Prepared in cooperation with the Albuquerque Bernalillo County Water Utility Authority

Selected Investigations and Statistical Summary of Surface-Water Quality in the Rio Grande and the Rio Chama, North-Central New Mexico, During Water Years 1985–2007

Data Series 629

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

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U.S. Department of the Interior
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Conversion Factors

Inch/Pound to SI

Multiply	By	To obtain
	Length	
mile (mi)	1.609	kilometer (km)
	Radioactivity	
1 millirem (mrem)	10	microsieverts (µSv)
picocurie per liter (pCi/L)	0.037	becquerel per liter (Bq/L)

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

°F=(1.8×°C)+32

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

°C=(°F-32)/1.8

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

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

1 picocurie per liter (pCi/L) is equivalent to 10^-9 microcuries per milliliter (µCi/mL)

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

Selected Investigations and Statistical Summary of Surface-Water Quality in the Rio Grande and the Rio Chama, North-Central New Mexico, During Water Years 1985–2007

By Sarah E. Falk, Scott K. Anderholm, and Nicholas B. Engdahl

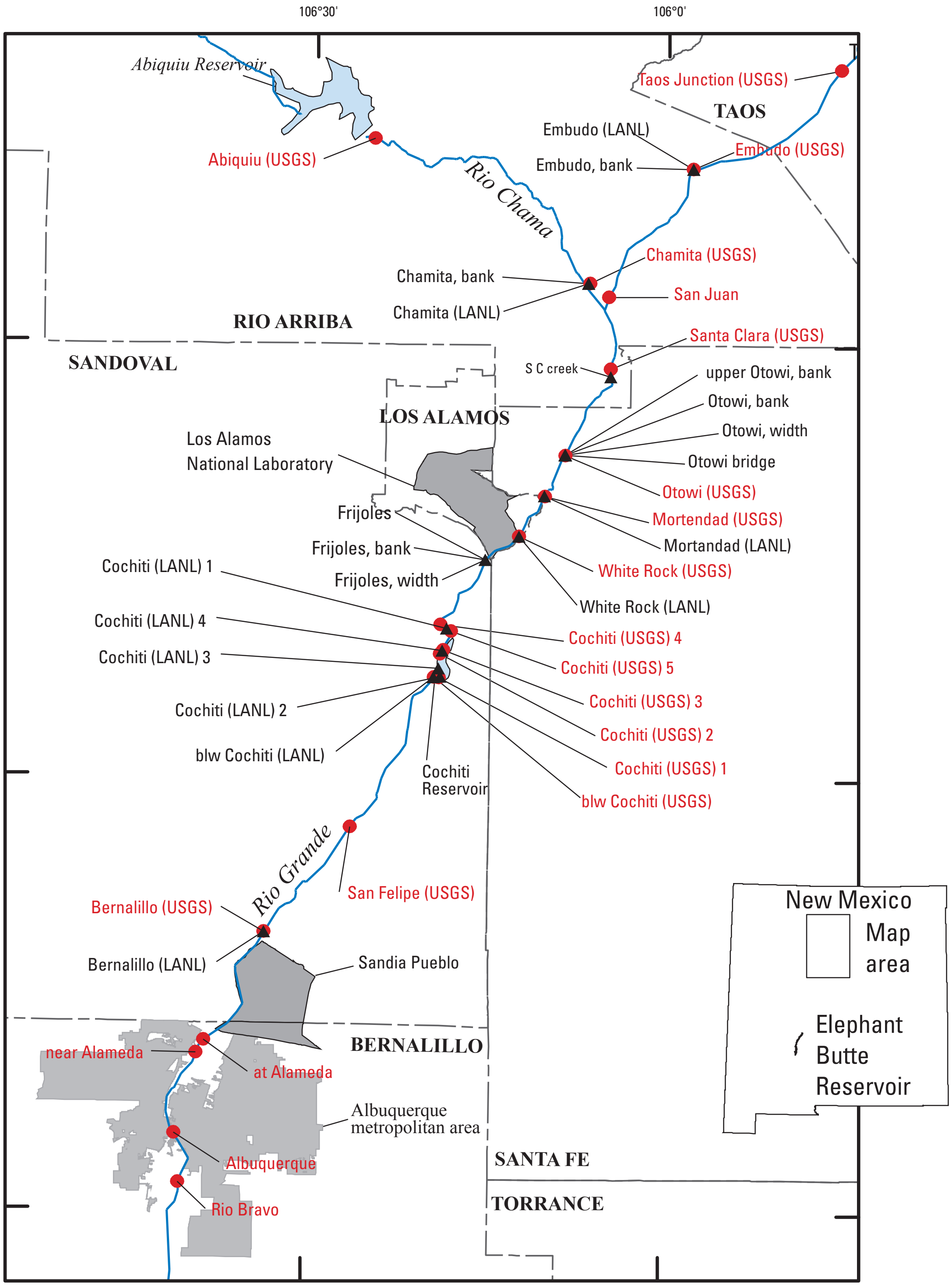
Abstract

The Albuquerque Bernalillo County Water Utility Authority (ABCWUA) is supplementing the municipal water supply for Albuquerque, New Mexico, and the surrounding area with water diverted from the Rio Grande. The distribution of surface water for municipal supply has raised questions about the quality of water in the Rio Grande and the possibility of contaminants in the water. The U.S. Geological Survey, in cooperation with ABCWUA, has compiled existing water-quality data collected on the Rio Grande and its main tributary, the Rio Chama, by various Federal and State agencies to provide a comprehensive overview of water quality in the Rio Grande basin upstream from Albuquerque. This report describes selected water-quality investigations conducted by various Federal and State agencies and 2007 USGS surface-water-quality investigations and data-collection activities and presents a statistical summary of selected water-quality data collected on the Rio Grande and the Rio Chama in central and northern New Mexico.

Introduction

The Albuquerque Bernalillo County Water Utility Authority (ABCWUA) is supplementing the municipal water supply for Albuquerque, N. Mex., and the surrounding area with water diverted from the Rio Grande. Historically, groundwater has been pumped from the Santa Fe Group aquifer at a rate that has resulted in water-level declines in the aquifer near the metropolitan area (Bexfield and Anderholm, 2002). The principal component of ABCWUA's strategy to obtain and develop sustainable sources of water is the San Juan-Chama Drinking Water Project, which includes a diversion dam, water treatment facilities, and a distribution system (City of Albuquerque, 1997). Water diverted from the Rio Grande will be treated by a "multistage purification process, which employs carbon filtration and ozone disinfection…" (Albuquerque Bernalillo County Water Utility Authority, 2011). The distribution of surface water for municipal supply has raised questions about the quality of water in the Rio Grande and the possibility of contaminants in the water.

The U.S. Geological Survey (USGS), in cooperation with ABCWUA, has compiled existing water-quality data from water year (WY) 1985 through WY 2005 (October 1, 1985, to September 30, 2005) collected on the Rio Grande and its main tributary, the Rio Chama, by various Federal and State agencies to provide a comprehensive overview of water quality in the Rio Grande basin upstream of Albuquerque. The study area, comprising the Rio Grande and the Rio Chama in central and northern New Mexico (figs. 1 and 2), includes water-quality stations from the USGS (fig. 1 and table 1), the Los Alamos National Laboratory (LANL; fig. 1 and table 2), the New Mexico Environment Department (NMED; fig. 2 and table 3), and the U.S. Fish and Wildlife Service (USFWS; fig. 2 and table 4). Previous investigations have analyzed water samples for a wide range of constituents including physical properties, major ions, trace elements, nutrients, various radionuclides, and various organic compounds including explosives, herbicides, pesticides, volatile organic compounds, and pharmaceuticals.



Base from U.S. Geological Survey digital data, 1999, 1:100,000
County line derived from the U.S. Department of Commerce, Bureau of the Census, 1994, TIGER/Line files, digital data, 1:100,000
Universal Transverse Mercator Zone 13N projection and North American Datum of 1983

0 5 10 MILES
0 5 10 KILOMETERS

EXPLANATION

● U.S. Geological Survey (USGS) water-quality station name (table 1)

▲ Los Alamos National Laboratory (LANL) water-quality station name (table 2)

Figure 1. U.S. Geological Survey and Los Alamos National Laboratory water-quality stations in the study area near the Rio Grande and the Rio Chama in north-central New Mexico.

Table 1. U.S. Geological Survey water-quality station information near the Rio Grande and the Rio Chama in north-central New Mexico.

[USGS, U.S. Geological Survey; NAD 83, North American Datum of 1983; nr, near; blw, below; Hwy, Highway]

USGS station number	USGS station name	Report station name (fig. 1)	Latitude (NAD 83)	Longitude (NAD 83)
08317300	Cochiti Lake near Cochiti Pueblo, N. Mex.	Cochiti (USGS) 1	35° 40' 41"	106° 18' 55"
354015106180010	Cochiti Lake delta nr Cochiti Pueblo, N. Mex.	Cochiti (USGS) 5	35° 40' 15"	106° 18' 02"
08313408	Cochiti Lake (site D) nr Cochiti Pueblo, N. Mex.	Cochiti (USGS) 4	35° 38' 57"	106° 18' 41"
08313412	Cochiti Lake (site C) nr Cochiti Pueblo, N. Mex.	Cochiti (USGS) 3	35° 38' 39"	106° 18' 55"
08317298	Cochiti Lake (site B) nr Cochiti Pueblo, N. Mex.	Cochiti (USGS) 2	35° 37' 10"	106° 19' 00"
08287000	Rio Chama below Abiquiu Dam, N. Mex.	Abiquiu (USGS)	36° 14' 13"	106° 24' 59"
08290000	Rio Chama nr Chamita, N. Mex.	Chamita (USGS)	36° 04' 22"	106° 06' 34"
08276500	Rio Grande blw Taos Junction Bridge near Taos, N. Mex.	Taos Junction (USGS)	36° 19' 12"	105° 45' 16"
08279500	Rio Grande at Embudo, N. Mex.	Embudo (USGS)	36° 12' 20"	105° 57' 51"
08281100	Rio Grande above San Juan Pueblo, N. Mex.	San Juan	36° 03' 25"	106° 04' 56"
08291600	Rio Grande at Santa Clara, N. Mex.	Santa Clara (USGS)	35° 58' 28"	106° 04' 43"
08313000	Rio Grande at Otowi Bridge, N. Mex.	Otowi (USGS)	35° 52' 28"	106° 08' 30"
354936106101110	Rio Grande at mouth of Mortendad Canyon, N. Mex.	Mortendad (USGS)	35° 49' 36"	106° 10' 13"
08313268	Rio Grande near White Rock, N. Mex.	White Rock (USGS)	35° 46' 51"	106° 12' 23"
08317400	Rio Grande below Cochiti Dam, N. Mex.	blw Cochiti (USGS)	35° 37' 04"	106° 19' 25"
08319000	Rio Grande at San Felipe, N. Mex.	San Felipe (USGS)	35° 26' 40"	106° 26' 22"
351921106332710	Rio Grande at Hwy 44 at Bernalillo, N. Mex.	Bernalillo (USGS)	35° 19' 21"	106° 33' 29"
08329918	Rio Grande at Alameda Bridge at Alameda, N. Mex.	at Alameda	35° 11' 49"	106° 38' 27"
08329928	Rio Grande nr Alameda, N. Mex.	near Alameda	35° 10' 55"	106° 39' 04"
08330000	Rio Grande at Albuquerque, N. Mex.	Albuquerque	35° 05' 21"	106° 40' 49"
08330150	Rio Grande at Rio Bravo Bridge near Albuquerque, N. Mex.	Rio Bravo	35° 01' 59"	106° 40' 25"

