA	QAW-19
		06-27-11	12.9	NA	NS	NA	NS	NA	NS	NA	
		06-21-12	12.1	NA	19.1	NA	NS	NA	NS	NA	
		06-21-12	12.0	0.83	19.1	0.00	NS	NA	NS	NA	QAW-29
		06-24-13	11.6	NA	18.7	NA	NS	NA	NS	NA	
Zone 7	570	08-20-09	13.6	NA	NS	NA	NS	NA	NS	NA	
		08-05-10	13.6	NA	NS	NA	NS	NA	NS	NA	
Zone 4	686	08-20-09	12.9	NA	NS	NA	NS	NA	NS	NA	
		08-05-10	14.1	NA	NS	NA	NS	NA	NS	NA	
Zone 1	746	08-20-09	15.0	NA	NS	NA	NS	NA	NS	NA	
		08-05-10	14.9	NA	NS	NA	NS	NA	NS	NA	
USGS 134											
Zone 15	578	08-18-09	10.2	NA	NS	NA	NS	NA	NS	NA	
		06-22-10	10.1	NA	NS	NA	NS	NA	NS	NA	
		06-29-11	10.2	NA	NS	NA	NS	NA	NS	NA	
		06-29-11	10.2	0.00	NS	NA	NS	NA	NS	NA	QAW-26
Zone 12	646	08-18-09	10.5	NA	NS	NA	NS	NA	NS	NA	
		06-22-10	10.0	NA	NS	NA	NS	NA	NS	NA	
		06-29-11	9.7	NA	NS	NA	NS	NA	NS	NA	
Zone 9	706	08-18-09	7.8	NA	19.8	NA	NS	NA	0.174	NA	
		06-21-10	7.8	NA	NS	NA	NS	NA	NS	NA	
		06-21-10	7.8	0.13	NS	NA	NS	NA	NS	NA	QAW-17
		06-18-12	7.5	NA	17.8	NA	NS	NA	NS	NA	
		07-10-13	7.3	NA	17.2	NA	NS	NA	NS	NA	
Zone 6	807	08-17-09	10.2	NA	NS	NA	NS	NA	NS	NA	
		06-21-10	10.3	NA	NS	NA	NS	NA	NS	NA	
Zone 3	847	08-17-09	7.6	NA	NS	NA	NS	NA	NS	NA	
		06-21-10	8.4	NA	NS	NA	NS	NA	NS	NA	
USGS 135											
Zone 10	738	09-15-09	7.5	NA	21.4	NA	167	NA	0.231	NA	
		09-14-10	7.6	NA	20.3	NA	166	NA	0.245	NA	
Zone 7	837	09-15-09	7.2	NA	21.1	NA	161	NA	0.226	NA	
		09-14-10	7.1	NA	19.5	NA	141	NA	0.244	NA	
		07-07-11	7.2	NA	NS	NA	NS	NA	NS	NA	
		06-21-12	6.9	NA	19.7	NA	NS	NA	NS	NA	
		06-24-13	6.7	NA	19.2	NA	NS	NA	NS	NA	
		06-24-13	6.7	0.15	19.3	0.52	NS	NA	NS	NA	QAW-40

Table 4. Concentrations of dissolved major anions in water from multiple zones in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter (mg/L). Bicarbonate data were calculated from field measurements shown in table 2; alkalinity (as calcium carbonate) was divided by 0.8202 (Hem, 1989, p. 57). NS, not sampled. NA, not applicable. **Remarks:** QAW, quality assurance Westbay™ sample. RPD, relative percent difference in percent. <, less than]

Well name	Port depth	Date	Chloride		Sulfate		Bicarbonate		Fluoride		Remarks
			mg/L	RPD	mg/L	RPD	mg/L	RPD	mg/L	RPD	
USGS 135—Continued											
Zone 4	988	09-15-09	7.9	NA	21.3	NA	168	NA	0.226	NA	
		09-13-10	7.6	NA	20.3	NA	171	NA	0.230	NA	
Zone 1	1,116	09-14-09	7.4	NA	21.4	NA	158	NA	0.229	NA	
		09-13-10	7.4	NA	20.0	NA	166	NA	0.230	NA	
USGS 137A											
Zone 5	662	10-24-12	14.3	NA	25.5	NA	174	NA	0.192	NA	
		07-15-13	13.7	NA	26.2	NA	173	NA	0.234	NA	
Zone 4	747	10-23-12	12.4	NA	24.3	NA	173	NA	0.204	NA	
		07-15-13	12.0	NA	25.1	NA	173	NA	0.229	NA	
Zone 3	841	10-23-12	11.5	NA	23.8	NA	173	NA	0.19	NA	
		07-15-13	11.0	NA	24.7	NA	177	NA	0.231	NA	
Zone 1	876	10-23-12	11.9	NA	24.1	NA	177	NA	0.202	NA	
		07-15-13	11.0	NA	24.7	NA	176	NA	0.227	NA	
QAW-13		08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	Equipment Blank at USGS 133; FU cap broke, LC1571 and 69 deleted
QAW-20		06-30-10	<0.12	NA	NS	NA	NS	NA	NS	NA	Equipment Blank at USGS 132
QAW-28		07-06-11	<0.06	NA	NS	NA	NS	NA	NS	NA	Equipment Blank at USGS 132
QAW-30		06-21-12	<0.06	NA	<0.09	NA	NS	NA	NS	NA	Field Blank at USGS 135
QAW-31		06-26-12	<0.06	NA	<0.09	NA	NS	NA	NS	NA	Equipment Blank at USGS 108
QAW-37		07-10-13	<0.06	NA	<0.09	NA	NS	NA	NS	NA	Field Blank at USGS 134
QAW-38		07-10-13	<0.06	NA	<0.09	NA	NS	NA	NS	NA	Equipment Blank at USGS 134

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
Middle 2050A												
Zone 15	517	08-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-27-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-19-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 12	644	05-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 9	791	08-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 6	999	08-18-09	NS	NA	NA	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NA	NA	NS	NA	NS	NA	NS	NA
Zone 3	1,180	08-18-09	NS	NA	NA	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NA	NA	NS	NA	NS	NA	NS	NA

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
Middle 2050A—Continued												
Zone 15	517	08-19-09	NS	NA	NS	NA	7.89	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	7.16	NA	NS	NA	NS	NA
		06-27-11	NS	NA	NS	NA	7.18	NA	NS	NA	NS	NA
		06-19-12	NS	NA	NS	NA	1.55	NA	NS	NA	NS	NA
		07-10-13	NS	NA	NS	NA	6.95	NA	NS	NA	NS	NA
Zone 12	644	05-19-09	NS	NA	NS	NA	2.99	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	3.17	NA	NS	NA	NS	NA
Zone 9	791	08-19-09	NS	NA	NS	NA	4.52	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	4.04	NA	NS	NA	NS	NA
Zone 6	999	08-18-09	NS	NA	NS	NA	3.44	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	3.33	NA	NS	NA	NS	NA
Zone 3	1,180	08-18-09	NS	NA	NS	NA	1.12 E	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	0.819 E	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
Middle 2050A—Continued												
Zone 15	517	08-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	1.85	NA	NS	NA	NS	NA
		06-27-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-19-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 12	644	05-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	1.97	NA	NS	NA	NS	NA
Zone 9	791	08-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	2.86	NA	NS	NA	NS	NA
Zone 6	999	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	3.13	NA	NS	NA	NS	NA
Zone 3	1,180	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	4.16	NA	NS	NA	NS	NA

Well name	Port depth	Date	Molybdenum		Nickel		Selenium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
Middle 2050A—Continued												
Zone 15	517	08-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-27-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-19-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 12	644	05-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 9	791	08-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 6	999	08-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 3	1,180	08-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
Middle 2050A—Continued													
Zone 15	517	08-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-27-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-19-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 12	644	05-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 9	791	08-19-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 6	999	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 3	1,180	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
Middle 2051												
Zone 12	603	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 9	749	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 6	827	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 3	1,091	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	1,141	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
Middle 2051—Continued												
Zone 12	603	09-03-09	NS	NA	NS	NA	1.19 E	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	0.790 E	NA	NS	NA	NS	NA
Zone 9	749	09-03-09	NS	NA	NS	NA	7.16	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	6.43	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	6.40	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	6.42	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	6.23	NA	NS	NA	NS	NA
Zone 6	827	09-03-09	NS	NA	NS	NA	8.05	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	7.34	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	6.54	NA	NS	NA	NS	NA
		09-03-09	NS	NA	NS	NA	7.12	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	7.34	NA	NS	NA	NS	NA
Zone 3	1,091	09-03-09	NS	NA	NS	NA	6.80	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	4.87	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	5.64	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	6.52	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	6.26	NA	NS	NA	NS	NA
Zone 1	1,141	09-03-09	NS	NA	NS	NA	6.89	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	6.40	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	5.51	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	6.82	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	6.45	NA	NS	NA	NS	NA

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
Middle 2051—Continued												
Zone 12	603	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	2.05	NA	NS	NA	NS	NA
Zone 9	749	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	2.56	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 6	827	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	2.46	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
Middle 2051—Continued												
Zone 3	1,091	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	2.20	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	1,141	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	3.17	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Well name	Port depth	Date	Molybdenum		Nickel		Selenium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
Middle 2051—Continued												
Zone 12	603	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 9	749	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 6	827	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 3	1,091	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	1,141	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
Middle 2051—Continued													
Zone 12	603	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 9	749	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 6	827	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 3	1,091	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 1	1,141	09-03-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		07-01-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-20-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-20-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 103												
Zone 17	680	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-24-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 15	802	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 12	909	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 9	993	08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 103—Continued												
Zone 6	1,087	08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 3	1,210	08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	1,258	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-24-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 103—Continued												
Zone 17	680	08-25-09	NS	< 1.2	NS	NA	< 1.2	NA	NS	NA	NS	NA
		06-24-10	NS	< 1.2	NS	NA	< 1.2	NA	NS	NA	NS	NA
Zone 15	802	08-25-09	NS	5.24	NS	NA	5.24	NA	NS	NA	NS	NA
		06-23-10	NS	5.53	NS	NA	5.53	NA	NS	NA	NS	NA
Zone 12	909	08-25-09	NS	NA	NS	NA	5.87	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	5.91	NA	NS	NA	NS	NA
Zone 9	993	08-24-09	NS	NA	NS	NA	6.36	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	6.66	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	6.26	6.2	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	6.92	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	6.61	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	6.64	NA	NS	NA	NS	NA
Zone 6	1,087	08-24-09	NS	NA	NS	NA	6.02	NA	NS	NA	NS	NA
		08-24-09	NS	NA	NS	NA	6.02	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	6.74	NA	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	6.44	0.0	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	6.32	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	6.19	NA	NS	NA	NS	NA
Zone 3	1,210	08-24-09	NS	NA	NS	NA	5.90	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	6.14	NA	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	6.13	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	5.73	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	5.93	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 103—Continued												
Zone 1	1,258	08-25-09	NS	NA	NS	NA	6.03	NA	NS	NA	NS	NA
		06-24-10	NS	NA	NS	NA	5.47	NA	NS	NA	NS	NA
		06-20-11	NS	NA	NS	NA	6.54	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	5.77	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	6.05	NA	NS	NA	NS	NA

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 103—Continued												
Zone 17	680	08-25-09	NS	NA	NS	NA	6.66	NA	NS	NA	NS	NA
		06-24-10	NS	NA	NS	NA	5.65	NA	NS	NA	NS	NA
Zone 15	802	08-25-09	NS	NA	NS	NA	4.74	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	6.09	NA	NS	NA	NS	NA
Zone 12	909	08-25-09	NS	NA	NS	NA	4.34	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	5.41	NA	NS	NA	NS	NA
Zone 9	993	08-24-09	NS	NA	NS	NA	2.42	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	3.23	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	3.21	0.6	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 6	1,087	08-24-09	NS	NA	NS	NA	2.17	NA	NS	NA	NS	NA
		08-24-09	NS	NA	NS	NA	2.15	0.9	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	2.96	NA	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 3	1,210	08-24-09	NS	NA	NS	NA	2.08	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	3.01	NA	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	1,258	08-25-09	NS	NA	NS	NA	2.17	NA	NS	NA	NS	NA
		06-24-10	NS	NA	NS	NA	2.90	NA	NS	NA	NS	NA
		06-20-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Molybdenum		Nickel		Selenium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 103—Continued												
Zone 17	680	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-24-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 15	802	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 12	909	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 9	993	08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 6	1,087	08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 3	1,210	08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	1,258	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-24-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-20-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
USGS 103—Continued													
Zone 17	680	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-24-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 15	802	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 12	909	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 9	993	08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	QAW-18
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
USGS 103—Continued													
Zone 6	1,087	08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	QAW-105
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 3	1,210	08-24-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-23-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-21-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 1	1,258	08-25-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-24-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-20-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-25-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-25-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 105												
Zone 13	728	09-18-09	3.95 E	NA	0.099	NA	1.59	NA	31.5	NA	<0.2	NA
		09-16-10	5.47	NA	0.120	NA	1.44	NA	31.6	NA	<0.2	NA
Zone 11	851	09-18-09	4.71	NA	0.105	NA	1.87	NA	33.9	NA	<0.2	NA
		09-16-10	6.23	NA	0.150	NA	1.62	NA	32.5	NA	<0.2	NA
		09-16-10	6.42	3.0	0.120	22.2	1.63	0.6	32.9	1.2	<0.2	0.0
		07-13-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		09-17-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 8	952	09-17-09	4.68	NA	0.096	NA	1.78	NA	33.2	NA	<0.2	NA
		09-15-10	5.96	NA	0.120	NA	1.63	NA	30.6	NA	<0.2	NA
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-27-13	NS	NA	NS	NA	NS	0.6	NS	NA	NS	NA
Zone 5	1,072	09-17-09	5.40	NA	0.110	NA	1.79	NA	33.1	NA	<0.2	NA
		09-17-09	8.34	42.8	0.101	8.5	1.78	0.6	33.5	1.2	<0.2	0.0
		09-15-10	5.97	NA	0.124	NA	1.61	NA	30.7	NA	<0.2	NA
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-27-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 2	1,242	09-16-09	5.24	NA	0.010	NA	1.72	NA	35.3	NA	<0.2	NA
		09-15-10	6.76	NA	0.123	NA	1.63	NA	33.3	NA	<0.2	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 105—Continued												
Zone 13	728	09-18-09	0.032	NA	0.018 E	NA	5.72	NA	0.162	NA	<1	NA
		09-16-10	0.034	NA	0.010 E	NA	5.69	NA	0.080	NA	<1	NA
Zone 11	851	09-18-09	0.031	NA	0.016 E	NA	7.43	NA	0.113	NA	< 1	NA
		09-16-10	0.033	NA	0.010 E	NA	7.36	NA	0.100	NA	< 1	NA
		09-16-10	0.031	6.3	0.010 E	0.0	7.33	0.4	0.040	85.7	< 1	0.0
		07-13-11	NS	NA	NS	NA	6.94	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	7.10	NA	NS	NA	NS	NA
		09-17-09	NS	NA	NS	NA	7.45	NA	NS	NA	NS	NA
Zone 8	952	09-17-09	0.035	NA	0.011 E	NA	7.17	NA	0.093	NA	< 1	NA
		09-15-10	0.034	NA	< 0.02	NA	7.32	NA	0.057	NA	< 1	NA
		07-11-11	NS	NA	NS	NA	7.46	NA	NS	NA	NS	NA
		07-11-11	NS	NA	NS	NA	6.85	8.5	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	7.60	NA	NS	NA	NS	NA
		06-27-13	NS	NA	NS	NA	8.15	NA	NS	NA	NS	NA
Zone 5	1,072	09-17-09	0.033	NA	0.011 E	NA	7.78	NA	0.093	NA	< 1	NA
		09-17-09	0.034	3.0	0.014 E	24.0	7.66	1.6	0.087	6.7	< 1	0.0
		09-15-10	0.035	NA	< 0.02	NA	7.90	NA	0.069	NA	< 1	NA
		07-11-11	NS	NA	NS	NA	7.72	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	8.00	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	7.98	0.3	NS	NA	NS	NA
		06-27-13	NS	NA	NS	NA	7.94	NA	NS	NA	NS	NA
Zone 2	1,242	09-16-09	0.032	NA	< 0.02	NA	7.17	NA	0.091	NA	<1	NA
		09-15-10	0.030	NA	< 0.02	NA	7.68	NA	0.093	NA	<1	NA

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 105—Continued												
Zone 13	728	09-18-09	9.20	NA	< 0.06	NA	1.99	NA	11.8	NA	< 0.01	NA
		09-16-10	6.62	NA	0.020 E	NA	2.08	NA	5.47	NA	NS	NA
Zone 11	851	09-18-09	< 4	NA	< 0.06	NA	2.09	NA	0.200	NA	< 0.01	NA
		09-16-10	< 6	NA	0.020 E	NA	2.08	NA	0.310	NA	NS	NA
		09-16-10	< 6	0.0	< 0.030	NC	2.09	0.5	0.180 E	53.1	NS	NA
		07-13-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		09-17-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 8	952	09-17-09	< 4	NA	< 0.06	NA	2.06	NA	0.180 E	NA	< 0.01	NA
		09-15-10	< 6	NA	< 0.030	NA	2.35	NA	0.196 E	NA	NS	NA
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-27-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 105—Continued												
Zone 5	1,072	09-17-09	< 4	NA	< 0.06	NA	2.05	NA	0.153 E	NA	< 0.01	NA
		09-17-09	< 4	0.0	< 0.06	0.0	2.09	1.9	0.137 E	11.0	< 0.01	0.0
		09-15-10	7.30	NA	< 0.030	NA	2.46	NA	0.175 E	NA	NS	NA
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-27-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 2	1,242	09-16-09	< 4	NA	< 0.06	NA	2.04	NA	0.606	NA	< 0.01	NA
		09-15-10	4.3 E	NA	< 0.030	NA	2.31	NA	0.359	NA	NS	NA

