

# **Aqueous Geochemical Data from the Analysis of Stream-Water Samples Collected in June and July 2006— Taylor Mountains 1:250,000-Scale Quadrangle, Alaska**

Open-File Report 2011–1011



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By Bronwen Wang, Seth Mueller, Sarah Stetson, Elizabeth Bailey, and Greg Lee

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

**U.S. Department of the Interior**  
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## Conversion Factors and Datums

### Conversion Factors

<b>Multiply</b>	<b>By</b>	<b>To obtain</b>
kilometer (km)	0.6214	mile (mi)
liter (L)	33.82	ounce, fluid (fl. oz)

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

$$^{\circ}\text{F}=(1.8\times^{\circ}\text{C})+32.$$

Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius ( $\mu\text{S}/\text{cm}$  at 25°C).

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter ( $\mu\text{g}/\text{L}$ ).

### Datums

Vertical coordinate information is referenced to the North American Vertical Datum of 1927 (NAVD 27)

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

# Aqueous Geochemical Data from the Analysis of Stream-Water Samples Collected in June and July 2006—Taylor Mountains 1:250,000-Scale Quadrangle, Alaska

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## Abstract

We report on the chemical analysis of water samples collected from the Taylor Mountains 1:250,000-scale quadrangle, Alaska. Parameters for which data are reported include pH, conductivity, water temperature, major cation and anion concentrations, trace-element concentrations, and dissolved organic-carbon concentrations. Samples were collected as part of a multiyear U.S. Geological Survey project entitled “Geologic and Mineral Deposit Data for Alaskan Economic Development.” Data presented here are from samples collected in June and July 2006. The data are being released at this time with minimal interpretation. This is the third release of aqueous geochemical data from this project; aqueous geochemical data from samples collected in 2004 and 2005 were published previously. The data in this report augment but do not duplicate or supersede the previous data release. Site selection was based on a regional sampling strategy that focused on first- and second-order drainages. Water sample site selection was based on landscape parameters that included physiography, wetland extent, lithological changes, and a cursory field review of mineralogy from pan concentrates. Stream water in the Taylor Mountains quadrangle is dominated by bicarbonate ( $\text{HCO}_3^-$ ), although in a few samples more than 50 percent of the anionic charge can be attributed to sulfate ( $\text{SO}_4^{2-}$ ). The major-cation chemistry ranges from  $\text{Ca}^{2+}/\text{Mg}^{2+}$  dominated to a mix of  $\text{Ca}^{2+}/\text{Mg}^{2+}/\text{Na}^+/\text{K}^+$ . Generally, good agreement was found between the major cations and anions in the duplicate samples. Many trace elements in these samples were at or near the analytical method detection limit, but good agreement was found between duplicate samples for elements with detectable concentrations. All field blank major-ion and trace-element concentrations were below detection.

## Introduction

Geological, geochemical, and geophysical data are important to the development of mineral resources in Alaska. However, even at a reconnaissance scale of 1:250,000, adequate data to assess the undiscovered mineral resource potential is available for less than half of Alaska. Government agencies and private industry have requested the collection of new geological data and in response the U.S. Geological Survey (USGS) initiated the “Geologic and Mineral Deposit Data for Alaskan Economic Development” project to obtain geological and geoenvironmental data for data-poor regions of the state.

Southwestern Alaska, which includes the Taylor Mountains quadrangle ([fig. 1](#)), is a region with minimal geologic data available (Miller and others, 2006). However, based on the limited data and known mineral prospects, the region is thought to have a high potential for undiscovered mineral resources. Therefore, we initially focused our data collection in this area. This is the third release of aqueous geochemical data from this project; the 2004 and 2005 aqueous geochemical data were released previously (Wang and others, 2006a; Wang and others, 2006b). The data released in this report augment but do not duplicate or supersede the previous data release. Data from the 2006 sample collection are being released at this time with minimal interpretation.