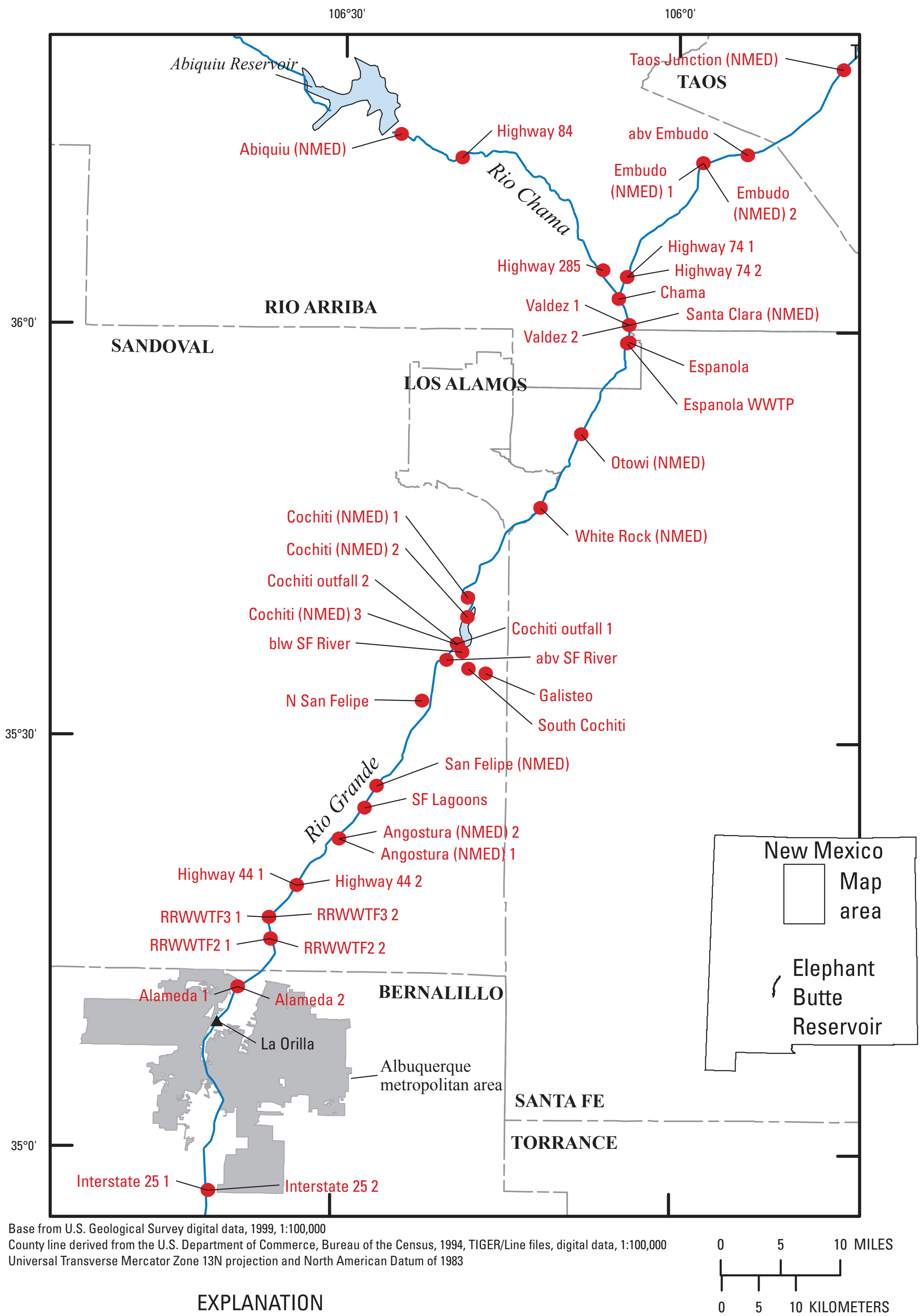
Table 2. Los Alamos National Laboratory water-quality station information near the Rio Grande and the Rio Chama in north-central New Mexico.

[Crk, creek; LANL, Los Alamos National Laboratory; NAD 83, North American Datum of 1983; wdth intgrt, width integrated]

LANL station synonym	LANL station name	Report station name (fig. 1)	Latitude (NAD 83)	Longitude (NAD 83)
SUOC	Cochiti Upper	Cochiti (LANL) 1	35° 40' 26"	106° 18' 24"
SMOC	Cochiti Middle	Cochiti (LANL) 3	35° 38' 53"	106° 18' 46"
SLOC	Cochiti Lower	Cochiti (LANL) 4	35° 37' 40"	106° 19' 04"
WALC	Cochiti Lake (site A) near Cochiti Pueblo, N. Mex.	Cochiti (LANL) 2	35° 37' 06"	106° 18' 56"
SATI	Rio Chama at Chamita	Chamita (LANL)	36° 04' 23"	106° 06' 43"
WCCR	Rio Chama at Chamita (bank)	Chamita, bank	36° 04' 23"	106° 06' 43"
SODU	Rio Grande at Embudo	Embudo (LANL)	36° 12' 19"	105° 57' 50"
WEGR	Rio Grande at Embudo (bank)	Embudo, bank	36° 12' 19"	105° 57' 50"
WUOR	Rio Grande at S C Crk	SC creek	35° 57' 57"	106° 04' 43"
WUOR	Rio Grande at Otowi Upper (bank)	upper Otowi, bank	35° 52' 31"	106° 08' 29"
WBOR	Rio Grande at Otowi (bank)	Otowi, bank	35° 52' 29"	106° 08' 32"
WIOR	Rio Grande at Otowi (wdth intgrt)	Otowi, width	35° 52' 29"	106° 08' 31"
WOGR	Rio Grande at Otowi Bridge, N. Mex.	Otowi bridge	35° 52' 29"	106° 08' 32"
STMR	Rio Grande at Mortandad	Mortandad (LANL)	35° 49' 40"	106° 10' 16"
SRWGR	Rio Grande near White Rock	White Rock (LANL)	35° 46' 51"	106° 12' 23"
PRGF	Rio Grande at Frijoles	Frijoles	35° 45' 13"	106° 15' 12"
WBFR	Rio Grande at Frijoles (bank)	Frijoles, bank	35° 45' 13"	106° 15' 12"
WIFR	Rio Grande at Frijoles (wdth intgrt)	Frijoles, width	35° 45' 12"	106° 15' 11"
WCGR	Rio Grande by Ditch Headgate	Ditch[1]	35° 37' 30"[2]	105° 40' 38"[2]
WCGR	Rio Grande below Cochiti	blw Cochiti (LANL)	35° 37' 03"	106° 19' 28"
SBGR	Rio Grande at Bernalillo	Bernalillo (LANL)	35° 19' 21"	106° 33' 30"

[1] Station not shown in figure 1.

[2] Location that was provided by LANL is not located on Rio Grande.



EXPLANATION

▲ U.S. Fish and Wildlife Service (USFWS) water-quality station name (table 4)

● New Mexico Environment Department (NMED) water-quality station name (table 3)

Figure 2. New Mexico Environment Department and U.S. Fish and Wildlife Service water-quality stations in the study area near the Rio Grande and the Rio Chama in north-central New Mexico.

Table 3. New Mexico Environment Department water-quality station information near the Rio Grande and the Rio Chama in north-central New Mexico.

[NMED, New Mexico Environment Department; USEPA, U.S. Environmental Protection Agency; NAD 83, North American Datum of 1983; L, USEPA Legacy STORET database; M, USEPA Modernized STORET database; N, north; USGS, U.S. Geological Survey; blw, below; abv, above; @, at; Hwy, Highway; Cr., Creek; STP, Sewage Treatment Plant; yds, yards; WWTP, Waste Water Treatment Plant; SF, Santa Fe; WWTF, Waste Water Treatment Facility]

NMED station identification	USEPA database	NMED station name	Report station name (fig. 2)	Latitude (NAD 83)	Longitude (NAD 83)
CBC	L	Cochiti Lake near Bland Canyon	Cochiti (NMED) 1	35° 40' 27"	106° 18' 30"
URG109.001512	L	Cochiti Lake shallow N of Tetilla boat ramp	Cochiti (NMED) 2	35° 39' 03"	106° 18' 31"
COD	L	Cochiti Lake at the dam	Cochiti (NMED) 3	35° 37' 00"	106° 19' 19"
URG113.008025	L	Rio Chama below Abiquiui Dam at USGS Gage	Abiquiu (NMED)	36° 14' 12"	106° 24' 59"
URG113.008020	L	Rio Chama at US Highway 84 bridge near Abiquiu	Highway 84	36° 12' 33"	106° 19' 28"
URG113.004510	L	Rio Chama at US Highway 285 at USGS Gage	Highway 285	36° 04' 26"	106° 06' 42"
TJB	L	Rio Grande blw Taos Junc bridge	Taos Junction (NMED)	36° 19' 12"	105° 45' 14"
28RGRAND628.0	M	Rio Grande above Embudo Creek	abv Embudo	36° 12' 55"	105° 53' 49"
28RGRAND593.7	M	Rio Grande at Embudo Station	Embudo (NMED) 1	36° 12' 20"	105° 57' 49"
URG111.021035	L	Rio Grande at the Embudo Gaging Station	Embudo (NMED) 2	36° 12' 20"	105° 57' 49"
28RGRAND572.8	M	Rio Grande at Highway 74 near San Juan Pueblo	Highway 74 1	36° 03' 58"	106° 04' 34"
URG111.021025	L	Rio Grande at San Juan Pueblo at Hwy 74 Bridge	Highway 74 2	36° 03' 58"	106° 04' 34"
28RGRAND569.4	M	Rio Grande below Rio Chama	Chama	36° 02' 23"	106° 05' 17"
28RGRAND565.5	M	Rio Grande above Espanola at Valdez Bridge	Valdez 1	36° 00' 27"	106° 04' 20"
URG111.004407	L	Rio Grange abv Espanola at Valdez Bridge	Valdez 2	36° 00' 27"	106° 04' 20"
URG111.003903	L	Rio Grande 1/4 mile upstream of Santa Clara Cr.	Santa Clara (NMED)	36° 00' 27"	106° 04' 20"
URG20	L	Rio Grande above Espanola STP	Espanola	35° 59' 12"	106° 04' 17"
URG111.004404	L	Rio Grande 300 yds below Espanola WWTP Outfall	Espanola WWTP	35° 59' 07"	106° 04' 30"
URG111.003115	L	Rio Grande at Otowi Bridge	Otowi (NMED)	35° 52' 29"	106° 08' 30"
28RGRAND533.6	M	Rio Grande at USGS Gage in White Rock Canyon (near Water Can)	White Rock (NMED)	35° 47' 05"	106° 12' 05"
MRG1	L	Rio Grande at Cochiti Dam Outfall	Cochiti outfall 1	35° 37' 05"	106° 19' 24"
30RGRAND507.2	M	Rio Grande at USGS Gage below Cochiti Reservoir Outlet	Cochiti outfall 2	35° 37' 04"	106° 19' 24"
URG108.001060	L	Rio Grande below Santa Fe River	blw SF River	35° 36' 28"	106° 18' 54"
URG108.001080	L	Rio Grande above Santa Fe River	abv SF River	35° 35' 53"	106° 20' 20"
URG108.001020	L	Rio Grande at Cochiti South Boundary	South Cochiti	35° 35' 17"	106° 18' 22"
URG108.001005	L	Rio Grande above Galisteo Creek	Galisteo	35° 34' 56"	106° 16' 49"
URG108.000475	L	Rio Grande at San Felipe N Boundary	N San Felipe	35° 32' 53"	106° 22' 27"

Table 3. New Mexico Environment Department water-quality station information near the Rio Grande and the Rio Chama in north-central New Mexico.—Continued

[NMED, New Mexico Environment Department; USEPA, U.S. Environmental Protection Agency; NAD 83, North American Datum of 1983; L, USEPA Legacy STORET database; M, USEPA Modernized STORET database; N, north; USGS, U.S. Geological Survey; blw, below; abv, above; @, at; Hwy, Highway; Cr., Creek; STP, Sewage Treatment Plant; yds, yards; WWTP, Waste Water Treatment Plant; SF, Santa Fe; WWTF, Waste Water Treatment Facility]

NMED station identification	USEPA database	NMED station name	Report station name (fig. 2)	Latitude (NAD 83)	Longitude (NAD 83)
URG108.000415	L	Rio Grande at San Felipe Pueblo	San Felipe (NMED)	35° 26' 39"	106° 26' 23"
URG108.000405	L	Rio Grande below San Felipe Lagoons	SF Lagoons	35° 25' 02"	106° 27' 28"
32RGRAND473.2	M	Rio Grande Below Angostura Diversion Works	Angostura (NMED) 1	35° 22' 45"	106° 29' 41"
MRG5	L	Rio Grande at Angostura Diversion Dam	Angostura (NMED) 2	35° 22' 45"	106° 29' 40"
MRG105.005765	L	Rio Grande at US Highway 44 Bridge	Highway 44 1	35° 19' 19"	106° 33' 23"
32RGRAND464.2	M	Rio Grande above Highway 44 Bridge	Highway 44 2	35° 19' 19"	106° 33' 23"
32RGRAND458.0	M	Rio Grande above Rio Rancho WWTF #3	RRWWTF3 1	35° 16' 58"	106° 35' 49"
MRG105.005755	L	Rio Grande above RRU WWTF #3 Discharge	RRWWTF3 2	35° 16' 58"	106° 35' 49"
32RGRAND455.1	M	Rio Grande above Rio Rancho WWTF #2	RRWWTF2 1	35° 15' 23"	106° 35' 37"
MRG105.005749	L	Rio Grande Upstream from RRU WWTF#2 Discharge	RRWWTF2 2	35° 15' 23"	106° 35' 37"
MRG22B	L	Rio Grande at Alameda Bridge (Corrales Bridge)	Alameda 1	35° 11' 51"	106° 38' 30"
32RGRAND445.4	M	Rio Grande above Alameda Bridge	Alameda 2	35° 11' 51"	106° 38' 30"
MRG015	L	Rio Grande at Interstate 25 Bridge	Interstate 25 1	34° 56' 58"	106° 40' 49"
32RGRAND413.2	M	Rio Grande above I-25 Bridge	Interstate 25 2	34° 56' 58"	106° 40' 49"

Table 4. U.S. Fish and Wildlife Service water-quality station information near the Rio Grande and the Rio Chama in north-central New Mexico.