Well name	Port depth	Date	Molybdenum		Nickel		Selenium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 105—Continued												
Zone 13	728	09-18-09	1.94	NA	0.548	NA	1.21	NA	<0.008	NA	207	NA
		09-16-10	2.18	NA	0.10 E	NA	1.11	NA	<0.010	NA	227	NA
Zone 11	851	09-18-09	2.20	NA	0.517	NA	1.28	NA	<0.008	NA	218	NA
		09-16-10	2.32	NA	0.110 E	NA	1.15	NA	<0.010	NA	236	NA
		09-16-10	2.32	0.0	0.110 E	0.0	1.13	1.8	<0.010	0.0	235	0.4
		07-13-11	NS	NA	NS	NA	NA	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NA	NA	NS	NA	NS	NA
		09-17-09	NS	NA	NS	NA	NA	NA	NS	NA	NS	NA
Zone 8	952	09-17-09	1.88	NA	0.464	NA	1.29	NA	<0.008	NA	216	NA
		09-15-10	1.80	NA	0.095 E	NA	1.21	NA	<0.010	NA	235	NA
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-27-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 5	1,072	09-17-09	1.94	NA	0.470	NA	1.29	NA	<0.008	NA	218	NA
		09-17-09	1.92	1.0	0.490	4.2	1.23	4.8	<0.008	0.0	218	0.0
		09-15-10	1.87	NA	0.284	NA	1.13	NA	<0.010	NA	232	NA
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-27-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 2	1,242	09-16-09	2.33	NA	0.531	NA	1.28	NA	0.004 E	NA	217	NA
		09-15-10	2.18	NA	0.131	NA	1.14	NA	<0.010	NA	227	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
USGS 105—Continued													
Zone 13	728	09-18-09	< 0.04	NA	0.127	NA	1.62	NA	4.56	NA	7.32	NA	
		09-16-10	< 0.020	NA	0.119	NA	1.74	NA	5.03	NA	10.5	NA	
Zone 11	851	09-18-09	< 0.04	NA	0.250	NA	1.81	NA	5.44	NA	2.70	NA	
		09-16-10	< 0.020	NA	0.198	NA	1.83	NA	5.66	NA	10.5	NA	
		09-16-10	< 0.020	0.0	0.205	3.5	1.84	0.5	5.63	0.05	12.4	16.6	QAW-21
		07-13-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		09-17-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 8	952	09-17-09	< 0.04	NA	0.485	NA	1.70	NA	5.45	NA	2.35	NA	
		09-15-10	< 0.020	NA	0.162	NA	1.83	NA	5.69	NA	13.8	NA	
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	QAW-27
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-27-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 5	1,072	09-17-09	< 0.04	NA	0.131	NA	1.71	NA	5.75	NA	4.04	NA	
		09-17-09	< 0.04	0.0	0.135	3.0	1.69	1.2	5.68	1.2	3.92	3.0	QAW-16
		09-15-10	< 0.020	NA	0.136	NA	1.81	NA	5.94	NA	3.71	NA	
		07-11-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-28-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	QAW-32
		06-27-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 2	1,242	09-16-09	< 0.04	NA	0.631	NA	1.89	NA	5.14	NA	4.79	NA	
		09-15-10	< 0.020	NA	0.576	NA	1.89	NA	5.54	NA	3.00	NA	

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 108												
Zone 11	661	09-21-10	3.33 E	NA	0.118	NA	1.22	NA	35.4	NA	< 0.2	NA
		06-23-11	3.12	NA	0.136	NA	1.62	NA	33.8	NA	< 0.10	NA
Zone 9	809	09-21-10	4.71	NA	0.103	NA	1.53	NA	36.1	NA	< 0.2	NA
		06-23-11	4.62	NA	0.114	NA	1.67	NA	36.9	NA	< 0.10	NA
Zone 7	888	09-20-10	4.13	NA	0.080	NA	1.49	NA	37.8	NA	< 0.2	NA
		06-23-11	4.11	NA	0.104	NA	1.62	NA	38.7	NA	0.103	NA
		06-23-11	4.09	0.5	0.101	2.9	1.62	0.0	38.0	1.8	< 0.10	3.0
		06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 4	1,029	09-22-10	5.45	NA	0.084	NA	1.48	NA	44.3	NA	< 0.2	NA
		09-22-10	5.27	3.4	0.081	3.6	1.44	2.7	44.0	0.7	< 0.2	0.0
		09-22-11	4.95	NA	0.101	NA	1.61	NA	41.7	NA	0.143	NA
		09-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	1,072	09-20-10	4.10	NA	0.088	NA	0.308	NA	40.4	NA	< 0.2	NA
		06-22-11	2.10	NA	0.085	NA	0.467	NA	40.9	NA	0.101	NA
		06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-12-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 108—Continued												
Zone 11	661	09-21-10	0.046	NA	<0.02	NA	1.65	NA	0.120	NA	<1	NA
		06-23-11	0.036	NA	0.018	NA	2.22	NA	0.086	NA	<0.5	NA
Zone 9	809	09-21-10	0.035	NA	<0.02	NA	6.10	NA	0.042	NA	<1	NA
		06-23-11	0.032	NA	0.045	NA	5.79	NA	0.068	NA	<0.5	NA
Zone 7	888	09-20-10	0.036	NA	<0.02	NA	6.04	NA	0.028	NA	<1	NA
		06-23-11	0.036	NA	0.054	NA	5.59	NA	0.046	NA	<0.5	NA
		06-23-11	0.034	5.7	0.060	10.5	5.60	0.2	0.034	30.0	<0.5	0.0
		06-26-12	NS	NA	NS	NA	6.40	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	5.42	NA	NS	NA	NS	NA
Zone 4	1,029	09-22-10	0.042	NA	<0.02	NA	6.05	NA	0.038	NA	<1	NA
		09-22-10	0.038	10.0	<0.02	0.0	5.93	2.0	0.034	11.1	<1	0.0
		09-22-11	0.038	NA	0.041	NA	5.68	NA	0.052	NA	<0.5	NA
		09-26-12	NS	NA	NS	NA	6.41	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	5.29	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	5.51	4.1	NS	NA	NS	NA
Zone 1	1,072	09-20-10	0.039	NA	0.013 E	NA	2.94	NA	0.084	NA	4.33	NA
		06-22-11	0.035	NA	0.036	NA	5.16	NA	0.072	NA	<0.5	NA
		06-26-12	NS	NA	NS	NA	6.12	NA	NS	NA	NS	NA
		06-12-13	NS	NA	NS	NA	5.88	NA	NS	NA	NS	NA

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 108—Continued												
Zone 11	661	09-21-10	40.6	NA	<0.030	NA	2.91	NA	28.3	NA	< 0.010	NA
		06-23-11	65.8	NA	<0.015	NA	3.74	NA	6.86	NA	NS	NA
Zone 9	809	09-21-10	<6	NA	<0.030	NA	2.34	NA	0.220	NA	< 0.010	NA
		06-23-11	<3.2	NA	<0.015	NA	2.33	NA	0.239	NA	NS	NA
Zone 7	888	09-20-10	<6	NA	<0.030	NA	2.26	NA	<0.26	NA	< 0.010	NA
		06-23-11	<3.2	NA	<0.015	NA	2.18	NA	0.271	NA	NS	NA
		06-23-11	5.92	59.6	<0.015	0.0	2.20	0.9	0.256	5.7	NS	NA
		06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 4	1,029	09-22-10	<6	NA	<0.030	NA	2.37	NA	<0.26	NA	< 0.010	NA
		09-22-10	<6	0.0	<0.030	0.0	2.38	0.4	<0.26	0.0	< 0.010	0.0
		09-22-11	<3.2	NA	0.016	NA	2.30	NA	0.209	NA	NS	NA
		09-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	1,072	09-20-10	<6	NA	0.025 E	NA	2.61	NA	25.3	NA	< 0.010	NA
		06-22-11	<3.2	NA	0.017	NA	2.64	NA	26.8	NA	NS	NA
		06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-12-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Molybdenum		Nickel		Selenium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 108—Continued												
Zone 11	661	09-21-10	2.30	NA	0.655	NA	1.26	NA	<0.010	NA	194	NA
		06-23-11	2.50	NA	0.153	NA	1.45	NA	<0.005	NA	194	NA
Zone 9	809	09-21-10	1.87	NA	0.187	NA	1.43	NA	<0.010	NA	215	NA
		06-23-11	2.04	NA	0.179	NA	1.48	NA	<0.005	NA	209	NA
Zone 7	888	09-20-10	1.78	NA	0.081 E	NA	1.48	NA	<0.010	NA	222	NA
		06-23-11	1.92	NA	0.151	NA	1.44	NA	<0.005	NA	210	NA
		06-23-11	1.94	1.0	0.144	4.7	1.43	0.7	<0.005	0.0	210	0.0
		06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 4	1,029	09-22-10	1.64	NA	0.284	NA	1.47	NA	<0.010	NA	231	NA
		09-22-10	1.65	0.6	0.280	1.4	1.46	0.7	<0.010	0.0	230	0.4
		09-22-11	1.84	NA	0.125	NA	1.52	NA	<0.005	NA	219	NA
		09-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	1,072	09-20-10	3.77	NA	1.46	NA	1.45	NA	<0.010	NA	239	NA
		06-22-11	2.55	NA	1.10	NA	1.48	NA	<0.005	NA	223	NA
		06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-12-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
USGS 108—Continued													
Zone 11	661	09-21-10	< 0.020	NA	0.182	NA	1.45	NA	4.90	NA	1.95 E	NA	
		06-23-11	< 0.010	NA	0.188	NA	1.59	NA	5.40	NA	9.50	NA	
Zone 9	809	09-21-10	< 0.020	NA	0.152	NA	1.41	NA	5.11	NA	1.77 E	NA	
		06-23-11	< 0.010	NA	0.139	NA	1.43	NA	5.13	NA	7.79	NA	
Zone 7	888	09-20-10	< 0.020	NA	0.109	NA	1.40	NA	4.58	NA	1.90 E	NA	
		06-23-11	< 0.010	NA	0.114	NA	1.37	NA	4.33	NA	8.40	NA	
		06-23-11	< 0.010	0.0	0.117	2.6	1.39	1.4	4.35	0.5	8.60	2.4	QAW-24
		06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 4	1,029	09-22-10	< 0.020	NA	0.102	NA	1.42	NA	4.42	NA	1.52 E	NA	
		09-22-10	< 0.020	0.0	0.098	4.0	1.41	0.7	4.34	1.8	1.86 E	20.1	QAW-22
		09-22-11	< 0.010	NA	0.104	NA	1.44	NA	4.22	NA	6.84	NA	
		09-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-26-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	QAW-39
Zone 1	1,072	09-20-10	< 0.020	NA	0.130	NA	1.12	NA	0.586	NA	11.8	NA	
		06-22-11	0.011	NA	0.262	NA	1.36	NA	0.793	NA	13.4	NA	
		06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-12-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 131A												
Zone 12	616	10-29-12	<2.2	NA	0.218	NA	0.494	NA	21.9	NA	<0.10	NA
		07-17-13	3.14	NA	0.184	NA	1.30	NA	22.0	NA	<0.10	NA
		07-17-13	3.11	1.0	0.137	29.3	1.30	0.0	25.0	12.8	<0.10	0.0
Zone 8	812	10-29-12	3.51	NA	0.142	NA	1.30	NA	49.8	NA	<0.10	NA
		07-16-13	3.96	NA	0.135	NA	1.24	NA	47.0	NA	<0.10	NA
Zone 5	981	10-29-12	7.14	NA	0.106	NA	1.49	NA	46.1	NA	<0.10	NA
		07-16-13	7.41	NA	0.116	NA	1.36	NA	43.8	NA	<0.10	NA
Zone 3	1,137	10-24-12	6.61	NA	0.099	NA	1.47	NA	45.9	NA	<0.10	NA
		07-16-13	6.94	NA	0.104	NA	1.42	NA	41.0	NA	<0.10	NA

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 131A—Continued												
Zone 12	616	10-29-12	0.027 E	NA	0.019	NA	6.06	NA	0.219	NA	< 0.8	NA
		07-17-13	0.033	NA	<0.016	NA	10.5	NA	0.260	NA	< 0.8	NA
		07-17-13	0.032	3.1	<0.016	0.0	10.6	0.9	0.082	104.1	< 0.8	0.0
Zone 8	812	10-29-12	0.026 E	NA	<0.016	NA	10.6	NA	0.292	NA	< 0.8	NA
		07-16-13	0.037	NA	<0.016	NA	10.8	NA	0.193	NA	< 0.8	NA
Zone 5	981	10-29-12	0.028 E	NA	<0.016	NA	5.35	NA	0.191	NA	< 0.8	NA
		07-16-13	0.036	NA	<0.016	NA	5.31	NA	0.179	NA	< 0.8	NA
Zone 3	1,137	10-24-12	0.020	NA	<0.016	NA	5.20	NA	0.102	NA	< 0.8	NA
		07-16-13	0.040	NA	<0.016	NA	5.22	NA	0.195	NA	< 0.8	NA

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 131A—Continued												
Zone 12	616	10-29-12	<4.0	NA	<0.025	NA	2.45	NA	0.488	NA	<0.005	NA
		07-17-13	<4.0	NA	<0.025	NA	3.05	NA	0.482	NA	NS	NA
		07-17-13	16.1	120.4	<0.025	0.0	3.07	0.7	0.243	65.9	NS	NA
Zone 8	812	10-29-12	<4.0	NA	<0.025	NA	1.58	NA	0.580	NA	<0.005	NA
		07-16-13	9.01	NA	<0.025	NA	1.99	NA	0.402	NA	NS	NA
Zone 5	981	10-29-12	<4.0	NA	<0.025	NA	1.84	NA	0.471	NA	<0.005	NA
		07-16-13	6.74	NA	0.026	NA	2.01	NA	0.436	NA	NS	NA
Zone 3	1,137	10-24-12	<4.0	NA	<0.025	NA	2.55	NA	0.258	NA	<0.005	NA
		07-16-13	<4.0	NA	<0.025	NA	2.27	NA	0.370	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Molybdenum		Nickel		Selenium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 131A—Continued												
Zone 12	616	10-29-12	6.95	NA	0.756	NA	1.12	NA	<0.005	NA	237	NA
		07-17-13	2.79	NA	0.575	NA	1.08	NA	<0.005	NA	239	NA
		07-17-13	2.84	1.8	0.588	2.2	1.10	1.8	<0.005	0.0	239	NA
Zone 8	812	10-29-12	1.95	NA	0.389	NA	1.31	NA	0.007	NA	278	NA
		07-16-13	1.82	NA	0.409	NA	1.13	NA	<0.005	NA	291	NA
Zone 5	981	10-29-12	1.16	NA	0.347	NA	1.25	NA	<0.005	NA	235	NA
		07-16-13	1.09	NA	0.332	NA	1.15	NA	<0.005	NA	229	NA
Zone 3	1,137	10-24-12	1.10	NA	0.296	NA	1.25	NA	<0.005	NA	234	NA
		07-16-13	1.08	NA	0.379	NA	1.15	NA	<0.005	NA	236	NA

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
USGS 131A—Continued													
Zone 12	616	10-29-12	< 0.010	NA	9.07	NA	1.93	NA	1.15	NA	7.08	NA	
		07-17-13	< 0.010	NA	6.75	NA	1.93	NA	3.89	NA	5.34	NA	
		07-17-13	< 0.010	0.0	6.88	1.9	1.95	1.0	3.92	0.8	5.72	6.9	QAW-41
Zone 8	812	10-29-12	< 0.010	NA	0.491	NA	1.87	NA	4.08	NA	5.22	NA	
		07-16-13	< 0.010	NA	0.332	NA	1.84	NA	4.21	NA	3.75	NA	
Zone 5	981	10-29-12	< 0.010	NA	0.092	NA	1.54	NA	4.04	NA	5.60	NA	
		07-16-13	< 0.010	NA	0.042	NA	1.52	NA	4.10	NA	6.85	NA	
Zone 3	1,137	10-24-12	< 0.010	NA	0.068	NA	1.60	NA	4.04	NA	4.70	NA	
		07-16-13	< 0.010	NA	0.251	NA	1.55	NA	4.08	NA	6.62	NA	

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 132												
Zone 17	638	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 14	765	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-19-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-19-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 11	827	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 8	919	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 5	1,012	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	1,173	08-26-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 132—Continued												
Zone 17	638	08-27-09	NS	NA	NS	NA	10.5	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	8.33	NA	NS	NA	NS	NA
		07-06-11	NS	NA	NS	NA	7.92	NA	NS	NA	NS	NA
Zone 14	765	08-27-09	NS	NA	NS	NA	8.07	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	7.46	NA	NS	NA	NS	NA
		07-06-11	NS	NA	NS	NA	7.81	NA	NS	NA	NS	NA
		06-19-12	NS	NA	NS	NA	7.80	NA	NS	NA	NS	NA
		06-19-13	NS	NA	NS	NA	7.94	NA	NS	NA	NS	NA
Zone 11	827	08-27-09	NS	NA	NS	NA	8.21	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	7.59	NA	NS	NA	NS	NA
Zone 8	919	08-27-09	NS	NA	NS	NA	8.19	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	7.56	NA	NS	NA	NS	NA
Zone 5	1,012	08-27-09	NS	NA	NS	NA	8.41	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	7.78	NA	NS	NA	NS	NA
Zone 1	1,173	08-26-09	NS	NA	NS	NA	8.08	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	7.99	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 132—Continued												
Zone 17	638	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	3.34	NA	NS	NA	NS	NA
		07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 14	765	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	2.84	NA	NS	NA	NS	NA
		07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-19-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-19-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 11	827	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	2.64	NA	NS	NA	NS	NA
Zone 8	919	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	2.55	NA	NS	NA	NS	NA
Zone 5	1,012	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	2.50	NA	NS	NA	NS	NA
Zone 1	1,173	08-26-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	2.59	NA	NS	NA	NS	NA

Well name	Port depth	Date	Molybdemun		Nickel		Selenium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 132—Continued												
Zone 17	638	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 14	765	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-19-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-19-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 11	827	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 8	919	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 5	1,012	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	1,173	08-26-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
USGS 132—Continued													
Zone 17	638	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 14	765	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-19-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-19-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 11	827	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 8	919	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 5	1,012	08-27-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 1	1,173	08-26-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 133												
Zone 10	469	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-27-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-24-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 7	570	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 4	686	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	746	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 133—Continued												
Zone 10	469	08-20-09	NS	NA	NS	NA	3.28	NA	NS	NA	NS	NA
		08-20-09	NS	NA	NS	NA	2.99	9.3	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	4.39	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	3.67	17.9	NS	NA	NS	NA
		06-27-11	NS	NA	NS	NA	4.05	NA	NS	NA	NS	NA
		06-21-12	NS	NA	NS	NA	5.84	NA	NS	NA	NS	NA
		06-21-12	NS	NA	NS	NA	5.72	2.1	NS	NA	NS	NA
		06-24-13	NS	NA	NS	NA	6.44	NA	NS	NA	NS	NA
Zone 7	570	08-20-09	NS	NA	NS	NA	5.70	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	5.20	NA	NS	NA	NS	NA
Zone 4	686	08-20-09	NS	NA	NS	NA	5.36	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	4.46	NA	NS	NA	NS	NA
Zone 1	744	08-20-09	NS	NA	NS	NA	5.06	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	4.50	NA	NS	NA	NS	NA

