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Determination of Representative Uranium and Selenium Concentrations From Groundwater, 2016, Homestake Mining Company Superfund Site, Milan, New Mexico

Open-File Report 2018–1055

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

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RYAN K. ZINKE, Secretary

U.S. Geological Survey
James F. Reilly II, Director

U.S. Geological Survey, Reston, Virginia: 2018

Suggested citation:
Harte, P.T., Blake, J.M., and Becher, K.D., 2018, Determination of representative uranium and selenium concentrations from groundwater, 2016, Homestake Mining Company Superfund site, Milan, New Mexico: U.S. Geological Survey Open-File Report 2018–1055, 37 p., appendix, https://doi.org/10.3133/ofr20181055.

ISSN 2331-1258 (online)

Acknowledgments

The authors would like to thank Sai Appaji, remedial project manager with U.S. Environmental Protection Agency Region 6, for his assistance as he oversaw project management of the Homestake Superfund site. Mr. Appaji facilitated site access to wells and helped coordinate our field activities. Site employees for the Homestake Mining Company also were very helpful in providing access to wells on company land. Landowners adjacent to the site supported our work before and during the data collection process.

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Conversion Factors

U.S. customary units to International System of Units

Multiply	By	To obtain
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)

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

$$°F = (1.8 \times °C) + 32.$$

Datum

Vertical coordinate information is referenced to mean sea level and is derived from site reports.

Horizontal coordinate information is North American Datum of 1983.

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

Supplemental Information

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

Activities for radioactive constituents in water are given in picocuries per liter (pCi/L).

Abbreviations

EPA U.S. Environmental Protection Agency

ICPMS inductively coupled plasma mass spectrometry

NWQL National Water Quality Laboratory

R^2 coefficient of determination

RPD relative percent difference

U_c combined standard uncertainty

USGS U.S. Geological Survey

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Abstract

In 2016, the U.S. Geological Survey, in cooperation with the U.S. Environmental Protection Agency, collected data on isotopes, age dating, and geochemistry including aqueous uranium concentrations of samples from 20 locations in the vicinity of the Homestake Mining Company Superfund site near Milan, New Mexico. The 20 sampled locations include 19 groundwater wells and 1 treatment plant for water used for injection into aquifers. At 6 of the 19 wells, multiple samples were collected by several different sampling methods, including passive, micropurge, and volumetric methods.

Aqueous uranium concentrations were adjusted on the basis of comparisons between three sampling methods (called sample adjustments). These adjustments were specific to passive sample results because they underestimated uranium concentrations compared with results from purge samples (micropurge and volumetric). Sample adjustments were also made on aqueous selenium concentrations from previously published data for passive sampler results following a similar procedure.

Aqueous uranium concentrations in dissolved and total form were adjusted from the original analytical values (called laboratory analytical adjustments) on the basis of a rigorous comparison to several external tests, including reruns and analysis by a different laboratory after accuracy issues were identified in data from the original laboratory. The original laboratory analytical results were found to be two to five times greater than historical concentrations at the same locations, which prompted further evaluation, as described in this report.

Introduction

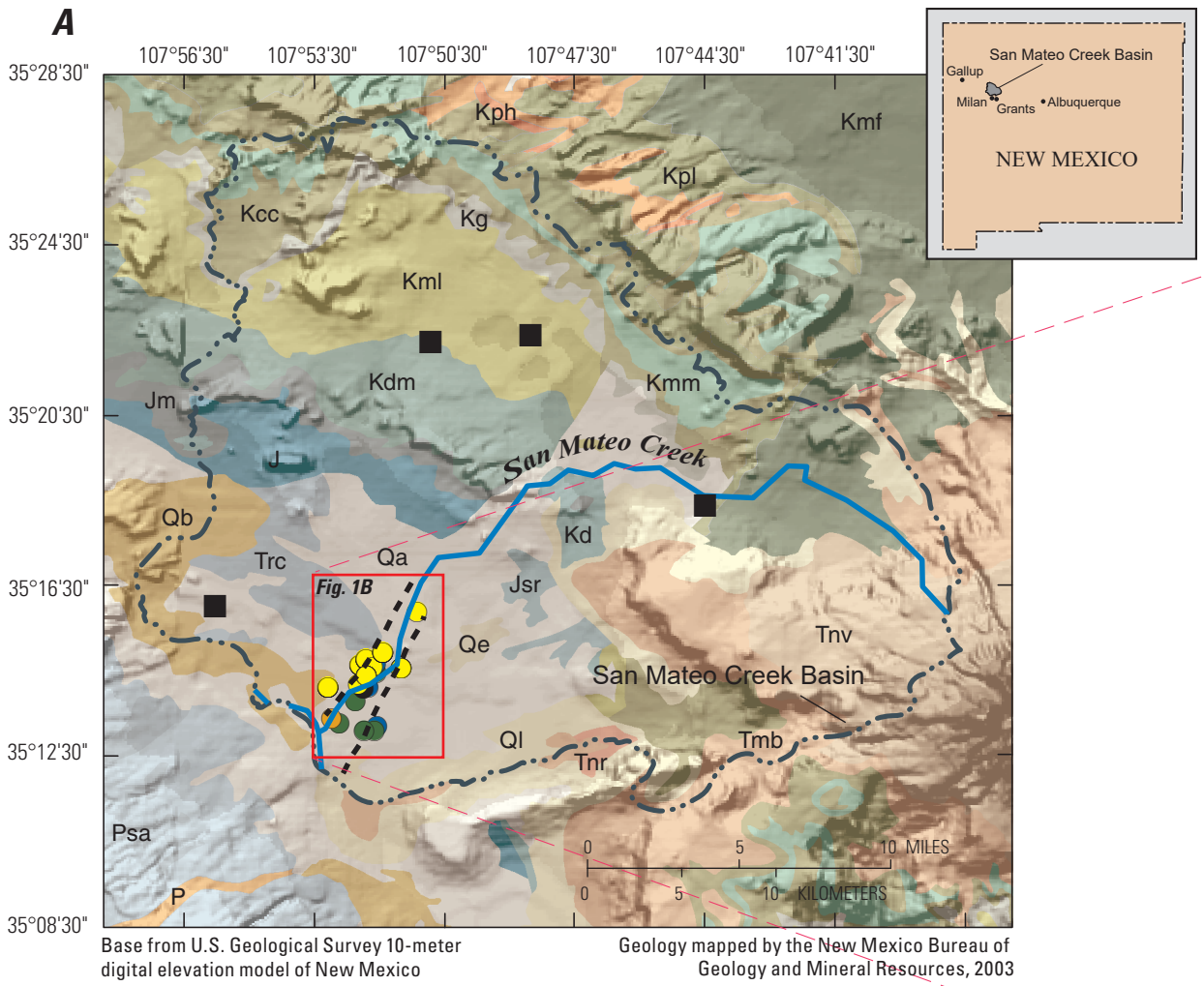
Reliable sampling procedures and analytical results are critical for understanding water chemistry. Unsatisfactory results, either from sampling or laboratory analysis, of a category of chemicals or selective constituent can prevent interpretation of findings and completion of projects. In these situations, results may need to be carefully assessed, and adjusted on the basis of a series of external testing procedures and comparisons.

In 2016, the U.S. Geological Survey (USGS), in cooperation with the U.S. Environmental Protection Agency (EPA), collected data on isotopes, age dating, and geochemistry of samples from 20 locations at the Homestake Mining Company Superfund site near Milan, New Mexico. Data were collected to characterize the groundwater chemistry in the vicinity of the Homestake Superfund site (fig. 1).

Version 1.0 of the USGS data release for this work (Becher and others, 2017) contained information on isotopes, age dating, and geochemistry, including aqueous concentrations of metals—excluding dissolved and total uranium. All metals previously reported in data release version 1.0 (Becher and others, 2017) as well as uranium samples documented in the present report, were analyzed by **inductively coupled plasma mass spectrometry**[1] (ICPMS; EPA method 6020A; U.S. Environmental Protection Agency, 1998). These analyses were conducted by RTI Laboratories, Inc. (RTI). However, uranium concentrations from RTI were found to be two to five times greater than historical concentrations of uranium at the site (U.S. Environmental Protection Agency, 2016). In some wells, the historical sampling record spanned 40 years and the uranium concentrations reported by RTI exceeded all previously reported concentrations. This discrepancy prompted followup laboratory analysis, multiple comparisons between lab results, and postanalytical adjustments.

Version 1.1 of the USGS data release (Blake and others, 2017) reported aqueous uranium concentrations from a subset of the original samples (17 samples from 16 wells), which were analyzed by EPA method 6020A at the EPA Region 6 laboratory (EPA lab). Uranium concentrations measured by the EPA lab were comparable to historical concentrations of uranium. All analytical results for uranium samples, both previously unpublished (RTI) and published (EPA lab), are documented in this report and in Harte and others (2018).

[1]Terms listed in the glossary at the back of this report are in bold typeface at first use in the text.



Base from U.S. Geological Survey 10-meter digital elevation model of New Mexico

Geology mapped by the New Mexico Bureau of Geology and Mineral Resources, 2003

EXPLANATION

Quaternary
- Qb Basalt
- Ql Landslide
- Qe Eolian

Tertiary
- Tnv/Tnr Volcanics
- Tmb Basalts

Cretaceous
- Kmf Menefee Formation
- Kpl/Kph Point Lookout Sandstone
- Km/Kmm/Kml Mancos Shale
- Kcc Crevasse Canyon Formation
- Kd/Kdm Dakota Sandstone and Mancos Shale, undifferentiated
- Kg Gallup Sandstone

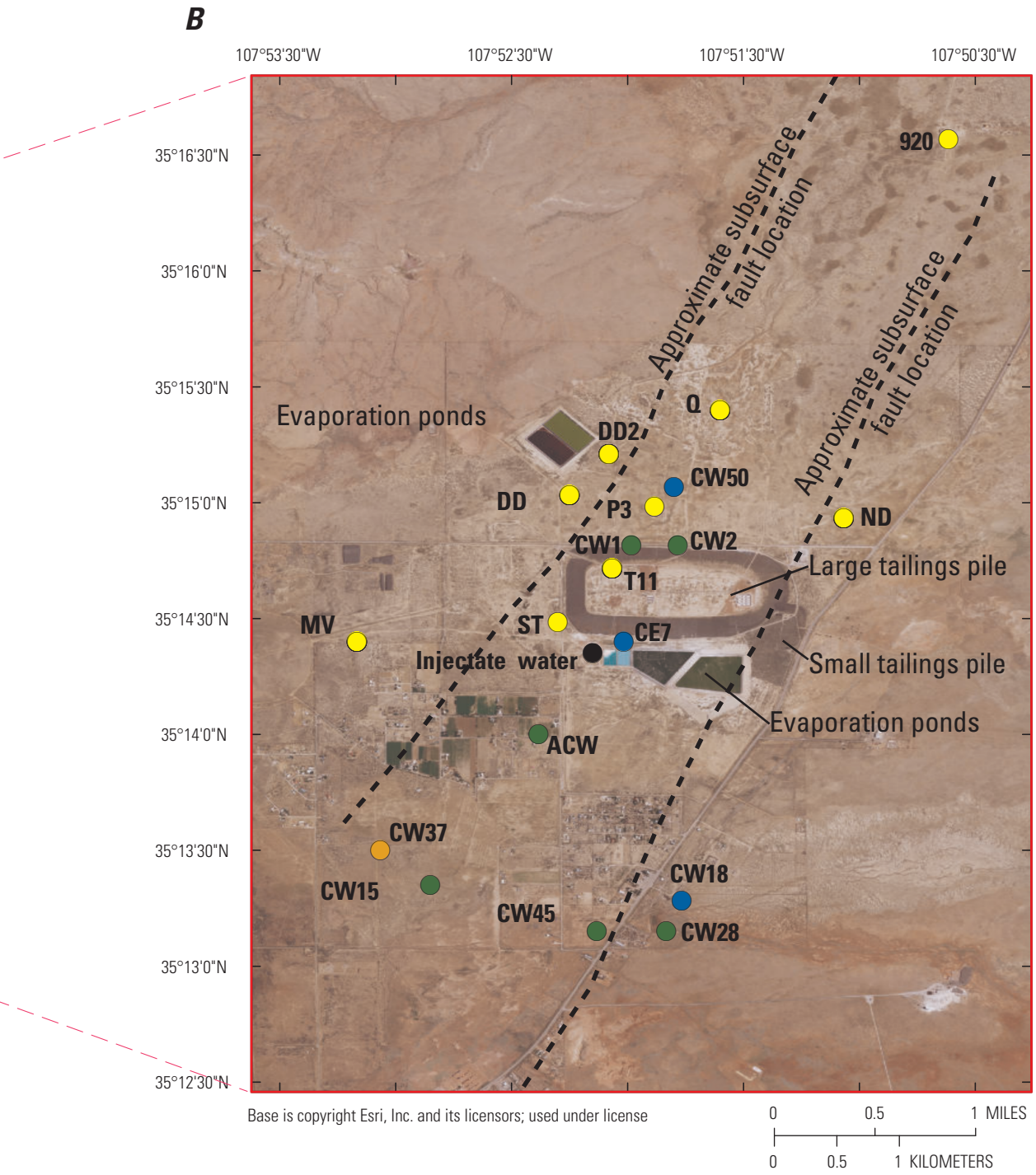
Jurassic
- Jm Morrison Formation
- J Undivided
- Jsr San Rafael Group

Triassic
- Trc Chinle Group

Permian
- Psa San Andres Formation
- P Undivided

- Mill or mine

Figure 1. *A*, The geology of the San Mateo Creek Basin at the study area of the Homestake Mining Company Superfund site, Milan, New Mexico, and *B*, wells sampled and the treatment plant where treated water was sampled.