## Methods

The water sampling sites ([fig. 1](#)) represent a subset of sites used for sediment sampling for the overall project. Site selection was based on a regional sampling strategy that focused on first- and second-order streams. Water sampling site selection also was based on landscape parameters

2 Aqueous Geochemical Data from Samples Collected June–July 2006, Taylor Mountains Quadrangle, Alaska

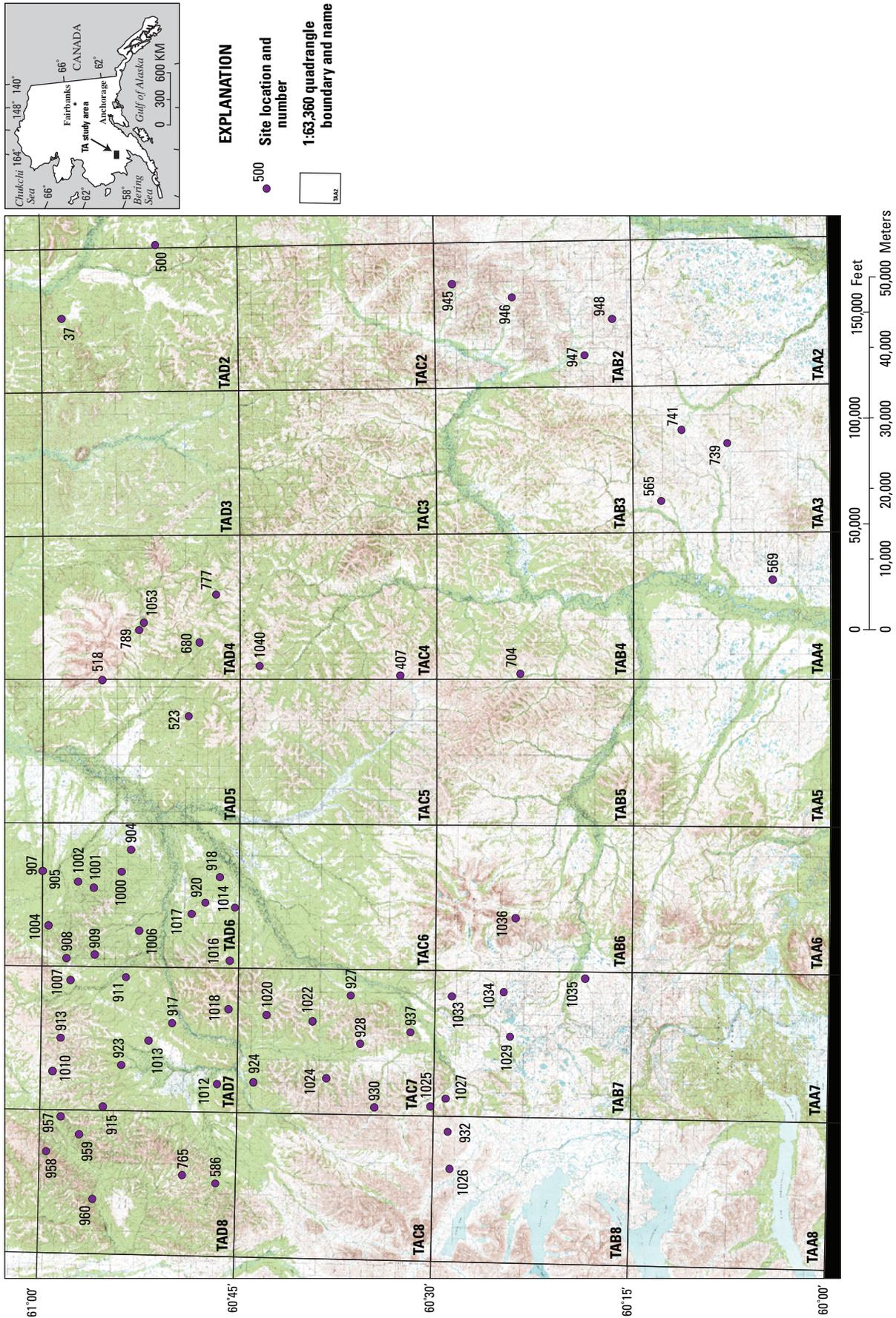


Figure 1. Location of stream-water sites in the Taylor Mountains (TA) quadrangle, Alaska, for 2006.

that included physiography, wetland extent, lithological changes, and a cursory field review of the mineralogy in the pan concentrate samples. Stream pH, conductivity, and temperature were measured on site. All three of these parameters were measured directly in the stream using standard pH meters, conductivity meters, and submersible thermometers. The pH meters were calibrated daily using a three-point calibration (pH 4, 7, 10), and pH standards were used in the field to monitor the performance of the pH probe. The conductivity meters were checked and calibrated daily with a 1,430  $\mu\text{S}/\text{cm}$  standard.