[USFWS, U.S. Fish and Wildlife Service; NAD 83, North American Datum of 1983]

USFWS station name	Report station name (fig. 2)	Latitude (NAD 83)	Longitude (NAD 83)
Rio Grande at La Orilla, N. Mex.	La Orilla	35° 09' 22"	106° 40' 17"

Purpose and Scope

This report describes selected water-quality investigations conducted by various Federal and State agencies and 2007 USGS surface-water-quality investigations and data-collection activities and presents a statistical summary of selected water-quality data collected on the Rio Grande and its main tributary, the Rio Chama, in central and northern New Mexico. Data included in this report were collected by the USGS, the LANL, the NMED, and the USFWS. Results of selected water analyses are compared to water-quality standards. The water-quality data included in this report do not represent finished drinking-water samples, and any measured concentration that exceeds a Federal or State standard does not indicate a violation of drinking-water standards. The planned treatment process may reduce or eliminate many constituent concentrations detected in untreated surface-water samples, including bacteria and viruses.

Selected Investigations of Surface-Water Quality

In 1934, the U.S. Salinity Laboratory initiated a 30-year study to measure the quality of water in the Rio Grande, to determine the salt burden of the Rio Grande, and to calculate the salt-balance conditions along the Rio Grande (Wilcox, 1968). Data were collected during that study by the U.S. Bureau of Reclamation, the International Boundary and Water Commission, the USGS, and the U.S. Salinity Laboratory. A summary report was published in 1968 that included data and the calculated salt balances for the Rio Grande from Otowi Bridge, N. Mex., to Fort Quitman, Tex. (Wilcox, 1968). Wilcox (1968) found that the concentration of ions in water typically increased downstream and that salt balances in individual basins generally were positive (more salt entered the basin than was removed) during years of below normal streamflow and generally were negative during years of above normal streamflow.

Wilkins (1986) published a report summarizing the results of the Southwest Alluvial basins portion of the USGS Regional Aquifer-System Analysis program. Figures showing average surface-water quality for selected sites on the Rio Grande upstream of Fort Quitman were included and indicated that concentrations of analytes generally increased downstream from the headwaters and that upstream from Albuquerque calcium and bicarbonate were the principal dissolved constituents.

In 1992, the USGS National Water-Quality Assessment Program (NAWQA) initiated a series of studies to assess the quality of groundwater and surface water in the Rio Grande Valley from the headwaters to El Paso, Tex. Data on surface-water quality were collected at selected sites monthly and during synoptic studies to determine composition of the water and to assess the correlation between land use and surface-water quality. From 1992 to 1995, surface-water samples were collected at numerous locations in the Rio Grande basin and were analyzed for various constituents including trace elements, nutrients, and pesticides.

Anderholm and others (1995) summarized available nutrient, suspended sediment, and pesticide data for the Rio Grande from the headwaters to El Paso. They found that nutrient concentrations generally were small upstream of Albuquerque. Surface-water samples were analyzed for a range of chlorinated insecticides and polychlorinated biphenyls, organophosphorus insecticides, and herbicides. Of the 5,192 analyses for individual compounds, 98 percent of the results were censored, and DDT (dichlorodiphenyltrichloroethane) and its degradation products (diazinon and 2,4-D) were the most commonly detected pesticides (Anderholm and others, 1995). Carter (1997) presented the results of bed sediment and fish tissue sampling and reported that DDT and DDT-degradation compounds were common in fish tissue but seldom detected in bed sediment. Miller and others (1997) presented data collected during a synoptic study of trace element concentrations in surface water upstream of Albuquerque, and Taylor and others (2001) discussed the results of the sampling. Taylor and others (2001) indicated that runoff from the Creede mining district near the headwaters of the Rio Grande contributed to the concentration of dissolved trace elements in the Rio Grande for a distance of about 100 miles downstream. The Red River mining district did not appear to contribute to the concentration of dissolved trace elements in the Rio Grande. Taylor and others (2001) reported that, with the exception of cadmium at one site near the Creede mining district, no concentration of trace elements exceeded USEPA primary drinking-water standards. Healy (1997) discussed the results of monthly surface-water sampling along the Rio Grande. Healy (1997) found that dissolved-ion concentrations generally increased downstream as the result of natural sources, irrigation-return flow, wastewater treatment plant inflow, and urban runoff. Healy (1997) also noted that five pesticides including diazinon, s-Ethyl dipropylthiocarbamate (EPTC), malathion, simazine, and tebuthiuron were detected at amounts greater than the method detection limit in samples collected at sample site Rio Grande at Otowi Bridge. Moore and Anderholm (2002) evaluated spatial and temporal variations in dissolved solids, nitrate, total phosphorus, and suspended sediment concentrations and loads; they determined that ion concentration and load generally increase downstream from the New Mexico-Colorado State line as a result of increased streamflow.

The USGS, in cooperation with the City of Albuquerque, conducted a study to measure concentrations of dissolved trace elements and calculate instantaneous loads of selected trace elements and other constituents in the Rio Grande (Kelly and Taylor, 1996). Surface-water samples were collected at seven sites on the Rio Grande from near Bernalillo, N. Mex., to upstream of Isleta Diversion Dam, N. Mex., from May to October 1994 (Kelly and Taylor, 1996). Kelly and Taylor (1996) concluded that dissolved concentrations of trace elements generally increased downstream of the Albuquerque Wastewater Treatment Facility, that concentrations of dissolved trace elements did not significantly increase downstream of the effluent channel during periods of high flow, and that concentrations of dissolved trace elements increased downstream from Bernalillo to Isleta Diversion Dam during periods of low flow. Kelly and Taylor (1996) also noted that all measured concentrations were less than New Mexico water-quality standards for water designated as domestic or livestock supply.

Eight sites on the Rio Grande from the Pueblo of San Felipe, N. Mex., to Los Lunas, N. Mex., were sampled quarterly from October 1994 to August 1996 as part of a larger study conducted by the USGS. The purpose of that study was to determine ambient concentrations and loads of trace elements in the Rio Grande and to determine the mean concentrations of inorganic and organic forms of arsenic in the edible parts of fish tissue (Wilcox, 1997). Wilcox (1997) determined that dissolved-solids concentrations and dissolved-arsenic concentrations increased downstream from the Rio Grande at San Felipe Pueblo to Los Lunas, that nearly all arsenic measured in the Rio Grande was in the dissolved phase, and that major ion and trace element concentrations generally were greatest in outfall from wastewater treatment facilities.

The USGS, in cooperation with other Federal, State, and local agencies, conducted a 6-year (1995–2001) study of the Middle Rio Grande basin with the objective of improving the understanding of the hydrology, geology, and land-surface characteristics of the basin (Bartolino and Cole, 2002). Surface-water samples were collected from the Rio Grande, tributaries to the Rio Grande, irrigation canals, and surface drains (Plummer and others, 2004). Plummer and others (2004) concluded that isotopic variations in the Rio Grande are caused by seasonal variation in source waters. Measured tritium concentrations in the Rio Grande at Alameda, N. Mex., ranged from 7.2 to 11 tritium units (TU) and showed a distinct increase in concentration during summer 1997 (Plummer and others, 2004). Major and minor trace element data are further detailed in Plummer and others (2004).

The State of New Mexico initiated a survey to measure concentrations of pharmaceutical residuals in water from various locations across the State (McQuillan and others, 2002). Water samples were collected from 15 sewage effluent locations, 23 surface-water locations, 9 groundwater locations, and 2 public drinking-water supply systems; these samples were analyzed for various analgesics, anticonvulsants, antidepressants, anti-inflammatory compounds, hormones, antibiotics, caffeine, and tamoxifen (McQuillan and others, 2002). All sewage effluent samples in the Rio Grande watershed above Albuquerque contained at least one drug residue; an antidepressant was detected in a sample collected at Buckman Crossing, and a hormone and esterone were detected downstream of the Albuquerque wastewater treatment facility (McQuillan and others, 2002).

Results presented in a USFWS draft report show a small number of volatile organic compounds, pesticides, herbicides, explosives, and pharmaceuticals detected in water samples at levels greater than laboratory reporting limits or method detection (Abeyta and Lusk, 2004). Physical property measurements across channel transects indicated increased variability near the riverbanks, and physical property measurements from continuous monitoring probes indicated diurnal temperature variation and wide variation in specific conductance, dissolved oxygen, and turbidity (Abeyta and Lusk, 2004).

In 2000 and 2001, after the Cerro Grande fire near Los Alamos, N. Mex., the USGS collected surface-water samples from the Rio Grande and Cochiti Reservoir to monitor storm runoff events in watersheds affected by the fire. Concentrations of radionuclides including cesium-137, strontium-90, plutonium-238, and plutonium-239/240 measured in the Rio Grande after major storm events in 2001 and 2003 were greater than concentrations measured in base flow (Gallaher and Koch, 2004, p. 156–157). Sediment samples collected from Cochiti Reservoir after the fire indicated increased concentrations of cesium-137, plutonium-238, and plutonium-239 (Gallaher and Koch, 2004). Additional results are summarized in Gallaher and Koch (2004).

Langman and Anderholm (2004) described the effects of reservoir installation and operation and the introduction of water from the San Juan-Chama Project (SJCP) on water quality and suspended-sediment concentrations in the Rio Grande and Rio Chama. The authors concluded that extreme streamflow decreased and that median streamflow increased after installation of dams and the addition of water from the SJCP. Langman and Anderholm (2004) also concluded that reservoirs attenuated the water-quality dilution from snowmelt runoff and that the influence of the SJCP and reservoirs diminished downstream.

Passell and others (2004, 2005) used water-quality data collected from 1975 to 1999 by the USGS on the Rio Grande to determine spatial and temporal trends for specific conductance; total dissolved solids; pH; major ions including calcium, magnesium, sodium, potassium, chloride, fluoride, sulfate, bicarbonate, and silicate; and nutrients including total organic carbon, ammonium plus organic nitrogen, ammonium, nitrate plus nitrite, phosphorus, and orthophosphate. The water-quality data were collected as part of the USGS's National Stream Quality Accounting Network (NASQAN) and NAWQA. Temporal trends generally indicated improved quality of the water over time likely because of improved water treatment (Passell and others, 2004, 2005). Seasonal variation in water quality was correlated with seasonal variation in discharge, suggesting that improved water quality was partially caused by dilution from increased discharge (Passell and others, 2004, 2005). Spatial trends indicated that pH, major ion, and nutrient concentrations increased downstream of Albuquerque and likely were affected by effluent discharge, by river geomorphology, and possibly by discharge of saline groundwater to the river (Passell and others, 2004, 2005).