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 133—Continued												
Zone 10	469	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	1.81	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	1.68	7.4	NS	NA	NS	NA
		06-27-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-24-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 7	570	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	1.91	NA	NS	NA	NS	NA
Zone 4	686	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	2.45	NA	NS	NA	NS	NA
Zone 1	746	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	2.60	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Molybdenum		Nickel		Selenium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 133—Continued												
Zone 10	469	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-27-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-24-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 7	570	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 4	686	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 1	746	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
USGS 133—Continued													
Zone 10	469	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	QAW-14
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	QAW-19
		06-27-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	QAW-29
		06-24-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 7	570	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 4	686	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 1	746	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		08-05-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 134												
Zone 15	578	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-22-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 12	646	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-22-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 9	706	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-18-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 6	807	08-17-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 3	847	08-17-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 134—Continued												
Zone 15	578	08-18-09	NS	NA	NS	NA	6.34	NA	NS	NA	NS	NA
		06-22-10	NS	NA	NS	NA	6.99	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	4.96	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	5.23	5.3	NS	NA	NS	NA
Zone 12	646	08-18-09	NS	NA	NS	NA	5.28	NA	NS	NA	NS	NA
		06-22-10	NS	NA	NS	NA	6.97	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	4.90	NA	NS	NA	NS	NA
Zone 9	706	08-18-09	NS	NA	NS	NA	6.02	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	6.43	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	6.67	3.7	NS	NA	NS	NA
		06-18-12	NS	NA	NS	NA	6.45	NA	NS	NA	NS	NA
		07-10-13	NS	NA	NS	NA	5.5	NA	NS	NA	NS	NA
Zone 6	807	08-17-09	NS	NA	NS	NA	6.04	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	6.78	NA	NS	NA	NS	NA
Zone 3	847	08-17-09	NS	NA	NS	NA	3.01	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	5.61	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 134—Continued												
Zone 15	578	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-22-10	NS	NA	NS	NA	3.09	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 12	646	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-22-10	NS	NA	NS	NA	4.9	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 9	706	08-18-09	<4	NA	NS	NA	NS	NA	0.648	NA	NS	NA
		06-21-10	NS	NA	NS	NA	3.65	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-18-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 6	807	08-17-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	3.32	NA	NS	NA	NS	NA
Zone 3	847	08-17-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	5.47	NA	NS	NA	NS	NA

Well name	Port depth	Date	Molybdenum		Nickel		Selenium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 134—Continued												
Zone 15	578	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-22-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 12	646	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-22-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 9	706	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-18-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 6	807	08-17-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 3	847	08-17-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
USGS 134—Continued													
Zone 15	578	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-22-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	QAW-26
Zone 12	646	08-18-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-22-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-29-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 9	706	08-18-09	<4	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	QAW-17
		06-18-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 6	807	08-17-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Zone 3	847	08-17-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-21-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 135												
Zone 10	738	09-15-09	21.9	NA	0.104	NA	1.48	NA	56.2	NA	<0.2	NA
		09-14-10	7.94	NA	0.117	NA	1.38	NA	56.1	NA	<0.2	NA
Zone 7	837	09-15-09	4.41	NA	0.120	NA	0.881	NA	49.2	NA	<0.2	NA
		09-14-10	5.24	NA	0.120	NA	1.36	NA	42.6	NA	<0.2	NA
		07-07-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-24-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-24-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
Zone 4	988	09-15-09	6.64	NA	0.106	NA	1.28	NA	58.6	NA	<0.2	NA
		09-13-10	5.86	NA	0.114	NA	1.31	NA	58.3	NA	<0.2	NA
Zone 1	1,116	09-14-09	6.74	NA	0.101	NA	1.24	NA	47.8	NA	<0.2	NA
		09-13-10	6.08	NA	0.111	NA	1.29	NA	48.8	NA	<0.2	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 135—Continued												
Zone 10	738	09-15-09	0.023	NA	0.013 E	NA	2.10	NA	0.313	NA	<1	NA
		09-14-10	0.022	NA	0.011 E	NA	2.04	NA	0.088	NA	<1	NA
Zone 7	837	09-15-09	0.023	NA	0.023	NA	1.90	NA	0.178	NA	<1	NA
		09-14-10	0.021	NA	< 0.02	NA	2.28	NA	0.079	NA	<1	NA
		07-07-11	NS	NA	NS	NA	2.73	NA	NS	NA	NS	NA
		06-21-12	NS	NA	NS	NA	2.56	NA	NS	NA	NS	NA
		06-24-13	NS	NA	NS	NA	2.74	NA	NS	NA	NS	NA
		06-24-13	NS	NA	NS	NA	2.40	13.2	NS	NA	NS	NA
Zone 4	988	09-15-09	0.022	NA	0.014 E	NA	2.07	NA	0.203	NA	<1	NA
		09-13-10	0.022	NA	<0.02	NA	1.79	NA	0.089	NA	<1	NA
Zone 1	1,116	09-14-09	0.024	NA	0.013 E	NA	2.28	NA	0.349	NA	<1	NA
		09-13-10	0.022	NA	0.024	NA	1.86	NA	0.122	NA	1.13	NA

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 135—Continued												
Zone 10	738	09-15-09	2.35 E	NA	<0.06	NA	1.63	NA	0.932	NA	<0.01	NA
		09-14-10	6.15	NA	0.025 E	NA	1.94	NA	0.353	NA	NS	NA
Zone 7	837	09-15-09	3.52 E	NA	<0.06	NA	1.59	NA	0.749	NA	<0.01	NA
		09-14-10	3.64 E	NA	<0.030	NA	1.54	NA	0.548	NA	NS	NA
		07-07-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-24-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
		06-24-13	NS	NA	NS	NA	NS	13.2	NS	NA	NS	NA
Zone 4	988	09-15-09	4.84	NA	0.032 E	NA	1.43	NA	5.78	NA	<0.01	NA
		09-13-10	3.76 E	NA	<0.030	NA	1.52	NA	1.23	NA	NS	NA
Zone 1	1,116	09-14-09	<4	NA	<0.06	NA	2.05	NA	9.32	NA	<0.01	NA
		09-13-10	<6	NA	0.021 E	NA	1.76	NA	2.87	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Molybdenum		Nickel		Selenium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 135—Continued												
Zone 10	738	09-15-09	2.19	NA	0.634	NA	1.14	NA	0.013	NA	237	NA
		09-14-10	2.11	NA	0.160	NA	1.02	NA	<0.010	NA	245	NA
Zone 7	837	09-15-09	3.79	NA	2.09	NA	1.11	NA	<0.008	< 0.008	228	NA
		09-14-10	2.97	NA	0.387	NA	1.01	NA	<0.010	< 0.010	218	NA
		07-07-11	NS	NA	NS	NA	NS	NA	NS	NS	NS	NA
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NS	NS	NA
		06-24-13	NS	NA	NS	NA	NS	NA	NS	NS	NS	NA
		06-24-13	NS	NA	NS	NA	NS	13.2	NS	NS	NS	NA
Zone 4	988	09-15-09	3.12	NA	0.780	NA	1.15	NA	< 0.008	< 0.008	241	NA
		09-13-10	2.32	NA	0.181	NA	0.994	NA	< 0.010	< 0.010	248	NA
Zone 1	1,116	09-14-09	2.33	NA	1.37	NA	1.12	NA	< 0.008	< 0.008	246	NA
		09-13-10	2.22	NA	0.625	NA	0.975	NA	< 0.010	< 0.010	246	NA

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
USGS 135—Continued													
Zone 10	738	09-15-09	< 0.04	NA	2.43	NA	1.76	NA	2.64	NA	8.38	NA	
		09-14-10	< 0.020	NA	1.58	NA	1.64	NA	2.74	NA	7.96	NA	
Zone 7	837	09-15-09	< 0.04	NA	3.21	NA	1.57	NA	1.52	NA	28.1	NA	
		09-14-10	< 0.020	NA	1.48	NA	1.39	NA	2.92	NA	6.84	NA	
		07-07-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-24-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
		06-24-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	QAW-40
Zone 4	988	09-15-09	< 0.04	NA	2.85	NA	1.69	NA	2.85	NA	12.4	NA	
		09-13-10	< 0.020	NA	0.773	NA	1.58	NA	2.66	NA	3.48	NA	
Zone 1	1,116	09-14-09	< 0.04	NA	0.854	NA	1.58	NA	3.79	NA	55.1	NA	
		09-13-10	< 0.020	NA	0.320	NA	1.51	NA	3.15	NA	33.2	NA	

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 137A												
Zone 5	738	09-15-09	6.42	NA	0.102	NA	1.51	NA	30.5	NA	< 0.10	NA
		09-14-10	6.00	NA	0.143	NA	1.51	NA	30.6	NA	< 0.10	NA
Zone 4	837	09-15-09	6.57	NA	0.122	NA	1.53	NA	31.1	NA	< 0.10	NA
		09-14-10	6.71	NA	0.145	NA	1.47	NA	28.9	NA	< 0.10	NA
Zone 3	988	09-15-09	6.49	NA	0.145	NA	1.49	NA	32.6	NA	< 0.10	NA
		09-13-10	6.70	NA	0.128	NA	1.45	NA	31.2	NA	< 0.10	NA
Zone 1	1,116	09-14-09	7.66	NA	0.149	NA	1.56	NA	33.4	NA	< 0.10	NA
		09-13-10	7.81	NA	0.145	NA	1.48	NA	31.4	NA	< 0.10	NA

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 137A—Continued												
Zone 5	738	09-15-09	0.039 E	NA	0.032	NA	6.65	NA	0.335	NA	<0.8	NA
		09-14-10	0.038	NA	< 0.016	NA	6.91	NA	0.192	NA	<0.8	NA
Zone 4	837	09-15-09	NS	NA	< 0.016	NA	6.57	NA	0.119	NA	<0.8	NA
		09-14-10	0.033	NA	< 0.016	NA	6.44	NA	0.226	NA	<0.8	NA
Zone 3	988	09-15-09	0.032	NA	0.019	NA	6.13	NA	0.126	NA	<0.8	NA
		09-13-10	0.032	NA	< 0.016	NA	6.20	NA	0.162	NA	<0.8	NA
Zone 1	1,116	09-14-09	0.033 E	NA	< 0.016	NA	6.19	NA	0.178	NA	<0.8	NA
		09-13-10	0.036	NA	0.023	NA	5.97	NA	0.327	NA	<0.8	NA

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 137A—Continued												
Zone 5	738	09-15-09	<4.0	NA	0.027	NA	2.79	NA	0.669	NA	<0.005	NA
		09-14-10	<4.0	NA	<0.025	NA	2.36	NA	0.378	NA	NS	NA
Zone 4	837	09-15-09	<4.0	NA	<0.025	NA	2.50	NA	0.613	NA	<0.005	NA
		09-14-10	<4.0	NA	<0.025	NA	2.09	NA	0.491	NA	NS	NA
Zone 3	988	09-15-09	6.40	NA	<0.025	NA	2.45	NA	0.488	NA	<0.005	NA
		09-13-10	5.54	NA	0.032	NA	1.97	NA	0.385	NA	NS	NA
Zone 1	1,116	09-14-09	<4	NA	<0.025	NA	2.44	NA	0.714	NA	<0.005	NA
		09-13-10	6.95	NA	0.035	NA	2.29	NA	0.822	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Molybdenum		Nickel		Selnium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
USGS 137A—Continued												
Zone 5	738	09-15-09	2.52	NA	0.296	NA	1.16	NA	< 0.005	NA	229	NA
		09-14-10	2.47	NA	0.268	NA	1.12	NA	< 0.005	NA	237	NA
Zone 4	837	09-15-09	2.64	NA	0.470	NA	1.16	NA	< 0.005	NA	241	NA
		09-14-10	2.46	NA	0.338	NA	1.08	NA	< 0.005	NA	233	NA
Zone 3	988	09-15-09	2.54	NA	0.282	NA	1.13	NA	< 0.005	NA	234	NA
		09-13-10	2.48	NA	0.318	NA	1.08	NA	< 0.005	NA	231	NA
Zone 1	1,116	09-14-09	2.55	NA	0.666	NA	1.18	NA	< 0.005	NA	236	NA
		09-13-10	2.52	NA	0.536	NA	1.02	NA	< 0.005	NA	238	NA

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
USGS 137A—Continued													
Zone 5	738	09-15-09	< 0.010	NA	0.146	NA	1.94	NA	5.35	NA	5.87	NA	
		09-14-10	< 0.010	NA	0.107	NA	1.98	NA	5.67	NA	7.71	NA	
Zone 4	837	09-15-09	< 0.010	NA	0.643	NA	2.02	NA	5.41	NA	3.62	NA	
		09-14-10	< 0.010	NA	0.488	NA	1.93	NA	5.42	NA	4.60	NA	
Zone 3	988	09-15-09	< 0.010	NA	0.230	NA	1.99	NA	5.28	NA	8.67	NA	
		09-13-10	< 0.010	NA	0.130	NA	1.95	NA	5.45	NA	5.02	NA	
Zone 1	1,116	09-14-09	< 0.010	NA	5.00	NA	2.03	NA	5.38	NA	6.16	NA	
		09-13-10	< 0.010	NA	1.33	NA	1.96	NA	5.24	NA	9.26	NA	

Well name	Port depth	Date	Aluminum		Antimony		Arsenic		Barium		Beryllium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
QAW-13	NA	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-20	NA	06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-28	NA	07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-30	NA	06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-31	NA	06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-37	NA	07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-38	NA	07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Well name	Port depth	Date	Bromide		Cadmium		Chromium		Cobalt		Copper	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
QAW-13	NA	08-20-09	NS	NA	NS	NA	<1.2	NA	NS	NA	NS	NA
QAW-20	NA	06-30-10	NS	NA	NS	NA	<1.2	NA	NS	NA	NS	NA
QAW-28	NA	07-06-11	NS	NA	NS	NA	<0.6	NA	NS	NA	NS	NA
QAW-30	NA	06-21-12	NS	NA	NS	NA	<0.6	NA	NS	NA	NS	NA
QAW-31	NA	06-26-12	NS	NA	NS	NA	<0.6	NA	NS	NA	NS	NA
QAW-37	NA	07-10-13	NS	NA	NS	NA	<0.6	NA	NS	NA	NS	NA
QAW-38	NA	07-10-13	NS	NA	NS	NA	<0.6	NA	NS	NA	NS	NA

Table 5. Concentrations of selected minor dissolved inorganic constituents in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in micrograms per liter (µg/L). NS, not sampled; NC, not calculated. NA; not applicable; E, estimated. **Remarks:** QAW, quality assurance Westbay™ sample. RPD; Relative percent difference in percent; <, less than]

Well name	Port depth	Date	Iron		Lead		Lithium		Manganese		Mercury	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
QAW-13	NA	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-20	NA	06-30-10	NS	NA	NS	NA	<0.06	NA	NS	NA	NS	NA
QAW-28	NA	07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-30	NA	06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-31	NA	06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-37	NA	07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-38	NA	07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Well name	Port depth	Date	Molybdenum		Nickel		Selenium		Silver		Strontium	
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD
QAW-13	NA	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-20	NA	06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-28	NA	07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-30	NA	06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-31	NA	06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-37	NA	07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA
QAW-38	NA	07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA

Well name	Port depth	Date	Thallium		Tungsten		Uranium		Vanadium		Zinc		Remarks
			µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	µg/L	RPD	
QAW-13	NA	08-20-09	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	Equipment blank at USGS 133
QAW-20	NA	06-30-10	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	Equipment blank at USGS 132
QAW-28	NA	07-06-11	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	Equipment blank at USGS 132
QAW-30	NA	06-21-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	Equipment blank at USGS 135
QAW-31	NA	06-26-12	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	Equipment blank at USGS 108
QAW-37	NA	07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	Equipment blank at USGS 134
QAW-38	NA	07-10-13	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	Equipment blank at USGS 133

Table 6. Concentrations of dissolved nutrients and total organic carbon in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter. E, estimated: NA, not applicable. NS, not sampled. NC, Not calculated. Remarks: QAW, quality assurance westbay sample. RPD, Relative percent difference. <, less than, NCR, not calculated because one of the samples had a concentration less than the reporting level]

Sample identifier	Port depth	Date	Ammonia (as nitrogen)	RPD	Nitrite (as nitrogen)	RPD	Nitrite plus nitrate (as nitrogen)	RPD	Orthophosphate (as phosphorus)	RPD	Total organic carbon	RPD	Remarks
Middle 2050A													
Zone 15	517	08-19-09	< 0.02	NA	< 0.002	NA	0.941	NA	0.029	NA	0.471 E	NA	
		06-28-10	0.012 E	NA	< 0.002	NA	0.902	NA	0.034	NA	< 0.6	NA	
		06-27-11	< 0.01	NA	< 0.001	NA	0.832	NA	0.030	NA	0.300	NA	
		06-19-12	0.013	NA	< 0.001	NA	0.519	NA	0.026	NA	NS	NA	
		07-10-13	< 0.01	NA	< 0.001	NA	0.799	NA	0.030	NA	NS	NA	
Zone 12	644	05-19-09	< 0.02	NA	< 0.002	NA	0.386	NA	0.020	NA	0.723	NA	
		06-28-10	0.013 E	NA	< 0.002	NA	0.401	NA	0.027	NA	< 0.6	NA	
Zone 9	791	08-19-09	< 0.02	NA	< 0.002	NA	0.961	NA	0.020	NA	0.372 E	NA	
		06-28-10	0.015 E	NA	< 0.002	NA	0.968	NA	0.027	NA	< 0.6	NA	
Zone 6	999	08-19-09	< 0.02	NA	< 0.002	NA	0.907	NA	0.016	NA	1.65	NA	
		06-28-10	0.013 E	NA	< 0.002	NA	0.903	NA	0.023	NA	< 0.6	NA	
Zone 3	1,180	08-19-09	0.110	NA	< 0.002	NA	< 0.04	NA	0.016	NA	1.87	NA	
		06-28-10	0.113	NA	< 0.002	NA	< 0.04	NA	0.024	NA	0.991	NA	