Dip-composite water samples were collected using telfon collection bottles. The collection bottles were cleaned in a boiling nitric-acid bath prior to field deployment (Olson and DeWild, 1999). In the field, the sample bottles were capped in a clean plastic-resealable bag and carried in the samplers' backpacks. The sample collection bottle was rinsed with copious amounts of native water prior to sample collection. Sampling consisted of dipping the collection bottle at several locations across the stream, upstream of all other sampling activities. Samplers wore disposable gloves during the sampling and sample processing. Water samples for major- and trace-element analysis were filtered immediately after collection through a 0.45  $\mu\text{m}$  capsule filter, using a peristaltic pump, into high density polyethylene bottles. Samples for major cation ( $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{K}^+$ ,  $\text{Na}^+$ ) and trace-element analysis were preserved with 0.5 mL of ultra-high-purity concentrated  $\text{HNO}_3$ . Samples for alkalinity and major anion ( $\text{SO}_4^{2-}$ ,  $\text{Cl}^-$ ,  $\text{F}^-$ ,  $\text{NO}_3^-$ ) analysis were filtered but not acidified. A single sample was collected for both low-level total and methyl-mercury analysis, and a final sample was collected for dissolved organic carbon (DOC) analysis. The mercury and DOC samples were collected as described above. However, the total- and methyl-mercury sample was not filtered and was simply transferred from the collection bottle to a sterile polyethylene terephthalate copolyester (PETG) bottle. PETG bottles are appropriate for low-level mercury analysis (Dave Kabbenhoft, U.S. Geological Survey, oral commun., March 2006). The mercury samples were preserved with 5 mL of 5 percent mercury-free hydrochloric acid. Samples for DOC were filtered through a 0.45  $\mu\text{m}$  baked-glass fiber filter into an amber glass bottle. The mercury samples were refrigerated and then shipped, on ice, to the USGS Wisconsin Science Center Mercury Research Laboratory in Middleton, Wis., for analysis. The DOC samples were refrigerated and then shipped, on ice, to the USGS National Research Program's Carbon Research Laboratory in Boulder, Colo. for analysis.

Samples for major- and trace-element analysis were shipped to the USGS Minerals Program Denver laboratories for analysis. Major cations ( $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{K}^+$ ,  $\text{Na}^+$ ) and trace element concentrations were determined by inductively coupled plasma-mass spectrometry (ICP-MS) (Lamothe and others, 2002) and major anions ( $\text{SO}_4^{2-}$ ,  $\text{Cl}^-$ ,  $\text{F}^-$ ,  $\text{NO}_3^-$ ) by

ion chromatography (IC) (Theodorakos and others, 2002). Alkalinity was determined using a preset endpoint (pH 4.5) autotitration system (Theodorakos, 2002). Laboratory procedures require instrument calibration with an appropriate standard and analysis of standard reference materials where appropriate. Generally, the instrument calibration and quality control procedures for the laboratory are: (1) daily hardware and software checks to insure the instrument and its components are working properly; (2) calibration of the instrument using appropriate standards (the calibration standards used contain all the elements that are reported from the analysis); (3) standard reference materials run where appropriate (for water samples, the standard reference materials are acquired from the USGS Water Resource Discipline. Information regarding these reference materials is at <http://bqs.usgs.gov/SRS/> [last accessed May 10, 2010]); (4) samples are analyzed with every 10th sample a calibration check solution (that is, a calibration standard run as a sample). After every 20 samples, the instrument is recalibrated and standard reference materials are analyzed; and (5) each group of samples concludes with a standard reference material analysis (Paul Lamothe, U.S. Geological Survey, oral commun., September 2005).

Elements determined by ICP-MS and IC are censored to the lower limit of determination (LLD) for the method as determined in Lamothe and others (2002) and Theodorakos and others (2002). The method LLD is defined as 5-times the standard deviation of the instrument response on a blank solution. All values below the LLD are reported as less than the LLD. In some instances, the LLD has changed since the methods were published. The LLD values used in this data release are presented in [table 1](#). Because of instrumental variations and matrix interferences, the analyst may censor the data at a higher limit than the method LLD.

Mercury concentrations were determined using cold-vapor atomic-fluorescence spectrometry (Olson and DeWild, 1999; DeWild and others, 2002). DOC was determined by wet oxidation (Aiken, 1992) and specific ultraviolet absorbance was determined using the method of Weishaar and others (2003). Laboratory procedures for ensuring total and methyl-mercury and DOC data quality are given in Olson and DeWild (1999). Method performance and method detection limits for total and methyl-mercury are given in Olson and DeWild (1999) and DeWild and others (2002). Theodorakos (2002) details the uncertainty assignment information for the alkalinity determination method.