In 2002 and 2003, the LANL conducted a study of polychlorinated biphenyl (PCB) concentrations in the Rio Grande upstream and downstream of the laboratory boundary (Gonzalez and Montoya, 2005). Samples were collected by using semipermeable membrane devices. PCB concentrations in the Rio Grande upstream of Cochiti Reservoir were less than concentrations downstream of the reservoir, and PCB concentrations were similar upstream and downstream of the laboratory boundary (Gonzalez and Montoya, 2005). The report concluded that the LANL did not contribute to PCB concentrations in the Rio Grande during the sampling periods.

Langman and Nolan (2005) characterized streamflow and water-quality trends of the Rio Grande and Rio Chama during WYs 1985 to 2002 and concluded that streamflow in the Rio Grande and Rio Chama follows seasonal and climatic patterns and that water quality generally decreases downstream as indicated by an increase in specific conductance downstream. Langman and Nolan (2005) determined that water quality in the Rio Grande and the Rio Chama was affected by reservoir management and groundwater inflows. The authors noted that median concentrations of trace elements and maximum concentrations of radionuclides and anthropogenic compounds did not exceed drinking-water standards (Langman and Nolan, 2005).

2007 Investigations of Surface-Water Quality

The USGS, in cooperation with the ABCWUA, conducted several investigations on the Rio Grande and its tributaries in 2007. Water samples were collected at four sites on the Rio Grande, at one site on the Rio Chama, and at one site on the Jemez River to evaluate water-quality trends and determine concentrations of selected trace elements, organic compounds, and radionuclides. Samples were collected three times per year at the sites on the Rio Grande and Rio Chama and once per year on the Jemez River. Continuous specific conductance and water temperature were measured at three sites on the Rio Grande and at three sites on the Rio Chama to determine short-term water-quality variations and the effects of snowmelt and summer thunderstorm runoff, operation of reservoirs, and the introduction of SJCP water on water quality. Water-quality profiles were measured in Abiquiu and Cochiti Reservoirs to determine variations in water quality throughout those reservoirs. Data were evaluated to determine travel times in the Rio Grande downstream from Cochiti Reservoir.

Statistical Summary of Selected Surface-Water-Quality Data

The surface-water-quality data compiled for this report—collected by the USGS, the LANL, the NMED, and the USFWS—either were requested from the collecting agency or were obtained from an agency-supported database. Data that were not relevant to the study were removed; these data included those for sites outside the study area, sites that were not located on the main stem of the Rio Grande or the Rio Chama, samples that were collected before WY 1985 or after WY 2005, samples of media other than water, and quality-control samples such as blanks and replicates. Additional filtering criteria (detailed below) differed for each database. The authors assumed that each agency had reviewed their data prior to release; thus, the data compiled for this report were not reviewed for accuracy or correctness by the authors, and no attempt was made by the authors to evaluate quality-control samples.

The USGS has collected data as part of various Federal, State, and municipal projects with the focus of long-term monitoring of water quality. Data collection included many water-resources and water-quality studies conducted in cooperation with the City of Albuquerque and ABCWUA. Data were collected by following protocols outlined in the USGS National Field Manual for the Collection of Water-Quality Data (U.S. Geological Survey, variously dated), and water-quality constituents were analyzed by following the USGGS National Water Quality Laboratory, Denver, Colo., procedure outlined in the USGS Techniques of Water-Resources Investigations Book 5: Laboratory Analysis (U.S. Geological Survey, variously dated) Details of individual studies are provided herein in the section "Selected Investigations of Surface-Water Quality."

Data collected by the USGS were retrieved from the National Water Information System (NWIS) on December 28, 2006, by hydrologic unit code (HUC) for the Rio Grande and the Rio Chama including HUCs 13020101, 13020102, and 13020201 through 13020211. Data that were removed included data that were not relevant to the study, results that were flagged as erroneous, and invalid data such as negative or zero values for analytes other than radionuclides (which can have negative values). Analytes determined by multiple methods (alkalinity or acid-neutralizing capacity and bicarbonate) were combined. All sites located on Cochiti Reservoir were combined.

The LANL has established an environmental surveillance program that includes annual sampling of water, air, and soil in areas possibly affected by laboratory activities. As part of the annual surveillance, the LANL collects surface-water samples on the Rio Grande and Rio Chama upstream of the laboratory boundary to characterize regional background conditions and downstream of the laboratory boundary to characterize the effect of laboratory activities on regional surface-water quality (Los Alamos National Laboratory, 2005). Water-quality samples (generally dip samples collected from the bank) are analyzed for a variety of constituents including general chemistry, major ions, trace elements, radionuclides, and a range of organic compounds including explosives (Los Alamos National Laboratory, 2005). Results from environmental monitoring at the LANL are published in an annual report that characterizes environmental management performance, summarizes environmental occurrences and responses, demonstrates compliance with applicable standards, and emphasizes significant programs and efforts (Los Alamos National Laboratory, 2005).

Water-quality data collected by the LANL were obtained from the Sandia Tritium workbook in the Oracle Discoverer interface of the LANL Water Quality Database, accessed at http://wqdbworld.lanl.gov/ on November 26, 2006. Data were retrieved for relevant surface-water sites (location type code “WCS” described as Watercourse) on the Rio Grande and Rio Chama and all sites on Cochiti Reservoir. Data that were removed included data that were not relevant to the study, results for which the method detection limit was greater than the reported result, results that did not indicate whether the sample was filtered or unfiltered, results that were flagged as erroneous, and invalid data such as negative or zero values for analytes other than radionuclides (which can have negative values). All sites located on Cochiti Reservoir were combined.

The NMED Surface Water Quality Bureau (SWQB), under the New Mexico Water Quality Act and the Federal Clean Water Act, established monitoring programs to assess the quality of surface water, to develop and update water-quality standards and discharge permits, to identify and prioritize water-quality problems, to develop total daily maximum load standards, and to assess existing water-quality controls and wetland restoration projects (New Mexico Environment Department, 2006). The monitoring program is rotated among water basins on an 8-year cycle that includes monthly sampling of rivers and streams from spring to fall and seasonal sampling of reservoirs and lakes (New Mexico Environment Department, 2006). Samples are analyzed for parameters that have applicable standards, and selected samples are analyzed for major ions, trace elements, and other toxic substances (New Mexico Environment Department, 2006). Samples are collected by using methods detailed in various SWQB publications (New Mexico Environment Department, 2006). Results from the surveys are described in various reports that are available from the NMED.

Water-quality data collected by the NMED were obtained from the U.S. Environmental Protection Agency (USEPA) STORET Legacy (Legacy) and Modernized STORET (Modern) databases, accessed at http://www.epa.gov/storet/dbtop.html on November 17, 2006. Data for Bernalillo, Los Alamos, Rio Arriba, Sandoval, Santa Fe, and Taos Counties were retrieved from the Legacy database, and data for the entire State of New Mexico was retrieved from the Modern database. Data from the Legacy and Modern databases were combined to generate a complete dataset from the NMED. Sample locations were combined by matching station names between the datasets, and analytes were combined by matching parameter names between the datasets. Some analyte matches required conversion of the reported analyte unit to ensure that units matched between databases, and if units were missing, they were determined either from the listed USGS parameter code or from the listed method code. Sample fractions were separated into dissolved and total, which included total, whole, total recoverable, and whole recoverable. Data not relevant to the study were removed. All sites located on Cochiti Reservoir were combined.

In 2002, the USFWS began an assessment of the effect of water-quality conditions on the health of the silvery minnow (*Hybognathus amarus*) in the Middle Rio Grande (Abeyta and Lusk, 2004). Samples were collected from 14 sites along the Rio Grande between the southern border of Sandia Pueblo and the northern edge of Elephant Butte Reservoir. Field parameters, including water temperature, pH, specific conductance, dissolved oxygen, and turbidity, were measured, and composite samples for laboratory analysis were collected in low-velocity, shallow areas (C. Abeyta, USFWS, written commun., 2007). Filtered samples were analyzed for total dissolved solids, common anions, major ions, trace elements, and perchlorate, and unfiltered samples were analyzed for alkalinity, total suspended solids, hardness, total cyanide, nutrients, biological oxygen demand, chemical oxygen demand, and organic compounds including volatile organic compounds, pesticides, herbicides, explosives, and pharmaceuticals.

Data collected by the USFWS were provided by the agency in a spreadsheet of water-quality data associated with a draft report (Abeyta and Lusk, 2004). Data not relevant to the study were removed.

Nonparametric statistical methods, which are dependent on the relative position of numerically ranked data (Helsel, 2005), were applied to calculate summary statistics. Summary statistics—including median and maximum concentrations, the number of samples analyzed, and the percentage of values that were censored—were calculated for all constituents for which two or more values were available.

Most of the available data were values that are less than a threshold value and are imprecisely known and denoted as censored (Helsel, 2005). The data obtained from the USGS, the LANL, and the NMED denoted censored data with a qualifier code that indicated that the reported value was the threshold value. The data obtained from the USFWS denoted censored data by alteration of the reported value to indicate that the measured value was less than the associated reporting limit. All values that were less than or equal to the largest censored value for that constituent were raised to the largest censored value for statistical analysis.

Estimated values (measured values that are equal to or less than a threshold value) indicated that the analyte was present in the sample but that the actual concentration is imprecisely known. Estimated values in all databases were indicated by a qualifier code. The concentrations of estimated values were assumed to equal the estimated value for statistical analysis.

In general, analysis methods for radionuclides differ from methods for organic and inorganic constituents. Radionuclides are quantified by measuring the rate of radioactive decay, and the uncertainty of the measured value is a function of the length of time that is monitored for decay. The minimum detectable concentration (the minimum concentration required to give a specified probability that an analyte is present in a sample, U.S. Nuclear Regulatory Commission, 2004, p. 20–6) determines the threshold for censoring a value. For this report, the databases did not provide the required information to define the threshold values and did not consistently designate censored data. Therefore, the reported values for radionuclides were assumed to be absolute concentrations unless the constituent was qualified as censored.

Results from analyses for radionuclides can be expressed in units of concentration (µg/L), activity (pCi/L or µCi/mL), or exposure (millirems). The conversion from units of concentration or activity to units of exposure is dependent on factors such as body mass, radionuclide species, and the amount of radionuclide consumed. In addition, given the same concentration or activity, different radionuclides would contribute different levels of exposure to the final exposure value. Because of the complexities, the equivalent exposure for the reported concentrations or activities of radionuclides are not presented in this report.

Results of selected water analyses are compared to (1) national drinking-water standards promulgated by the USEPA including primary standards (U.S. Environmental Protection Agency, 2007a) and secondary standards (U.S. Environmental Protection Agency, 2007b); (2) health-based screening levels (HBSL) developed by the USGS, USEPA, Oregon Health and Science University (OSHU), and the New Jersey Department of Environmental Protection (NJDEP; U.S. Geological Survey, 2007); (3) human-health screening levels for tapwater developed by the USEPA (U.S. Environmental Protection Agency, 2007c); and (4) derived concentration guide (DCG) reference values for operational U.S. Department of Energy (USDOE) facilities developed by the USDOE (U.S. Department of Energy, 2007). The comparison is useful to evaluate the suitability of surface water for municipal supply. Because the water-quality data for radionuclides were reported in units of concentration or activity, standards for radionuclides reported in units of exposure were not included in the comparison.

Primary drinking-water standards established by the USEPA (table 5) are either maximum contaminant levels or treatment techniques and are legally enforceable limits on concentrations of specific contaminants known to adversely affect human health (U.S. Environmental Protection Agency, 2011). Standards are the lowest concentration of a contaminant that can be achieved in drinking water with the best available and economically feasible technology and treatment techniques and are generally established with the objective of attaining the maximum contaminant level goal (the maximum concentration of a contaminant that does not cause adverse health effects, U.S. Environmental Protection Agency, 2011). Secondary drinking-water standards established by the USEPA (table 6) are non-enforceable guidelines for contaminants that may affect the cosmetic or aesthetic quality of the water (U.S. Environmental Protection Agency, 2011). The USGS, in cooperation with the USEPA, OHSU, and the NJDEP, developed HBSLs (table 7) to provide a context for interpretation of water-quality data for compounds with no existing drinking-water standards (Toccalino and others, 2003). Toccalino and others (2003) detailed the methods used to determine HBSLs, and Toccalino (2007) summarized revisions to the methodology used to determine HBSLs. The USEPA Region 6 developed screening levels (table 8) on the basis of fixed levels of risk associated with contaminant concentrations in soil, air, and water to aid in the process of closure and realignment of surplus military property (U.S. Environmental Protection Agency, 2007c, 2007d). The USDOE DCG reference values (table 9) are the concentrations of radionuclides at which continuous exposure for 1 year by a single mode (ingestion of water, submersion in air, or inhalation) would result in an effective dose equivalent of 100 millirems. The values were established to limit exposure of the public to radiation from USDOE facilities and activities to the lowest achievable level and to control radioactive contamination of the environment to the extent practical (U.S. Department of Energy, 2007).