EXPLANATION

Injectate water

Sampled well with local name, by aquifer

Q	Alluvial
CE7	Upper Chinle Formation
CW1	Middle Chinle Formation
CW37	Lower Chinle Formation

Aqueous uranium and selenium concentration data were collected in 2016 from 20 sample locations: 19 samples were from wells, and 1 sample was from treated water used for injection purposes as part of the remediation of the site. Multiple samples were collected at 6 of the 19 wells by using three different sampling methods. A total of 123 samples, including total and dissolved (water processed through filters with 0.45-micrometer [µm] pore size) for uranium, and a total of 122 samples for selenium were collected. Besides well samples, 9 replicates, 9 equipment blanks, 4 **bench test** samples, and 1 **blind sample** for uranium were analyzed. All samples were submitted for analysis of uranium and selenium by EPA method 6020A to RTI. Subsequent reanalysis (rerun) of uranium was done on 20 samples by RTI. Furthermore, 17 samples of dissolved uranium were submitted to the EPA lab for analysis of uranium by EPA method 6020A.

The Homestake site contains a large uranium tailing pile produced as part of the uranium milling process (fig. 1*B*). The Homestake site is within the San Mateo Creek Basin (fig. 1*A*) and the Grants Mineral Belt and contains numerous uranium mines and other uranium mill operations (U.S. Environmental Protection Agency, 2016). The tailings pile at the Homestake site contains elevated uranium concentrations in the tailings and pore water. Leaching from the tailings has affected uranium concentrations of the surrounding groundwater in two aquifers: alluvial unconsolidated deposits and the underlying bedrock of the Chinle Formation. Both aquifers have been used as a water source for the nearby communities. The tailings and adjacent groundwater are undergoing remediation. In the past (before 2015), the remediation had included accelerated flushing of the tailings pile, which has been discontinued. Currently [2018], groundwater remediation at the site includes treatment through reverse osmosis and water treatment systems, evaporation of extracted water in evaporation ponds, extractions of contaminated groundwater, and injection of clean water into the underlying formations.

This report documents sample and postlaboratory analytical adjustments made to aqueous uranium and selenium concentrations from 20 sampled locations. This report describes three sampling methods and the analyses done by two labs, compares results between sampling methods and between labs, and explains the conversions that were applied to the sampling and laboratory data.

Methods of Groundwater Sampling, Laboratory Analysis, and Data Evaluation

Groundwater sampling methods for uranium and selenium included two purge methods (**volumetric** and **micropurge**) and one passive sampling method (nylon screen **passive** samplers). Purge samples were collected at 19 of the 20 locations shown in figure 1. One sample from the treatment plant was collected using the existing infrastructure. Only a subset of six the wells (wells Q, ND, DD, DD2, T11, and MV; fig. 1), all in the alluvium, had passive and micropurge samples collected. At the six wells, 55 passive, 7 micropurge, and 6 volumetric samples were collected. The remaining 68 of the total 123 samples collected were collected from 13 of the 19 wells by volumetric sampling methods, a blind sample, and multiple lab samples.

Uranium and selenium concentrations between purge (volumetric and micropurge) and passive sampling results were compared and adjustments were made to results from passive samplers to minimize differences with results from purge samples (called sampling adjustments). Analytical adjustments also were done to minimize differences in results of concentration in uranium as measured by RTI and the EPA lab (called laboratory analytical adjustments).

Uranium concentrations from volumetric and micropurge samples were compared with historical concentrations of uranium, as reported in Homestake site reports, from commonly sampled wells (U.S. Environmental Protection Agency, 2016). The large difference in reported values, despite similar analytical methods (ICPMS) between previous sampling and sampling done for this project, prompted further investigation. Investigations included rerunning some samples, comparing uranium mass and isotope relations, and reanalyzing the same samples at a different laboratory (EPA lab). For representative final concentrations to be reported, the investigation determined that two types of adjustments had to be made to the original concentration data: sampling adjustments and laboratory analytical adjustments. A description of sampling methods, analytical methods, and sampling and analytical adjustments follows.

Groundwater Sampling Types

Three sampling methods were used to evaluate volume-dependent chemistry results and the relation between the physical and chemical heterogeneity of groundwater and the formation. Passive and micropurge samples represent discrete (volume-limited) samples, whereas volumetric purge samples represent samples from larger volumes.

Passive sampling.—Passive samplers were used to map vertical variation in well chemistry (specifically uranium and selenium). Passive samplers use the existing ambient flow of a well to collect representative water from the formation. They typically collect more discrete, depth-dependent samples than volumetric purge sampling methods (Harte and others, 2000).

The nylon screen passive samplers (Vroblesky and Pravecek, 2002; Vroblesky and others, 2003) were deployed in six wells. Samplers were attached to a weighted string at target depths. Fifty-five nylon screen passive samplers were deployed with a maximum of 12 samplers in one well (table 1; Harte and others, 2018). Depths of nylon screen passive samplers were coincident with open well intervals and formation contacts as determined by borehole geophysical logging

and reported drill logs. Where the water level in the well was above the top of the screen (four of six wells), one passive sampler was installed in the well casing.

Nylon screen passive samplers consist of a 250-milliliter (mL) bottle covered with a 125-µm mesh screen that is held in place by a standard cap with its top drilled out. The samplers were filled with deionized water of known (less than detection level) concentrations of uranium (<50 micrograms per liter [µg/L]) and selenium (<10 µg/L). Samplers were held in place inside a Vexar sock mesh attached to a suspended-weighted line consisting of a ¼-inch diameter nylon line and stainless steel weight. The samplers were deployed with the mesh facing downward. Inverting the samplers prevents pushing of borehole water from above the sampler into the sampler during retrieval.

The nylon screen passive samplers were tested before deployment to assess their ability to collect representative uranium and selenium concentration data in a well (called a bench test). The samplers were immersed for several weeks inside standard baths (one bath each for uranium and selenium) of known uranium and selenium concentrations. The water in the baths was mixed by inducing convective circulation. Baths were each covered with clear plastic and an ice pack a minimum of two times for 30 minutes to cause temperature inversions and mixing. After several weeks, the bath water and the water from inside the samplers were sent for analysis of uranium and selenium concentrations by EPA method 6020A. The deionized water from a sampler that was not exposed to the baths but was exposed to atmospheric conditions inside the lab where the testing was taking place (called a bath equipment blank sample) was tested for uranium and selenium concentrations.

An equipment blank sample was collected and submitted for analysis after deployment of all passive samplers into wells. The equipment blank was drawn from the first nylon screen passive sampler constructed and was transported with all other samplers. The equipment blank served two purposes: as a blank of the deionized water and to ensure no contamination occurred before and during deployment of samplers. Sample duplicates were collected at each well by adding a second, separate sampler at one depth location per well. Therefore, sample duplicates were collected from separate bottles but similar depths. The nylon screen samplers were left downhole in place for approximately 1 month.

The samplers were retrieved by pulling up on the suspension line, bringing each sampler to the surface, detaching the samplers from the suspension line, and replacing the nylon screen mesh covering the open mouth of the bottle with a regular cap. The conditions of the samplers were examined to ensure that the integrity of the nylon screen membrane and the sampler bottle was maintained during deployment. The integrity of the nylon screen membrane is important to allow for the process of equilibrium diffusion of uranium and selenium between the well water and the deionized water inside the sampler. Visual inspection of the nylon screen sampler was made to identify if it was intact and to note whether iron-staining was evident or leakage occurred from the sampler. Iron-staining indicates a redox reaction from the mixing of different waters—potentially oxygenated water from inside the sampler with reduced water from the well borehole. Passive samplers were not filtered. The nylon screen mesh has a 125-µm opening and represents a quasifiltered sample. However, because the nylon screen mesh is coarser than the 0.45-µm filter, the sample is designated as total (unfiltered). The samples were kept on ice and submitted for analysis for uranium and selenium by EPA method 6020A.

Micropurge sampling.—The primary purpose of a micropurge sample is to allow a direct comparison with the results of the passive samplers, which serves as calibration of the passive sampling results. A micropurge sample is an instantaneous grab sample of well water at a discrete depth. To facilitate capture of well water from a discrete depth, a minimum volume of water is purged prior to sample collection to reduce additional mixing in the well column and converging flow toward the pump intake.

After retrieval of passive samplers, micropurge samples were collected by setting a variable-speed, submersible pump at the same depth as one of the string of passive samplers formerly deployed in the well. The depth of the pump intake was selected on the basis of borehole log responses and whether the nylon screens of the passive samplers were affected by the absence or presence of iron-staining. The micropurge sample was collected after a volume of water equal to 1.5 to 2.0 tubing and pump storage volumes was purged. Samples were collected for total uranium and selenium. A new ¼-inch-diameter polyethylene tube was used in each well. Field parameters (dissolved oxygen, temperature, conductivity, turbidity, and pH) were not collected.

Small mixing in the water column of the well may result from the retrieval of the passive samplers and deployment of the pump for the micropurge sample. Mixing was minimized by pulling samplers out of the well at a consistent, slow rate (1 foot per second) and lowering the pump for the micropurge sample at a similar rate. Studies have documented vertical differences in concentrations in passive and purged samples collected by similar procedures (Divine and others, 2005), suggesting that these methods induce minimal mixing.

Volumetric sampling.—Volumetric sampling is purging a certain volume of well water, quantified by the volume of water in a static water column of the well casing and screen, prior to sample collection, to achieve a representative sample of groundwater. In this study, volumetric sampling typically purged a minimum of three equivalent well volumes of water prior to sampling. An exception to purging three equivalent well volumes was at well T11, which experienced pump problems, and samples were collected before the volume criteria were met. Field parameters were monitored during purging until the readings stabilized, which helped ensure the capture of formation water (U.S. Geological Survey, variously dated). The pump intake was set at the base of the casing, right above the top of the screen. The same variable-speed, submersible pump was used as for the collection of the micropurge

Table 1. Reported well construction data for sampled wells, summary of borehole geophysical logging depths, and range of deployment depths of passive samplers, Homestake Mining Company Superfund site, Milan, New Mexico.