The analytical data are stored in the USGS National Geochemical Database maintained by the Minerals Program in Denver, Colo. (contact David B. Smith), and the USGS Wisconsin Science Center Mercury Research Laboratory database (contact John DeWild). Data in the appendices of this report are the complete analytical data available for these samples.

#### 4 Aqueous Geochemical Data from Samples Collected June–July 2006, Taylor Mountains Quadrangle, Alaska

**Table 1.** Summary statistics for parameters measured in water samples from the Taylor Mountains quadrangle, Alaska, 2006.

[**Abbreviations:**  $\mu\text{S}/\text{cm}$ , microsiemens per centimeter;  $^{\circ}\text{C}$ , degrees Celsius;  $\text{mg}/\text{L}$ , milligram per liter;  $\mu\text{g}/\text{L}$ , microgram per liter;  $\text{ng}/\text{L}$ , nanogram per liter; NA, not applicable; Hg, mercury; –, not calculated because the amount of qualified data exceeded 25 percent; <, less than]

Parameter	Lower limit of determination	Minimum	Maximum	Mean	Standard deviation	Median	Interquartile range
Conductivity, $\mu\text{S}/\text{cm}$	NA	14.0	234	84.5	54.11	70.1	71
pH	NA	5.68	7.87	7.2	0.44	7.3	0.54
Water Temperature, $^{\circ}\text{C}$	NA	4.0	17.6	8.6	2.6	8.1	3.1
Concentrations are in $\text{mg}/\text{L}$							
Calcium, Ca	0.2	0.23	38.8	10.6	7.8	8.96	9.4
Potassium, K	0.03	0.03	0.40	0.16	0.07	0.20	0.10
Magnesium, Mg	0.01	0.08	14.20	3.65	2.88	2.96	3.25
Sodium, Na	0.5	0.6	4.3	1.9	0.9	1.5	1.1
Alkalinity, $\text{CaCO}_3$	1	2	84	36	19	32	28
Chlorine, Cl	0.05	<0.08	2.40	1.38	0.16	1.40	0.20
Fluorine, F	0.01	<0.08	0.80	0.3	0.3	0.1	0.5
Nitrate, $\text{NO}_3$	0.08	<0.08	2.4	–	–	–	–
Sulfate, $\text{SO}_4$	0.05	<0.08	107	14.6	19.5	7.0	11.5
Phosphorous, P	0.01	<0.01	0.09	–	–	–	–
Silicon dioxide, $\text{SiO}_2$	0.2	0.5	19.5	7.7	2.6	7.1	2.8
Dissolved organic carbon, DOC	0.1	0.4	14.8	3.8	0.5	2.7	2.9
Concentrations are in $\mu\text{g}/\text{L}$							
Silver, Ag	3	<3	<3	–	–	–	–
Aluminum, Al	2	<2	209	30	36	16	32
Arsenic, As	1	<1	78	–	–	–	–
Barium, Ba	0.2	1.6	114	16.9	14.2	15.4	11.0
Beryllium, Be	0.05	<0.05	<0.05	–	–	–	–
Bismuth, Bi	0.2	<0.2	<0.2	–	–	–	–
Cadmium, Cd	0.02	<0.02	0.03	–	–	–	–
Cerium, Ce	0.01	<0.01	0.44	–	–	–	–
Cobalt, Co	0.02	<0.04	7.03	–	–	–	–
Chromium, Cr	1	<1	2.1	–	–	–	–
Cesium, Cs	0.02	<0.02	0.02	–	–	–	–
Copper, Cu	0.5	<0.5	2.8	–	–	–	–
Dysprosium, Dy	0.005	<0.005	0.081	–	–	–	–
Erbium, Er	0.005	<0.005	0.040	–	–	–	–
Europium, Eu	0.005	<0.005	0.020	–	–	–	–
Iron, Fe	50	50	5,370	–	–	–	–
Gallium, Ga	0.05	<0.05	<0.05	–	–	–	–
Gadolinium, Gd	0.005	<0.005	0.110	0.021	0.023	0.010	0.025
Germanium, Ge	0.05	<0.05	<0.05	–	–	–	–
Holmium, Ho	0.005	<0.005	0.020	–	–	–	–
Lanthanum, La	0.01	<0.01	0.16	–	–	–	–
Lithium, Li	0.1	<0.1	4.7	0.8	0.1	0.3	1.2
Lutetium, Lu	<0.1	<0.1	<0.1	–	–	–	–
Manganese, Mn	0.2	0.3	281	24.4	42.6	11.2	1.1
Molybdenum, Mo	2	<2	<2	–	–	–	–
Niobium, Nb	0.2	<0.2	<0.2	–	–	–	–
Neodymium, Nd	0.01	<0.01	0.01	0.06	0.06	0.03	0.08
Nickel, Ni	0.4	<0.4	2.6	–	–	–	–
Lead, Pb	0.05	<0.05	0.08	–	–	–	–
Praesodymium, Pr	0.01	<0.01	0.06	–	–	–	–
Rubidium, Rb	0.01	0.05	0.64	0.18	0.11	0.15	0.07
Antimony, Sb	0.3	<0.3	1.6	–	–	–	–
Scandium, Sc	0.6	<0.6	1.6	–	–	–	–