Table 5. Primary drinking-water standards and maximum contaminant level goals promulgated by the U.S. Environmental Protection Agency.

[Standards and goals from U.S. Environmental Protection Agency, 2007a. CASRN, Chemical Abstracts Service registry number; MCL, maximum contaminant level; TT, treatment technique; mg/L, milligrams per liter; n/a, not available; N, nitrogen; Cl_2, chlorine; ClO_2, chlorine dioxide; pCi/L, picocuries per liter; mrem/year, millirems per year; µg/L, micrograms per liter; MRDL, maximum residual disinfectant level; MRDLG, maximum residual disinfectant level goal]

Constituent	CASRN	Highest allowable concentration(MCL or TT) (mg/L)	Maximum contaminant level goal (MCLG) (mg/L)
General chemistry			
Turbidity		[1]TT	n/a
Cyanide (as free cyanide)	57-12-5	.2	.2
Major ions			
Fluoride	16984-48-8	4	4
Nutrients			
Nitrate (measured as N)	14797-55-8	10	10
Nitrite (measured as N)	14797-65-0	1	1
Trace elements			
Antimony	7440-36-0	.006	.006
Arsenic	7440-38-2	.01	0
Barium	7440-39-3	2	2
Beryllium	7440-41-7	.004	.004
Cadmium	7440-43-9	.005	.005
Chromium (total)	7440-47-3	.1	.1
Copper	7440-50-8	[2]TT	1.3
Lead	7439-92-1	[2]TT	0
Mercury (inorganic)	7439-97-6	.002	.002
Selenium	7782-49-2	.05	.05
Thallium	7440-28-0	.002	.0005
Organic compounds			
Volatile organic compounds			
1,1,1-Trichloroethane	71-55-6	.2	.2
1,1,2-Trichloroethane	79-00-5	.005	.003
1,2,4-Trichlorobenzene	120-82-1	.07	.07
1,1-Dichloroethylene	75-35-4	.007	.007
1,2-Dichloroethane	107-06-2	.005	0
cis-1,2-Dichloroethylene	156-59-2	.07	.07
trans-1,2-Dichloroethylene	156-60-5	.1	.1
1,2-Dichloropropane	78-87-5	.005	0
Benzene	71-43-2	.005	0
Carbon tetrachloride	56-23-5	.005	0
Chlorobenzene	108-90-7	.1	.1
o-Dichlorobenzene	95-50-1	.6	.6
p-Dichlorobenzene	106-46-7	.075	.075
Dichloromethane	75-09-2	.005	0
Ethylbenzene	100-41-4	.7	.7
Ethylene dibromide	106-93-4	.00005	0
Styrene	100-42-5	.1	.1
Tetrachloroethylene	127-18-4	.005	0
Toluene	108-88-3	1	1
Trichloroethylene	79-01-6	.005	0
Vinyl chloride	75-01-4	.002	0
Xylenes (total)	1330-20-7	10	10

Table 5. Primary drinking-water standards and maximum contaminant level goals promulgated by the U.S. Environmental Protection Agency.—Continued

[Standards and goals from U.S. Environmental Protection Agency, 2007a. CASRN, Chemical Abstracts Service registry number; MCL, maximum contaminant level; TT, treatment technique; mg/L, milligrams per liter; n/a, not available; N, nitrogen; Cl_2, chlorine; ClO_2, chlorine dioxide; pCi/L, picocuries per liter; mrem/year, millirems per year; µg/L, micrograms per liter; MRDL, maximum residual disinfectant level; MRDLG, maximum residual disinfectant level goal]

Constituent	CASRN	Highest allowable concentration (MCL or TT) (mg/L)	Maximum contaminant level goal (MCLG) (mg/L)
Semivolatile organic compounds			
Di(2-ethylhexyl) adipate	103-23-1	0.4	0.4
Di(2-ethylhexyl) phthalate	117-81-7	.006	0
Hexachlorobenzene	118-74-1	.001	0
Hexachlorocyclopentadiene	77-47-4	.05	.05
Pentachlorophenol	87-86-5	.001	0
Pesticides			
1,2-Dibromo-3-chloropropane	96-12-8	.0002	0
2,4,5-TP	93-72-1	.05	.05
2,4-D	94-75-7	.07	.07
Alachlor	15972-60-8	.002	0
Atrazine	1912-24-9	.003	.003
Carbofuran	1563-66-2	.04	.04
Chlordane	12789-03-6	.002	0
Dalapon	75-99-0	.2	.2
Dinoseb	88-85-7	.007	.007
Dioxin (2,3,7,8-TCDD)	1746-01-6	.00000003	0
Diquat	2764-72-9	.02	.02
Endothall	145-73-3	.1	.1
Endrin	72-20-8	.002	.002
Glyphosate	1071-83-6	.7	.7
Heptachlor	76-44-8	.0004	0
Heptachlor epoxide	1024-57-3	.0002	0
Lindane	58-89-9	.0002	.0002
Methoxychlor	72-43-5	.04	.04
Oxamyl	23135-22-0	.2	.2
Picloram	1918-02-1	.5	.5
Simazine	122-34-9	.004	.004
Toxaphene	8001-35-2	.003	0
Polyaromatic hydrocarbons			
Benzo(a)pyrene (PAHs)	50-32-8	.0002	0
Polychlorinated biphenyls			
Polychlorinated biphenyls (PCBs)	1336-36-3	.0005	0
Radionuclides			
Alpha particles		15 pCi/L	0
Beta particles and photon emitters		4 mrem/year	0
Radium 226 and Radium 228 (combined)		5 pCi/L	0
Tritium		20,000 pCi/L	
Strontium-90		8 pCi/L	
Uranium		30 mg/L	0

Table 5. Primary drinking-water standards and maximum contaminant level goals promulgated by the U.S. Environmental Protection Agency.—Continued

[Standards and goals from U.S. Environmental Protection Agency, 2007a. CASRN, Chemical Abstracts Service registry number; MCL, maximum contaminant level; TT, treatment technique; mg/L, milligrams per liter; n/a, not available; N, nitrogen; Cl_2, chlorine; ClO_2, chlorine dioxide; pCi/L, picocuries per liter; mrem/year, millirems per year; µg/L, micrograms per liter; MRDL, maximum residual disinfectant level; MRDLG, maximum residual disinfectant level goal]

Constituent	CASRN	Highest allowable concentration (MCL or TT) (mg/L)	Maximum contaminant level goal (MCLG) (mg/L)
Bacteria and viruses			
Total coliforms (including fecal coliform and *Escherichia coli*)		[3]5.0 percent	0
Disinfection and treatment products			
Acrylamide	79-06-1	[4]TT	0
Chloramines (as Cl_2)		[5]MRDL = 4.0	[6]MRDLG = 4.0
Chlorine (as Cl_2)		[5]MRDL = 4.0	[6]MRDLG = 4.0
Chlorine dioxide (as ClO_2)	10049-04-4	[5]MRDL = 0.8	[6]MRDLG = 0.8
Epichlorohydrin	106-89-8	[4]TT	0
Disinfection byproducts			
Bromate	15541-45-4	.01	0
Chlorite	14998-27-7	1	.8
Haloacetic acids		.06	[7]n/a
Total trihalomethanes (TTHMs)		.01/.08	[8]none/[7]n/a

[1] Turbidity: At no time can turbidity (cloudiness of water) be greater than 5 nephelolometric turbidity units (NTU); systems that filter must ensure that the turbidity does not exceed 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95 percent of the daily samples in any month. As of January 1, 2002, turbidity may never exceed 1 NTU and must not exceed 0.3 NTU in 95 percent of daily samples in any month.

[2] Lead and copper are regulated by a treatment technique that requires systems to control the corrosiveness of their water. If more than 10 percent of tapwater samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead the action level is 0.015 mg/L.

[3] More than 5.0 percent samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli*. In a system, if two consecutive samples are total coliform positive—one of which is also positive for *E. coli* fecal coliforms—then the system has an acute MCL violation.

[4] Each water system must certify, in writing, to the State (using third-party or manufacturer's certification) that, when acrylamide and epichlorohydrin are used in drinking-water systems, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05 percent dosed at 1 mg/L (or equivalent) and Epichlorohydrin = 0.01 percent dosed at 20 mg/L (or equivalent).

[5] Maximum residual disinfectant level (MRDL)—The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

[6] Maximum residual disinfectant level goal (MRDLG)—The level of a drinking-water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

[7] Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants: Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L). Chloroform is regulated with this group but has no MCLG. Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L). Monochloroacetic acid, bromoacetic acid, and dibromoacetic acid are regulated with this group but have no MCLGs.

[8] MCLGs were not established before the 1986 Amendments to the Safe Drinking Water Act. Therefore, there is no MCLG for this contaminant.

Table 6. Secondary drinking-water standards promulgated by the U.S. Environmental Protection Agency and noticeable effects above the standard.

[Standards and effects from U.S. Environmental Protection Agency, 2007b. mg/L, milligrams per liter]

Constituent	Secondary standard (mg/L)	Noticeable effects above the secondary maximum contaminant level
	General chemistry	
pH	6.5–8.5 standard units	low pH: bitter metallic taste; corrosion high pH: slippery feel; soda taste; deposits
Total dissolved solids (TDS)	500	hardness; deposits; colored water; staining; salty taste
	Major ions	
Chloride	250	salty taste
Fluoride	2	tooth discoloration
Sulfate	250	salty taste
	Trace elements	
Aluminum	.05–.2	colored water
Copper	1	metallic taste; blue-green staining
Iron	.3	rusty color; sediment; metallic taste; reddish or orange staining
Manganese	.05	black to brown color; black staining; bitter metallic taste
Silver	.1	skin discoloration; graying of the white part of the eye
Zinc	5	metallic taste
	Other	
Color	15 (color units)	visible tint
Corrosivity	noncorrosive	metallic taste; corroded pipes/ fixtures staining
Foaming agents	.5	frothy, cloudy; bitter taste; odor
Odor	3 threshold odor number	“rotten egg,” musty, or chemical smell

Table 7. Health-based screening levels developed by the U.S. Geological Survey in cooperation with the U.S. Environmental Protection Agency, Oregon Health and Science University, and the New Jersey Department of Environmental Protection.