[Horizontal information (northern and eastern) is relative to the New Mexico State planar feet, North American Datum of 1983. Vertical information is relative to mean sea level (msl). USGS, U.S. Geological Survey; ft, foot; MP, measurement point; als, above land surface; bls, below land surface; in., inch; —, no data]

Local well name	Northern coordinate	Eastern coordinate	General location, relative to tailings pile (fig. 1)	Reported (Hydro-Engineering, LLC, 2013)								
				Geologic formation	Well depth, in ft below MP	Casing diameter, in in.	Date of installation	Water level depth, in ft below MP	MP, in ft als	MP elevation, in ft msl	Depth to base of alluvium, in ft bls	Screen interval, in ft bls
T11	1544585	489887	Tailings pile	Alluvium	193	5	8/24/09	116.52	2.7	6,656.81	160	113–193
DD	1546989	488943	North	Alluvium	78.5	4	11/22/2013	49.04	1.9	6,592.59	83	40–80
DD2	1547439	489251	North	Alluvium	94.3	5	11/22/2013	47.8	2	6,593.28	—	—
ND	1545927	494872	North	Alluvium	70	4	12/3/2013	43.49	1.1	6,592.89	65	50–70
P3	1546159	490785	North	Alluvium	95	5	7/22/2013	44.03	2.2	6,589.95	85	55–95
Q	1548693	492153	Far north	Alluvium	98.3	4	5/13/2013	44.96	2.3	6,593.82	100	72–102
920	1555800	496900	Far north	Alluvium	—	7	5/11/1994	33.4	0.7	6,627.60	—	—
MV	1542618	484418	South	Alluvium	105	4.5	12/12/2013	58.31	1.3	6,569.78	95	75–105
ST	1543215	488688	South	Alluvium	97	5	11/23/2013	48.35	2.2	6,579.31	96	55–97
CW50	1546687	491159	—	Upper Chinle	170	5	12/11/2013	45.43	3	6,588.56	128	130–170
CW18	1535924	491378	—	Upper Chinle	230.7	5	12/11/2013	36.05	1.5	6,572.65	90	—
CE7	1542652	490079	—	Upper Chinle	120	6	12/11/2013	36.7	1.9	6,575.99	95	100–140
CW45	1535036	489494	—	Middle Chinle	193	5	12/11/2013	—	0.6	6,561.30	166	163–193
CW15	1536259	485961	—	Middle Chinle	134.6	5	12/11/2013	85.56	2.6	6,551.32	50	—
CW28	1535112	491008	—	Middle Chinle	370	5	12/11/2013	74.98	1.9	6,571.68	90	—
CW1	1545235	490295	—	Middle Chinle	325	5	6/24/2013	93.82	0.7	6,585.22	105	—
CW2	1545212	491302	—	Middle Chinle	355	5	11/4/2013	106.6	1.7	6,585.48	85	—
ACW	1540235	488070	—	Middle Chinle	325	6	12/11/2013	73.36	1.2	6,563.80	40	—
CW37	1537240	484853	—	Lower Chinle	150.1	5	12/11/2013	63.55	1.3	6,551.17	55	100–150

Table 1. Reported well construction data for sampled wells, summary of borehole geophysical logging depths, and range of deployment depths of passive samplers, Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

[Horizontal information (northern and eastern) is relative to the New Mexico State planar feet, North American Datum of 1983. Vertical information is relative to mean sea level (msl). USGS, U.S. Geological Survey; ft, foot; MP, measurement point; als, above land surface; bls, below land surface; in., inch; —, no data]

Local well name	Northern coordinate	Eastern coordinate	General location, relative to tailings pile (fig. 1)	USGS borehole log measurements and passive sampler information							
				Well depth, in ft below MP	Screen interval, in ft bls	Top of screen interval, in ft bls	MP, in ft als	Predeployment water level for passive deployment, in ft bls	Retrieval water level for passive deployment, in ft bls	Passive deployment interval, in ft bls	Comment
T11	1544585	489887	Tailings pile	193	113–193	113	2.8	111.30	111.83	115–190	
DD	1546989	488943	North	81.5	40–80	41	1.5	45.08	45.12	45–68	
DD2	1547439	489251	North	93	53–93	53	1.7	43.39	43.56	48–90	
ND	1545927	494872	North	69	41–61	41	2.8	39.05	39.03	42–68	
P3	1546159	490785	North	—	—	—	—	—	—	—	Extraction well
Q	1548693	492153	Far north	100	68–98	68	1.9	40.40	40.29	57–97	
920	1555800	496900	Far north	—	—	—	—	—	—	—	
MV	1542618	484418	South	105	75–105	75	1.1	64.00	64.36	64–102	
ST	1543215	488688	South	—	—	—	—	—	—	—	Extraction well
CW50	1546687	491159	—	—	—	—	—	—	—	—	
CW18	1535924	491378	—	—	—	—	—	—	—	—	
CE7	1542652	490079	—	—	—	—	—	—	—	—	Extraction well
CW45	1535036	489494	—	—	—	—	—	—	—	—	
CW15	1536259	485961	—	—	—	—	—	—	—	—	
CW28	1535112	491008	—	—	—	—	—	—	—	—	
CW1	1545235	490295	—	—	—	—	—	—	—	—	
CW2	1545212	491302	—	—	—	—	—	—	—	—	
ACW	1540235	488070	—	—	—	—	—	—	—	—	
CW37	1537240	484853	—	—	—	—	—	—	—	—	

samples. In the absence of water in the casing (called casing water), the pump intake was placed at the midpoint of the open interval.

Groundwater samples were collected at 19 wells by using volumetric sampling methods and from injected water after flushing of the sample line at the treatment plant. One sample was collected per well and treatment plant. The purge rate ranged from approximately 0.4 gallon per minute (gal/min) to 3 gal/min depending on the depth to water and well discharge (flow into the well during pumping). For volumetric sampling, purging practices generally followed historical sampling practices. Sampling was done from a valve and T-joint setup. All materials were constructed of polyethylene. The flow rate off the T-joint was approximately 300 milliliters per minute to minimize turbulence, and the residual water was discharged to waste. An inline flowmeter was used to track purge volume and improve tracking of field parameter responses to purging. New polyethylene, $^{5}/_{8}$-inch-diamenter sampling hoses were used at each well to prevent cross-contamination between wells (except wells ST and CE7, where existing hosing was used). The downhole submersible pump was decontaminated after use at each well, and equipment blanks were collected after decontamination 20 percent of the time (samples called equipment blanks).

During purging, water levels and common field parameters were tracked by using a calibrated water-level meter and a YSI, Inc., multiparameter sonde probe that measured field parameters (dissolved oxygen, temperature, turbidity, water conductivity, and pH). Prior to sampling, one measurement of dissolved oxygen and ferrous iron concentration was measured by using field kits (Becher and others, 2017). Daily calibration field sheets were kept for the multiparameter sonde. Postsampling checks were done on the multiparameter sonde to identify daily drift at the end of each day. At each well, samples were collected in a prescribed sequence to maximize consistency. Both an unfiltered (total) and 0.45-µm-filtered (dissolved) sample were collected. The 0.45-µm-filtered sample was collected after the unfiltered sample and after flushing of sample water through the filter cartridge (1 minute or 300 mL). This sequence of filtering more closely followed previous sample collection procedures at the site.

Laboratory Analysis

Samples for uranium and selenium concentration were analyzed by EPA method 6020A (ICPMS) at RTI. Upon transmittal to the USGS, the analytical data were examined by the USGS National Water Quality Laboratory (NWQL) for general validation of performance of various metrics. Performance metrics evaluated included the following:

- Were analyses on chain-of-custody forms performed by the lab?
- Were the samples properly preserved and labeled?
- Were samples chilled if needed?
- Were preparation (extraction) and analysis holding times met?
- Did surrogate recoveries meet quality control acceptance criteria?
- Were any target analytes detected in the laboratory method blanks?
- Did **laboratory control samples** and duplicates meet percent recovery and **relative percent difference** (RPD) acceptance criteria?
- Did the matrix sample and matrix sample duplicate results meet percent recovery or RPD acceptance criteria?
- Did results for the environmental-sample duplicate that was prepared by the lab meet RPD acceptance criteria?

The four analytical reports from RTI that included uranium or selenium data were reviewed by the NWQL in January and February 2017. Analyses on chain-of-custody forms were performed by RTI for each of the samples, and all samples were properly preserved and labeled. One blind test sample was sent to RTI with a known concentration of uranium. Preparation and analysis holding times were met for all samples analyzed by RTI. All samples submitted to RTI had field sample temperatures of 0.1 to 1.9 degrees Celsius and were on ice when received by the laboratory. There were no surrogate recoveries measured, and therefore this metric was not applicable.

Neither uranium nor selenium was detected in laboratory method blanks, and all laboratory control samples met percent recovery and RPD acceptance criteria. However, there were multiple high or low matrix sample and matrix sample duplicate percent recovery or RPD values. The matrix sample percent recovery was 132 percent for uranium for one sample, and the acceptance criteria were from 87 to 120 percent. Several dissolved matrix samples had a percent recovery of 0 percent. A matrix sample duplicate for selenium had a percent recovery of 0 percent, and the RPD for that sample was greater than 200 percent. Finally, when applicable, the environmental-sample duplicate prepared by the lab met RPD acceptance criteria.

Samples were rerun to check the original uranium results. The same method was used, but a different bench chemist performed the analysis (Rachel Dear, RTI Laboratories, Inc., written commun., 2016).

A known diluted standard sample of uranium was submitted to RTI as a blind sample for analysis and confirmation of uranium measurement. The blind sample was derived from a diluted sample of standard catalog number TM–062L (lot 061316, NSI Lab Solutions). The standard had a concentration of 1,000,000 µg/L. It was diluted to a ratio of 1:5 for a concentration of 200,000 µg/L with laboratory deionized water.

A subset of dissolved uranium samples (17 samples), which were collected by volumetric sample methods, were submitted to the EPA lab for analysis by ICPMS (EPA

200 series, method ILMO5.3; Martin, 2003). These samples had previously been analyzed by RTI. The EPA lab performed a laboratory blank analysis, a laboratory control sample, and four **matrix spikes**. The laboratory control samples had a recovery of 105 percent and a RPD of 6 percent. The matrix spikes had recoveries of 114 to 127 percent and a RPD of less than 4.3 percent.

Uranium isotopes were used to evaluate uranium concentrations. The uranium isotopes were determined from volumetric samples using EPA method 900 at the Pace Analytical Services, LLC (Pace) labs. The uranium isotopes included uranium-234, uranium-235, and uranium-238 (method HSL–300). Data are available in Becher and others (2017) and also included other radiochemistry data, such as radon (EPA method 300.7), gross alpha (EPA method 900), gross beta (EPA method 900), radium-226 (EPA method 903.1), and radium-228 (EPA method 904).

A review of uranium isotope results was performed in April 2017 by the NWQL. The analyses on the chain of custody form were performed by the lab. The holding times for these samples were met. Preservation, chilling, surrogate recoveries, laboratory control samples, matrix spikes, and duplicates were reviewed for accessibility. For the uranium isotopes analyzed at the Pace labs, most laboratory method blanks were at or below detection levels.

Evaluation of Groundwater Sampling Methods and Laboratory Results

Multiple lines of evidence were used to evaluate the reliability of groundwater sample methods for uranium and selenium and laboratory results for uranium. These lines of evidence included the following:

- historical trends in concentrations
- bench testing
- blind sample testing
- comparison of uranium concentrations to uranium isotopes using a common activity factor
- additional laboratory testing using reruns
- external laboratory analysis and comparison

The historical data comparison was qualitative and was used to identify problems in uranium analyzed by RTI. The bench testing was done to identify how effectively the nylon screen samplers equilibrated with a known bath concentration for uranium and selenium. The blind sample was used to confirm the interlaboratory (interlab) comparison between results from the RTI and EPA labs.

Comparison of results from different groundwater sample methods included linear and nonlinear regression from concurrent depths for passive and micropurge samples and regression at similar depths for passive and volumetric samples. Comparison of interlab analysis results also included linear and nonlinear regression of results for the same sample.

The sum of activities of uranium isotopes for uranium-234, uranium-235, and uranium-238 in picocuries per liter were multiplied by an activity-to-mass conversion factor of 1.5 to calculate an equivalent uranium concentration. The equivalent uranium concentration from activities was compared to reported uranium concentrations from the RTI. Uranium isotopes and activities have been used to assess uranium mass (Massachusetts Office of Energy and Environmental Affairs, 2011), and typical conversion factors range from 0.67 to 1.5.

Uncertainty Analysis

The **combined standard uncertainty** (U_c) has been used when interpreting radiological results (McCurdy and others, 2008). It is used here to incorporate laboratory measurement uncertainty from the RTI and EPA labs and uncertainty from postlaboratory adjustments for samples collected by passive, micropurge, and volumetric methods for uranium. The standard deviation, as reported in RPD, from replicate samples was used to quantify RTI uncertainty. The standard deviation, as reported in RPD, from the postlaboratory adjustments between the converted concentrations and the EPA-measured concentrations (calibrated data) was used. The equation has the following form:

$$U_c = \sqrt{\sigma^2_{RDP_r} + \sigma^2_{RDP_{adj}}}, \quad (1)$$

where

σ = standard deviation,
RPD_r = relative percent difference of replicates, and
RDP_{adj} = relative percent difference of the fit of the adjustments.

Where the concentration was measured by the EPA lab, the $\sigma^2_{RPD_{adj}}$ drops out.

Samples collected by passive samplers have an additional level of uncertainty for uranium concentrations related to sample adjustments, as incorporated in the following equation:

$$U_c = \sqrt{\sigma^2_{RDP_r} + \sigma^2_{RDP_{adj}} + \sigma^2_{RDP_{pass}}}, \quad (2)$$

where

RDP_{pass} = relative percent difference of the fit of the passive sampler adjustments.