**Table 1.** Summary statistics for parameters measured in water samples from the Taylor Mountains quadrangle, Alaska, 2006.—Continued

[**Abbreviations:**  $\mu\text{S/cm}$ , microsiemens per centimeter;  $^{\circ}\text{C}$ , degrees Celsius;  $\text{mg/L}$ , milligram per liter;  $\mu\text{g/L}$ , microgram per liter;  $\text{ng/L}$ , nanogram per liter; NA, not applicable; Hg, mercury; —, not calculated because the amount of qualified data exceeded 25 percent; <, less than]

Parameter	Lower limit of determination	Minimum	Maximum	Mean	Standard deviation	Median	Interquartile range
Concentrations are in $\mu\text{g/L}$ —Continued							
Selenium, Se	1	<1.0	1.4	—	—	—	—
Samarium, Sm	0.01	<0.01	0.08	—	—	—	—
Strontium, Sr	0.5	1.9	387	66.3	65.9	45.7	44.9
Tantalum, Ta	0.02	<0.02	0.08	—	—	—	—
Terbium, Tb	0.005	<0.005	0.010	—	—	—	—
Thorium, Th	0.2	<0.2	<0.2	—	—	—	—
Titanium, Ti	0.5	<0.5	6.6	—	—	—	—
Thallium, Tl	0.1	<0.1	<0.1	—	—	—	—
Thulium, Tm	0.005	<0.005	0.007	—	—	—	—
Uranium, U	0.1	<0.11	0.2	—	—	—	—
Vanadium, V	0.5	<0.5	2.2	—	—	—	—
Tungsten, W	0.5	<0.5	<0.5	—	—	—	—
Yttrium, Y	0.01	<0.01	0.42	—	—	—	—
Ytterbium, Yb	0.005	<0.005	0.050	—	—	—	—
Zinc, Zn	0.5	<0.5	95.4	—	—	—	—
Zirconium, Zr	0.2	<0.2	0.54	—	—	—	—
Concentrations are in $\text{ng/L}$							
Methyl-Hg	<sup>2</sup> 0.04	<0.04	1.86	—	—	—	—
Filtered-Methyl-Hg	<sup>2</sup> 0.04	<0.04	0.57	—	—	—	—
Total-Hg	<sup>3</sup> 0.01	0.82	52.10	3.90	8.09	2.08	2.18
Filtered-Total-Hg	<sup>3</sup> 0.01	0.58	5.97	2.53	1.83	2.05	3.23

<sup>1</sup>See Theodorakos (2002) for uncertainty assignment information.

<sup>2</sup>See DeWild and others (2002) for method detection limit determination information.

<sup>3</sup>See Olson and DeWild (1999) for method detection limit determination information.

## Data Summary

Major- and trace- element data are summarized in [tables 1](#) and [2](#), and the complete analytical data are presented in the appendices. Of the trace elements analyzed, Ag, Be, Bi, Ga, Ge, Lu, Mo, Nb, Th, Tl, W were not detected in the water samples. Minimum and maximum concentrations, mean, and median values of the elements in water are given in [table 1](#); however, summary statistics were not calculated if the number of qualified values exceeded 25 percent of the samples ([table 1](#)). For elements with qualified values, summary statistics were calculated using the Kaplan-Meier method for censored data as detailed in Helsel (2005).

The major anion chemistry of the samples collected in 2006 from the Taylor Mountains quadrangle is dominated by bicarbonate ( $\text{HCO}_3^-$ , calculated from the alkalinity measurements) although in a few samples more than 50 percent of the anionic charge can be attributed to sulfate

( $\text{SO}_4^{2-}$ ). The major-cation chemistry ranges from  $\text{Ca}^{2+}/\text{Mg}^{2+}$ -dominated water to a mix of  $\text{Ca}^{2+}/\text{Mg}^{2+}/\text{Na}^+/\text{K}^+$  water ([fig. 2](#)).