Table 6. Concentrations of dissolved nutrients and total organic carbon in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter. E, estimated: NA, not applicable. NS, not sampled. NC, Not calculated. Remarks: QAW, quality assurance westbay sample. RPD, Relative percent difference. <, less than, NCR, not calculated because one of the samples had a concentration less than the reporting level]

Sample identifier	Port depth	Date	Ammonia (as nitrogen)	RPD	Nitrite (as nitrogen)	RPD	Nitrite plus nitrate (as nitrogen)	RPD	Orthophosphate (as phosphorus)	RPD	Total organic carbon	RPD	Remarks
Middle 2051													
Zone 12	603	09-03-09	< 0.02	NA	< 0.002	NA	0.374	NA	0.025	NA	< 0.6	NA	
		07-01-10	0.012 E	NA	< 0.002	NA	0.375	NA	0.034	NA	< 0.6	NA	
Zone 9	749	09-03-09	< 0.02	NA	< 0.002	NA	0.866	NA	0.021	NA	< 0.6	NA	
		07-01-10	0.012 E	NA	< 0.002	NA	0.713	NA	0.021	NA	< 0.6	NA	
		06-28-11	< 0.01	NA	< 0.001	NA	0.836	NA	0.027	NA	< 0.3	NA	
		06-20-12	0.013	NA	< 0.001	NA	0.861	NA	0.020	NA	NS	NA	
		06-20-13	< 0.01	NA	< 0.001	NA	0.836	NA	0.024	NA	NS	NA	
Zone 6	827	09-03-09	< 0.02	NA	< 0.002	NA	0.912	NA	0.021	NA	< 0.6	NA	
		07-01-10	0.011 E	NA	< 0.002	NA	0.909	NA	0.029	NA	< 0.6	NA	
		06-28-11	< 0.010	NA	< 0.001	NA	0.883	NA	0.027	NA	< 0.3	NA	
		06-20-12	0.013	NA	< 0.001	NA	0.887	NA	0.022	NA	NS	NA	
		06-20-13	< 0.01	NA	< 0.001	NA	0.891	NA	0.025	NA	NS	NA	
Zone 3	1,091	09-03-09	< 0.02	NA	< 0.002	NA	0.902	NA	0.016	NA	< 0.6	NA	
		07-01-10	0.011 E	NA	< 0.002	NA	0.912	NA	0.024	NA	< 0.6	NA	
		06-28-11	< 0.01	NA	< 0.001	NA	0.903	NA	0.022	NA	0.303	NA	
		06-20-12	0.012	NA	< 0.001	NA	0.889	NA	0.016	NA	NS	NA	
		06-20-13	0.013	NA	< 0.001	NA	0.901	NA	0.018	NA	NS	NA	
Zone 1	1,141	09-03-09	< 0.02	NA	< 0.002	NA	0.867	NA	0.018	NA	0.359 E	NA	
		07-01-10	0.017 E	NA	< 0.002	NA	0.878	NA	0.025	NA	< 0.6	NA	
		06-28-11	< 0.01	NA	< 0.001	NA	0.855	NA	0.022	NA	0.505	NA	
		06-20-12	0.014	NA	< 0.001	NA	0.863	NA	0.017	NA	NS	NA	
		06-20-13	< 0.01	NA	< 0.001	NA	0.901	NA	0.018	NA	NS	NA	

Table 6. Concentrations of dissolved nutrients and total organic carbon in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter. E, estimated: NA, not applicable. NS, not sampled. NC, Not calculated. Remarks: QAW, quality assurance westbay sample. RPD, Relative percent difference. <, less than, NCR, not calculated because one of the samples had a concentration less than the reporting level]

Sample identifier	Port depth	Date	Ammonia (as nitrogen)	RPD	Nitrite (as nitrogen)	RPD	Nitrite plus nitrate (as nitrogen)	RPD	Orthophosphate (as phosphorus)	RPD	Total organic carbon	RPD	Remarks
USGS 103													
Zone 17	680	08-25-09	0.040	NA	< 0.002	NA	0.094	NA	< 0.008	NA	0.829	NA	
		06-24-10	0.020	NA	< 0.002	NA	0.098	NA	0.005 E	NA	< 0.6	NA	
Zone 15	802	08-25-09	< 0.02	NA	< 0.002	NA	0.665	NA	0.018	NA	0.323 E	NA	
		06-23-10	< 0.02	NA	0.001 E	NA	0.675	NA	0.024	NA	< 0.6	NA	
Zone 12	909	08-25-09	< 0.02	NA	0.002 E	NA	0.504	NA	0.019	NA	0.905	NA	
		06-23-10	< 0.02	NA	0.002	NA	0.493	NA	0.026	NA	< 0.6	NA	
Zone 9	993	08-24-09	< 0.02	NA	< 0.002	NA	0.678	NA	0.018	NA	1.60	NA	
		06-23-10	< 0.02	NA	0.001 E	NA	0.667	NA	0.023	NA	< 0.6	NA	
		06-23-10	0.010 E	NCR	0.001 E	0.0	0.668	0.0	0.023	0.0	< 0.6	0.0	QAW-18
		06-21-11	< 0.01	NA	< 0.001	NA	0.673	NA	0.019	NA	< 0.3	NA	
		06-25-12	< 0.01	NA	< 0.001	NA	0.708	NA	0.017	NA	NS	NA	
		06-25-13	< 0.01	NA	< 0.001	NA	0.720	NA	0.018	NA	NS	NA	
Zone 6	1,087	08-24-09	< 0.02	NA	< 0.002	NA	0.776	NA	0.018	NA	0.300 E	NA	
		08-24-09	< 0.02	0.0	< 0.002	0.0	0.777	0.0	0.019	1.4	0.764	21.8	QAW-15
		06-23-10	< 0.02	NA	0.001 E	NA	0.767	NA	0.024	NA	< 0.6	NA	
		06-21-11	< 0.01	NA	< 0.001	NA	0.770	NA	0.021	NA	< 0.3	NA	
		06-25-12	< 0.01	NA	< 0.001	NA	0.737	NA	0.018	NA	NS	NA	
		06-25-13	0.017	NA	< 0.001	NA	0.579	NA	0.037	NA	NS	NA	
Zone 3	1,210	08-24-09	< 0.02	NA	< 0.002	NA	0.780	NA	0.019	NA	0.352 E	NA	
		06-23-10	< 0.02	NA	0.001 E	NA	0.771	NA	0.024	NA	< 0.6	NA	
		06-21-11	< 0.01	NA	< 0.001	NA	0.780	NA	0.017	NA	< 0.3	NA	
		06-25-12	< 0.01	NA	< 0.001	NA	0.754	NA	0.018	NA	NS	NA	
		06-25-13	< 0.01	NA	< 0.001	NA	0.770	NA	0.019	NA	NS	NA	
Zone 1	1,258	08/25/09	< 0.02	NA	< 0.002	NA	0.782	NA	0.019	NA	0.456 E	NA	
		06/24/10	< 0.02	NA	< 0.002	NA	0.776	NA	0.027	NA	< 0.6	NA	
		06/20/11	< 0.01	NA	< 0.001	NA	0.782	NA	0.017	NA	< 0.3	NA	
		06/25/12	< 0.01	NA	< 0.001	NA	0.769	NA	0.019	NA	NS	NA	
		06/25/13	< 0.01	NA	< 0.001	NA	0.825	NA	0.019	NA	NS	NA	

Table 6. Concentrations of dissolved nutrients and total organic carbon in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter. E, estimated: NA, not applicable. NS, not sampled. NC, Not calculated. Remarks: QAW, quality assurance westbay sample. RPD, Relative percent difference. <, less than, NCR, not calculated because one of the samples had a concentration less than the reporting level]

Sample identifier	Port depth	Date	Ammonia (as nitrogen)	RPD	Nitrite (as nitrogen)	RPD	Nitrite plus nitrate (as nitrogen)	RPD	Orthophosphate (as phosphorus)	RPD	Total organic carbon	RPD	Remarks
USGS 105													
Zone 13	728	09-18-09	< 0.02	NA	0.003	NA	0.600	NA	0.017	NA	0.762	NA	
		09-16-10	< 0.02	NA	< 0.002	NA	0.675	NA	0.023	NA	0.489 E	NA	
Zone 11	851	09-18-09	< 0.02	NA	< 0.002	NA	0.698	NA	0.019	NA	0.430 E	NA	
		09-16-10	< 0.02	NA	< 0.002	NA	0.686	NA	0.025	NA	0.425E	NA	
		09-16-10	< 0.02	0.0	< 0.002	0.0	0.686	0.0	0.025	0.0	0.483E	3.2	QAW-21
		07-13-11	< 0.01	NA	0.001	NA	0.686	NA	0.024	NA	0.381	NA	
		06-28-12	< 0.01	NA	< 0.001	NA	0.662	NA	0.018	NA	NS	NA	
		06-27-13	< 0.01	NA	< 0.001	NA	0.715	NA	0.019	NA	NS	NA	
Zone 8	952	09-17-09	< 0.02	NA	< 0.002	NA	0.782	NA	0.019	NA	0.462 E	NA	
		09-15-10	< 0.02	NA	< 0.002	NA	0.770	NA	0.023	NA	0.350 E	NA	
		07-11-11	< 0.01	NA	< 0.001	NA	0.788	NA	0.024	NA	0.371	NA	
		07-11-11	< 0.01	0.0	< 0.001	0.0	0.782	0.2	0.024	0.0	0.449	4.8	QAW-27
		06-28-12	< 0.01	NA	< 0.001	NA	0.745	NA	0.018	NA	NS	NA	
		06-27-13	< 0.01	NA	< 0.001	NA	0.791	NA	0.018	NA	NS	NA	
Zone 5	1,072	09-17-09	< 0.02	NA	< 0.002	NA	0.746	NA	0.019	NA	0.614	NA	
		09-17-09	< 0.02	0.0	< 0.002	0.0	0.744	0.1	0.018	1.4	0.379 E	11.8	QAW-16
		09-15-10	< 0.02	NA	< 0.002	NA	0.753	NA	0.023	NA	0.459 E	NA	
		07-11-11	< 0.01	NA	< 0.001	NA	0.758	NA	0.024	NA	0.399	NA	
		06-28-12	< 0.01	NA	< 0.001	NA	0.725	NA	0.018	NA	NS	NA	
		06-28-12	< 0.01	0.0	< 0.001	0.0	0.720	0.2	0.018	0.0	NS	NA	QAW-32
		06-27-13	< 0.01	NA	< 0.001	NA	0.776	NA	0.018	NA	NS	NA	
Zone 2	1,242	09-16-09	< 0.02	NA	< 0.002	NA	0.648	NA	0.018	NA	1.02 E	NA	
		09-15-10	< 0.02	NA	< 0.002	NA	0.640	NA	0.023	NA	0.428 E	NA	

Table 6. Concentrations of dissolved nutrients and total organic carbon in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter. E, estimated: NA, not applicable. NS, not sampled. NC, Not calculated. Remarks: QAW, quality assurance westbay sample. RPD, Relative percent difference. <, less than, NCR, not calculated because one of the samples had a concentration less than the reporting level]

Sample identifier	Port depth	Date	Ammonia (as nitrogen)	RPD	Nitrite (as nitrogen)	RPD	Nitrite plus nitrate (as nitrogen)	RPD	Orthophosphate (as phosphorus)	RPD	Total organic carbon	RPD	Remarks
USGS 108													
Zone 11	728	09-21-10	< 0.02	NA	0.001 E	NA	0.718	NA	0.020	NA	0.304 E	NA	
		06-23-11	< 0.01	NA	< 0.001	NA	0.732	NA	0.021	NA	0.327	NA	
Zone 9	851	09-21-10	< 0.02	NA	< 0.002	NA	0.903	NA	0.025	NA	< 0.6	NA	
		06-23-11	< 0.01	NA	< 0.001	NA	0.866	NA	0.025	NA	0.494	NA	
Zone 7	952	09-20-10	< 0.02	NA	< 0.002	NA	0.968	NA	0.024	NA	0.344 E	NA	
		06-23-11	< 0.01	NA	< 0.001	NA	0.914	NA	0.023	NA	0.301	NA	
		06-23-11	< 0.01	0.0	< 0.001	0.0	0.914	0.0	0.023	0.0	0.408	7.5	QAW-24
		06-26-12	< 0.01	NA	< 0.001	NA	0.920	NA	0.018	NA	NS	NA	
		06-26-13	< 0.01	NA	< 0.001	NA	0.977	NA	0.018	NA	NS	NA	
Zone 4	1,072	09-22-10	< 0.02	NA	< 0.002	NA	1.06	NA	0.024	NA	0.346 E	NA	
		09-22-10	< 0.02	0.0	< 0.002	0.0	1.05	0.2	0.024	0.0	0.301 E	0.0	QAW-22
		06-23-11	< 0.01	NA	< 0.001	NA	1.00	NA	0.023	NA	< 0.3	NA	
		06-26-12	< 0.01	NA	< 0.001	NA	1.02	NA	0.017	NA	NS	NA	
		06-26-13	< 0.01	NA	< 0.001	NA	1.06	NA	0.018	NA	NS	NA	
		06-26-13	< 0.01	0.0	< 0.001	0.0	1.06	0.0	0.017	1.4	NS	NA	QAW-39
Zone 1	1,242	09-20-10	< 0.02	NA	0.014	NA	1.01	NA	0.018	NA	0.688	NA	
		06-22-11	0.0142	NA	0.010	NA	0.938	NA	0.021	NA	0.355	NA	
		06-26-12	< 0.01	NA	0.012	NA	0.987	NA	0.020	NA	NS	NA	
		06-12-13	0.011	NA	0.007	NA	1.02	NA	0.023	NA	NS	NA	
USGS 131A													
Zone 12	616	10-29-12	< 0.01	NA	< 0.001	NA	0.881	NA	0.013	NA	NS	NA	
		07-17-13	< 0.01	NA	< 0.001	NA	0.918	NA	0.019	NA	NS	NA	
		07-17-13	< 0.01	0.0	< 0.001	0.0	0.872	1.3	0.019	0.0	NS	NA	QAW-41
Zone 8	812	10-29-12	< 0.01	NA	< 0.001	NA	1.27	NA	0.019	NA	NS	NA	
		07-16-13	< 0.01	NA	< 0.001	NA	1.30	NA	0.017	NA	NS	NA	
Zone 5	981	10-29-12	< 0.01	NA	< 0.001	NA	1.02	NA	0.020	NA	NS	NA	
		07-16-13	< 0.01	NA	< 0.001	NA	1.03	NA	0.018	NA	NS	NA	
Zone 3	1,137	10-24-12	< 0.01	NA	< 0.001	NA	1.03	NA	0.018	NA	NS	NA	
		07-16-13	< 0.01	NA	< 0.001	NA	1.05	NA	0.019	NA	NS	NA	

Table 6. Concentrations of dissolved nutrients and total organic carbon in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter. E, estimated: NA, not applicable. NS, not sampled. NC, Not calculated. Remarks: QAW, quality assurance westbay sample. RPD, Relative percent difference. <, less than, NCR, not calculated because one of the samples had a concentration less than the reporting level]

Sample identifier	Port depth	Date	Ammonia (as nitrogen)	RPD	Nitrite (as nitrogen)	RPD	Nitrite plus nitrate (as nitrogen)	RPD	Orthophosphate (as phosphorus)	RPD	Total organic carbon	RPD	Remarks
USGS 132													
Zone 17	638	08-27-09	< 0.02	NA	< 0.002	NA	0.936	NA	0.019	NA	0.681	NA	
		06-30-10	< 0.02	NA	< 0.002	NA	0.856	NA	0.027	NA	< 0.6	NA	
		07-06-11	< 0.01	NA	< 0.001	NA	0.833	NA	0.026	NA	0.362	NA	
Zone 14	765	08-27-09	< 0.02	NA	< 0.002	NA	0.723	NA	0.019	NA	0.311 E	NA	
		06-30-10	< 0.02	NA	< 0.002	NA	0.726	NA	0.027	NA	< 0.6	NA	
		07-06-11	< 0.01	NA	< 0.001	NA	0.714	NA	0.026	NA	< 0.3	NA	
		06-19-12	0.011	NA	< 0.001	NA	0.725	NA	0.018	NA	NS	NA	
		06-19-13	< 0.01	NA	< 0.001	NA	0.744	NA	0.021	NA	NS	NA	
Zone 11	827	08-27-09	< 0.02	NA	< 0.002	NA	0.682	NA	0.018	NA	1.07	NA	
		06-30-10	< 0.02	NA	< 0.002	NA	0.675	NA	0.026	NA	< 0.6	NA	
Zone 8	919	08-27-09	< 0.02	NA	< 0.002	NA	0.669	NA	0.019	NA	0.724	NA	
		06-30-10	< 0.02	NA	< 0.002	NA	0.671	NA	0.026	NA	< 0.6	NA	
Zone 5	1,012	08-27-09	< 0.02	NA	< 0.002	NA	0.690	NA	0.019	NA	1.56	NA	
		06-30-10	< 0.02	NA	< 0.002	NA	0.677	NA	0.025	NA	< 0.6	NA	
Zone 1	1,173	08-26-09	< 0.02	NA	< 0.002	NA	0.751	NA	0.020	NA	0.908	NA	
		06-30-10	< 0.02	NA	< 0.002	NA	0.747	NA	0.027	NA	< 0.6	NA	

Table 6. Concentrations of dissolved nutrients and total organic carbon in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter. E, estimated: NA, not applicable. NS, not sampled. NC, Not calculated. Remarks: QAW, quality assurance westbay sample. RPD, Relative percent difference. <, less than, NCR, not calculated because one of the samples had a concentration less than the reporting level]