Samples collected by micropurge and volumetric methods for selenium have a level of uncertainty specific to replicates for selenium, as shown in the following equation:

$$U_c = \sqrt{\sigma^2_{RDP_r}}. \quad (3)$$

Finally, samples collected by passive samplers for selenium concentrations have a level of uncertainty related to replicates for selenium and to sample adjustments, calculated from the following equation:

$$U_c = \sqrt{\sigma^2_{RDP_r} + \sigma^2_{RDP_{pass}}} \quad . \tag{4}$$

Results of Comparison

All uranium and selenium data analyzed by RTI are presented in tables 2 and 3 (replicated from Harte and others, 2018). Data are denoted as preliminary and organized by sample type. These data include results from testing the source water blanks used to fill the passive samplers and equipment blanks derived from the predeployed passive sampler or from decontamination of the sample pumps. All source water and equipment blank samples were nondetects except one equipment blank sample that had a low selenium concentration of 2.1 µg/L. Uranium concentrations as analyzed and reported by the EPA lab are listed in table 4 (replicated from Harte and others, 2018). Final adjusted values for uranium concentrations are listed in table 5, and for selenium, in table 6 (replicated from Harte and others, 2018). Table 1.1 contains information needed to evaluate sample depths of volumetric, micropurge, and passive samples. Table 2.1 lists steps in adjusting uranium concentrations from preliminary to final results. Table 3.1 lists results of a reanalysis of the initial uranium concentrations.

Comparison of Groundwater Sampling Methods

The bench test found that the nylon screen samplers underpredicted the uranium concentration from a known bath concentration of uranium by a factor of 3.23 and for selenium by a factor of 1.81 (tables 2 and 3). Examination of the original RTI dataset of uranium concentrations also found that the passive samplers underpredicted uranium and selenium concentrations on the basis of a comparison to the micropurge samples collected at concurrent depths by a factor of 3.56 (1/0.2811) for uranium and 3.46 (1/0.2888) for selenium. The linear regression performed on coupled passive and micropurge samples had a **coefficient of determination** (R^2) of 0.9996 for uranium (fig. 2) and 0.9788 for selenium (fig. 3). The R^2 for uranium was the same between the comparison of results from coupled passive and volumetric samples at nearest depths as the comparison between coupled passive and micropurge samples at same depths. In contrast, R^2 for selenium differed between the comparison of results from coupled passive and volumetric samples at nearest depths (R^2 of 0.75) and the coupled micropurge and passive samples at the same depths (R^2 of 0.9788). Table 1.1 lists the sampling depths for the various types of samples.

Comparison of Analytical Laboratory Results

Reruns by RTI for uranium yielded results similar to the original results (table 3.1). In general, the rerun results were 2 to 3 percent greater than original results. The R^2 comparison between original and rerun results was 0.986. This comparison indicates a high degree of precision of reported results despite accuracy issues.

The RTI analysis of the blind sample measured a concentration of 720,000 µg/L or a 3.65 multiplicative factor greater than the expected concentration of 200,000 µg/L, as diluted at a ratio of 1:5 from the 1,000,000 µg/L standard. The laboratory deionized water used for the blind sample was tested for uranium and was found to be below detection levels (<50 µg/L).

Uranium results from the EPA lab were approximately one-third the RTI results (fig. 4). Figure 4*A* contains the regression without inclusion of the blind sample. Figure 4*B* contains the regression with the blind sample. Both regressions are nonlinear and provide similar adjustment results. The regression shown on figure 4*B* was selected to describe the relation between results from RTI and the EPA lab because it increased the range of the calibrated values. The power law expression in figure 4*B* has an R^2 of 0.9903.

The ratio of uranium as reported by RTI and the calculated uranium concentration from the summation of uranium isotopes multiplied by an activity conversion of 1.5 ranged from 1.97 to 6.29, with an average ratio of 3.21; RTI reported that uranium concentration is 3.21 greater on average than the uranium as calculated from activities. This comparison is illustrated in figure 5 with the 1.5 conversion line plotted. In contrast, the results for uranium concentration from the EPA lab show close agreement with the 1.5 conversion line (fig. 6).

Table 2. Original results of aqueous uranium concentrations as analyzed by RTI Laboratories, Inc., Homestake Mining Company Superfund site, Milan, New Mexico.

[Uranium is assigned Chemical Abstract Service (CAS) Registry Number 7440-61-11; CAS registry numbers (CASRNs) are a registered trademark of the American Chemical Society; CAS recommends the verification of the CASRNs through CAS Client Services. Results were analyzed with U.S. Environmental Protection Agency Method 602A (U.S. Environmental Protection Agency, 1998). ID, identifier; µg/L, microgram per liter; MDL, minimum detection level; LOD, limit of detection; LOQ, limit of quantification; T, total; D, dissolved; GW, groundwater; ND, nondetect; EQ, equipment blank; DI, deionized water]

Lab sample ID	Client sample ID	Date collected	Time collected	Date received	Analysis date	Original uncorrected result, in µg/L[1]	MDL, in µg/L	LOD, in µg/L	LOQ, in µg/L	Sample origin	Sample type
Volumetric dissolved samples											
1610157-005B	351459107515301 Well P3	10/4/2016	12:30	10/7/2016	12/30/2016	84	6.7	10	25	GW	D
1610157-001B	351449107514701 CW2	10/4/2016	13:00	10/7/2016	12/30/2016	150	6.7	10	25	GW	D
1610157-002B	351449107514701 CW2 replicate	10/4/2016	13:05	10/7/2016	12/30/2016	170	6.7	10	25	Replicate	D
1610157-007B	351421107520901 injectate	10/4/2016	16:45	10/7/2016	12/30/2016	34	6.7	10	25	Injectate	D
1610157-006B	351456107510401 ND	10/4/2016	17:30	10/7/2016	12/30/2016	79	6.7	10	25	GW	D
1610157-004B	351424107531001 MV	10/5/2016	13:30	10/7/2016	12/30/2016	960	6.7	10	25	GW	D
1610258-001B	351321107525101 CW15	10/5/2016	15:00	10/11/2016	12/30/2016	110	6.7	10	25	GW	D
1610157-003B	351449107515901 CW1	10/5/2016	16:00	10/7/2016	12/30/2016	170	6.7	10	25	GW	D
1610193-001B	351524107513601 Well Q	10/6/2016	10:30	10/10/2016	12/30/2016	200	6.7	10	25	GW	D
1610258-002B	351634107503701 920	10/6/2016	11:05	10/11/2016	1/3/2017	520	130	200	500	GW	D
1610193-003B	351309107515001 CW28	10/6/2016	12:00	10/10/2016	12/30/2016	100	6.7	10	25	GW	D
1610258-003B	351429107521801 ST	10/6/2016	16:00	10/11/2016	1/3/2017	8,400	130	200	500	GW	D
1610193-005B	351502107521501 DD	10/6/2016	16:40	10/10/2016	12/30/2016	330	6.7	10	25	GW	D
1610193-006B	351502107521501 DD replicate	10/6/2016	16:41	10/10/2016	12/30/2016	330	6.7	10	25	Replicate	D
1610258-004B	351504107514801 CW50	10/6/2016	17:30	10/11/2016	12/30/2016	120	6.7	10	25	GW	D
1610258-005B	351504107514801 CW50 replicate	10/6/2016	17:35	10/11/2016	12/30/2016	110	6.7	10	25	Replicate	D
1610281-002B	351309107520801 Well CW45	10/7/2016	11:00	10/12/2016	1/3/2017	740	130	200	500	GW	D
1610281-003B	351404107513401 Well DD2	10/7/2016	12:40	10/12/2016	1/3/2017	810	130	200	500	GW	D
1610281-004B	351424107520101 Well CE7	10/7/2016	15:00	10/12/2016	1/9/2017	70,000	1,300	2,000	5,000	GW	D
1610281-005B	351317107514601 Well CW18	10/7/2016	16:45	10/12/2016	12/30/2016	120	6.7	10	25	GW	D
1610281-006B	351443107520401 Well T11	10/7/2016	17:10	10/12/2016	1/4/2017	31,000	670	1,000	2,500	GW	D
1610281-007B	351330107530401 Well CW37	10/8/2016	13:50	10/12/2016	12/30/2016	120	6.7	10	25	GW	D
1610281-008B	351400107522301 Well ACW	10/8/2016	14:00	10/12/2016	12/30/2016	190	6.7	10	25	GW	D
Volumetric total samples											
1610157-005A	351459107515301 Well P3	10/4/2016	12:30	10/7/2016	1/5/2017	84	6.7	10	25	GW	T
1610157-001A	351449107514701 CW2	10/4/2016	13:00	10/7/2016	1/5/2017	170	6.7	10	25	GW	T
1610157-002A	351449107514701 CW2 replicate	10/4/2016	13:05	10/7/2016	1/5/2017	170	6.7	10	25	Replicate	T
1610157-007A	351421107520901 Injectate	10/4/2016	16:45	10/7/2016	1/5/2017	35	6.7	10	25	Injectate	T
1610157-006A	351456107510401 ND	10/4/2016	17:30	10/7/2016	1/5/2017	78	6.7	10	25	GW	T
1610157-004A	351424107531001 MV	10/5/2016	13:30	10/7/2016	1/5/2017	870	130	200	500	GW	T
1610258-001A	351321107525101 CW15	10/5/2016	15:00	10/11/2016	1/5/2017	100	6.7	10	25	GW	T
1610157-003A	351449107515901 CW1	10/5/2016	16:00	10/7/2016	1/5/2017	160	6.7	10	25	GW	T
1610193-001A	351524107513601 Well Q	10/6/2016	10:30	10/10/2016	1/5/2017	200	6.7	10	25	GW	T
1610258-002A	351634107503701 920	10/6/2016	11:05	10/11/2016	1/5/2017	810	130	200	500	GW	T
1610193-003A	351309107515001 CW28	10/6/2016	12:00	10/10/2016	1/5/2017	100	6.7	10	25	GW	T
1610281-005A	351317107514601 Well CW18	10/7/2016	16:45	10/12/2016	12/21/2016	110	6.7	10	25	GW	T
1610281-006A	351443107520401 Well T11	10/7/2016	17:10	10/12/2016	12/21/2016	33,000	670	1,000	2,500	GW	T

Table 2. Original results of aqueous uranium concentrations as analyzed by RTI Laboratories, Inc., Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

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Lab sample ID	Client sample ID	Date collected	Time collected	Date received	Analysis date	Original uncorrected result, in µg/L[1]	MDL, in µg/L	LOD, in µg/L	LOQ, in µg/L	Sample origin	Sample type
1610281-007A	351330107530401 Well CW37	10/8/2016	13:50	10/12/2016	12/21/2016	150	6.7	10	25	GW	T
1610281-008A	351400107522301 Well ACW	10/8/2016	14:00	10/12/2016	12/21/2016	180	6.7	10	25	GW	T
1610281-002A	351309107520801 Well CW45	10/7/2016	11:00	10/12/2016	12/21/2016	1,300	6.7	10	25	GW	T
1610281-003A	351404107513401 Well DD2	10/7/2016	12:40	10/12/2016	12/21/2016	810	6.7	10	25	GW	T
1610281-004A	351424107520101 Well CE7	10/7/2016	15:00	10/12/2016	12/21/2016	67,000	670	1,000	2,500	GW	T
1610258-003A	351429107521801 ST	10/6/2016	16:00	10/11/2016	1/6/2017	29,000	2,700	4,000	10,000	GW	T
1610193-005A	351502107521501 DD	10/6/2016	16:40	10/10/2016	1/5/2017	320	6.7	10	25	GW	T
1610193-006A	351502107521501 DD replicate	10/6/2016	16:41	10/10/2016	1/5/2017	310	6.7	10	25	Replicate	T
1610258-004A	351504107514801 CW50	10/6/2016	17:30	10/11/2016	12/21/2016	100	6.7	10	25	GW	T
1610258-005A	351504107514801 CW50 replicate	10/6/2016	17:35	10/11/2016	12/21/2016	110	6.7	10	25	Replicate	T
				Micropurge samples							
1610709-003A	351404107513401 DD2 at 72-ft depth micropurge	10/7/2016	10:29	10/21/2016	12/21/2016	820	6.7	10	25	GW	T
1610709-002A	351404107513401 DD2 at 60-ft depth micropurge	10/7/2016	10:37	10/21/2016	12/21/2016	800	6.7	10	25	GW	T
1610709-001A	351443107520401 T11 at 140-ft depth micropurge	10/7/2016	15:54	10/21/2016	12/21/2016	32,000	670	1,000	2,500	GW	T
1610157-010A	351456107510401 ND at 64-ft depth micropurge	10/4/2016	15:34	10/7/2016	1/5/2017	98	6.7	10	25	GW	T
1610157-008A	351424107531001 MV at 82-ft depth micropurge	10/5/2016	11:18	10/7/2016	12/21/2016	1,100	6.7	10	25	GW	T
1610157-009A	351524107513601 Q at 88-ft depth micropurge	10/5/2016	16:50	10/7/2016	12/21/2016	190	6.7	10	25	GW	T
1610258-007A	351502107521501 DD at 54-ft depth micropurge	10/6/2016	14:30	10/11/2016	12/21/2016	280	6.7	10	25	GW	T
				Passive samples							
1610194-001A	351456107510401 ND S6-42	10/4/2016	13:54	10/10/2016	11/4/2016	1[1e]	6.7	10	25	GW	T
1610194-002A	351456107510401 ND S5-50	10/4/2016	13:56	10/10/2016	11/4/2016	16[e]	6.7	10	25	GW	T
1610194-003A	351456107510401 ND S4-57	10/4/2016	13:58	10/10/2016	11/4/2016	22[e]	6.7	10	25	GW	T
1610194-004A	351456107510401 ND S3-60	10/4/2016	14:00	10/10/2016	11/4/2016	26	6.7	10	25	GW	T
1610194-005A	351456107510401 ND S3-60 replicate	10/4/2016	14:01	10/10/2016	11/4/2016	27	6.7	10	25	Replicate	T
1610194-006A	351456107510401 ND S2-64	10/4/2016	14:02	10/10/2016	11/4/2016	22[e]	6.7	10	25	GW	T
1610194-007A	351456107510401 ND S1-68	10/4/2016	14:04	10/10/2016	11/4/2016	27	6.7	10	25	GW	T
1610194-008A	351424107531001 MV S8-67	10/5/2016	9:34	10/10/2016	11/4/2016	210	6.7	10	25	GW	T
1610194-009A	351424107531001 MV S7-76	10/5/2016	9:36	10/10/2016	11/4/2016	250	6.7	10	25	GW	T
1610194-010A	351424107531001 MV S6-82	10/5/2016	9:38	10/10/2016	11/4/2016	270	6.7	10	25	GW	T
1610194-011A	351424107531001 MV S5-87	10/5/2016	9:40	10/10/2016	11/4/2016	300	6.7	10	25	GW	T
1610194-012A	351424107531001 MV S5-87 replicate	10/5/2016	9:41	10/10/2016	11/4/2016	300	6.7	10	25	Replicate	T
1610194-013A	351424107531001 MV S4-91	10/5/2016	9:42	10/10/2016	11/4/2016	310	6.7	10	25	GW	T
1610194-014A	351424107531001 MV S3-95	10/5/2016	9:44	10/10/2016	11/4/2016	280	6.7	10	25	GW	T