[Screening levels from U.S. Geological Survey, 2007. CASRN, Chemcial Abstracts Service registry number; USGS, U.S. Geological Survey; µg/L, micrograms per liter]

Constituent	CASRN	USGS parameter codes	Low health-based screening level (µg/L)	High health-based screening level (µg/L)
Major ions				
Perchlorate	14797730	61209, 62171	5	5
Trace elements				
Boron	7440428	01020, 01022	1,000	1,000
Chromium (III)	16065831	1030	10,000	10,000
Chromium (VI)	18540299	1032	20	20
Manganese	7439965	01054, 01055, 01056	300	300
Molybdenum	7439987	01060, 01062	40	40
Nickel	7440020	01065, 01067	100	100
Silver	7440224	01075, 01077	100	100
Strontium	7440246	01080, 01082	4,000	4,000
Vanadium	7440622	01085, 01087		
Zinc	7440666	01090, 01092	2,000	2,000
Organic compounds				
Volatile organic compounds				
1,1,1,2-Tetrachloroethane	630206	77562	70	70
1,1,2,2-Tetrachloroethane	79345	34516	.3	.3
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	50283, 77652	200,000	200,000
1,2,3-Trichloropropane	96184	77443	40	40
1,3-Dichlorobenzene	541731	34566	600	600
1,3-Dichloropropene	542756		.3	30
1-Chloro-2-methylbenzene	95498	77275	100	100
4-Chlorotoluene	106434	77277	100	100
Acetone	67641	81552	6,000	6,000
Acrolein	107028	34210	4	4
Acrylonitrile	107131	34215	.06	6
Bromochloromethane	74975	77297	90	90
Bromomethane	74839	30202, 34413	100	100
Carbon Disulfide	75150	77041	700	700
Dichlorodifluoromethane	75718	34668, 50282	1,000	1,000
Ether, Ethyl	60297	81576	1,000	1,000
Hexachlorobutadiene	87683	34392, 39702	.9	90
Hexachloroethane	67721	34396, 34397	.7	.7
Isopropylbenzene	98828	62078, 77223	700	700
Methyl acrylonitrile	126987	81593	.7	.7
Methyl Ethyl Ketone	78933	81595	4,000	4,000
Methyl methacrylate	80626	81597	10,000	10,000
Methylchloride	74873	30201, 34418	30	30
Naphthalene	91203	34443, 34696	100	100
Trichlorofluoromethane	75694	34488, 50281	2,000	2,000

Table 7. Health-based screening levels developed by the U.S. Geological Survey in cooperation with the U.S. Environmental Protection Agency, Oregon Health and Science University, and the New Jersey Department of Environmental Protection.—Continued

[Screening levels from U.S. Geological Survey, 2007. CASRN, Chemcial Abstracts Service registry number; USGS, U.S. Geological Survey; µg/L, micrograms per liter]

Constituent	CASRN	USGS parameter codes	Low health-based screening level (µg/L)	High health-based screening level (µg/L)
Semivolatile Organic Compounds				
1,2-Diphenylhydrazine	122667	82626	0.04	4
2,4,6-Trichlorophenol	88062	34621, 34622	3	300
2,4-Dichlorophenol	120832	34601, 34602	20	20
2,4-Dimethylphenol	105679	34606, 34607	100	100
2,4-Dinitrophenol	51285	34616, 34617	10	10
2,4-Dinitrotoluene	121142	34611, 34612	.05	5
2,6-Dinitrotoluene	606202	34626, 34627	.05	5
2-Chloronaphthalene	91587	34581, 34582	600	600
2-Chlorophenol	95578	34586, 34587	40	40
2-Methylnaphthalene	91576	62056	30	30
3,3'-Dichlorobenzidine	91941	34631, 34632	.08	8
Acenaphthene	83329	34205, 34206	400	400
Acetophenone	98862	62064	700	700
Anthracene	120127	34220, 34221	2,000	2,000
Benzidine	92875	34239, 39120	.0002	.02
bis(2-Chloroethyl)ether	111444	34273, 34274	.03	3
bis(2-chloroisopropyl) ether	108601	34283, 34284	300	300
Butylbenzyl phthalate	85687	34292, 34293	100	100
Diethyl phthalate	84662	34336, 34337	6,000	6,000
Di-n-butyl phthalate	84742	34327, 39110	700	700
Fluoranthene	206440	34376, 34377	300	300
Fluorene	86737	34381, 34382	300	300
Isophorone	78591	34408, 34409	100	100
Nitrobenzene	98953	34447, 34448	4	4
N-Nitrosodimethylamine	62759	34438, 34439	.0007	.07
N-Nitrosodi-N-propylamine	621647	34428	.005	.5
N-Nitrosodiphenylamine	86306	34433, 34434	7	700
Phenol	108952	34466, 34694	2,000	2,000
p-Nitrophenol	100027	34646, 34647	60	60
Pyrene	129000	34469, 34470	200	200
Pesticide				
2,4,5-T	93765	39740, 39742	70	70
2,4-DB	94826	38746	200	200
Acetochlor	34256821	49260	1	100
Acifluorfen	50594666	49315	90	90
Acifluorfen, sodium	62476599		90	90
Aldicarb	116063	49312	7	7
Aldrin	309002	39330, 39331	.002	.2
Ametryn	834128	38401, 82184	500	500
Azinphos-methyl	86500	82686	10	10

Table 7. Health-based screening levels developed by the U.S. Geological Survey in cooperation with the U.S. Environmental Protection Agency, Oregon Health and Science University, and the New Jersey Department of Environmental Protection.—Continued

[Screening levels from U.S. Geological Survey, 2007. CASRN, Chemcial Abstracts Service registry number; USGS, U.S. Geological Survey; µg/L, micrograms per liter]

Constituent	CASRN	USGS parameter codes	Low health-based screening level (µg/L)	High health-based screening level (µg/L)
Bendiocarb	22781233	50299	9	9
Benfluralin	1861401	82673	4	4
Benomyl	17804352	50300	40	40
Bensulfuron-methyl	83055996	61676, 61693	1,000	1,000
Bentazon	25057890	38711	200	200
beta-HCH	319857	39338	.04	.04
Bifenthrin	82657043	61580	10	10
Bromacil	314409	04029, 30234	70	70
Bromoxynil	1689845	49311	10	10
Butylate	2008415	04028, 30236	400	400
Captan	133062	61582	900	900
Carbaryl	63252	39750, 49310, 82680	40	4,000
Carboxin	5234684	04027, 30245	60	60
Chloramben	133904	49307	100	100
Chlorimuron-ethyl	90982324	50306, 61677	600	600
Chlorothalonil	1897456	49306, 70314	5	500
Chlorpyrifos	2921882	38932, 38933	2	2
Chlorsulfuron	64902723	61678	100	100
Cyanazine	21725462	04041, 50010, 81757	1	1
Cycloate	1134232	04031, 30254	40	40
Cyfluthrin	68359375	61585	200	200
Cyhalothrin/Karate	68085858		40	40
Cypermethrin	52315078	61586	40	40
Dacthal	1861321	82682	70	70
Diazinon	333415	39570, 39572	1	1
Dicamba	1918009	38442, 82052	3,000	3,000
Dichlobenil	1194656	49303	9	9
Dichlorvos	62737	38775	.4	.4
Dicrotophos	141662	38454	.05	.05
Dieldrin	60571	39380, 39381	.002	.2
Dimethoate	60515	82662	2	2
Diphenamid	957517	04033, 30255	200	200
Disulfoton	298044	39011, 82677	.9	.9
Diuron	330541	49300	2	200
Endosulfan	115297	82354	40	40
EPTC	759944	82668	200	200
Ethalfluralin	55283686	82663	30	30
Ethion	563122	39398, 82346	4	4
Ethoprophos	13194484	82672	1	100
Fenamiphos	22224926	61591	.7	.7
Fenthion	55389	38801	.5	.5

Table 7. Health-based screening levels developed by the U.S. Geological Survey in cooperation with the U.S. Environmental Protection Agency, Oregon Health and Science University, and the New Jersey Department of Environmental Protection.—Continued

[Screening levels from U.S. Geological Survey, 2007. CASRN, Chemcial Abstracts Service registry number; USGS, U.S. Geological Survey; µg/L, micrograms per liter]

Constituent	CASRN	USGS parameter codes	Low health-based screening level (µg/L)	High health-based screening level (µg/L)
Flumetsulam	98967409	61679, 61694	7,000	7,000
Fluometuron	2164172	38811	4	4
Fonofos	944229	04095, 82614	10	10
Glufosinate ammonium	77182822		3	3
Hexazinone	51235042	04025, 30264	400	400
Imazapyr	81334341	61681	20,000	20,000
Imazaquin	81335377	50356, 61682	2,000	2,000
Imazethapyr	81335775	50407, 61683	2,000	2,000
Imidacloprid	105827789	61695	400	400
Iprodione	36734197	61593	.8	80
Isofenphos	25311711	61594	6	6
Linuron	330552	38478, 82666	5	5
Malathion	121755	39530, 39532	50	50
MCPA	94746	38482	30	30
MCPB	94815	38487	100	100
Metalaxyl	57837191	50359, 61596	600	600
Methidathion	950378	61598	1	1
Methiocarb	2032657	30282, 38501	40	40
Methomyl	16752775	39051, 49296	200	200
Metolachlor	51218452	39415, 82612, 82694	700	700
Metribuzin	21087649	82611, 82630	90	90
Metsulfuron-methyl	74223646	61684, 61697	2,000	2,000
Mirex	2385855	39755, 39756	1	1
Molinate	2212671	50375, 82671	.7	.7
Myclobutanil	88671890	61599	200	200
Naled	300765	38856	10	10
Napropamide	15299997	82684	800	800
Nicosulfuron	111991094	50364, 61685	9,000	9,000
Norflurazon	27314132	49293, 50332	10	10
Oryzalin	19044883	49292	4	400
Oxyfluorfen	42874033	61600	20	20
p,p'-DDD	72548	39310, 39360, 39361	.1	10
p,p'-DDT	50293	39300, 39370, 39371	.1	10
Parathion	56382	39540, 39542	.02	.02
Parathion-methyl	298000	39600, 39602, 82667	1	1
Pebulate	1114712	82669	50	50
Pendimethalin	40487421	82683	70	70
Permethrin	52645531		4	400
Phorate	298022	39023, 82664	4	4
Phosmet	732116	61601	8	8
Primisulfuron methyl	86209510	61686	2,000	2,000

Table 7. Health-based screening levels developed by the U.S. Geological Survey in cooperation with the U.S. Environmental Protection Agency, Oregon Health and Science University, and the New Jersey Department of Environmental Protection.—Continued

[Screening levels from U.S. Geological Survey, 2007. CASRN, Chemcial Abstracts Service registry number; USGS, U.S. Geological Survey; µg/L, micrograms per liter]

Constituent	CASRN	USGS parameter codes	Low health-based screening level (µg/L)	High health-based screening level (µg/L)
Profenofos	41198087	61603	.4	.4
Prometon	1610180	04037, 39056	100	100
Prometryn	7287196	04036, 39057	300	300
Propachlor	1918167	04024, 30295	1	100
Propanil	709988	50377, 82679	6	6
Propargite	2312358	82685	1	100
Propazine	139402	38535, 39024	100	100
Propetamphos	31218834	61604	4	4
Propham	122429	39052, 49236	100	100
Propiconazole	60207901	50471	70	70
Propoxur	114261	30296, 38538	9	900
Propyzamide	23950585	82676	1	100
Prosulfuron	94125345	61687	100	100
Sulfotepp	3689245	61605	4	4
Tebuthiuron	34014181	82670	1,000	1,000
Tefluthrin	79538322	61606	40	40
Terbacil	5902512	04032, 30311, 82665	90	90
Terbufos	13071799	82675	.4	.4
Terbuthylazine	5915413	04022, 91064	2	2
Terbutryn	886500	38888	.7	.7
Thifensulfuron methyl	79277273	61689	90	90
Thiobencarb	28249776	82681	70	70
Triallate	2303175	82678	20	20
Triasulfuron	82097505	61690	70	70
Tribenuron-methyl	101200480	61159	6	6
Tribuphos	78488	39040, 61610	7	7
Triclopyr	55335063	49235	400	400
Trifluralin	1582098	04023, 39030, 82661	20	20
Triflusulfuron methyl	126535157	61691	20	20
Vernolate	1929777	04034, 30324	7	7
Pesticide degradation product				
2-Hydroxyatrazine	2163680	50355	70	70
Aldicarb sulfone	1646884	49313, 82587	7	7
Aldicarb sulfoxide	1646873	49314, 82586	7	7
alpha-HCH	319846	34253, 39337	.006	.6
p,p'-DDE	72559	34653, 39320, 39365, 39366	.1	10
Polychlorinated biphenyls				
Aroclor 1016	12674112	34671	.5	.5
Aroclor 1254	11097691	39504	.1	.1
Emerging contaminant				
Bisphenol A	80057	62069	400	400