Sample identifier	Port depth	Date	Ammonia (as nitrogen)	RPD	Nitrite (as nitrogen)	RPD	Nitrite plus nitrate (as nitrogen)	RPD	Orthophosphate (as phosphorus)	RPD	Total organic carbon	RPD	Remarks
USGS 133													
Zone 10	469	08-20-09	< 0.02	NA	< 0.002	NA	0.772	NA	0.013	NA	0.923	NA	
		08-20-09	< 0.02	0.0	< 0.002	0.0	0.774	0.1	0.013	0.0	0.628	9.5	QAW-14
		08-05-10	< 0.02	NA	< 0.002	NA	0.781	NA	0.017	NA	0.610	NA	
		08-05-10	< 0.02	0.0	< 0.002	0.0	0.786	0.6	0.017	0.0	0.663	8.3	QAW-19
		06-27-11	< 0.01	NA	< 0.001	NA	0.778	NA	0.021	NA	< 0.3	NA	
		06-21-12	0.015	NA	< 0.001	NA	0.789	NA	0.019	NA	NS	NA	
		06-21-12	0.015	0.0	< 0.001	0.0	0.794	0.2	0.019	0.0	NS	NA	QAW-29
		06-24-13	< 0.01	NA	< 0.001	NA	0.789	NA	0.019	NA	NS	NA	
Zone 7	570	08-20-09	< 0.02	NA	< 0.002	NA	0.900	NA	0.028	NA	0.977	NA	
		08-05-10	< 0.02	NA	< 0.002	NA	0.908	NA	0.030	NA	0.742	NA	
Zone 4	686	08-20-09	< 0.02	NA	< 0.002	NA	0.870	NA	0.022	NA	0.446 E	NA	
		08-05-10	< 0.02	NA	< 0.002	NA	1.07	NA	0.024	NA	0.492 E	NA	
Zone 1	746	08-20-09	< 0.02	NA	< 0.002	NA	1.20	NA	0.022	NA	0.691	NA	
		08-05-10	< 0.02	NA	< 0.002	NA	1.17	NA	0.023	NA	0.560 E	NA	

Table 6. Concentrations of dissolved nutrients and total organic carbon in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter. E, estimated: NA, not applicable. NS, not sampled. NC, Not calculated. Remarks: QAW, quality assurance westbay sample. RPD, Relative percent difference. <, less than, NCR, not calculated because one of the samples had a concentration less than the reporting level]

Sample identifier	Port depth	Date	Ammonia (as nitrogen)	RPD	Nitrite (as nitrogen)	RPD	Nitrite plus nitrate (as nitrogen)	RPD	Orthophosphate (as phosphorus)	RPD	Total organic carbon	RPD	Remarks
USGS 134													
Zone 15	578	08-18-09	< 0.02	NA	< 0.002	NA	0.620	NA	0.276	NA	0.307 E	NA	
		06-22-10	< 0.02	NA	0.001 E	NA	0.611	NA	0.150	NA	< 0.6	NA	
		06-29-11	< 0.01	NA	< 0.001	NA	0.613	NA	0.115	NA	0.381	NA	
		06-29-11	< 0.01	0.0	< 0.001	0.0	0.613	0.0	0.115	0.0	0.464	4.9	QAW-26
Zone 12	646	08-18-09	< 0.02	NA	< 0.002	NA	0.613	NA	1.92	NA	< 0.6	NA	
		06-22-10	0.011 E	NA	0.001 E	NA	0.567	NA	1.70	NA	< 0.6	NA	
		06-29-11	< 0.01	NA	< 0.001	NA	0.545	NA	1.33	NA	0.603	NA	
Zone 9	706	08-18-09	< 0.02	NA	< 0.002	NA	0.459	NA	0.049	NA	1.26	NA	
		06-21-10	< 0.02	NA	0.001 E	NA	0.462	NA	0.053	NA	< 0.6	NA	
		06-21-10	0.011 E	NC	0.001 E	0.0	0.459	0.2	0.052	0.5	< 0.6	0.0	QAW-17
		06-18-12	0.013	NA	< 0.001	NA	0.484	NA	0.041	NA	NS	NA	
		07-10-13	< 0.01	NA	< 0.001	NA	0.468	NA	0.036	NA	NS	NA	
Zone 6	807	08-17-09	< 0.02	NA	< 0.002	NA	0.678	NA	0.637	NA	0.921	NA	
		06-21-10	< 0.02	NA	0.001 E	NA	0.667	NA	0.519	NA	< 0.6	NA	
USGS 135													
Zone 10	738	09-15-09	< 0.02	NA	< 0.002	NA	0.784	NA	0.017	NA	0.607	NA	
		09-14-10	< 0.02	NA	< 0.002	NA	0.765	NA	0.020	NA	0.307 E	NA	
Zone 7	837	09-15-09	< 0.02	NA	0.004	NA	0.655	NA	0.026	NA	0.511 E	NA	
		09-14-10	< 0.02	NA	< 0.002	NA	0.577	NA	0.026	NA	< 0.6	NA	
		07-07-11	< 0.01	NA	< 0.001	NA	0.573	NA	0.025	NA	< 0.3	NA	
		06-21-12	0.013	NA	< 0.001	NA	0.587	NA	0.018	NA	NS	NA	
		06-24-13	< 0.01	NA	< 0.001	NA	0.796	NA	0.019	NA	NS	NA	
		06-24-13	< 0.01	0.0	< 0.001	0.0	0.588	7.5	0.018	1.4	NS	NA	QAW-40
Zone 4	988	09-15-09	< 0.02	NA	0.002 E	NA	0.779	NA	0.025	NA	0.398 E	NA	
		09-13-10	< 0.02	NA	0.001 E	NA	0.770	NA	0.023	NA	0.438 E	NA	
Zone 1	1,116	09-14-09	< 0.02	NA	0.003	NA	0.717	NA	0.026	NA	< 0.6	NA	
		09-13-10	< 0.02	NA	0.005	NA	0.714	NA	0.022	NA	0.367 E	NA	

Table 6. Concentrations of dissolved nutrients and total organic carbon in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[Well locations are shown in figure 2. Port depth in feet below land surface. Analytical results in milligrams per liter. E, estimated: NA, not applicable. NS, not sampled. NC, Not calculated. Remarks: QAW, quality assurance westbay sample. RPD, Relative percent difference. <, less than, NCR, not calculated because one of the samples had a concentration less than the reporting level]

Sample identifier	Port depth	Date	Ammonia (as nitrogen)	RPD	Nitrite (as nitrogen)	RPD	Nitrite plus nitrate (as nitrogen)	RPD	Orthophosphate (as phosphorus)	RPD	Total organic carbon	RPD	Remarks
USGS 137A													
Zone 5	662	10-24-12	< 0.01	NA	< 0.001	NA	0.698	NA	0.016	NA	NS	NA	
		07-15-13	< 0.01	NA	< 0.001	NA	0.705	NA	0.015	NA	NS	NA	
Zone 4	747	10-23-12	< 0.01	NA	< 0.001	NA	0.661	NA	0.016	NA	NS	NA	
		07-15-13	< 0.01	NA	< 0.001	NA	0.665	NA	0.015	NA	NS	NA	
Zone 3	841	10-23-12	< 0.01	NA	0.001	NA	0.614	NA	0.017	NA	NS	NA	
		07-15-13	< 0.01	NA	< 0.001	NA	0.637	NA	0.017	NA	NS	NA	
Zone 1	876	10-23-12	< 0.01	NA	< 0.001	NA	0.633	NA	0.018	NA	NS	NA	
		07-15-13	< 0.01	NA	< 0.001	NA	0.655	NA	0.018	NA	NS	NA	

Sample identifier	Date	Ammonia (as nitrogen)	RPD	Nitrite (as nitrogen)	RPD	Nitrite plus nitrate (as nitrogen)	RPD	Orthophosphate (as phosphorus)	RPD	Total organic carbon	RPD	Remarks
QAW-13	08-20-09	< 0.02	NA	< 0.002	NA	< 0.04	NA	< 0.008	NA	0.328 E	NA	Equipment Blank at USGS 133
QAW-20	06-30-10	0.011 E	NA	< 0.002	NA	< 0.04	NA	< 0.008	NA	< 0.6	NA	Equipment Blank at USGS 132
QAW-28	07-06-11	< 0.010	NA	< 0.0010	NA	< 0.020	NA	< 0.004	NA	< 0.3	NA	Equipment Blank at USGS 132
QAW-30	06-21-12	0.013	NA	< 0.0010	NA	< 0.04	NA	< 0.004	NA	NS	NA	Field Blank at USGS 135
QAW-31	06-26-12	< 0.010	NA	< 0.0010	NA	< 0.04	NA	< 0.004	NA	NS	NA	Equipment Blank at USGS 108
QAW-37	07-10-13	< 0.010	NA	< 0.0010	NA	< 0.04	NA	< 0.004	NA	NS	NA	Field Blank at USGS 134
QAW-38	07-10-13	< 0.010	NA	< 0.0010	NA	< 0.040	NA	< 0.004	NA	NS	NA	Equipment Blank at USGS 134

Table 7. Concentrations of gross alpha-particle radioactivity, gross-beta particle radioactivity, strontium-90, tritium, and cesium-137 in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NS, not sampled. NR, Not requested. Remarks: QAW, quality assurance westbay sample. RESL, Radiological and Environmental Sciences Laboaratory. Menlo Park, U.S. Geological Survey Menlo Park research laboratory]

Sample identifier	Port depth	Date	Gross alpha-particle radioactivity	Z-value	Gross beta-particle radioactivity	Z-value	Strontium-90	Z-value	Tritium (RESL)	Z-value	Tritium (Menlo Park)	Z-value	Cesium-137	Z-value	Remarks
Middle 2050A															
Zone 15	517	08-19-09	3.5 ± 1.2	NA	**3.6 ± 0.8**	NA	NS	NA	60 ± 60	NA	NS	NA	13 ± 10	NA	
		06-28-10	5 ± 3	NA	2.6 ± 1.0	NA	NS	NA	160 ± 60	NA	NS	NA	14 ± 7	NA	
		06-27-11	-2 ± 3	NA	2.5 ± 0.9	NA	NS	NA	170 ± 60	NA	NS	NA	36 ± 13	NA	
		06-19-12	2 ± 2	NA	**12.9 ± 1.2**	NA	NS	NA	20 ± 60	NA	NS	NA	3 ± 5	NA	
		07-10-13	3 ± 2	NA	**2.7 ± 0.8**	NA	NS	NA	80 ± 40	NA	NS	NA	12 ± 7	NA	
Zone 12	644	08-19-09	2.2 ± 1	NA	**2.9 ± 0.8**	NA	NS	NA	-20 ± 60	NA	NS	NA	10 ± 9	NA	
		06-28-09	-1.19 ± 2.66	NA	2.1 ± 1.1	NA	NS	NA	**190 ± 60**	NA	NS	NA	3 ± 14	NA	
Zone 9	797	08-19-09	2.8 ± 1.1	NA	**2.5 ± 0.8**	NA	NS	NA	20 ± 60	NA	NS	NA	24 ± 12	NA	
		06-28-10	2 ± 3	NA	2.2 ± 1.1	NA	NS	NA	-40 ± 60	NA	NS	NA	14.2 ± 18.4	NA	
Zone 6	999	08-19-09	2.4 ± 1	NA	1.4 ± 0.7	NA	**NS**	NA	-90 ± 60	NA	NS	NA	3 ± 9	NA	
		06-28-10	2 ± 3	NA	1.7 ± 1.1	NA	NS	NA	40 ± 60	NA	NS	NA	17 ± 15	NA	
Zone 3	1,180	08-19-09	0.8 ± 0.8	NA	1.1 ± 0.7	NA	NS	NA	120 ± 60	NA	NS	NA	30 ± 20	NA	
		06-28-10	-2 ± 3	NA	2.3 ± 1.2	NA	NS	NA	170 ± 60	NA	NS	NA	12 ± 8	NA	

Table 7. Concentrations of gross alpha-particle radioactivity, gross-beta particle radioactivity, strontium-90, tritium, and cesium-137 in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NS, not sampled. NR, Not requested. Remarks: QAW, quality assurance westbay sample. RESL, Radiological and Environmental Sciences Laboaratory. Menlo Park, U.S. Geological Survey Menlo Park research laboratory]

Sample identifier	Port depth	Date	Gross alpha-particle radioactivity	Z-value	Gross beta-particle radioactivity	Z-value	Strontium-90	Z-value	Tritium (RESL)	Z-value	Tritium (Menlo Park)	Z-value	Cesium-137	Z-value	Remarks
Middle 2051															
Zone 12	603	09-03-09	2.3 ± 1	NA	1.8 ± 0.7	NA	NS	NA	-10 ± 60	NA	NS	NA	32 ± 12	NA	
		07-01-10	3 ± 3	NA	2.6 ± 1.1	NA	NS	NA	**190 ± 60**	NA	NS	NA	19 ± 9	NA	
Zone 9	749	09-03-09	3.4 ± 1.2	NA	**2.8 ± 0.8**	NA	NS	NA	**400 ± 70**	NA	NS	NA	9 ± 9	NA	
		07-01-10	3 ± 3	NA	1.6 ± 1	NA	NS	NA	**490 ± 70**	NA	NS	NA	3 ± 3	NA	
		06-28-11	-0.05 ± 2.29	NA	**4.9 ± 0.9**	NA	NS	NA	**320 ± 70**	NA	NS	NA	18 ± 8	NA	
		06-20-12	2 ± 3	NA	1 ± 0.8	NA	NS	NA	**280 ± 60**	NA	NS	NA	11 ± 7	NA	
		06-20-13	1 ± 1.5	NA	**3.4 ± 0.8**	NA	NS	NA	**340 ± 50**	NA	NS	NA	29 ± 10	NA	
Zone 6	827	09-03-09	**4.1 ± 1.3**	NA	**3.4 ± 0.8**	NA	NS	NA	**440 ± 70**	NA	NS	NA	18 ± 12	NA	
		07-01-10	4 ± 3	NA	2.1 ± 1	NA	NS	NA	**640 ± 80**	NA	NS	NA	14 ± 13	NA	
		06-28-11	4 ± 3	NA	**4.8 ± 0.9**	NA	NS	NA	**500 ± 70**	NA	NS	NA	21 ± 9	NA	
		06-20-12	-2 ± 3	NA	1 ± 1	NA	NS	NA	**520 ± 70**	NA	NS	NA	15 ± 9	NA	
		06-20-13	3 ± 2	NA	**2.1 ± 0.7**	NA	NS	NA	**400 ± 50**	NA	NS	NA	15 ± 8	NA	
Zone 3	1,091	09-03-09	2.4 ± 1	NA	**2.7 ± 0.8**	NA	NS	NA	120 ± 60	NA	NS	NA	5 ± 9	NA	
		07-01-10	0 ± 13	NA	1.5 ± 1.1	NA	NS	NA	**370 ± 70**	NA	NS	NA	15 ± 16	NA	
		06-28-11	-0.02 ± 0.98	NA	**3.6 ± 0.8**	NA	NS	NA	**290 ± 60**	NA	NS	NA	30 ± 11	NA	
		06-20-12	0 ± 2	NA	**8.1 ± 1.1**	NA	NS	NA	120 ± 60	NA	NS	NA	21 ± 11	NA	
		06-20-13	3 ± 2	NA	**2.5 ± 0.8**	NA	NS	NA	**200 ± 50**	NA	NS	NA	17 ± 8	NA	
Zone 1	1,141	09-03-09	2.9 ± 1.1	NA	**2.7 ± 0.8**	NA	NS	NA	**190 ± 60**	NA	NS	NA	30 ± 20	NA	
		07-01-10	1.14 ± 2.8	NA	0.6 ± 1	NA	NS	NA	**370 ± 70**	NA	NS	NA	-30 ± 30	NA	
		06-28-11	-1.15 ± 2.64	NA	**3 ± 0.8**	NA	NS	NA	**200 ± 60**	NA	NS	NA	27 ± 11	NA	
		06-20-12	-1 ± 3	NA	**3.1 ± 0.9**	NA	NS	NA	120 ± 60	NA	NS	NA	10 ± 6	NA	
		06-20-13	5 ± 2	NA	**4.8 ± 0.8**	NA	NS	NA	**210 ± 50**	NA	NS	NA	15 ± 8	NA	

Table 7. Concentrations of gross alpha-particle radioactivity, gross-beta particle radioactivity, strontium-90, tritium, and cesium-137 in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NS, not sampled. NR, Not requested. Remarks: QAW, quality assurance westbay sample. RESL, Radiological and Environmental Sciences Laboaratory. Menlo Park, U.S. Geological Survey Menlo Park research laboratory]