Table 2. Original results of aqueous uranium concentrations as analyzed by RTI Laboratories, Inc., Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

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Lab sample ID	Client sample ID	Date collected	Time collected	Date received	Analysis date	Original uncorrected result, in µg/L[1]	MDL, in µg/L	LOD, in µg/L	LOQ, in µg/L	Sample origin	Sample type
				Passive samples—Continued							
1610194-015A	351424107531001 MV S2-98	10/5/2016	9:46	10/10/2016	11/4/2016	300	6.7	10	25	GW	T
1610194-016A	351424107531001 MV S1-102	10/5/2016	9:50	10/10/2016	11/4/2016	260	6.7	10	25	GW	T
1610194-017A	351524107513601 Q S8-57	10/5/2016	15:45	10/10/2016	11/4/2016	41	6.7	10	25	GW	T
1610194-018A	351524107513601 Q S7-74	10/5/2016	15:47	10/10/2016	11/4/2016	46	6.7	10	25	GW	T
1610194-019A	351524107513601 Q S6-78	10/5/2016	15:48	10/10/2016	11/4/2016	47	6.7	10	25	GW	T
1610194-020A	351524107513601 Q S5-82	10/5/2016	15:49	10/10/2016	11/4/2016	48	6.7	10	25	GW	T
1610194-021A	351524107513601 Q S4-85	10/5/2016	15:50	10/10/2016	11/4/2016	51	6.7	10	25	GW	T
1610194-022A	351524107513601 Q S4-85 replicate	10/5/2016	15:51	10/10/2016	11/4/2016	49	6.7	10	25	Replicate	T
1610194-023A	351524107513601 Q S3-88	10/5/2016	15:52	10/10/2016	11/4/2016	43	6.7	10	25	GW	T
1610194-024A	351524107513601 Q S2-93	10/5/2016	15:53	10/10/2016	11/4/2016	45	6.7	10	25	GW	T
1610194-025A	351524107513601 Q S1-97	10/6/2016	15:54	10/10/2016	11/4/2016	54	6.7	10	25	GW	T
1610194-026A	351502107521501 DD S1-68	10/6/2016	12:59	10/10/2016	11/4/2016	61	6.7	10	25	GW	T
1610194-027A	351502107521501 DD S2-63	10/6/2016	12:58	10/10/2016	11/4/2016	72	6.7	10	25	GW	T
1610194-028A	351502107521501 DD S3-60	10/6/2016	12:57	10/10/2016	11/4/2016	67	6.7	10	25	GW	T
1610194-029A	351502107521501 DD S4-54	10/6/2016	12:56	10/10/2016	11/4/2016	67	6.7	10	25	GW	T
1610194-030A	351502107521501 DD S5-50	10/6/2016	12:54	10/10/2016	11/4/2016	67	6.7	10	25	GW	T
1610194-031A	351502107521501 DD S5-50 replicate	10/6/2016	12:55	10/10/2016	11/4/2016	63	6.7	10	25	Replicate	T
1610194-032A	351502107521501 DD S6-45	10/6/2016	12:53	10/10/2016	11/4/2016	6.8[e]	6.7	10	25	GW	T
1610706-001A	351443107520401 T11 S11-115	10/7/2016	14:40	10/21/2016	11/4/2016	3,300	67	100	250	GW	T
1610706-002A	351443107520401 T11 S5-170	10/7/2016	14:47	10/21/2016	11/4/2016	22,000	670	1,000	2,500	GW	T
1610706-003A	351443107520401 T11 S1-190	10/7/2016	14:51	10/21/2016	11/4/2016	20,000	670	1,000	2,500	GW	T
1610706-004A	351443107520401 T11 S7-154	10/7/2016	14:44	10/21/2016	11/4/2016	11,000	670	1,000	2,500	GW	T
1610706-005A	351443107520401 T11 S10-134	10/7/2016	14:41	10/21/2016	11/4/2016	5,700	670	1,000	2,500	GW	T
1610706-006A	351443107520401 T11 S6-164	10/7/2016	14:45	10/21/2016	11/4/2016	11,000	670	1,000	2,500	GW	T
1610706-007A	351443107520401 T11 S4-175	10/7/2016	14:48	10/21/2016	11/4/2016	21,000	670	1,000	2,500	GW	T
1610706-008A	351443107520401 T11 S9-140	10/7/2016	14:42	10/21/2016	11/4/2016	9,000	670	1,000	2,500	GW	T
1610706-009A	351443107520401 T11 S8-148	10/7/2016	14:43	10/21/2016	11/4/2016	11,000	670	1,000	2,500	GW	T
1610706-010A	351443107520401 T11 S2-185	10/7/2016	14:50	10/21/2016	11/4/2016	21,000	670	1,000	2,500	GW	T
1610706-011A	351443107520401 T11 S3-180	10/7/2016	14:49	10/21/2016	11/4/2016	23,000	670	1,000	2,500	GW	T
1610706-012A	351443107520401 T11 S6-164 replicate	10/7/2016	14:46	10/21/2016	11/4/2016	15,000	670	1,000	2,500	Replicate	T
1610706-013A	351404107513401 DD2 S3-78	10/7/2016	8:53	10/21/2016	11/4/2016	180	6.7	10	25	GW	T
1610706-014A	351404107513401 DD2 S8-60	10/7/2016	8:47	10/21/2016	11/4/2016	77	6.7	10	25	GW	T
1610706-015A	351404107513401 DD2 S6-67	10/7/2016	8:49	10/21/2016	11/4/2016	180	6.7	10	25	GW	T
1610706-016A	351404107513401 DD2 S7-63	10/7/2016	8:48	10/21/2016	11/4/2016	110	6.7	10	25	GW	T
1610706-017A	351404107513401 DD2 S4-75	10/7/2016	8:51	10/21/2016	11/4/2016	190	6.7	10	25	GW	T
1610706-018A	351404107513401 DD2 S1-90	10/7/2016	8:55	10/21/2016	11/4/2016	190	6.7	10	25	GW	T
1610706-019A	351404107513401 DD2 S10-48	10/7/2016	8:45	10/21/2016	11/4/2016	39	6.7	10	25	GW	T

Table 2. Original results of aqueous uranium concentrations as analyzed by RTI Laboratories, Inc., Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

[Uranium is assigned Chemical Abstract Service (CAS) Registry Number 7440-61-11; CAS registry numbers (CASRNs) are a registered trademark of the American Chemical Society; CAS recommends the verification of the CASRNs through CAS Client Services. Results were analyzed with U.S. Environmental Protection Agency Method 602A (U.S. Environmental Protection Agency, 1998). ID, identifier; µg/L, microgram per liter; MDL, minimum detection level; LOD, limit of detection; LOQ, limit of quantification; T, total; D, dissolved; GW, groundwater; ND, nondetect; EQ, equipment blank; DI, deionized water]

Lab sample ID	Client sample ID	Date collected	Time collected	Date received	Analysis date	Original uncorrected result, in µg/L[1]	MDL, in µg/L	LOD, in µg/L	LOQ, in µg/L	Sample origin	Sample type
Passive samples—Continued											
1610706-020A	351404107513401 DD2 S9-56	10/7/2016	8:46	10/21/2016	11/4/2016	90	6.7	10	25	GW	T
1610706-021A	351404107513401 DD2 S4-75 replicate	10/7/2016	8:52	10/21/2016	12/6/2016	200	6.7	10	25	Replicate	T
1610706-022A	351404107513401 DD2 S5-72	10/7/2016	8:50	10/21/2016	12/6/2016	190	6.7	10	25	GW	T
1610706-023A	351404107513401 DD2 S2-84	10/7/2016	8:54	10/21/2016	12/6/2016	180	6.7	10	25	GW	T
Equipment blanks											
1609238-001A	351433107511601 equipment blank passive	8/31/2016	15:30	9/8/2016	9/30/2016	ND	6.7	10	25	Passive	T
1610193-004A	351309107515001 CW28 equipment blank	10/6/2016	12:05	10/10/2016	1/5/2017	ND	6.7	10	25	EQ	T
1610193-002B	351502107521501 DD source blank, distilled water	10/6/2016	11:39	10/10/2016	12/30/2016	ND	6.7	10	25	DI	D
1610281-001B	351317107514601 CW18 equipment blank	10/7/2016	10:10	10/12/2016	12/30/2016	ND	6.7	10	25	EQ	D
1610193-002A	351502107521501 DD source blank, distilled water	10/6/2016	11:39	10/10/2016	1/5/2017	ND	6.7	10	25	DI	T
1610258-008A	351502107521501 DD equipment blank	10/7/2016	11:00	10/11/2016	12/21/2016	ND	6.7	10	25	EQ	T
1610281-001A	351317107514601 CW18 equipment blank	10/7/2016	10:10	10/12/2016	12/21/2016	ND	6.7	10	25	EQ	T
1610258-006A	351309107515001 CW28 equipment blank	10/6/2016	12:05	10/11/2016	12/30/2016	ND	6.7	10	25	EQ	D
1607742-001A	340101081050601 DI for bath	7/19/2016	16:15	7/22/2016	10/12/2016	ND	—	—	50	DI	T
Bench test											
1607742-005A	340101081050601 selenium bath	7/19/2016	16:34	07/22/16	10/12/16	ND	—	—	50	Bath	T
1607742-004A	340101081050601 selenium diffusion	7/19/2016	16:33	07/22/16	10/12/16	14[e]	—	—	50	Passive	T
1607742-003A	340101081050601 uranium bath	7/19/2016	16:26	07/22/16	10/12/16	85,000	—	—	25,000	Bath	T
1607742-002A	340101081050601 uranium diffusion	7/19/2016	16:25	07/22/16	10/12/16	26,000	—	—	2,500	Passive	T
Blind											
1704300-001	Blind uranium sample	4/11/2017	10:00	04/11/17	04/17/17	730,000	—	25,000	120,000	Blind	T

[1]Values adjusted in tables 5 and 6.

Table 3. Original results of aqueous selenium concentrations as analyzed by RTI Laboratories, Inc., Homestake Mining Company Superfund site, Milan, New Mexico.