Duplicate samples (A and B) were collected for trace-element and major-ion analysis at sites 06TA924, 06TA1010, and 06TA1022 ([table 2](#)). Duplicate samples were collected for total and methyl-mercury and DOC analysis at site 06TA1010. Good agreement was found between the major cation values in recorded the duplicate samples ([table 2](#)). Generally, good agreement also was found between the major anions values ([table 2](#)). Many trace elements were at or near the detection limit of the method used in these samples; however, good agreement was found between duplicate samples for elements with detectable concentrations, except for Co, Mn, Zn from site 06TA1022 and Al in site 06TA1010. Major-ion concentrations were below the detection limit in all field blanks, and generally, the trace-element concentrations also were below detection; however, Co, Li, and Mn also were detected in the blank water ([table 2](#)).

## 6 Aqueous Geochemical Data from Samples Collected June–July 2006, Taylor Mountains Quadrangle, Alaska

**Table 2.** Concentrations of major and trace elements in duplicate and blank samples from the Taylor Mountains quadrangle, Alaska, 2006.

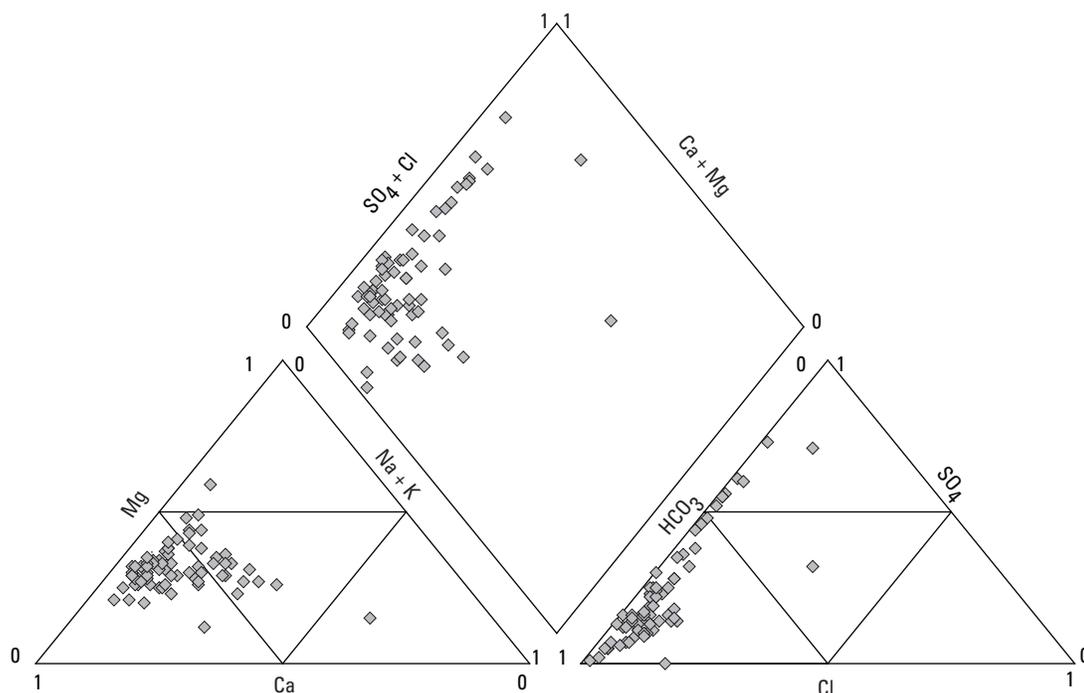
[Field No.: A or B indicates duplicate sample. Abbreviations: °C, degrees Celsius;  $\mu\text{S}/\text{cm}$ , microsiemens per centimeter; mg/L, milligram per liter;  $\mu\text{g}/\text{L}$ , microgram per liter; ng/L, nanogram per liter; Hg, mercury; <, less than; –, not determined]