Sample identifier	Port depth	Date	Gross alpha-particle radioactivity	Z-value	Gross beta-particle radioactivity	Z-value	Strontium-90	Z-value	Tritium (RESL)	Z-value	Tritium (Menlo Park)	Z-value	Cesium-137	Z-value	Remarks
USGS 103															
Zone 17	680	08-25-09	-0.152 ± 0.59	NA	2.3 ± 0.7	NA	NS	NA	30 ± 60	NA	NS	NA	5 ± 9	NA	
		06-24-10	1.57 ± 2.64	NA	1.7 ± 1	NA	NS	NA	50 ± 60	NA	NS	NA	17 ± 13	NA	
Zone 15	802	08-25-09	2.5 ± 1	NA	**2.5 ± 0.8**	NA	NS	NA	-40 ± 60	NA	NS	NA	22 ± 9	NA	
		06-23-10	6 ± 3	NA	2.3 ± 1	NA	NS	NA	100 ± 60	NA	NS	NA	17 ± 12	NA	
Zone 12	909	08-25-09	**5.1 ± 1.5**	NA	**3.7 ± 0.8**	NA	NS	NA	30 ± 60	NA	NS	NA	7 ± 8	NA	
		06-23-10	0 ± 20	NA	2.2 ± 1.1	NA	NS	NA	140 ± 60	NA	NS	NA	-15 ± 10	NA	
Zone 9	993	08-24-09	3 ± 1.1	NA	1.5 ± 0.7	NA	NS	NA	80 ± 60	NA	NS	NA	**39 ± 13**	NA	
		06-23-10	2 ± 3	NA	**3.3 ± 1.1**	NA	NS	NA	**320 ± 70**	NA	NS	NA	-1 ± 11	NA	
		06-23-10	5 ± 3	0.71	**3.6 ± 1.1**	0.19	NS	NA	**290 ± 70**	0.30	NS	NA	11 ± 9	0.84	QAW-18
		06-21-11	-0.04 ± 1.8	NA	**4.4 ± 0.9**	NA	NS	NA	130 ± 60	NA	NS	NA	8 ± 8	NA	
		06-25-12	-5 ± 3	NA	2.2 ± 1	NA	NS	NA	120 ± 60	NA	NS	NA	25 ± 8	NA	
		06-25-13	2.7 ± 1.8	NA	2.2 ± 0.8	NA	NS	NA	**240 ± 50**	NA	NS	NA	15 ± 8	NA	
Zone 6	1,087	08-24-09	1.3 ± 0.8	NA	2 ± 0.7	NA	NS	NA	**270 ± 60**	NA	NS	NA	30 ± 13	NA	
		08-24-09	1.6 ± 0.9	0.25	**2.3 ± 0.7**	0.30	NS	NA	**310 ± 70**	0.43	NS	NA	34 ± 14	0.21	QAW-15
		06-23-10	3 ± 3	NA	2.5 ± 1.1	NA	NS	NA	**370 ± 70**	NA	NS	NA	1 ± 4	NA	
		06-21-11	3 ± 3	NA	**4 ± 0.8**	NA	NS	NA	**290 ± 60**	NA	NS	NA	13 ± 8	NA	
		06-25-12	-2 ± 3	NA	**3.6 ± 0.9**	NA	NS	NA	**380 ± 70**	NA	NS	NA	24 ± 10	NA	
		06-25-13	1.1 ± 1.5	NA	2.1 ± 0.8	NA	NS	NA	**280 ± 50**	NA	NS	NA	20 ± 8	NA	
Zone 3	1,210	08-24-09	2.5 ± 1	NA	**3.8 ± 0.8**	NA	NS	NA	**310 ± 70**	NA	NS	NA	23 ± 11	NA	
		06-23-10	8 ± 4	NA	1.9 ± 0.9	NA	NS	NA	**480 ± 70**	NA	NS	NA	-1 ± 9	NA	
		06-21-11	3 ± 3	NA	**5.2 ± 0.9**	NA	NS	NA	**350 ± 70**	NA	NS	NA	7 ± 7	NA	
		06-25-12	0 ± 0.2	NA	2.4 ± 0.9	NA	NS	NA	150 ± 60	NA	NS	NA	28 ± 10	NA	
		06-25-13	2.2 ± 1.7	NA	**3.2 ± 0.8**	NA	NS	NA	**250 ± 50**	NA	NS	NA	17 ± 9	NA	
Zone 1	1,258	08-25-09	0.8 ± 0.8	NA	**2.3 ± 0.7**	NA	NS	NA	**300 ± 60**	NA	NS	NA	20 ± 20	NA	
		06-24-10	13 ± 5	NA	**3.1 ± 1**	NA	NS	NA	**510 ± 70**	NA	NS	NA	12 ± 9	NA	
		06-20-11	3 ± 3	NA	**4.4 ± 0.8**	NA	NS	NA	**380 ± 70**	NA	NS	NA	22 ± 9	NA	
		06-25-12	7 ± 3	NA	**3.1 ± 0.8**	NA	NS	NA	**220 ± 60**	NA	NS	NA	18 ± 7	NA	
		06-25-13	4 ± 2	NA	**3.1 ± 0.8**	NA	NS	NA	**260 ± 50**	NA	NS	NA	26 ± 10	NA	

Table 7. Concentrations of gross alpha-particle radioactivity, gross-beta particle radioactivity, strontium-90, tritium, and cesium-137 in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NS, not sampled. NR, Not requested. Remarks: QAW, quality assurance westbay sample. RESL, Radiological and Environmental Sciences Laboaratory. Menlo Park, U.S. Geological Survey Menlo Park research laboratory]

Sample identifier	Port depth	Date	Gross alpha-particle radioactivity	Z-value	Gross beta-particle radioactivity	Z-value	Strontium-90	Z-value	Tritium (RESL)	Z-value	Tritium (Menlo Park)	Z-value	Cesium-137	Z-value	Remarks
USGS 105															
Zone 13	728	09-18-09	1.4 ± 0.9	NA	1.7 ± 0.7	NA	0.2 ± 0.7	NA	60 ± 60	NA	NS	NA	7 ± 9	NA	
		09-16-10	10 ± 4	NA	**4.3 ± 0.8**	NA	0.7 ± 0.7	NA	140 ± 50	NA	**171.3 ± 5.4**	NA	31 ± 17	NA	
Zone 11	851	09-18-09	**5.8 ± 1.6**	NA	**3.3 ± 0.8**	NA	0.1 ± 0.7	NA	120 ± 60	NA	NS	NA	14 ± 10	NA	
		09-16-10	0 ± 2	NA	**2.6 ± 0.8**	NA	0.5 ± 0.7	NA	**180 ± 50**	NA	**186.3 ± 5.7**	NA	32 ± 11	NA	
		09-16-10	2 ± 2	0.707	**3.3 ± 0.8**	0.619	0 ± 0.8	0.470	**230 ± 50**	0.707	**183.1 ± 5.4**	0.408	-12.4 ± 21.9	1.81	QAW-21
		07-13-11	10 ± 4	NA	**7.1 ± 0.9**	NA	NS	NA	140 ± 60	NA	NS	NA	**30 ± 10**	NA	
		06-28-12	-0.005 ± 0.218	NA	**2.8 ± 0.9**	NA	NS	NA	**190 ± 60**	NA	NS	NA	21 ± 9	NA	
		06-27-13	1.6 ± 1.6	NA	**4.1 ± 0.8**	NA	NS	NA	**190 ± 50**	NA	NS	NA	1 ± 6	NA	
Zone 8	952	09-17-09	2.9 ± 1.1	NA	1.6 ± 0.7	NA	0.5 ± 0.8	NA	**200 ± 60**	NA	NS	NA	20 ± 12	NA	
		09-15-10	1.51 ± 2.13	NA	**5.7 ± 0.9**	NA	0.9 ± 0.7	NA	**680 ± 60**	NA	**231.3 ± 6.7**	NA	**25 ± 8**	NA	
Rerun		09-15-10	NA	NA	NA	NA	NA	NA	**190 ± 50**	NA	NA	NA	NA	NA	
		07-11-11	3 ± 3	NA	**7.3 ± 1**	NA	NS	NA	**230 ± 60**	NA	NS	NA	14 ± 6	NA	
		07-11-11	5 ± 3	0.471	**5.8 ± 0.9**	1.11	NS	NA	**200 ± 60**	0.354	NS	NA	3 ± 6	1.30	QAW-27
		06-28-12	1.13 ± 2.78	NA	1.1 ± 0.8	NA	NS	NA	120 ± 60	NA	NS	NA	29 ± 11	NA	
		06-27-13	2.2 ± 1.7	NA	**3.6 ± 0.8**	NA	NS	NA	**190 ± 50**	NA	NS	NA	12 ± 6	NA	
Zone 5	1,072	09-17-09	1.3 ± 0.8	NA	**3.7 ± 0.8**	NA	0.1 ± 0.7	NA	**270 ± 60**	NA	NS	NA	4 ± 9	NA	
		09-17-09	1.5 ± 0.9	0.166	**5.8 ± 0.9**	1.74	0.6 ± 0.7	0.505	**270 ± 60**	0.00	NS	NA	2 ± 8	0.166	QAW-16
		09-15-10	2 ± 2	NA	**3.7 ± 0.8**	NA	0.6 ± 0.7	NA	**260 ± 50**	NA	**262.9 ± 7.7**	NA	-12 ± 11	NA	
		07-11-11	-1 ± 3	NA	**5.7 ± 0.9**	NA	NS	NA	**250 ± 60**	NA	NS	NA	11 ± 7	NA	
		06-28-12	-3 ± 3	NA	1.4 ± 1	NA	NS	NA	**240 ± 60**	NA	NS	NA	5 ± 5	NA	
		06-28-12	-6 ± 3	0.707	2.8 ± 1	0.990	NS	NA	160 ± 60	0.943	NS	NA	14 ± 7	1.05	QAW-32
		06-27-13	2.2 ± 1.7	NA	**2.9 ± 0.8**	NA	NS	NA	**320 ± 50**	NA	NS	NA	6 ± 7	NA	
Zone 2	1,242	09-16-09	1.3 ± 0.8	NA	**2.2 ± 0.7**	NA	0.1 ± 0.7	NA	80 ± 60	NA	NS	NA	40 ± 20	NA	
		09-15-10	2 ± 2	NA	**3.4 ± 0.8**	NA	0.3 ± 0.7	NA	**210 ± 50**	NA	**126.3 ± 4.1**	NA	18 ± 12	NA	

Table 7. Concentrations of gross alpha-particle radioactivity, gross-beta particle radioactivity, strontium-90, tritium, and cesium-137 in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NS, not sampled. NR, Not requested. Remarks: QAW, quality assurance westbay sample. RESL, Radiological and Environmental Sciences Laboaratory. Menlo Park, U.S. Geological Survey Menlo Park research laboratory]

Sample identifier	Port depth	Date	Gross alpha-particle radioactivity	Z-value	Gross beta-particle radioactivity	Z-value	Strontium-90	Z-value	Tritium (RESL)	Z-value	Tritium (Menlo Park)	Z-value	Cesium-137	Z-value	Remarks
USGS 108															
Zone 11	661	09-21-10	0 ± 2	NA	**2.5 ± 0.8**	NA	-0.3 ± 0.7	NA	80 ± 50	NA	NS	NA	3 ± 6	NA	
		06-23-11	-2 ± 3	NA	**5.4 ± 0.9**	NA	-0.5 ± 0.8	NA	30 ± 60	NA	**58.8 ± 3**	NA	8 ± 4	NA	
Zone 9	809	09-21-10	7 ± 3	NA	**3.8 ± 0.8**	NA	-0.3 ± 0.7	NA	**190 ± 50**	NA	NS	NA	10 ± 20	NA	
		06-23-11	-3 ± 3	NA	**5.1 ± 0.9**	NA	0.3 ± 0.8	NA	80 ± 60	NA	**119 ± 3**	NA	8 ± 8	NA	
Zone 7	888	09-20-10	4 ± 3	NA	**4.5 ± 0.8**	NA	1.2 ± 0.7	NA	130 ± 50	NA	NS	NA	33 ± 14	NA	
		06-23-11	-0.7 ± 3.11	NA	**5.7 ± 0.9**	NA	0.5 ± 0.8	NA	50 ± 60	NA	**79.3 ± 2.4**	NA	27 ± 11	NA	
		06-23-11	6 ± 3	1.55	**8.5 ± 1**	2.08	0.9 ± 0.8	0.35	20 ± 60	0.35	**78.5 ± 2.9**	0.21	21 ± 10	0.40	QAW-24
		06-26-12	-8 ± 3	NA	1.1 ± 1.5	NA	NS	NA	10 ± 60	NA	NS	NA	6 ± 7	NA	
		06-26-13	0.5 ± 1.4	NA	**3.4 ± 0.8**	NA	NS	NA	20 ± 40	NA	NS	NA	12 ± 6	NA	
Zone 4	1,029	09-22-10	-2 ± 2	NA	2 ± 8	NA	-0.122 ± 0.674	NA	100 ± 50	NA	NS	NA	39 ± 14	NA	
		09-22-10	1.67 ± 2.35	1.19	**2.9 ± 0.8**	0.80	0 ± 0.6	0.14	**190 ± 50**	1.27	NS	NA	30 ± 11	0.51	QAW-22
		06-22-11	7 ± 3	NA	**5.5 ± 0.9**	NA	-0.4 ± 0.8	NA	110 ± 60	NA	**83.6 ± 3.1**	NA	24 ± 10	NA	
		06-26-12	-6 ± 3	NA	0.9 ± 1.3	NA	NS	NA	60 ± 60	NA	NS	NA	7 ± 4	NA	
		06-26-13	0 ± 3	NA	**2.4 ± 0.8**	NA	NS	NA	60 ± 40	NA	NS	NA	9 ± 6	NA	
		06-26-13	1.1 ± 1.5	0.33	**2.9 ± 0.8**	0.44	NS	NA	20 ± 40	0.71	NS	NA	25 ± 10	1.37	QAW-39
Zone 1	1,172	09-20-10	3 ± 2	NA	**2.7 ± 0.8**	NA	0.3 ± 0.7	NA	**160 ± 50**	NA	NS	NA	21 ± 13	NA	
		06-22-11	5 ± 3	NA	**6.9 ± 0.9**	NA	-0.128 ± 0.768	NA	80 ± 60	NA	**97.4 ± 3.3**	NA	3 ± 5	NA	
		06-26-12	-8 ± 3	NA	**3.3 ± 1**	NA	NS	NA	40 ± 60	NA	NS	NA	23 ± 8	NA	
		06-26-13	2.2 ± 1.7	NA	**5.4 ± 0.9**	NA	NS	NA	120 ± 50	NA	NS	NA	7 ± 7	NA	

Table 7. Concentrations of gross alpha-particle radioactivity, gross-beta particle radioactivity, strontium-90, tritium, and cesium-137 in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NS, not sampled. NR, Not requested. Remarks: QAW, quality assurance westbay sample. RESL, Radiological and Environmental Sciences Laboaratory. Menlo Park, U.S. Geological Survey Menlo Park research laboratory]

Sample identifier	Port depth	Date	Gross alpha-particle radioactivity	Z-value	Gross beta-particle radioactivity	Z-value	Strontium-90	Z-value	Tritium (RESL)	Z-value	Tritium (Menlo Park)	Z-value	Cesium-137	Z-value	Remarks
USGS 131A															
Zone 12	616	10-29-12	1.56 ± 1.83	NA	**3.4 ± 0.8**	NA	0.6 ± 0.6	NA	**940 ± 70**	NA	NS	NA	12 ± 6	NA	
		07-17-13	0.5 ± 1.3	NA	**3.8 ± 0.8**	NA	-0.4 ± 0.7	NA	**1,010 ± 60**	NA	**983 ± 26.3**	NA	7 ± 5	NA	
		07-17-13	5 ± 2	1.89	**3.2 ± 0.8**	0.53	0.6 ± 0.7	1.01	**860 ± 60**	1.77	**965 ± 25.6**	0.49	34 ± 12	2.08	QAW-41
Zone 8	812	10-29-12	0 ± 3	NA	**5.2 ± 0.9**	NA	1.3 ± 0.6	NA	**1,590 ± 90**	NA	NS	NA	**22 ± 7**	NA	
		07-16-13	2.2 ± 1.7	NA	**3.2 ± 0.8**	NA	-0.3 ± 0.7	NA	**1,550 ± 70**	NA	**1,454 ± 38.5**	NA	10 ± 7	NA	
Zone 5	981	10-29-12	-1.19 ± 1.85	NA	**3.5 ± 0.9**	NA	1.8 ± 0.7	NA	150 ± 60	NA	NS	NA	13 ± 6	NA	
		07-16-13	1.7 ± 1.6	NA	**2.6 ± 0.8**	NA	0.7 ± 0.7	NA	**170 ± 50**	NA	**149 ± 4.86**	NA	5 ± 4	NA	
Zone 3	1,137	10-24-12	1.32 ± 1.83	NA	**3.8 ± 0.8**	NA	0.7 ± 0.6	NA	140 ± 60	NA	NS	NA	29 ± 10	NA	
		07-16-13	1.6 ± 1.6	NA	**2.9 ± 0.8**	NA	0.9 ± 0.8	NA	**200 ± 50**	NA	**133 ± 4.51**	NA	14 ± 9	NA	
USGS 132															
Zone 17	638	08-27-09	2.4 ± 1	NA	**5.2 ± 0.9**	NA	NS	NA	80 ± 60	NA	NS	NA	-3 ± 6	NA	
		06-30-10	6 ± 3	NA	**6 ± 1.2**	NA	NS	NA	**270 ± 70**	NA	NS	NA	14 ± 7	NA	
		07-06-11	1.53 ± 2.5	NA	**5.7 ± 0.9**	NA	NS	NA	**200 ± 60**	NA	NS	NA	8 ± 7	NA	
Zone 14	765	08-27-09	3.5 ± 1.2	NA	**3.5 ± 0.8**	NA	NS	NA	**230 ± 60**	NA	NS	NA	25 ± 10	NA	
		06-30-10	6 ± 4	NA	0.9 ± 0.8	NA	NS	NA	**410 ± 70**	NA	NS	NA	9 ± 7	NA	
		07-06-11	0 ± 2	NA	**6.6 ± 0.9**	NA	NS	NA	**240 ± 60**	NA	NS	NA	22 ± 10	NA	
		06-19-12	-8 ± 3	NA	0.308 ± 2.28	NA	NS	NA	**170 ± 60**	NA	NS	NA	16 ± 10	NA	
		06-19-13	4 ± 2	NA	**2.9 ± 0.8**	NA	NS	NA	**300 ± 50**	NA	NS	NA	16 ± 7	NA	
Zone 11	827	08-27-09	1.9 ± 0.9	NA	1.8 ± 0.7	NA	NS	NA	130 ± 60	NA	NS	NA	18 ± 13	NA	
		06-30-10	6 ± 4	NA	0.7 ± 0.7	NA	NS	NA	**280 ± 70**	NA	NS	NA	17 ± 14	NA	
Zone 8	919	08-27-09	3.1 ± 1.1	NA	1.5 ± 0.7	NA	NS	NA	130 ± 60	NA	NS	NA	35 ± 13	NA	
		06-30-10	3 ± 3	NA	3 ± 1.1	NA	NS	NA	**310 ± 70**	NA	NS	NA	-11 ± 10	NA	
Zone 5	1,012	08-27-09	2.2 ± 1	NA	**2.2 ± 0.7**	NA	NS	NA	**210 ± 60**	NA	NS	NA	90 ± 70	NA	
		06-30-10	6 ± 3	NA	2.2 ± 1	NA	NS	NA	**340 ± 70**	NA	NS	NA	30 ± 20	NA	
Zone 1	1,173	08-26-09	1.5 ± 0.9	NA	**3.3 ± 0.8**	NA	NS	NA	**200 ± 60**	NA	NS	NA	10 ± 20	NA	
		06-30-10	4 ± 3	NA	3.1 ± 1.1	NA	NS	NA	**380 ± 70**	NA	NS	NA	-30 ± 20	NA	

Table 7. Concentrations of gross alpha-particle radioactivity, gross-beta particle radioactivity, strontium-90, tritium, and cesium-137 in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NS, not sampled. NR, Not requested. Remarks: QAW, quality assurance westbay sample. RESL, Radiological and Environmental Sciences Laboaratory. Menlo Park, U.S. Geological Survey Menlo Park research laboratory]