[Selenium is assigned Chemical Abstract Service (CAS) Registry Number 7782–49–21; CAS registry numbers (CASRNs) are a registered trademark of the American Chemical Society; CAS recommends the verification of the CASRNs through CAS Client Services. Results were analyzed with U.S. Environmental Protection Agency Method 602A (U.S. Environmental Protection Agency, 1998). µg/L, microgram per liter; MDL, minimum detection level; LOD, limit of detection; LOQ, limit of quantification; GW, groundwater; ND, nondetect; e, estimated; D, dissolved; T, total; DI, deionized water; EQ, equipment blank]

Lab sample identification number	Client sample identifier	Date collected	Time collected	Date received	Analysis date	Original, uncorrected result, in µg/L	MDL, in µg/L	LOD, in µg/L	LOQ, in µg/L	Sample origin	Sample type
Volumetric dissolved samples											
1610157-005B	351459107515301 Well P3	10/4/2016	12:30	10/7/2016	12/30/2016	300	1.5	2.5	5	GW	D
1610157-001B	351449107514701 CW2	10/4/2016	13:00	10/7/2016	12/30/2016	52	1.5	2.5	5	GW	D
1610157-002B	351449107514701 CW2 replicate	10/4/2016	13:05	10/7/2016	12/30/2016	50	1.5	2.5	5	Replicate	D
1610157-007B	351421107520901 injectate	10/4/2016	16:45	10/7/2016	12/30/2016	9.2	1.5	2.5	5	Injectate	D
1610157-006B	351456107510401 ND	10/4/2016	17:30	10/7/2016	12/30/2016	150	1.5	2.5	5	GW	D
1610157-004B	351424107531001 MV	10/5/2016	13:30	10/7/2016	12/30/2016	36	1.5	2.5	5	GW	D
1610258-001B	351321107525101 CW15	10/5/2016	15:00	10/11/2016	12/30/2016	17	1.5	2.5	5	GW	D
1610157-003B	351449107515901 CW1	10/5/2016	16:00	10/7/2016	12/30/2016	51	1.5	2.5	5	GW	D
1610193-001B	351524107513601 Well Q	10/6/2016	10:30	10/10/2016	12/30/2016	470	1.5	2.5	5	GW	D
1610258-002B	351634107503701 920	10/6/2016	11:05	10/11/2016	12/30/2016	290	1.5	2.5	5	GW	D
1610193-003B	351309107515001 CW28	10/6/2016	12:00	10/10/2016	12/30/2016	56	1.5	2.5	5	GW	D
1610258-003B	351429107521801 ST	10/6/2016	16:00	10/11/2016	12/30/2016	210	1.5	2.5	5	GW	D
1610193-005B	351502107521501 DD	10/6/2016	16:40	10/10/2016	12/30/2016	140	1.5	2.5	5	GW	D
1610193-006B	351502107521501 DD replicate	10/6/2016	16:41	10/10/2016	12/30/2016	130	1.5	2.5	5	Replicate	D
1610258-004B	351504107514801 CW50 environmental	10/6/2016	17:30	10/11/2016	12/30/2016	1.8[e]	1.5	2.5	5	GW	D
1610258-005B	351504107514801 CW50 replicate	10/6/2016	17:35	10/11/2016	12/30/2016	1.8[e]	1.5	2.5	5	Replicate	D
1610281-002B	351309107520801 Well CW45	10/7/2016	11:00	10/12/2016	12/30/2016	38	1.5	2.5	5	GW	D
1610281-003B	351404107513401 Well DD2	10/7/2016	12:40	10/12/2016	12/30/2016	4.2[e]	1.5	2.5	5	GW	D
1610281-004B	351424107520101 Well CE7	10/7/2016	15:00	10/12/2016	12/30/2016	900	1.5	2.5	5	GW	D
1610281-005B	351317107514601 Well CW18	10/7/2016	16:45	10/12/2016	12/30/2016	18	1.5	2.5	5	GW	D
1610281-006B	351443107520401 Well T11	10/7/2016	17:10	10/12/2016	12/30/2016	160	1.5	2.5	5	GW	D
1610281-007B	351330107530401 Well CW37	10/8/2016	13:50	10/12/2016	12/30/2016	81	1.5	2.5	5	GW	D
1610281-008B	351400107522301 Well ACW	10/8/2016	14:00	10/12/2016	12/30/2016	70	1.5	2.5	5	GW	D
Volumetric total samples											
1610157-005A	351459107515301 Well P3	10/4/2016	12:30	10/7/2016	1/5/2017	280	1.5	2.5	5	GW	T
1610157-001A	351449107514701 CW2	10/4/2016	13:00	10/7/2016	1/5/2017	54	1.5	2.5	5	GW	T
1610157-002A	351449107514701 CW2 replicate	10/4/2016	13:05	10/7/2016	1/5/2017	55	1.5	2.5	5	Replicate	T
1610157-007A	351421107520901 injectate	10/4/2016	16:45	10/7/2016	1/5/2017	11	1.5	2.5	5	Injectate	T
1610157-006A	351456107510401 ND	10/4/2016	17:30	10/7/2016	1/5/2017	150	1.5	2.5	5	GW	T
1610157-004A	351424107531001 MV	10/5/2016	13:30	10/7/2016	1/5/2017	35	1.5	2.5	5	GW	T
1610258-001A	351321107525101 CW15	10/5/2016	15:00	10/11/2016	1/5/2017	20	1.5	2.5	5	GW	T
1610157-003A	351449107515901 CW1	10/5/2016	16:00	10/7/2016	1/5/2017	58	1.5	2.5	5	GW	T
1610193-001A	351524107513601 Well Q	10/6/2016	10:30	10/10/2016	1/5/2017	460	1.5	2.5	5	GW	T
1610258-002A	351634107503701 920	10/6/2016	11:05	10/11/2016	1/5/2017	290	1.5	2.5	5	GW	T
1610193-003A	351309107515001 CW28	10/6/2016	12:00	10/10/2016	1/5/2017	59	1.5	2.5	5	GW	T
1610258-003A	351429107521801 ST	10/6/2016	16:00	10/11/2016	1/5/2017	190	1.5	2.5	5	GW	T
1610193-005A	351502107521501 DD	10/6/2016	16:40	10/10/2016	1/5/2017	130	1.5	2.5	5	GW	T

Table 3. Original results of aqueous selenium concentrations as analyzed by RTI Laboratories, Inc., Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

[Selenium is assigned Chemical Abstract Service (CAS) Registry Number 7782–49–21; CAS registry numbers (CASRNs) are a registered trademark of the American Chemical Society; CAS recommends the verification of the CASRNs through CAS Client Services. Results were analyzed with U.S. Environmental Protection Agency Method 602A (U.S. Environmental Protection Agency, 1998). µg/L, microgram per liter; MDL, minimum detection level; LOD, limit of detection; LOQ, limit of quantification; GW, groundwater; ND, nondetect; e, estimated; D, dissolved; T, total; DI, deionized water; EQ, equipment blank]

Lab sample identification number	Client sample identifier	Date collected	Time collected	Date received	Analysis date	Original, uncorrected result, in µg/L	MDL, in µg/L	LOD, in µg/L	LOQ, in µg/L	Sample origin	Sample type
Volumetric total samples—Continued											
1610193-006A	351502107521501 DD replicate	10/6/2016	16:41	10/10/2016	1/5/2017	120	1.5	2.5	5	Replicate	T
1610258-004A	351504107514801 CW50 environmental	10/6/2016	17:30	10/11/2016	12/20/2016	ND	1.5	2.5	5	GW	T
1610258-005A	351504107514801 CW50 replicate	10/6/2016	17:35	10/11/2016	12/20/2016	ND	1.5	2.5	5	Replicate	T
1610281-002A	351309107520801 Well CW45	10/7/2016	11:00	10/12/2016	12/20/2016	35	1.5	2.5	5	GW	T
1610281-003A	351404107513401 Well DD2	10/7/2016	12:40	10/12/2016	12/20/2016	13	1.5	2.5	5	GW	T
1610281-004A	351424107520101 Well CE7	10/7/2016	15:00	10/12/2016	12/20/2016	790	150	250	500	GW	T
1610281-005A	351317107514601 Well CW18	10/7/2016	16:45	10/12/2016	12/20/2016	54	1.5	2.5	5	GW	T
1610281-006A	351443107520401 Well T11	10/7/2016	17:10	10/12/2016	12/20/2016	180	1.5	2.5	5	GW	T
1610281-007A	351330107530401 Well CW37	10/8/2016	13:50	10/12/2016	12/20/2016	73	1.5	2.5	5	GW	T
1610281-008A	351400107522301 Well ACW	10/8/2016	14:00	10/12/2016	12/20/2016	64	1.5	2.5	5	GW	T
Micropurge samples											
1610157-010A	351456107510401 ND at 64 ft depth micropurge	10/4/2016	15:34	10/7/2016	1/5/2017	51	1.5	2.5	5	GW	T
1610157-008A	351424107531001 MV at 82 ft depth micropurge	10/5/2016	11:18	10/7/2016	12/20/2016	29	1.5	2.5	5	GW	T
1610157-009A	351524107513601 Q at 88 ft depth micropurge	10/5/2016	16:50	10/7/2016	12/20/2016	380	1.5	2.5	5	GW	T
1610709-003A	351404107513401 DD2 at 72 ft depth micropurge	10/7/2016	10:29	10/21/2016	12/20/2016	2.4[e]	1.5	2.5	5	GW	T
1610709-002A	351404107513401 DD2 at 60 ft depth micropurge	10/7/2016	10:37	10/21/2016	12/20/2016	7.5	1.5	2.5	5	GW	T
1610709-001A	351443107520401 T11 at 140 ft depth micropurge	10/7/2016	15:54	10/21/2016	12/20/2016	350	1.5	2.5	5	GW	T
1610258-007A	351502107521501 DD at 54 ft depth micropurge	10/6/2016	14:30	10/11/2016	12/20/2016	170	1.5	2.5	5	GW	T
Passive samples											
1610194-001A	351456107510401 ND S6-42	10/4/2016	13:54	10/10/2016	11/4/2016	20	1.5	2.5	5	GW	T
1610194-002A	351456107510401 ND S5-50	10/4/2016	13:56	10/10/2016	11/4/2016	32	1.5	2.5	5	GW	T
1610194-003A	351456107510401 ND S4-57	10/4/2016	13:58	10/10/2016	11/4/2016	25	1.5	2.5	5	GW	T
1610194-004A	351456107510401 ND S3-60	10/4/2016	14:00	10/10/2016	11/4/2016	14	1.5	2.5	5	GW	T
1610194-005A	351456107510401 ND S3-60 replicate	10/4/2016	14:01	10/10/2016	11/4/2016	14	1.5	2.5	5	Replicate	T
1610194-006A	351456107510401 ND S2-64	10/4/2016	14:02	10/10/2016	11/4/2016	13	1.5	2.5	5	GW	T
1610194-007A	351456107510401 ND S1-68	10/4/2016	14:04	10/10/2016	11/4/2016	13	1.5	2.5	5	GW	T
1610194-008A	351424107531001 MV S8-67	10/5/2016	9:34	10/10/2016	11/4/2016	4.3[e]	1.5	2.5	5	GW	T
1610194-009A	351424107531001 MV S7-76	10/5/2016	9:36	10/10/2016	11/4/2016	8.5	1.5	2.5	5	GW	T
1610194-010A	351424107531001 MV S6-82	10/5/2016	9:38	10/10/2016	11/4/2016	8.5	1.5	2.5	5	GW	T
1610194-011A	351424107531001 MV S5-87	10/5/2016	9:40	10/10/2016	11/4/2016	9.6	1.5	2.5	5	GW	T
1610194-012A	351424107531001 MV S5-87 replicate	10/5/2016	9:41	10/10/2016	11/4/2016	9.4	1.5	2.5	5	Replicate	T
1610194-013A	351424107531001 MV S4-91	10/5/2016	9:42	10/10/2016	11/4/2016	9.2	1.5	2.5	5	GW	T

Table 3. Original results of aqueous selenium concentrations as analyzed by RTI Laboratories, Inc., Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

[Selenium is assigned Chemical Abstract Service (CAS) Registry Number 7782–49–21; CAS registry numbers (CASRNs) are a registered trademark of the American Chemical Society; CAS recommends the verification of the CASRNs through CAS Client Services. Results were analyzed with U.S. Environmental Protection Agency Method 602A (U.S. Environmental Protection Agency, 1998). µg/L, microgram per liter; MDL, minimum detection level; LOD, limit of detection; LOQ, limit of quantification; GW, groundwater; ND, nondetect; e, estimated; D, dissolved; T, total; DI, deionized water; EQ, equipment blank]