Parameter	Field No.						
	06TA924A	06TA924B	06TA1010A	06TA1010B	06TA1022A	06TA1022B	06TABlank
Conductivity, $\mu\text{S}/\text{cm}$	70.1	70.1	234	234	84	84	–
pH	6.83	6.83	7.87	7.87	7.35	7.35	–
Water Temperature, °C	7.4	7.4	11.1	11.1	4.8	4.8	–
Concentrations are in mg/L							
Calcium, Ca	10.4	10.4	29.5	29.3	10.9	10.3	<0.2
Potassium, K	0.2	0.2	0.2	0.2	0.1	0.1	<0.03
Magnesium, Mg	3.37	3.43	7.94	8	3.5	3.24	<0.01
Sodium, Na	1.23	1.25	4.33	4.33	1.25	1.16	<0.01
Alkalinity, $\text{CaCO}_3$	35.83	35.83	52.44	53.49	34.07	29.07	–
Chlorine, Cl	1.5	1.5	1.3	1.3	1.4	1.4	<0.08
Fluorine, F	<0.08	0.1	0.1	0.1	0.1	0.1	<0.08
Nitrate, $\text{NO}_3$	0.4	0.8	<0.8	<0.8	<0.8	0.6	<0.08
Sulfate, $\text{SO}_4$	6	6	63	63	7	7	<0.08
Phosphorous, P	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silicon dioxide, $\text{SiO}_2$	6.6	6.5	5.4	5.4	6.8	6.8	<0.2
Dissolved organic carbon, DOC	–	–	2.5	2.2	–	–	–
Concentrations are in $\mu\text{g}/\text{L}$							
Silver, Ag	<3	<3	<3	<3	<3	<3	<3
Aluminum, Al	11.8	12	2.6	3.8	8.5	8.4	<2
Arsenic, As	<1	<1	<1	<1	<1	<1	<1
Barium, Ba	11.8	12.2	34.3	34.4	14.4	13.6	<0.2
Beryllium, Be	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bismuth, Bi	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium, Cd	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cerium, Ce	0.01	0.02	<0.01	<0.01	0.01	0.01	<0.01
Cobalt, Co	0.07	0.14	1.46	1.49	2.95	0.19	0.28
Chromium, Cr	<1	<1	<1	<1	<1	<1	<1
Cesium, Cs	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Copper, Cu	<0.5	<0.5	<0.5	0.61	<0.5	<0.5	<0.5
Dysprosium, Dy	0.006	0.007	0.005	<0.005	0.006	0.006	<0.005
Erbium, Er	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Europium, Eu	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron, Fe	<50	<50	<50	<50	<50	<50	<50
Gallium, Ga	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Gallium, Gd	0.009	0.006	0.006	0.005	0.01	0.005	<0.005
Germanium, Ge	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Holmium, Ho	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Lanthanum, La	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lanthanum, Li	1	1	1.2	1.3	2	2.2	0.7
Lanthanum, Lu	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Manganese, Mn	7.4	7.4	10.8	11	14.2	9.6	0.5
Molybdenum, Mo	<2	<2	<2	<2	<2	<2	<2
Niobium, Nb	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Neodymium, Nd	0.02	0.02	<0.01	<0.01	0.02	0.02	<0.01
Nickel, Ni	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Lead, Pb	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Praesodymium, Pr	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Rubidium, Rb	0.16	0.16	0.25	0.24	0.14	0.13	<0.01

**Table 2.** Concentrations of major and trace elements in duplicate and blank samples from the Taylor Mountains quadrangle, Alaska, 2006.—Continued

[Field No.: A or B indicates duplicate sample. Abbreviations: °C, degrees Celsius;  $\mu\text{S}/\text{cm}$ , microsiemens per centimeter; mg/L, milligram per liter;  $\mu\text{g}/\text{L}$ , microgram per liter; ng/L, nanogram per liter; Hg, mercury; <, less than; —, not determined]

Parameter	Field No.						
	06TA924A	06TA924B	06TA1010A	06TA1010B	06TA1022A	06TA1022B	06TABlank
Concentrations are in $\mu\text{g}/\text{L}$ —Continued							
Antimony, Sb	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Scandium, Sc	0.6	0.6	<0.6	<0.6	<0.6	0.6	<0.6
Selenium, Se	<1	<1	<1	<1	<1	<1	<1
Samarium, Sm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium, Sr	53.4	53.5	211	211	42.2	40.9	<0.5
Tantalum, Ta	0.06	0.05	<0.02	<0.02	<0.02	0.04	<0.02
Terbium, Tb	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thorium, Th	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Titanium, Ti	<0.5	<0.5	0.7	0.8	<0.5	<0.5	<0.5
Thallium, Tl	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Thulium, Tm	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium, U	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium, V	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tungsten, W	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Yttrium, Y	0.03	0.03	0.02	0.02	0.03	0.03	<0.01
Ytterbium, Yb	0.006	0.005	<0.005	<0.005	0.005	<0.005	<0.005
Zinc, Zn	<0.5	0.7	3	3	5.3	0.7	<0.5
Zirconium, Zr	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Concentrations are in ng/L							
Methyl-Hg	—	—	0.1	0.1	—	—	—
Total-Hg	—	—	1.38	1.29	—	—	—

**Figure 2.** Range of major-ion ratios in stream-water samples collected from the Taylor Mountains quadrangle, Alaska, 2006.