Sample identifier	Port depth	Date	Gross alpha-particle radioactivity	Z-value	Gross beta-particle radioactivity	Z-value	Strontium-90	Z-value	Tritium (RESL)	Z-value	Tritium (Menlo Park)	Z-value	Cesium-137	Z-value	Remarks
USGS 133															
Zone 10	469	08-20-09	2.9 ± 1.1	NA	**4.3 ± 0.9**	NA	NS	NA	80 ± 60	NA	NS	NA	8 ± 11	NA	
		08-20-09	1.7 ± 0.9	0.84	**2.8 ± 0.8**	1.25	NS	NA	-30 ± 60	1.30	NS	NA	**32 ± 9**	1.69	QAW-14
		08-05-10	-2 ± 2	NA	**2.6 ± 0.8**	NA	NS	NA	80 ± 50	NA	NS	NA	-16 ± 12	NA	
		08-05-10	4 ± 2	2.12	**2.9 ± 0.7**	0.28	NS	NA	140 ± 50	0.85	NS	NA	5 ± 12	1.24	QAW-19
		06-27-11	4 ± 3	NA	**5.8 ± 0.9**	NA	NS	NA	90 ± 60	NA	NS	NA	10 ± 7	NA	
		06-21-12	-5 ± 3	NA	**3.2 ± 1**	NA	NS	NA	-60 ± 60	NA	NS	NA	25 ± 10	NA	
		06-21-12	4 ± 3	0.24	1.5 ± 0.8	1.33	NS	NA	-40 ± 60	0.24	NS	NA	28 ± 10	0.21	QAW-29
		06-24-13	4 ± 2	NA	**3 ± 0.8**	NA	NS	NA	60 ± 40	NA	NS	NA	22 ± 9	NA	
Zone 7	570	08-20-09	**4.3 ± 1.4**	NA	**2.9 ± 0.8**	NA	NS	NA	-80 ± 60	NA	NS	NA	11 ± 8	NA	
		08-05-10	1.54 ± 2.17	NA	**3.3 ± 0.8**	NA	NS	NA	10.6 ± 47.1	NA	NS	NA	25 ± 12	NA	
Zone 4	686	08-20-09	**10.7 ± 2.6**	NA	**6.3 ± 0.9**	NA	NS	NA	-40 ± 60	NA	NS	NA	9 ± 9	NA	
		08-05-10	1 ± 2	NA	**2.7 ± 0.8**	NA	NS	NA	30 ± 50	NA	NS	NA	39 ± 14	NA	
Zone 1	746	08-20-09	3.1 ± 1.2	NA	**5.4 ± 0.9**	NA	NS	NA	-13.1 ± 57.4	NA	NS	NA	8 ± 10	NA	
		08-05-10	0 ± 0.9	NA	1.5 ± 0.8	NA	NS	NA	100 ± 50	NA	NS	NA	34 ± 13	NA	

Table 7. Concentrations of gross alpha-particle radioactivity, gross-beta particle radioactivity, strontium-90, tritium, and cesium-137 in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NS, not sampled. NR, Not requested. Remarks: QAW, quality assurance westbay sample. RESL, Radiological and Environmental Sciences Laboaratory. Menlo Park, U.S. Geological Survey Menlo Park research laboratory]

Sample identifier	Port depth	Date	Gross alpha-particle radioactivity	Z-value	Gross beta-particle radioactivity	Z-value	Strontium-90	Z-value	Tritium (RESL)	Z-value	Tritium (Menlo Park)	Z-value	Cesium-137	Z-value	Remarks
USGS 134															
Zone 15	578	08-18-09	2.8 ± 1.1	NA	**4.3 ± 0.8**	NA	NS	NA	10 ± 60	NA	NS	NA	1 ± 10	NA	
		06-22-10	5 ± 3	NA	1.3 ± 0.9	NA	NS	NA	50 ± 60	NA	NS	NA	9 ± 10	NA	
		06-29-11	-0.07 ± 3.25	NA	**5.9 ± 0.9**	NA	NS	NA	-30 ± 60	NA	NS	NA	31 ± 12	NA	
		06-29-11	7 ± 3	1.60	**7 ± 0.9**	0.86	NS	NA	-20 ± 60	0.12	NS	NA	18 ± 10	0.83	QAW-26
Zone 12	646	08-18-09	0.7 ± 0.7	NA	**16.3 ± 1.4**	NA	NS	NA	-50 ± 60	NA	NS	NA	14 ± 10	NA	
		06-22-10	-4 ± 3	NA	1 ± 1.3	NA	NS	NA	**230 ± 70**	NA	NS	NA	1.43 ± 3.81	NA	
		06-29-11	0 ± 2	NA	**5.2 ± 0.9**	NA	NS	NA	130 ± 60	NA	NS	NA	11 ± 9	NA	
Zone 9	706	08-18-09	2.3 ± 1	NA	**7 ± 0.9**	NA	NS	NA	**180 ± 60**	NA	NS	NA	0 ± 20	NA	
		06-21-10	6 ± 3	NA	1.5 ± 0.9	NA	NS	NA	130 ± 60	NA	NS	NA	14 ± 12	NA	
		06-21-10	10 ± 4	0.80	**4.6 ± 1.1**	2.18	NS	NA	170 ± 60	0.47	NS	NA	15 ± 10	0.06	QAW-17
		06-18-12	-2 ± 3	NA	2.1 ± 0.9	NA	NS	NA	-50 ± 60	NA	NS	NA	22 ± 11	NA	
		07-10-13	1.6 ± 1.6	NA	**2.6 ± 0.8**	NA	NS	NA	0 ± 40	NA	NS	NA	24 ± 9	NA	
Zone 6	807	08-17-09	2.5 ± 1	NA	**3.2 ± 0.8**	NA	NS	NA	-100 ± 60	NA	NS	NA	27 ± 11	NA	
		06-21-10	6 ± 3	NA	2.7 ± 1	NA	NS	NA	130 ± 60	NA	NS	NA	2 ± 5	NA	
Zone 3	847	08-17-09	1.2 ± 0.9	NA	**2.3 ± 0.7**	NA	NS	NA	10.5 ± 58	NA	NS	NA	34 ± 14	NA	
		06-21-10	-3 ± 3	NA	**4 ± 1.2**	NA	NS	NA	90 ± 60	NA	NS	NA	14 ± 9	NA	
USGS 135															
Zone 10	738	09-15-09	2.8 ± 1.1	NA	1.5 ± 0.7	NA	0.6 ± 0.7	NA	-60 ± 60	NA	NS	NA	19 ± 10	NA	
		09-14-10	5 ± 3	NA	**3.8 ± 0.8**	NA	-0.3 ± 0.7	NA	80 ± 50	NA	**14 ± 1.9**	NA	32 ± 12	NA	
Zone 7	837	09-15-09	**4.6 ± 1.4**	NA	0.9 ± 0.7	NA	-0.3 ± 0.7	NA	-40 ± 60	NA	NS	NA	0 ± 20	NA	
		09-14-10	1 ± 2	NA	**2.5 ± 0.8**	NA	-0.4 ± 0.6	NA	0 ± 50	NA	**6.1 ± 1.9**	NA	8 ± 7	NA	
		07-07-11	0 ± 2	NA	**4.8 ± 0.9**	NA	NS	NA	12 ± 57.5	NA	NS	NA	12 ± 8	NA	
		06-21-12	-3 ± 3	NA	1.9 ± 1	NA	NS	NA	-70 ± 60	NA	NS	NA	13 ± 6	NA	
		06-24-13	12 ± 3	NA	**3.8 ± 0.7**	NA	NS	NA	40 ± 40	NA	NS	NA	10 ± 5	NA	
		06-24-13	3.1 ± 1.8	2.54	**3 ± 0.8**	0.75	NS	NA	-40 ± 40	1.41	NS	NA	2 ± 6	1.02	QAW-40
Zone 4	988	09-15-09	**4.1 ± 1.3**	NA	1.7 ± 0.7	NA	-0.6 ± 0.7	NA	-40 ± 60	NA	NS	NA	13 ± 10	NA	
		09-13-10	6 ± 3	NA	**2.4 ± 0.7**	NA	0.2 ± 0.7	NA	70 ± 50	NA	**15 ± 2.2**	NA	-10 ± 20	NA	
Zone 1	1,116	09-14-09	**3.9 ± 1.3**	NA	1.6 ± 0.7	NA	0.7 ± 0.7	NA	-10.5 ± 57.5	NA	NS	NA	20 ± 20	NA	
		09-13-10	-1 ± 2	NA	2.1 ± 0.8	NA	-0.4 ± 0.7	NA	30 ± 50	NA	**12.8 ± 1.9**	NA	-11 ± 6	NA	

Table 7. Concentrations of gross alpha-particle radioactivity, gross-beta particle radioactivity, strontium-90, tritium, and cesium-137 in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NS, not sampled. NR, Not requested. Remarks: QAW, quality assurance westbay sample. RESL, Radiological and Environmental Sciences Laboaratory. Menlo Park, U.S. Geological Survey Menlo Park research laboratory]

Sample identifier	Port depth	Date	Gross alpha-particle radioactivity	Z-value	Gross beta-particle radioactivity	Z-value	Strontium-90	Z-value	Tritium (RESL)	Z-value	Tritium (Menlo Park)	Z-value	Cesium-137	Z-value	Remarks
USGS 137A															
Zone 5	662	10-24-12	0 ± 2	NA	**4.5 ± 0.9**	NA	1.1 ± 0.6	NA	100 ± 50	NA	NS	NA	7 ± 5	NA	
		07-15-13	1 ± 1.5	NA	**4.5 ± 0.9**	NA	0 ± 0.7	NA	140 ± 50	NA	**106 ± 3.83**	NA	10 ± 5	NA	
Zone 4	747	10-23-12	1.56 ± 1.83	NA	**4.2 ± 0.8**	NA	1.4 ± 0.6	NA	130 ± 60	NA	NS	NA	10 ± 5	NA	
		07-15-13	2.1 ± 1.7	NA	**4.1 ± 0.8**	NA	0.2 ± 0.7	NA	250 ± 50	NA	**89.2 ± 3.47**	NA	15 ± 9	NA	
Zone 3	841	10-23-12	0.2 ± 1.3	NA	**3.6 ± 0.8**	NA	1.3 ± 0.7	NA	100 ± 60	NA	NS	NA	**40 ± 12**	NA	
		07-15-13	2.7 ± 1.8	NA	**3.4 ± 0.8**	NA	0.7 ± 0.7	NA	100 ± 40	NA	**67.6 ± 2.97**	NA	10 ± 5	NA	
Zone 1	876	10-23-12	-2 ± 2	NA	**5 ± 0.9**	NA	1.5 ± 0.6	NA	140 ± 60	NA	NS	NA	32 ± 11	NA	
		07-15-13	2.1 ± 1.7	NA	**3.6 ± 0.8**	NA	0.4 ± 0.7	NA	110 ± 50	NA	**64.8 ± 2.87**	NA	13 ± 7	NA	

Sample identifier	Date	Gross alpha-particle radioactivity	Z-value	Gross beta-particle radioactivity	Z-value	Strontium-90	Z-value	Tritium (RESL)	Z-value	Tritium (Menlo Park)	Z-value	Cesium-137	Z-value	Remarks
QAW-13	08-20-09	-0.9 ± 0.4	NA	1 ± 0.7	NA	NS	NA	-80 ± 60	NA	NS	NA	12 ± 10	NA	Equipment Blank at USGS 133
QAW-20	06-30-10	0 ± 2	NA	0.4 ± 1	NA	NS	NA	**230 ± 70**	NA	NS	NA	16 ± 10	NA	Equipment Blank at USGS 132
QAW-28	07-06-11	1.28 ± 2.09	NA	**2.6 ± 0.8**	NA	NS	NA	10 ± 60	NA	NS	NA	6 ± 7	NA	Equipment Blank at USGS 132
QAW-30	06-21-12	**29 ± 7**	NA	**6.4 ± 0.9**	NA	NS	NA	-90 ± 50	NA	NS	NA	12 ± 7	NA	Field Blank at USGS 135
QAW-31	06-26-12	-3 ± 2	NA	-1.7 ± 0.7	NA	NS	NA	-50 ± 60	NA	NS	NA	7 ± 6	NA	Equipment Blank at USGS 108
QAW-37	07-10-13	1.3 ± 1.3	NA	0.4 ± 0.6	NA	NS	NA	20 ± 40	NA	NS	NA	14 ± 7	NA	Field Blank at USGS 134
QAW-38	07-10-13	0.4 ± 1.2	NA	0.8 ± 0.7	NA	NS	NA	20 ± 40	NA	NS	NA	22 ± 9	NA	Equipment Blank at USGS 134

Table 8. Concentrations of uranium, plutonium, and americium isotopes in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NC, not calculated. NS, not sampled. NR, Not requested. LS, Sample lost. Remarks: QAW, quality assurance westbay sample]

Sample identifier	Port depth	Date	Uranium-233,234 (undivided)	Z-value	Uranium-235	Z-value	Uranium-238	Z-value	Plutonium-238	Z-value	Plutonium-239,240 (undivided)	Z-value	Americium-241	Z-value	Remarks
USGS 105															
Zone 13	728	09-18-09	**1.23 ± 0.078**	NA	0.0182 ± 0.0075	NA	**0.645 ± 0.053**	NA	0.003 ± 0.006	NA	0.006 ± 0.006	NA	0.013 ± 0.015	NA	
		09-16-10	NS	NA	NS	NA	NS	NA	0.009 ± 0.011	NA	0.009 ± 0.008	NA	-0.006 ± 0.011	NA	
Zone 11	851	09-18-09	**1.48 ± 0.092**	NA	**0.046 ± 0.015**	NA	**0.611 ± 0.051**	NA	-0.003 ± 0.006	NA	0.003 ± 0.006	NA	0.009 ± 0.012	NA	
		09-16-10	NS	NA	NS	NA	NS	NA	0.006 ± 0.01	NA	0.003 ± 0.006	NA	0.003 ± 0.013	NA	
		09-16-10	NS	NA	NS	NA	NS	NA	-0.003 ± 0.009	0.67	0.003 ± 0.007	0.00	-0.003 ± 0.012	0.34	QAW-21
Zone 8	952	09-17-09	**1.42 ± 0.098**	NA	0.04 ± 0.015	NA	**0.54 ± 0.054**	NA	-0.004 ± 0.007	NA	0.011 ± 0.013	NA	-0.003 ± 0.012	NA	
		09-15-10	NS	NA	NS	NA	NS	NA	-0.003 ± 0.009	NA	-0.003 ± 0.005	NA	-0.006 ± 0.009	NA	
Zone 5	1,072	09-17-09	**1.34 ± 0.092**	NA	**0.045 ± 0.014**	NA	**0.661 ± 0.061**	NA	-0.003 ± 0.004	NA	0.005 ± 0.005	NA	-0.006 ± 0.01	NA	
		09-17-09	**1.37 ± 0.093**	0.23	**0.043 ± 0.014**	0.10	**0.67 ± 0.057**	0.11	-0.004 ± 0.004	0.18	0.004 ± 0.008	0.11	0.009 ± 0.012	0.19	QAW-16
		09-15-10	NS	NA	NS	NA	NS	NA	-0.009 ± 0.008	NA	0.006 ± 0.008	NA	-0.003 ± 0.013	NA	
Zone 2	1,242	09-16-09	**1.36 ± 0.085**	NA	**0.048 ± 0.015**	NA	**0.582 ± 0.049**	NA	-0.004 ± 0.008	NA	0.009 ± 0.009	NA	0.003 ± 0.012	NA	
		09-15-10	NS	NA	NS	NA	NS	NA	-0.003 ± 0.01	NA	0.003 ± 0.007	NA	-0.003 ± 0.012	NA	
USGS 108															
Zone 11	661	09-21-10	**1.28 ± 0.11**	NA	0.017 ± 0.017	NA	**0.577 ± 0.069**	NA	0.006 ± 0.011	NA	0.006 ± 0.009	NA	-0.003 ± 0.011	NA	
		06-23-11	NS	NA	NS	NA	NS	NA	0.003 ± 0.003	NA	0.006 ± 0.007	NA	-0.003 ± 0.01	NA	
Zone 9	809	09-21-10	**1.14 ± 0.11**	NA	0.023 ± 0.016	NA	**0.526 ± 0.064**	NA	0.003 ± 0.01	NA	0.003 ± 0.007	NA	0.01 ± 0.015	NA	
		06-23-11	NS	NA	NS	NA	NS	NA	0.003 ± 0.003	NA	0.006 ± 0.008	NA	0.021 ± 0.014	NA	
Zone 7	888	09-20-10	**1.23 ± 0.11**	NA	0.042 ± 0.017	NA	**0.324 ± 0.051**	NA	0.007 ± 0.012	NA	-0.003 ± 0.007	NA	-0.004 ± 0.013	NA	
		06-23-11	NS	NA	NS	NA	NS	NA	-0.003 ± 0.003	NA	0.009 ± 0.008	NA	-0.006 ± 0.01	NA	
		06-23-11	NS	NA	NS	NA	NS	NA	-0.003 ± 0.003	0.00	-0.003 ± 0.005	1.27	0.012 ± 0.013	0.37	QAW-24
Zone 4	1,029	09-22-10	**1.2 ± 0.1**	NA	0.023 ± 0.016	NA	**0.467 ± 0.063**	NA	0.009 ± 0.011	NA	-0.003 ± 0.007	NA	0.003 ± 0.013	NA	
		09-22-10	**1.13 ± 0.096**	0.50	0.033 ± 0.014	0.47	**0.386 ± 0.052**	0.99	0.003 ± 0.01	0.81	0.003 ± 0.005	0.70	-0.003 ± 0.012	0.00	QAW-22
		06-22-11	NS	NA	NS	NA	NS	NA	-0.003 ± 0.003	NA	-0.003 ± 0.005	NA	0.012 ± 0.013	NA	
Zone 1	1,172	09-20-10	**0.98 ± 0.098**	NA	0.026 ± 0.017	NA	**0.412 ± 0.062**	NA	0.003 ± 0.01	NA	-0.003 ± 0.007	NA	-0.007 ± 0.013	NA	
		06-22-11	NS	NA	NS	NA	NS	NA	-0.003 ± 0.003	NA	0.003 ± 0.007	NA	0.011 ± 0.012	NA	

Table 8. Concentrations of uranium, plutonium, and americium isotopes in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.— Continued

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NC, not calculated. NS, not sampled. NR, Not requested. LS, Sample lost. Remarks: QAW, quality assurance westbay sample]