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
1,1,1,2-Tetrachloroethane	630-20-6	0.43238556
1,1,1-Trichloroethane	71-55-6	835.8364312268
1,1,2,2-Tetrachloroethane	79-34-5	.0553382456
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	59,179.8574761935
1,1,2-Trichloroethane	79-00-5	.1995131878
1,1,2-Trichloropropane	598-77-6	3.4166666667
1,1-Biphenyl	92-52-4	304.1666666667
1,1-Dichloroethane	75-34-3	1216.6666666667
1,1-Dichloroethylene	75-35-4	338.8436482085
1,1-Difluoroethane	75-37-6	69350
1,1-Dimethylhydrazine	57-14-7	.0258582824
1,2,3-Trichloropropane	96-18-4	.0016008561
1,2,3-Trichloropropene	96-19-5	2.0738636364
1,2,4,5-Tetrachlorobenzene	95-94-3	1.95
1,2,4-Tribromobenzene	615-54-3	182.5
1,2,4-Trichlorobenzene	120-82-1	8.156424581
1,2,4-Trimethylbenzene	95-63-6	12.4290578888
1,2-Dibromo-3-chloropropane	96-12-8	.0002031502
1,2-Dibromoethane	106-93-4	.0056029965
1,2-Dichlorobenzene	95-50-1	49.3058161351
1,2-Dichloroethane (EDC)	107-06-2	.1231427792
1,2-Dichloroethylene (cis)	156-59-2	6.8333333333
1,2-Dichloroethylene (trans)	156-60-5	106.8292682927
1,2-Dichloropropane	78-87-5	.1647940133
1,2-Dimethylhydrazine	540-73-8	.0018170685
1,2-Dinitrobenzene	528-29-0	3.65
1,2-Diphenylhydrazine	122-66-7	.0840394179
1,3,5-Trimethylbenzene	108-67-8	12.3261819627
1,3,5-Trinitrobenzene	99-35-4	1,095
1,3-Butadiene	106-99-0	.1280701754
1,3-Dichlorobenzene	541-73-1	14.479338843
1,3-Dichloropropene	542-75-6	.3954924694
1,3-Dinitrobenzene	99-65-0	3.65
1,4-Dibromobenzene	106-37-6	365
1,4-Dichloro-2-butene	764-41-0	.0012049455
1,4-Dichlorobenzene	106-46-7	.466916371
1,4-Dinitrobenzene	100-25-4	3.65
1,4-Dioxane	123-91-1	6.1119576684
1,4-Dithiane	505-29-3	365
1,6-Hexamethylene diisocyanate	822-06-0	.10439

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.—Continued

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
1,1,1,2-Tetrachloroethane	630-20-6	0.43238556
1,1,1-Trichloroethane	71-55-6	835.8364312268
1,1,2,2-Tetrachloroethane	79-34-5	.0553382456
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	59,179.8574761935
1,1,2-Trichloroethane	79-00-5	.1995131878
1,1,2-Trichloropropane	598-77-6	3.4166666667
1,1-Biphenyl	92-52-4	304.1666666667
1,1-Dichloroethane	75-34-3	1216.6666666667
1,1-Dichloroethylene	75-35-4	338.8436482085
1,1-Difluoroethane	75-37-6	69350
1,1-Dimethylhydrazine	57-14-7	.0258582824
1,2,3-Trichloropropane	96-18-4	.0016008561
1,2,3-Trichloropropene	96-19-5	2.0738636364
1,2,4,5-Tetrachlorobenzene	95-94-3	1.95
1,2,4-Tribromobenzene	615-54-3	182.5
1,2,4-Trichlorobenzene	120-82-1	8.156424581
1,2,4-Trimethylbenzene	95-63-6	12.4290578888
1,2-Dibromo-3-chloropropane	96-12-8	.0002031502
1,2-Dibromoethane	106-93-4	.0056029965
1,2-Dichlorobenzene	95-50-1	49.3058161351
1,2-Dichloroethane (EDC)	107-06-2	.1231427792
1,2-Dichloroethylene (cis)	156-59-2	6.8333333333
1,2-Dichloroethylene (trans)	156-60-5	106.8292682927
1,2-Dichloropropane	78-87-5	.1647940133
1,2-Dimethylhydrazine	540-73-8	.0018170685
1,2-Dinitrobenzene	528-29-0	3.65
1,2-Diphenylhydrazine	122-66-7	.0840394179
1,3,5-Trimethylbenzene	108-67-8	12.3261819627
1,3,5-Trinitrobenzene	99-35-4	1,095
1,3-Butadiene	106-99-0	.1280701754
1,3-Dichlorobenzene	541-73-1	14.479338843
1,3-Dichloropropene	542-75-6	.3954924694
1,3-Dinitrobenzene	99-65-0	3.65
1,4-Dibromobenzene	106-37-6	365
1,4-Dichloro-2-butene	764-41-0	.0012049455
1,4-Dichlorobenzene	106-46-7	.466916371
1,4-Dinitrobenzene	100-25-4	3.65
1,4-Dioxane	123-91-1	6.1119576684
1,4-Dithiane	505-29-3	365
1,6-Hexamethylene diisocyanate	822-06-0	.10439

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.—Continued

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
4-(2,4-Dichlorophenoxy)butyric Acid (2,4-DB)	94-82-6	292
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5	365
4,4'-Methylene bis(2-chloroaniline)	101-14-4	.0215339233
4,4'-Methylene bis(N,N'-dimethyl)aniline	101-61-1	1.4615550946
4,4'-Methylenediphenyl isocyanate	101-68-8	6.205
4,6-Dinitro-o-cyclohexyl phenol	131-89-5	73
4-Aminopyridine	504-24-5	.73
4-Chloro-2-methylaniline	95-69-2	.1159164385
4-Chloroaniline	106-47-8	146
4-Chlorobenzotrifluoride	98-56-6	730
4-Methylphenol	106-44-5	182.5
4-Nitrophenol	100-02-7	292
Acenaphthene	83-32-9	365
Acetaldehyde	75-07-0	1.7464114833
Acetochlor	34256-82-1	730
Acetone	67-64-1	5,475
Acetonitrile	75-05-8	124.1
Acetophenone	98-86-2	608.3333333333
Acrolein	107-02-8	.0416191562
Acrylamide	79-06-1	.0147761614
Acrylic acid	79-10-7	18,250
Acrylonitrile	107-13-1	.0388642689
Alachlor	15972-60-8	.8351743398
Alar	1596-84-5	5,475
Aldicarb	116-06-3	36.5
Aldicarb sulfone	1646-88-4	36.5
Aldrin	309-00-2	.0039547961
Allyl chloride	107-05-1	1,825
Aluminum	7429-90-5	36,500
Amdro	67485-29-4	1.95
Ammonia	7664-41-7	208.5714285714
Aniline	62-53-3	11.7950060268
Anthracene	120-12-7	1,825
Antimony and compounds	7440-36-0	14.6
Antimony pentoxide	1314-60-9	18.25
Antimony tetroxide	1332-81-6	14.6
Antimony trioxide	1309-64-4	14.6
Aroclor 1016	12674-11-2	.9604504908
Aroclor 1221	11104-28-2	.0336157672
Aroclor 1232	11141-16-5	.0336157672

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.—Continued

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
Aroclor 1242	53469-21-9	0.0336157672
Aroclor 1248	12672-29-6	.0336157672
Aroclor 1254	11097-69-1	.0336157672
Aroclor 1260	11096-82-5	.0336157672
Arsenic (cancer endpoint)	7440-38-2	.0448210229
Arsine	7784-42-1	.10439
Assure	76578-14-8	328.5
Atrazine	1912-24-9	.3028447493
Azobenzene	103-33-3	.6111957668
Barium and compounds	7440-39-3	7,300
Barium cyanide	542-62-1	3,650
Baygon	114-26-1	146
Baythroid	68359-37-5	912.5
Bentazon	25057-89-0	1,095
Benz[a]anthracene	56-55-3	.0215339233
Benzaldehyde	100-52-7	3,650
Benzene	71-43-2	.3538700293
Benzidine	92-87-5	.0215339233
Benzo[a]pyrene	50-32-8	.0215339233
Benzo[b]fluoranthene	205-99-2	.0215339233
Benzo[k]fluoranthene	207-08-9	.0215339233
Benzoic acid	65-85-0	146,000
Benzyl alcohol	100-51-6	10,950
Benzyl chloride	100-44-7	.0659176053
Beryllium and compounds	7440-41-7	73
beta-Chloronaphthalene	91-58-7	486.6666666667
Bis(2-chloroethyl)ether	111-44-4	.0097797808
Bis(2-chloroisopropyl)ether	108-60-1	.2744299001
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	4.8022524538
Bis(chloromethyl)ether	542-88-1	.0000515218
Boron	7440-42-8	7,300
Bromobenzene	108-86-1	23.252008907
Bromodichloromethane	75-27-4	.180741821
Bromoform (tribromomethane)	75-25-2	8.5103208041
Bromomethane	74-83-9	8.6610169492
Bromophos	2104-96-3	182.5
Bromoxynil	1689-84-5	730
Butyl benzyl phthalate	85-68-7	7,300
Butylate	2008-41-5	1,825
Cadmium and compounds	7440-43-9	18.25

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.—Continued

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
Calcium cyanide	592-01-8	1,460
Caprolactam	105-60-2	18,250
Captan	133-06-2	19.209009815
Carbaryl	63-25-2	3,650
Carbazole	86-74-8	3.3615767176
Carbofuran	1563-66-2	182.5
Carbon disulfide	75-15-0	1042.8571428571
Carbon tetrachloride	56-23-5	.1712995771
Carbosulfan	55285-14-8	365
Chloral	302-17-0	3,650
Chloranil	118-75-2	.1668276287
Chlordane	57-74-9	.1920900982
Chlorine	7782-50-5	3,650
Chlorine dioxide	10049-04-4	.4171428571
Chloroacetic acid	79-11-8	73
Chlorobenzene	108-90-7	91.25
Chlorobenzilate	510-15-6	.2490056828
Chlorodifluoromethane	75-45-6	85166.6666666667
Chloroform	67-66-3	.1670480549
Chloromethane	74-87-3	2.134502924
Chlorpyrifos	2921-88-2	109.5
Chlorpyrifos-methyl	5598-13-0	365
Chromium III	16065-83-1	54,750
Chromium VI	18540-29-9	109.5
Chrysene	218-01-9	9.2097992264
Cobalt	7440-48-4	730
Copper and compounds	7440-50-8	1,355.71428571428
Copper cyanide	544-92-3	182.5
Crotonaldehyde	123-73-9	.005897891
Cumene (isopropylbenzene)	98-82-8	658.1967213115
Cyanazine	21725-46-2	.0800375409
Cyanide, free	57-12-5	730
Cyanogen	460-19-5	1,460
Cyanogen bromide	506-68-3	3,285
Cyanogen chloride	506-77-4	1,825
Cyclohexane	110-82-7	12,514.2857142857
Cyclohexanone	108-94-1	182,500
Cyhalothrin/Karate	68085-85-8	182.5
Cypermethrin	52315-07-8	365
Dacthal	1861-32-1	365

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.—Continued

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
Dalapon	75-99-0	1,095
DDD	72-54-8	.2801313931
DDE	72-55-9	.1977398069
DDT	50-29-3	.1977398069
Di(2-ethylhexyl)adipate	103-23-1	56.0262786271
Diazinon	333-41-5	32.85
Dibenz[ah]anthracene	53-70-3	.0215339233
Dibenzofuran	132-64-9	12.1666666667
Dibromochloromethane	124-48-1	.1334046774
Dibutyl phthalate	84-74-2	3,650
Dicamba	1918-00-9	1,095
Dichlorodifluoromethane	75-71-8	394.5945945946
Dichlorvos	62-73-7	.2318328771
Dicofol	115-32-2	.1527989417
Dicyclopentadiene	77-73-6	13.9047619048
Dieldrin	60-57-1	.0042019709
Diethyl phthalate	84-66-2	29,200
Diethylene glycol, monobutyl ether	112-34-5	365
Diethylene glycol, monoethyl ether	111-90-0	2,190
Diethylstilbestrol	56-53-1	.0000143046
Difenzoquat (Avenge)	43222-48-6	2,920
Diisopropyl methylphosphonate	1445-75-6	2,920
Dimethyl phthalate	131-11-3	365,000
Dimethylamine	124-40-3	.0347473904
Dimethylphenethylamine	122-09-8	36.5
Dinitrotoluene mixture	25321-14-6	.0988699035
Dinoseb	88-85-7	36.5
Dioxin (2,3,7,8-TCDD)	1746-01-6	.0000004482
Diphenyl sulfone	127-63-9	109.5
Diphenylamine	122-39-4	912.5
Diquat	85-00-7	8.3
Disulfoton	298-04-4	1.46
Diuron	330-54-1	73
Endosulfan	115-29-7	219
Endothall	145-73-3	730
Endrin	72-20-8	1.95
Epichlorohydrin	106-89-8	2.0660377358
Ethion	563-12-2	18.25
Ethyl acetate	141-78-6	5,475
Ethyl chloride	75-00-3	3.864135484