Lab sample identification number	Client sample identifier	Date collected	Time collected	Date received	Analysis date	Original, uncorrected result, in µg/L	MDL, in µg/L	LOD, in µg/L	LOQ, in µg/L	Sample origin	Sample type
Passive samples—Continued											
1610194-014A	351424107531001 MV S3-95	10/5/2016	9:44	10/10/2016	11/4/2016	8.2	1.5	2.5	5	GW	T
1610194-015A	351424107531001 MV S2-98	10/5/2016	9:46	10/10/2016	11/4/2016	8.6	1.5	2.5	5	GW	T
1610194-016A	351424107531001 MV S1-102	10/5/2016	9:50	10/10/2016	11/4/2016	1.8[e]	1.5	2.5	5	GW	T
1610194-017A	351524107513601 Q S8-57	10/5/2016	15:45	10/10/2016	11/4/2016	110	1.5	2.5	5	GW	T
1610194-018A	351524107513601 Q S7-74	10/5/2016	15:47	10/10/2016	11/4/2016	110	1.5	2.5	5	GW	T
1610194-019A	351524107513601 Q S6-78	10/5/2016	15:48	10/10/2016	11/4/2016	110	1.5	2.5	5	GW	T
1610194-020A	351524107513601 Q S5-82	10/5/2016	15:49	10/10/2016	11/4/2016	120	1.5	2.5	5	GW	T
1610194-021A	351524107513601 Q S4-85	10/5/2016	15:50	10/10/2016	11/4/2016	120	1.5	2.5	5	GW	T
1610194-022A	351524107513601 Q S4-85 replicate	10/5/2016	15:51	10/10/2016	11/4/2016	120	1.5	2.5	5	Replicate	T
1610194-023A	351524107513601 Q S3-88	10/5/2016	15:52	10/10/2016	11/4/2016	120	1.5	2.5	5	GW	T
1610194-024A	351524107513601 Q S2-93	10/5/2016	15:53	10/10/2016	11/4/2016	120	1.5	2.5	5	GW	T
1610194-025A	351524107513601 Q S1-97	10/6/2016	15:54	10/10/2016	11/4/2016	130	1.5	2.5	5	GW	T
1610194-026A	351502107521501 DD S1-68	10/6/2016	12:59	10/10/2016	11/4/2016	39	1.5	2.5	5	GW	T
1610194-027A	351502107521501 DD S2-63	10/6/2016	12:58	10/10/2016	11/4/2016	45	1.5	2.5	5	GW	T
1610194-028A	351502107521501 DD S3-60	10/6/2016	12:57	10/10/2016	11/4/2016	46	1.5	2.5	5	GW	T
1610194-029A	351502107521501 DD S4-54	10/6/2016	12:56	10/10/2016	11/4/2016	48	1.5	2.5	5	GW	T
1610194-030A	351502107521501 DD S5-50	10/6/2016	12:54	10/10/2016	11/4/2016	61	1.5	2.5	5	GW	T
1610194-031A	351502107521501 DD S5-50 replicate	10/6/2016	12:55	10/10/2016	11/4/2016	43	1.5	2.5	5	Replicate	T
1610194-032A	351502107521501 DD S6-45	10/6/2016	12:53	10/10/2016	11/4/2016	25	1.5	2.5	5	GW	T
1610706-001A	351443107520401 T11 S11-115	10/7/2016	14:40	10/21/2016	11/4/2016	7.9	1.5	2.5	5	GW	T
1610706-002A	351443107520401 T11 S5-170	10/7/2016	14:47	10/21/2016	11/4/2016	22	1.5	2.5	5	GW	T
1610706-003A	351443107520401 T11 S1-190	10/7/2016	14:51	10/21/2016	11/4/2016	58	1.5	2.5	5	GW	T
1610706-004A	351443107520401 T11 S7-154	10/7/2016	14:44	10/21/2016	11/4/2016	20	1.5	2.5	5	GW	T
1610706-005A	351443107520401 T11 S10-134	10/7/2016	14:41	10/21/2016	11/4/2016	36	1.5	2.5	5	GW	T
1610706-006A	351443107520401 T11 S6-164	10/7/2016	14:45	10/21/2016	11/4/2016	19	1.5	2.5	5	GW	T
1610706-007A	351443107520401 T11 S4-175	10/7/2016	14:48	10/21/2016	11/4/2016	38	1.5	2.5	5	GW	T
1610706-008A	351443107520401 T11 S9-140	10/7/2016	14:42	10/21/2016	11/4/2016	88	1.5	2.5	5	GW	T
1610706-009A	351443107520401 T11 S8-148	10/7/2016	14:43	10/21/2016	11/4/2016	16	1.5	2.5	5	GW	T
1610706-010A	351443107520401 T11 S2-185	10/7/2016	14:50	10/21/2016	11/4/2016	38	1.5	2.5	5	GW	T
1610706-011A	351443107520401 T11 S3-180	10/7/2016	14:49	10/21/2016	11/4/2016	55	1.5	2.5	5	GW	T
1610706-012A	351443107520401 T11 S6-164 replicate	10/7/2016	14:46	10/21/2016	11/4/2016	23	1.5	2.5	5	Replicate	T
1610706-013A	351404107513401 DD2 S3-78	10/7/2016	8:53	10/21/2016	11/4/2016	3.3[e]	1.5	2.5	5	GW	T

Table 3. Original results of aqueous selenium concentrations as analyzed by RTI Laboratories, Inc., Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

[Selenium is assigned Chemical Abstract Service (CAS) Registry Number 7782–49–21; CAS registry numbers (CASRNs) are a registered trademark of the American Chemical Society; CAS recommends the verification of the CASRNs through CAS Client Services. Results were analyzed with U.S. Environmental Protection Agency Method 602A (U.S. Environmental Protection Agency, 1998). µg/L, microgram per liter; MDL, minimum detection level; LOD, limit of detection; LOQ, limit of quantification; GW, groundwater; ND, nondetect; e, estimated; D, dissolved; T, total; DI, deionized water; EQ, equipment blank]

Lab sample identification number	Client sample identifier	Date collected	Time collected	Date received	Analysis date	Original, uncorrected result, in µg/L	MDL, in µg/L	LOD, in µg/L	LOQ, in µg/L	Sample origin	Sample type
				Passive samples—Continued							
1610706-014A	351404107513401 DD2 S8-60	10/7/2016	8:47	10/21/2016	11/4/2016	1.7[e]	1.5	2.5	5	GW	T
1610706-015A	351404107513401 DD2 S6-67	10/7/2016	8:49	10/21/2016	11/4/2016	2.8[e]	1.5	2.5	5	GW	T
1610706-016A	351404107513401 DD2 S7-63	10/7/2016	8:48	10/21/2016	11/4/2016	1.5[e]	1.5	2.5	5	GW	T
1610706-017A	351404107513401 DD2 S4-75	10/7/2016	8:51	10/21/2016	11/4/2016	1.9[e]	1.5	2.5	5	GW	T
1610706-018A	351404107513401 DD2 S1-90	10/7/2016	8:55	10/21/2016	11/4/2016	2.7[e]	1.5	2.5	5	GW	T
1610706-019A	351404107513401 DD2 S10-48	10/7/2016	8:45	10/21/2016	11/4/2016	ND	1.5	2.5	5	GW	T
1610706-020A	351404107513401 DD2 S9-56	10/7/2016	8:46	10/21/2016	11/4/2016	1.6[e]	1.5	2.5	5	GW	T
1610706-021A	351404107513401 DD2 S4-75 replicate	10/7/2016	8:52	10/21/2016	12/6/2016	2.1[e]	1.5	2.5	5	Replicate	T
1610706-022A	351404107513401 DD2 S5-72	10/7/2016	8:50	10/21/2016	12/6/2016	1.9[e]	1.5	2.5	5	GW	T
1610706-023A	351404107513401 DD2 S2-84	10/7/2016	8:54	10/21/2016	12/6/2016	ND	1.5	2.5	5	GW	T
				Equipment blanks							
1609238-001A	351433107511601 equipment blank passive	8/31/2016	15:30	9/8/2016	9/30/2016	ND	1.5	2.5	5	Passive	T
1610193-002B	351502107521501 DD source blank, distilled water	10/6/2016	11:39	10/10/2016	12/30/2016	2.1e	1.5	2.5	5	DI	D
1610281-001B	351317107514601 CW18 equipment blank	10/7/2016	10:10	10/12/2016	12/30/2016	ND	1.5	2.5	5	EQ	D
1610193-004A	351309107515001 CW28 field equipment blank	10/6/2016	12:05	10/10/2016	1/5/2017	ND	1.5	2.5	5	EQ	T
1610281-001A	351317107514601 CW18 equipment blank	10/7/2016	10:10	10/12/2016	12/20/2016	ND	1.5	2.5	5	EQ	T
1610193-002A	351502107521501 DD source blank, distilled water	10/6/2016	11:39	10/10/2016	1/5/2017	ND	1.5	2.5	5	DI	T
1610258-008A	351502107521501 Well DD equipment blank	10/7/2016	11:00	10/11/2016	12/20/2016	ND	1.5	2.5	5	EQ	T
1610258-006A	351309107515001 CW28 equipment blank	10/6/2016	12:05	10/11/2016	12/30/2016	ND	1.5	2.5	5	EQ	D
1607742-001A	340101081050601 DI for bath	7/19/2016	16:15	7/22/2016	10/12/2016	ND	2.9	5	10	DI	T
				Bench test							
1607742-005A	340101081050601 selenium bath	7/19/2016	16:34	07/22/16	10/12/16	9,900	29	50	100	Bath	T
1607742-004A	340101081050601 selenium diffusion	7/19/2016	16:33	07/22/16	10/12/16	5,400	29	50	100	Passive	T
1607742-003A	340101081050601 uranium bath	7/19/2016	16:26	07/22/16	10/12/16	ND	2.9	5	10	Bath	T
1607742-002A	340101081050601 uranium diffusion	7/19/2016	16:25	07/22/16	10/12/16	ND	2.9	5	10	Passive	T

Table 4. Reanalyzed dissolved uranium concentrations as reported by the U.S. Environmental Protection Agency Region 6 laboratory, Homestake Mining Company Superfund site, Milan, New Mexico.

[Uranium was analyzed by using U.S. Environmental Protection Agency Method ILMO5.3, EPA Series 200 (Martin, 2003). µg/L, microgram per liter; ND, nondetect]

Sample name	Lab sample identifier	Sample date and time	Preparation date and time	Analysis date and time	Result, in µg/L	Reporting limit, in µg/L	Dilution factor
920	1705004-01	10/06/2016 11:05:00	05/09/2017 07:26:00	05/10/2017 14:05:09	265	1	2
ACW	1705004-02	10/08/2016 14:00:00	05/09/2017 07:26:00	05/10/2017 14:12:07	53.4	1	2
CW1	1705004-03	10/05/2016 16:00:00	05/09/2017 07:26:00	05/10/2017 14:19:03	51.2	1	2
CW15	1705004-04	10/05/2016 15:00:00	05/09/2017 07:26:00	05/10/2017 14:39:54	34.7	1	2
CW18	1705004-05	10/07/2016 16:45:00	05/09/2017 07:26:00	05/10/2017 14:46:52	28	1	2
CW2	1705004-06	10/04/2016 13:00:00	05/09/2017 07:26:00	05/10/2017 14:53:50	48.9	1	2
CW28 equipment blank sample	1705004-07	10/06/2016 12:00:00	05/09/2017 07:26:00	05/10/2017 15:00:47	ND	1	2
CW37	1705004-08	10/08/2016 13:50:00	05/09/2017 07:26:00	05/10/2017 15:07:44	31.8	1	2
CW45	1705004-09	10/07/2016 11:00:00	05/09/2017 07:26:00	05/10/2017 15:14:42	427	1	2
CW50	1705004-10	10/06/2016 17:30:00	05/09/2017 07:26:00	05/10/2017 15:21:39	35	1	2
DD	1705004-11	10/06/2016 16:40:00	05/09/2017 07:26:00	05/10/2017 15:28:36	103	1	2
DD2	1705004-12	10/07/2016 12:40:00	05/09/2017 07:26:00	05/10/2017 15:35:33	250	1	2
Injectate	1705004-13	10/04/2016 16:45:00	05/09/2017 07:26:00	05/10/2017 15:42:29	11	1	2
MV	1705004-14	10/05/2016 13:30:00	05/09/2017 07:26:00	05/10/2017 16:03:19	297	1	2
ND	1705004-15	10/04/2016 17:30:00	05/09/2017 07:26:00	05/10/2017 16:10:17	24.8	1	2
P3	1705004-16	10/04/2016 12:30:00	05/09/2017 07:26:00	05/10/2017 16:17:14	26	1	2
Q	1705004-17	10/06/2016 10:30:00	05/09/2017 07:26:00	05/10/2017 16:24:11	65.5	1	2

Table 5. Final aqueous uranium concentrations based on sampling and analytical adjustments, Homestake Mining Company Superfund site, Milan, New Mexico.