Sample identifier	Port depth	Date	Uranium-233,234 (undivided)	Z-value	Uranium-235	Z-value	Uranium-238	Z-value	Plutonium-238	Z-value	Plutonium-239,240 (undivided)	Z-value	Americium-241	Z-value	Remarks
USGS 131A															
Zone 12	616	10-29-12	**1.36 ± 0.093**	NA	0.022 ± 0.009	NA	**0.579 ± 0.053**	NA	0.006 ± 0.004	NA	0.006 ± 0.007	NA	0.012 ± 0.013	NA	
		07-17-13	NS	NA	NS	NA	NS	NA	-0.003 ± 0.003	NA	0.003 ± 0.007	NA	-0.006 ± 0.008	NA	
		07-17-13	NS	NA	NS	NA	NS	NA	0.003 ± 0.003	1.41	-0.003 ± 0.005	0.697	0.003 ± 0.01	0.703	QAW-41
Zone 8	812	10-29-12	**1.21 ± 0.089**	NA	**0.052 ± 0.016**	NA	**0.594 ± 0.055**	NA	0.003 ± 0.003	NA	0.003 ± 0.007	NA	0.003 ± 0.012	NA	
		07-16-13	NS	NA	NS	NA	NS	NA	-0.003 ± 0.005	NA	0.006 ± 0.008	NA	-0.003 ± 0.011	NA	
Zone 5	981	10-29-12	**1.4 ± 0.094**	NA	0.02 ± 0.01	NA	**0.498 ± 0.051**	NA	-0.003 ± 0.003	NA	0.003 ± 0.007	NA	0.01 ± 0.013	NA	
		07-16-13	NS	NA	NS	NA	NS	NA	-0.003 ± 0.003	NA	0.003 ± 0.005	NA	-0.012 ± 0.009	NA	
Zone 3	1,137	10-24-12	**1.4 ± 0.098**	NA	0.034 ± 0.015	NA	**0.437 ± 0.047**	NA	0.003 ± 0.003	NA	-0.003 ± 0.005	NA	0.006 ± 0.012	NA	
		07-16-13	NS	NA	NS	NA	NS	NA	-0.004 ± 0.006	NA	-0.004 ± 0.006	NA	0.03 ± 0.02	NA	
USGS 135															
Zone 10	738	09-15-09	**1.9 ± 0.11**	NA	0.036 ± 0.016	NA	**0.669 ± 0.054**	NA	-0.004 ± 0.004	NA	0.007 ± 0.009	NA	0.006 ± 0.013	NA	
		09-14-10	NS	NA	NS	NA	NS	NA	0.003 ± 0.01	NA	0.012 ± 0.009	NA	0.006 ± 0.012	NA	
Zone 7	837	09-15-09	**1.37 ± 0.093**	NA	0.045 ± 0.018	NA	**0.54 ± 0.05**	NA	-0.004 ± 0.004	NA	0.007 ± 0.009	NA	-0.003 ± 0.012	NA	
		09-14-10	NS	NA	NS	NA	NS	NA	0.009 ± 0.01	NA	0.003 ± 0.006	NA	-0.006 ± 0.011	NA	
Zone 4	988	09-15-09	**1.77 ± 0.12**	NA	0.012 ± 0.012	NA	**0.6 ± 0.06**	NA	-0.003 ± 0.005	NA	0.005 ± 0.008	NA	0.006 ± 0.013	NA	
		09-13-10	NS	NA	NS	NA	NS	NA	-0.003 ± 0.008	NA	0.008 ± 0.007	NA	-0.009 ± 0.011	NA	
Zone 1	1,116	09-14-09	**1.5 ± 0.096**	NA	0.02 ± 0.012	NA	**0.542 ± 0.049**	NA	-0.006 ± 0.005	NA	0.003 ± 0.007	NA	-0.013 ± 0.011	NA	
		09-13-10	NS	NA	NS	NA	NS	NA	0.009 ± 0.011	NA	0.003 ± 0.005	NA	-0.013 ± 0.011	NA	

Table 8. Concentrations of uranium, plutonium, and americium isotopes in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results and uncertainties in picocuries per liter. Analytical uncertainties are reported as 1 sample standard deviation (**s**). Concentrations that meet or exceed the reporting level of 3 times the 1s value are shown in boldface type. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NC, not calculated. NS, not sampled. NR, Not requested. LS, Sample lost. Remarks: QAW, quality assurance westbay sample]

Sample identifier	Port depth	Date	Uranium-233,234 (undivided)	Z-value	Uranium-235	Z-value	Uranium-238	Z-value	Plutonium-238	Z-value	Plutonium-239,240 (undivided)	Z-value	Americium-241	Z-value	Remarks
USGS 137A															
Zone 5	662	10-24-12	**1.36 ± 0.093**	NA	0.04 ± 0.015	NA	**0.57 ± 0.055**	NA	-0.003 ± 0.003	NA	-0.003 ± 0.003	NA	-0.003 ± 0.01	NA	
		07-15-13	NS	NA	NS	NA	NS	NA	-0.004 ± 0.004	NA	0.004 ± 0.007	NA	0.003 ± 0.01	NA	
Zone 4	747	10-23-12	**1.4 ± 0.1**	NA	**0.048 ± 0.016**	NA	**0.538 ± 0.054**	NA	0.003 ± 0.003	NA	0.003 ± 0.003	NA	0.003 ± 0.011	NA	
		07-15-13	NS	NA	NS	NA	NS	NA	-0.003 ± 0.003	NA	0.003 ± 0.005	NA	-0.012 ± 0.009	NA	
Zone 3	841	10-23-12	**1.5 ± 0.1**	NA	0.031 ± 0.016	NA	**0.62 ± 0.06**	NA	-0.003 ± 0.003	NA	0.003 ± 0.003	NA	0.006 ± 0.012	NA	
		07-15-13	NS	NA	NS	NA	NS	NA	0.003 ± 0.005	NA	-0.003 ± 0.005	NA	0.006 ± 0.012	NA	
Zone 1	876	10-23-12	**1.31 ± 0.096**	NA	0.036 ± 0.016	NA	**0.606 ± 0.056**	NA	0.003 ± 0.003	NA	-0.003 ± 0.003	NA	0.006 ± 0.012	NA	
		07-15-13	NS	NA	NS	NA	NS	NA	0.003 ± 0.003	NA	-0.003 ± 0.005	NA	-0.003 ± 0.01	NA	

Sample identifier	Port depth	Date	Uranium-233,234 (undivided)	Z-value	Uranium-235	Z-value	Uranium-238	Z-value	Plutonium-238	Z-value	Plutonium-239,240 (undivided)	Z-value	Americium-241	Z-value	Remarks
QAW-1	NA	08-28-06	0.017 ± 0.008	NA	0.004 ± 0.006	NA	0.016 ± 0.007	NA	-0.003 ± 0.003	NA	0.003 ± 0.005	NA	0.009 ± 0.009	NA	
QAW-2	NA	10-02-06	**0.150 ± 0.079**	NA	**0.048 ± 0.014**	NA	**0.767 ± 0.053**	NA	-0.003 ± 0.003	NA	0.003 ± 0.006	NA	0.009 ± 0.010	NA	
QAW-6	NA	10-12-07	NS	NA	NS	NA	NS	NA	0.020 ± 0.030	NA	0.010 ± 0.018	NA	0.003 ± 0.010	NA	
QAW-12	NA	09-08-08	NS	NA	NS	NA	**NS**	NA	-0.006 ± 0.004	NA	0.003 ± 0.005	NA	-0.009 ± 0.011	NA	

Table 9. Concentrations of isotopes of hydrogen, oxygen, and carbon in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results in per mil (parts per thousand) relative to a standard. Uncertainty of delta ^{2}H and delta ^{18}O is plus or minus 1.5 per mil. Uncertainty of delta ^{13}C is plus or minus 0.3 per mil. H, hydrogen; O, oxygen; C, carbon; NS, not sampled. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NC, not calculated. Remarks, QAW, quality assurance westbay sample]

Sample identifier	Port depth	Date	Delta ^{2}H	Z-value	Delta ^{18}O	Z-value	Delta ^{13}C	Z-value	Remarks
USGS 105									
Zone 13	728	09-18-09	-137.7	NA	-17.90	NA	-9.17	NA	
		09-16-10	-136.3	NA	-17.90	NA	NS	NA	
Zone 11	851	09-18-09	-137.4	NA	-17.85	NA	-9.24	NA	
		09-16-10	-136.5	NA	-17.83	NA	NS	NA	
		09-16-10	-137.6	0.52	-17.84	0.00	NS	NA	QAW-21
Zone 8	952	09-17-09	-138.0	NA	-18.00	NA	-9.01	NA	
		09-15-10	-137.6	NA	-17.95	NA	NS	NA	
Zone 5	1,072	09-17-09	-137.4	NA	-17.91	NA	-9.01	NA	
		09-17-09	-137.7	0.14	-17.94	0.01	-9.05	0.09	QAW-16
		09-15-10	-136.7	NA	-17.95	NA	NS	NA	
Zone 2	1,242	09-16-09	-137.3	NA	-17.83	NA	-9.41	NA	
		09-15-10	-136.7	NA	-17.80	NA	NS	NA	
USGS 108									
Zone 11	661	09-21-10	-136.4	NA	-17.88	NA	-9.15	NA	
		06-23-11	-136.2	NA	-17.79	NA	NS	NA	
Zone 9	809	09-21-10	-137.7	NA	-17.93	NA	-9.00	NA	
		06-23-11	-136.6	NA	-17.87	NA	NS	NA	
Zone 7	888	09-20-10	-136.9	NA	-17.91	NA	-9.02	NA	
		06-23-11	-136.0	NA	-17.88	NA	NS	NA	
		06-23-11	-137.0	0.47	-17.92	0.02	NS	NA	QAW-24
Zone 4	1,029	09-22-10	-137.2	NA	-17.98	NA	-9.15	NA	
		09-22-10	-137.6	0.19	-17.87	0.05	-9.11	NA	QAW-22
		06-22-11	-137.1	NA	-17.94	NA	NS	NA	
Zone 1	1,172	09-20-10	-136.3	NA	-17.98	NA	-9.17	NA	
		06-22-11	-136.6	NA	-17.96	NA	NS	NA	

Table 9. Concentrations of isotopes of hydrogen, oxygen, and carbon in water from multiple levels in the eastern Snake River Plain aquifer, Idaho National Laboratory, Idaho, 2009–13.—Continued

[See figure 2 for well locations. Port depth in feet below land surface. Analytical results in per mil (parts per thousand) relative to a standard. Uncertainty of delta ^{2}H and delta ^{18}O is plus or minus 1.5 per mil. Uncertainty of delta ^{13}C is plus or minus 0.3 per mil. H, hydrogen; O, oxygen; C, carbon; NS, not sampled. Z-values associated with QA replicates were calculated using equation 1. NA, not applicable. NC, not calculated. Remarks, QAW, quality assurance westbay sample]

Sample identifier	Port depth	Date	Delta ^{2}H	Z-value	Delta ^{18}O	Z-value	Delta ^{13}C	Z-value	Remarks
USGS 131A									
Zone 12	616	10-29-12	-137.9	NA	-17.96	NA	NS	NA	
		07-17-13	-137.8	NA	-17.99	NA	NS	NA	
		07-17-13	-138.5	0.33	-17.96	0.07	NS	NA	QAW-41
Zone 8	812	10-29-12	-136.2	NA	-17.84	NA	NS	NA	
		07-16-13	-136.9	NA	-17.81	NA	NS	NA	
Zone 5	981	10-29-12	-136.6	NA	-18.00	NA	NS	NA	
		07-16-13	-138.2	NA	-18.03	NA	NS	NA	
Zone 3	1,137	10-24-12	-137.2	NA	-18.04	NA	NS	NA	
		07-16-13	-136.9	NA	-18.07	NA	NS	NA	
USGS 135									
Zone 10	738	09-15-09	-137.0	NA	-17.96	NA	-9.06	NA	
		09-14-10	-137.0	NA	-17.92	NA	NS	NA	
Zone 7	837	09-15-09	-137.6	NA	-18.00	NA	-9.36	NA	
		09-14-10	-137.8	NA	-18.02	NA	NS	NA	
Zone 4	988	09-15-09	-136.6	NA	-17.92	NA	-8.87	NA	
		09-13-10	-137.2	NA	-17.90	NA	NS	NA	
Zone 1	1,116	09-14-09	-137.0	NA	-17.97	NA	-9.29	NA	
		09-13-10	-136.8	NA	-17.92	NA	NS	NA	
USGS 137A									
Zone 5	662	10-24-12	-136.6	NA	-17.86	NA	NS	NA	
		07-15-13	-137.0	NA	-17.83	NA	NS	NA	
Zone 4	747	10-23-12	-137.9	NA	-17.86	NA	NS	NA	
		07-15-13	-137.1	NA	-17.81	NA	NS	NA	
Zone 3	841	10-23-12	-137.5	NA	-17.83	NA	NS	NA	
		07-15-13	-136.9	NA	-17.89	NA	NS	NA	
Zone 1	876	10-23-12	-136.4	NA	-17.82	NA	NS	NA	
		07-15-13	-136.8	NA	-17.89	NA	NS	NA	

Appendix A. Chemical Concentrations of Selected Source Water that Provides Recharge to the Eastern Snake River Aquifer, Idaho National Laboratory, Idaho

[**Water source:** Big Lost River below INEL diverson data are from National Water Information System. Wells TRA-1 and TRA-2 called MTR 1 and MTR 2 in Olmstead (1962). Concentrations are in milligrams per liter (mg/L). Ca, calcium; Mg, magnesium; K, potassium; Na, sodium; SiO_2, silica; HCO_3, bicarbonate; Cl, chloride; F, fluoride; SO_4, sulfate; NO_3, nitrate; ^{18}O, delta oxygen-18; CPP, Chemical Processing Plant; GS, guard station; NRF, Naval Reators Facility; TRA, Test Reactor Area; USGS, U.S. Geological Survey; NC, not collected]

Water source	Date sampled	Ca	Mg	K	Na	SiO_2	HCO_3	Cl	F	SO_4	NO_3	Tritium	Deuterium	^{18}O
Snowpack near USGS 22[1]	02-02-1978	0.8	0.1	0.8	0.1	1.1	2	0.3	0.1	2.3	NC	NC	NC	NC
Snowpack near USGS 83[1]	02-02-1978	0.1	0.2	2.2	0.2	1.5	5	0.8	0.1	3.1	NC	NC	NC	NC
Snowpack near Site 9[1]	02-02-1978	1.7	0.5	0.4	9.1	0.3	29	0.7	0.1	2.8	NC	NC	NC	NC
Big Lost River at Mackay Dam[2]	06-28-1995	26	6.3	1.3	3.8	8.7	108	2.3	0.19	13.1	NC	NC	-134.4	-17.57
Big Lost River near Mackay[3]	03-28-1989	44	11	1.4	6.1	11	165	4.3	0.2	21	NC	NC	NC	NC
Big Lost River near Mackay[2]	06-17-1995	26	6.3	1.4	3.8	9.1	105	2.3	0.18	13	0.4	NC	-134.9	-17.6
Big Lost River near Moore[4]	08-27-1963	48	11	1.4	6.9	12	192	3.5	1.9	18	0.5	NC	NC	NC
Big Lost River near Butte City[1]	12-07-1977	61	18	1.7	11	15	260	8.2	0.3	23	NC	NC	NC	NC
Big Lost River below Arco[3]	03-28-1989	67	15	1.5	12	14	266	7.6	0.3	25	NC	NC	-132.2	-17.17
Big Lost River nr Arco[5]	06-05-1981	48	12	1.6	7.1	13	200	4.8	0.2	27	NC	NC	-135.0	-17.4
Big Lost River below INEL div	06-02-1995	35	8	1.4	5.4	12	132	3	0.2	18	<0.05	52 ± 3.2	NC	NC
Big Lost River below INEL div	07-05-1995	33	7.1	1.6	4.1	11	133	2.4	0.3	15	0.12	47 ± 3.2	NC	NC
Big Lost River near NRF[2]	06-19-1995	31	7.4	1.7	4.8	11	123	3.1	0.21	18	0.8	NC	NC	NC
Little Lost River near Clyde[10]	06-27-2000	30	10	0.58	2.8	9.2	131	2.2	0.12	11.4	<0.05	38.4 ± 25.6	-137.4	-17.94
Little Lost River near Howe[10]	06-27-2000	39	15	1.1	6.9	11	173	7.8	0.12	15.8	0.11	38.4 ± 25.6	-137.3	-17.89
Birch Creek at Kaufman GS[11]	06-27-2000	38	15	0.88	5.1	10	164	4.6	0.22	23	<0.05	22.4 ± 25.6	-141.2	-18.57
Birch Creek at Blue Dome[2]	06-28-1995	42	15	0.9	5.2	7.7	183	4.8	0.18	25	0.6	NC	-140.1	-18.62
CPP-1[7]	06-06-1991	54	14	2.5	7.9	23	194	18	0.1	22	1	355 ± 16	-137.0	-17.85
NRF-2[6]	05-23-1989	70	22	1.8	18	22	260	46	0.3	39	1.7	-40 ± 160	NC	NC
TRA-1[8]	07-24-1957	55	16	1.4	8.3	18	211	12	0.1	23	4.3	NC	NC	NC
TRA-2[8]	09-14-1955	40	17	2.3	8.6	25	183	10	0.1	22	2.3	NC	NC	NC
Big Lost River deep underflow-Arco City[9]	02-17-1999	54	15	1.1	5.7	15	222	6.4	0.16	20	0.71	35.2 ± 25.6	-135.0	-17.73
Big Lost River shallow underflow-Owen[9]	06-23-1999	68	14	1.2	7.4	16	243	6.3	0.19	23	2.1	0 ± 25.6	-132.0	-17.32
Little Lost River underflow-Harrell[10]	07-31-2000	62	22	1.4	17	18	259	22	0.16	34	1.9	35.2 ± 25.6	-135.2	-17.93
Birch Creek underflow-USGS 126B[11]	11-08-2000	38	15	2.5	9.0	19	162	8.2	0.23	29	0.53	6.4 ± 19.2	-140.9	-18.44

[1]From Rightmire and Lewis (1987).

[2]From Busenberg and others (2000).

[3]From Bartholomay (1990).

[4]From Robertson and others (1974).

[5]From Wood and Low (1988).

[6]From Knobel and others (1992).

[7]From Knobel and others (1999).

[8]From Olmstead (1962).

[9]From Carkeet and others (2001).

[10]From Swanson and others (2002).

[11]From Swanson and others (2003).

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