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.—Continued

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
Ethyl ether	60-29-7	1,216.66666666667
Ethyl methacrylate	97-63-2	547.5
Ethylbenzene	100-41-4	1,339.87341772152
Ethylene diamine	107-15-3	3,285
Ethylene glycol	107-21-1	73,000
Ethylene glycol, monobutyl ether	111-76-2	18,250
Ethylene oxide	75-21-8	.0242725226
Ethylene thiourea (ETU)	96-45-7	.6111957668
Fenamiphos	22224-92-6	9.125
Fluometuron	2164-17-2	474.5
Fluoranthene	206-44-0	1,460
Fluorene	86-73-7	243.3333333333
Fluoride	16984-48-8	2,190
Fomesafen	72178-02-0	.3538501808
Fonofos	944-22-9	73
Formaldehyde	50-00-0	1.4615550946
Formic Acid	64-18-6	73,000
Furan	110-00-9	6.0833333333
Furazolidone	67-45-8	.017692509
Furfural	98-01-1	109.5
Glycidaldehyde	765-34-4	14.6
Glyphosate	1071-83-6	3,650
HCH (alpha)	319-84-6	.0106716721
HCH (beta)	319-85-7	.0373508524
HCH (gamma) Lindane	58-89-9	.0517165649
HCH-technical	608-73-1	.0373508524
Heptachlor	76-44-8	.014940341
Heptachlor epoxide	1024-57-3	.0073880807
Hexabromobenzene	87-82-1	73
Hexachlorobenzene	118-74-1	.042019709
Hexachlorobutadiene	87-68-3	.8619427481
Hexachlorocyclopentadiene	77-47-4	219
Hexachlorodibenzo-p-dioxin mixture (HxCDD)	19408-74-3	.0000108438
Hexachloroethane	67-72-1	4.8022524538
Hexachlorophene	70-30-4	1.95
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	.6111957668
Hexazinone	51235-04-2	1,204.5
HMX	2691-41-0	1,825
Hydrazine, hydrazine sulfate	302-01-2	.0224105115
Hydrogen cyanide	74-90-8	6.2029407974

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.—Continued

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
Hydrogen sulfide	7783-06-4	109.5
Indeno[1,2,3-cd]pyrene	193-39-5	.0215339233
Iron	7439-89-6	25,550
Isobutanol	78-83-1	1,825
Isophorone	78-59-1	7.7700361606
Isopropalin	33820-53-0	547.5
Isopropyl methyl phosphonic acid	1832-54-8	3,650
Kepone	143-50-0	.0084039418
Lead	7439-92-1	15
Lead (tetraethyl)	78-00-2	.00365
Lithium	7439-93-2	730
Malathion	121-75-5	730
Maleic anhydride	108-31-6	3,650
Manganese and compounds	7439-96-5	1,703.09
Mephosfolan	950-10-7	3.285
Mepiquat	24307-26-4	1,095
Mercury (elemental)	7439-97-6	.6257142857
Mercury (methyl)	22967-92-6	3.65
Mercury and compounds	7487-94-7	1.95
Methacrylonitrile	126-98-7	1.0428571429
Methanol	67-56-1	18,250
Methidathion	950-37-8	36.5
Methoxychlor	72-43-5	182.5
Methyl acetate	79-20-9	6,083.33333333333
Methyl acrylate	96-33-3	182.5
Methyl ethyl ketone	78-93-3	7,064.51612903226
Methyl hydrazine	60-34-4	.0611195767
Methyl isobutyl ketone	108-10-1	1,99.90909090909
Methyl mercaptan	74-93-1	2.805
Methyl methacrylate	80-62-6	1,419.44444444444
Methyl parathion	298-00-0	9.125
Methyl phosphonic acid	993-13-5	730
Methyl styrene (alpha)	98-83-9	425.8333333333
Methyl styrene (mixture)	25013-15-4	6.4137931034
Methyl tertbutyl ether (MTBE)	1634-04-4	1.5882421197
Methylcyclohexane	108-87-2	5,217.17451523546
Methylene bromide	74-95-3	6.8333333333
Methylene chloride	75-09-2	4.2756318271
Metolaclor (Dual)	51218-45-2	5,475
Mirex	2385-85-5	.0373508524

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.—Continued

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
m-Nitrotoluene	99-08-1	121.6666666667
Molybdenum	7439-98-7	182.5
Monochloramine	10599-90-3	3,650
m-Phenylenediamine	108-45-2	219
Naled	300-76-5	73
Naphthalene	91-20-3	6.2029407974
n-Butylbenzene	104-51-8	6.8333333333
n-Hexane	110-54-3	1,454.71014492754
Nickel and compounds	7440-02-0	730
Nitrate	14797-55-8	10,000
Nitric Oxide	10102-43-9	3,650
Nitrite	14797-65-0	1,000
Nitrobenzene	98-95-3	3.3953488372
Nitrofurantoin	67-20-9	2,555
Nitrofurazone	59-87-0	.0448210229
Nitrogen dioxide	10102-44-0	36,500
N-N-Dimethylaniline	121-69-7	73
N-Nitroso di-n-propylamine	621-64-7	.0096045049
N-Nitrosodiethanolamine	1116-54-7	.0240112623
N-Nitrosodiethylamine	55-18-5	.0004482102
N-Nitrosodimethylamine	62-75-9	.0013182654
N-Nitrosodi-n-butylamine	924-16-3	.0020130534
N-Nitrosodiphenylamine	86-30-6	13.7207212964
N-Nitroso-N-methylethylamine	10595-95-6	.0030559788
N-Nitrosopyrrolidine	930-55-2	.0320150164
n-Propylbenzene	103-65-1	6.8333333333
NuStar	85509-19-9	25.55
o-Chloronitrobenzene	88-73-3	.1454183267
o-Chlorotoluene	95-49-8	121.6666666667
Octahydro-1357-tetranitro-1357-tetrazocine (HMX)	2691-41-0	1,825
o-Nitrotoluene	88-72-2	.2923110189
Oryzalin	19044-88-3	1,825
Oxadiazon	19666-30-9	182.5
Oxamyl	23135-22-0	912.5
Oxyfluorfen	42874-03-3	109.5
p,a,a,a-Tetrachlorotoluene	5216-25-1	.0033615767
Paraquat	4685-14-7	164.25
Parathion	56-38-2	219
p-Chlorobenzoic acid	74-11-3	7,300
p-Chloronitrobenzene	100-00-5	1.2001934236

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.—Continued

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
Pentachlorobenzene	608-93-5	29.2
Pentachloronitrobenzene	82-68-8	.2585828244
Pentachlorophenol	87-86-5	.5602627863
Perchlorate	7601-90-3	<24.5
Perchlorate-revised	7601-90-3	25.55
Permethrin	52645-53-1	1,825
Phenol	108-95-2	10,950
Phenothiazine	92-84-2	73
Phenylmercuric acetate	62-38-4	2.92
Phosphine	7803-51-2	1.95
Phosphoric acid	7664-38-2	2.878
Phosphorus (white)	7723-14-0	.73
Phthalic anhydride	85-44-9	73,000
p-Hydroquinone	123-31-9	1.2005631134
p-Nitrotoluene	99-99-0	3.9547961384
Polybrominated biphenyls		.007554105
Polychlorinated biphenyls (PCBs)	1336-36-3	.0336157672
Potassium cyanide	151-50-8	1,825
Potassium silver cyanide	506-61-6	7,300
p-Phenylenediamine	106-50-3	6,935
p-Phthalic acid	100-21-0	36,500
Prometon	1610-18-0	547.5
Prometryn	7287-19-6	146
Propachlor	1918-16-7	474.5
Propanil	709-98-8	182.5
Propargite	2312-35-8	730
Propargyl alcohol	107-19-7	73
Propazine	139-40-2	730
Propiconazole	60207-90-1	474.5
Propylene glycol	57-55-6	18,250
Propylene glycol, monoethyl ether	111-35-3	25,550
Propylene glycol, monomethyl ether	107-98-2	25,550
Propylene oxide	75-56-9	.22061579
p-Toluidine	106-49-0	.3538501808
Pursuit	81335-77-5	9,125
Pyrene	129-00-0	182.5
Pyridine	110-86-1	36.5
Quinoline	91-22-5	.0224105115
RDX (Cyclonite)	121-82-4	.6111957668
Resmethrin	10453-86-8	1,095

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.—Continued

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
Ronnel	299-84-3	1,825
Rotenone	83-79-4	146
sec-Butylbenzene	135-98-8	6.8333333333
Selenious Acid	7783-00-8	182.5
Selenium	7782-49-2	182.5
Silver and compounds	7440-22-4	182.5
Silver cyanide	506-64-9	3,650
Simazine	122-34-9	.5602627863
Sodium azide	26628-22-8	146
Sodium cyanide	143-33-9	1,460
Sodium diethyldithiocarbamate	148-18-5	.2490056828
Sodium fluoroacetate	62-74-8	.73
Sodium metavanadate	13718-26-8	36.5
Strontium, stable	7440-24-6	21,900
Strychnine	57-24-9	1.95
Styrene	100-42-5	1,641.08527131783
tert-Butylbenzene	98-06-6	6.8333333333
Tetrachloroethylene (PCE)	127-18-4	.1045198387
Tetrachlorovinphos	961-11-5	2.8013139314
Tetrahydrofuran	109-99-9	8.8462545201
Thallic oxide	1314-32-5	2.555
Thallium		2.555
Thallium acetate	563-68-8	3.285
Thallium carbonate	6533-73-9	2.92
Thallium chloride	7791-12-0	2.92
Thallium nitrate	10102-45-1	3.285
Thallium selenite	12039-52-0	3.285
Thallium sulfate	7446-18-6	2.92
Thiobencarb	28249-77-6	365
Thiocyanate	n/a	7.3
Tin and compounds	n/a	21,900
Toluene	108-88-3	2281.2495009762
Toluene-2,4-diamine	95-80-7	.0210098545
Toluene-2,5-diamine	95-70-5	21,900
Toluene-2,6-diamine	823-40-5	1,095
Toxaphene	8001-35-2	.0611195767
Tributyltin oxide (TBTO)	56-35-9	1.95
Trichloroethylene (TCE)	79-01-6	.0280149823
Trichlorofluoromethane	75-69-4	1,288.23529411765
Triethylamine	121-44-8	12.1666666667

Table 8. Human-health screening levels for tapwater developed by the U.S. Environmental Protection Agency.—Continued

[Screening levels from U.S. Environmental Protection Agency, 2007c. CASRN, Chemcial Abstracts Service registry number; µg/L, micrograms per liter; n/a, not available; <, less than]

Constituent	CASRN	Screening level (µg/L)
Trimethyl phosphate	512-56-1	1.817068496
Trinitrophenylmethylnitramine	479-45-8	146
Vanadium	7440-62-2	182.5
Vanadium pentoxide	1314-62-1	328.5
Vinclozolin	50471-44-8	912.5
Vinyl acetate	108-05-4	412.4293785311
Vinyl bromide	593-60-2	.1018726628
Vinyl chloride	75-01-4	.015
Warfarin	81-81-2	1.95
Xylene (m)	108-38-3	207.9772079772
Xylene (o)	95-47-6	1,431.37254901961
Xylenes	1330-20-7	202.7777777778
Zinc	7440-66-6	10,950
Zinc cyanide	557-21-1	1,825
Zinc phosphide	1314-84-7	1.95
Zineb	12122-67-7	1,825

Table 9. Derived concentration guide reference values for ingested water for operational U.S. Department of Energy facilities.

[Values from U.S. Department of Energy, 2007. DCG, derived concentration guide; µCi/mL, microcuries per milliliter; pCi/L, picocuries per liter]

Radionuclide	DCG (ingested water) (µCi/mL)	DCG (ingested water) (pCi/L)
Americium-241	0.00000003	30
Cesium-137	.000003	3,000
Strontium-90	.000001	1,000–10,000
Plutonium-238	.00000004	40–3,000
Plutonium-239	.00000003	30–2,000
Plutonium-240	.00000003	30–2,000
Radium-224	.0000004	400
Radium-226	.0000001	100
Radium-228	.0000001	100
Thorium-228	.0000004	400
Thorium-230	.0000003	300
Thorium-232	.00000005	50
Tritium	.002	2,000,000
Uranium-234	.0000005	500–5,000
Uranium-235	.0000006	600–5,000
Uranium-236	.0000005	500–6,000
Uranium-238	.0000006	600–6,000
Uranium-Natural	.0000006	600–6,000

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