## References Cited

- Aiken, G.R., 1992, Chloride interference in the analysis of dissolved organic carbon by the wet oxidation method: *Environmental Science and Technology*, v. 26, p. 2435-2439.
- DeWild, J.F., Olson, M.L., and Olund, S.D., 2002, Determination of methyl mercury by aqueous phase ethylation, followed by gas chromatographic separation with cold vapor atomic fluorescence detection: U.S. Geological Survey Open-File Report 01-445, 14 p. (Available at <http://pubs.usgs.gov/of/2001/ofr-01-445/>.)
- Helsel, D.R., 2005, *Nondetects and data analysis—statistics for censored environmental data*: Hoboken, New Jersey, Wiley-Interscience, 250 p.
- Lamothe, P.J., Meier, A.L., and Wilson, S.A., 2002, The determination of forty-four elements in aqueous samples by inductively coupled plasma-mass spectrometry, *in* Taggart, J.E. ed., *Analytical methods for chemical analysis of geologic and other material*: U.S. Geological Survey Open-File Report 02-223, p. H1-H11. (Available at <http://pubs.usgs.gov/of/2002/ofr-02-0223/>.)
- Miller, M.L., Bailey, E.A., Beischer, G.A., Bradley, D.C., Bundtzen, T.K., Goldfarb, R.J., Karl, S.M., Saltus, R.W., and Wang, Bronwen, 2006, USGS mineral resource studies in the Taylor Mountains quadrangle, southwestern Alaska—new “AMRAP”: *Journal of the Alaska Miners Association*, v. 34, no. 2, p. 1-15.
- Olson, M.L., and DeWild, J.F., 1999, Low-level collection techniques and species-specific analytical methods for mercury in water, sediment, and biota: U.S. Geological Survey Water Resources Investigations 99-4018-B, 11 p.
- Theodorakos, P.M., 2002, Determination of total alkalinity using a preset endpoint (pH 4.5) autotitration system, *in* Taggart, J.E. ed., *Analytical methods for chemical analysis of geologic and other material*: U.S. Geological Survey Open-File Report 02-0223. (Available at <http://pubs.usgs.gov/of/2002/ofr-02-0223/>.)
- Theodorakos, P.M., d’Angelo, W.M., Ficklin, W.H., 2002, Fluoride, chloride, nitrate, and sulfate in aqueous solutions utilizing autosuppression chemically suppressed ion chromatography *in* Taggart, J.E., ed., *Analytical methods for chemical analysis of geologic and other material*: U.S. Geological Survey Open-File Report 02-223, p. V1-V7. (Available at <http://pubs.usgs.gov/of/2002/ofr-02-0223/>.)
- Wang, Bronwen, Mueller, Seth, Bailey, Elizabeth, Lee, Greg, 2006a, *Aqueous geochemical data from the analysis of stream water samples collected in August 2004—Taylor Mountains 1:250,00-scale quadrangle, Alaska*: U.S. Geological Survey Open-File Report 2006-1175. (Available at <http://pubs.usgs.gov/of/2006/1175/>.)
- Wang, Bronwen, Mueller, Seth, Stetson, Sarah, Bailey, Elizabeth, Lee, Greg, 2006b, *Aqueous geochemical data from the analysis of stream water samples collected in June and July 2005—Taylor Mountains 1:250,00 scale quadrangle, Alaska*: U.S. Geological Survey Open-File Report 2006-1361. (Available at <http://pubs.usgs.gov/of/2006/1361/>.)
- Weishaar, J.L., Aiken, G.R., Bergamaschi, B.A., Fram, M.S., Fujii, R., and Mopper, K., 2003, Evaluation of specific ultraviolet absorbance as an indicator of the chemical composition and reactivity of dissolved organic carbon: *Environmental Science and Technology*, v. 37, no. 20, p. 4702-4708.

## **Appendix A. Analytical Data For Stream-Water Samples Collected in 2006 from the Taylor Mountains Quadrangle, Alaska**

Microsoft Excel spreadsheet is available for download at <http://pubs.usgs.gov/of/2011/1011>.

## **Appendix B. Standard Reference Material (Srm) and Field Blank Data Accompanying Water Samples Collected in 2006 from the Taylor Mountain Quadrangle, Alaska**

Microsoft Excel spreadsheet is available for download at <http://pubs.usgs.gov/of/2011/1011>.

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