[Data uncertainty levels are defined in table 7 of this report. µg/L, microgram per liter; GW, groundwater; EQ, equipment blank; DI, deionized water; NC, no change; D, dissolved; T, total]

Laboratory sample identifier	Client sample identifier	Date collected	Time collected	Original uncorrected result, in µg/L	Final result, in µg/L	Data uncertainty level	Sample type	Sample origin
Volumetric dissolved samples								
1610157-005B	351459107515301 Well P3	10/4/2016	12:30	84	26	I	D	GW
1610157-001B	351449107514701 CW2	10/4/2016	13:00	150	49	I	D	GW
1610157-002B	351449107514701 CW2 replicate	10/4/2016	13:05	170	54	II	D	Replicate
1610157-007B	351421107520901 injectate	10/4/2016	16:45	34	11	I	D	Injectate
1610157-006B	351456107510401 ND	10/4/2016	17:30	79	25	I	D	GW
1610157-004B	351424107531001 MV	10/5/2016	13:30	960	297	I	D	GW
1610258-001B	351321107525101 CW15	10/5/2016	15:00	110	35	I	D	GW
1610157-003B	351449107515901 CW1	10/5/2016	16:00	170	51	I	D	GW
1610193-001B	351524107513601 Well Q	10/6/2016	10:30	200	66	I	D	GW
1610258-002B	351634107503701 920	10/6/2016	11:05	520	265	I	D	GW
1610193-003B	351309107515001 CW28	10/6/2016	12:00	100	32	II	D	GW
1610258-003B	351429107521801 ST	10/6/2016	16:00	8,400	2,709	II	D	GW
1610193-005B	351502107521501 DD	10/6/2016	16:40	330	103	I	D	GW
1610193-006B	351502107521501 DD replicate	10/6/2016	16:41	330	106	II	D	Replicate
1610258-004B	351504107514801 CW50	10/6/2016	17:30	120	35	I	D	GW
1610258-005B	351504107514801 CW50 replicate	10/6/2016	17:35	110	35	II	D	Replicate
1610281-002B	351309107520801 Well CW45	10/7/2016	11:00	740	427	I	D	GW
1610281-003B	351404107513401 Well DD2	10/7/2016	12:40	810	250	I	D	GW
1610281-004B	351424107520101 Well CE7	10/7/2016	15:00	70,000	22,688	II	D	GW
1610281-005B	351317107514601 Well CW18	10/7/2016	16:45	120	28	I	D	GW
1610281-006B	351443107520401 Well T11	10/7/2016	17:10	31,000	10,029	II	D	GW
1610281-007B	351330107530401 Well CW37	10/8/2016	13:50	120	32	I	D	GW
1610281-008B	351400107522301 Well ACW	10/8/2016	14:00	190	53	I	D	GW

Table 5. Final aqueous uranium concentrations based on sampling and analytical adjustments, Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

[Data uncertainty levels are defined in table 7 of this report. µg/L, microgram per liter; GW, groundwater; EQ, equipment blank; DI, deionized water; NC, no change; D, dissolved; T, total]

Laboratory sample identifier	Client sample identifier	Date collected	Time collected	Original uncorrected result, in µg/L	Final result, in µg/L	Data uncertainty level	Sample type	Sample origin
Volumetric total samples								
1610157-005A	351459107515301 Well P3	10/4/2016	12:30	84	26	II	T	GW
1610157-001A	351449107514701 CW2	10/4/2016	13:00	170	55	II	T	GW
1610157-002A	351449107514701 CW2 replicate	10/4/2016	13:05	170	54	II	T	Replicate
1610157-007A	351421107520901 injectate	10/4/2016	16:45	35	11	II	T	Injectate
1610157-006A	351456107510401 ND	10/4/2016	17:30	78	25	II	T	GW
1610157-004A	351424107531001 MV	10/5/2016	13:30	870	269	II	T	GW
1610258-001A	351321107525101 CW15	10/5/2016	15:00	100	32	II	T	GW
1610157-003A	351449107515901 CW1	10/5/2016	16:00	160	48	II	T	GW
1610193-001A	351524107513601 Well Q	10/6/2016	10:30	200	66	II	T	GW
1610258-002A	351634107503701 920	10/6/2016	11:05	810	413	II	T	GW
1610193-003A	351309107515001 CW28	10/6/2016	12:00	100	32	II	T	GW
1610281-005A	351317107514601 Well CW18	10/7/2016	16:45	110	26	II	T	GW
1610281-006A	351443107520401 Well T11	10/7/2016	17:10	33,000	10,677	II	T	GW
1610281-007A	351330107530401 Well CW37	10/8/2016	13:50	150	40	II	T	GW
1610281-008A	351400107522301 Well ACW	10/8/2016	14:00	180	53	II	T	GW
1610281-002A	351309107520801 Well CW45	10/7/2016	11:00	1,300	750	II	T	GW
1610281-003A	351404107513401 Well DD2	10/7/2016	12:40	810	250	II	T	GW
1610281-004A	351424107520101 Well CE7	10/7/2016	15:00	67,000	21,713	II	T	GW
1610258-003A	351429107521801 ST	10/6/2016	16:00	29,000	9,380	II	T	GW
1610193-005A	351502107521501 DD	10/6/2016	16:40	320	100	II	T	GW
1610193-006A	351502107521501 DD replicate	10/6/2016	16:41	310	99	II	T	Replicate
1610258-004A	351504107514801 CW50	10/6/2016	17:30	100	30	II	T	GW
1610258-005A	351504107514801 CW50 replicate	10/6/2016	17:35	110	35	II	T	Replicate
Micropurge samples								
1610709-003A	351404107513401 DD2 at 72-ft depth micropurge	10/7/2016	10:29	820	263	II	T	GW
1610709-002A	351404107513401 DD2 at 60-ft depth micropurge	10/7/2016	10:37	800	257	II	T	GW
1610709-001A	351443107520401 T11 at 140-ft depth micropurge	10/7/2016	15:54	32,000	10,353	II	T	GW
1610157-010A	351456107510401 ND at 64-ft depth micropurge	10/4/2016	15:34	98	31	II	T	GW
1610157-008A	351424107531001 MV at 82-ft depth micropurge	10/5/2016	11:18	1,100	353	II	T	GW
1610157-009A	351524107513601 Q at 88-ft depth micropurge	10/5/2016	16:50	190	61	II	T	GW
1610258-007A	351502107521501 DD at 54-ft depth micropurge	10/6/2016	14:30	280	90	II	T	GW
Passive samples								
1610194-001A	351456107510401 ND S6-42	10/4/2016	13:54	11	12	IV	T	GW
1610194-002A	351456107510401 ND S5-50	10/4/2016	13:56	16	18	IV	T	GW
1610194-003A	351456107510401 ND S4-57	10/4/2016	13:58	22	25	IV	T	GW
1610194-004A	351456107510401 ND S3-60	10/4/2016	14:00	26	29	IV	T	GW
1610194-005A	351456107510401 ND S3-60 replicate	10/4/2016	14:01	27	31	IV	T	Replicate
1610194-006A	351456107510401 ND S2-64	10/4/2016	14:02	22	25	IV	T	GW
1610194-007A	351456107510401 ND S1-68	10/4/2016	14:04	27	31	IV	T	GW
1610194-008A	351424107531001 MV S8-67	10/5/2016	9:34	210	239	IV	T	GW
1610194-009A	351424107531001 MV S7-76	10/5/2016	9:36	250	285	IV	T	GW
1610194-010A	351424107531001 MV S6-82	10/5/2016	9:38	270	307	IV	T	GW
1610194-011A	351424107531001 MV S5-87	10/5/2016	9:40	300	342	IV	T	GW
1610194-012A	351424107531001 MV S5-87 replicate	10/5/2016	9:41	300	342	IV	T	Replicate
1610194-013A	351424107531001 MV S4-91	10/5/2016	9:42	310	353	IV	T	GW
1610194-014A	351424107531001 MV S3-95	10/5/2016	9:44	280	319	IV	T	GW
1610194-015A	351424107531001 MV S2-98	10/5/2016	9:46	300	342	IV	T	GW
1610194-016A	351424107531001 MV S1-102	10/5/2016	9:50	260	296	IV	T	GW
1610194-017A	351524107513601 Q S8-57	10/5/2016	15:45	41	46	IV	T	GW
1610194-018A	351524107513601 Q S7-74	10/5/2016	15:47	46	52	IV	T	GW
1610194-019A	351524107513601 Q S6-78	10/5/2016	15:48	47	53	IV	T	GW
1610194-020A	351524107513601 Q S5-82	10/5/2016	15:49	48	54	IV	T	GW
1610194-021A	351524107513601 Q S4-85	10/5/2016	15:50	51	58	IV	T	GW
1610194-022A	351524107513601 Q S4-85 replicate	10/5/2016	15:51	49	56	IV	T	Replicate
1610194-023A	351524107513601 Q S3-88	10/5/2016	15:52	43	49	IV	T	GW

Table 5. Final aqueous uranium concentrations based on sampling and analytical adjustments, Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

[Data uncertainty levels are defined in table 7 of this report. µg/L, microgram per liter; GW, groundwater; EQ, equipment blank; DI, deionized water; NC, no change; D, dissolved; T, total]

Laboratory sample identifier	Client sample identifier	Date collected	Time collected	Original uncorrected result, in µg/L	Final result, in µg/L	Data uncertainty level	Sample type	Sample origin
Passive samples—Continued								
1610194-024A	351524107513601 Q S2-93	10/5/2016	15:53	45	51	IV	T	GW
1610194-025A	351524107513601 Q S1-97	10/6/2016	15:54	54	61	IV	T	GW
1610194-026A	351502107521501 DD S1-68	10/6/2016	12:59	61	69	IV	T	GW
1610194-027A	351502107521501 DD S2-63	10/6/2016	12:58	72	82	IV	T	GW
1610194-028A	351502107521501 DD S3-60	10/6/2016	12:57	67	76	IV	T	GW
1610194-029A	351502107521501 DD S4-54	10/6/2016	12:56	67	76	IV	T	GW
1610194-030A	351502107521501 DD S5-50	10/6/2016	12:54	67	76	IV	T	GW
1610194-031A	351502107521501 DD S5-50 replicate	10/6/2016	12:55	63	71	IV	T	Replicate
1610194-032A	351502107521501 DD S6-45	10/6/2016	12:53	6.8	8	IV	T	GW
1610706-001A	351443107520401 T11 S11-115	10/7/2016	14:40	3,300	3,778	IV	T	GW
1610706-002A	351443107520401 T11 S5-170	10/7/2016	14:47	22,000	25,299	IV	T	GW
1610706-003A	351443107520401 T11 S1-190	10/7/2016	14:51	20,000	22,994	IV	T	GW
1610706-004A	351443107520401 T11 S7-154	10/7/2016	14:44	11,000	12,629	IV	T	GW
1610706-005A	351443107520401 T11 S10-134	10/7/2016	14:41	5,700	6,534	IV	T	GW
1610706-006A	351443107520401 T11 S6-164	10/7/2016	14:45	11,000	12,629	IV	T	GW
1610706-007A	351443107520401 T11 S4-175	10/7/2016	14:48	21,000	24,146	IV	T	GW
1610706-008A	351443107520401 T11 S9-140	10/7/2016	14:42	9,000	10,328	IV	T	GW
1610706-009A	351443107520401 T11 S8-148	10/7/2016	14:43	11,000	12,629	IV	T	GW
1610706-010A	351443107520401 T11 S2-185	10/7/2016	14:50	21,000	24,146	IV	T	GW
1610706-011A	351443107520401 T11 S3-180	10/7/2016	14:49	23,000	26,451	IV	T	GW
1610706-012A	351443107520401 T11 S6-164 replicate	10/7/2016	14:46	15,000	17,234	IV	T	Replicate
1610706-013A	351404107513401 DD2 S3-78	10/7/2016	8:53	180	205	IV	T	GW
1610706-014A	351404107513401 DD2 S8-60	10/7/2016	8:47	77	87	IV	T	GW
1610706-015A	351404107513401 DD2 S6-67	10/7/2016	8:49	180	205	IV	T	GW
1610706-016A	351404107513401 DD2 S7-63	10/7/2016	8:48	110	125	IV	T	GW
1610706-017A	351404107513401 DD2 S4-75	10/7/2016	8:51	190	216	IV	T	GW
1610706-018A	351404107513401 DD2 S1-90	10/7/2016	8:55	190	216	IV	T	GW
1610706-019A	351404107513401 DD2 S10-48	10/7/2016	8:45	39	44	IV	T	GW
1610706-020A	351404107513401 DD2 S9-56	10/7/2016	8:46	90	102	IV	T	GW
1610706-021A	351404107513401 DD2 S4-75 replicate	10/7/2016	8:52	200	228	IV	T	Replicate
1610706-022A	351404107513401 DD2 S5-72	10/7/2016	8:50	190	216	IV	T	GW
1610706-023A	351404107513401 DD2 S2-84	10/7/2016	8:54	180	205	IV	T	GW

Table 6. Final aqueous selenium concentrations based on sampling adjustments, Homestake Mining Company Superfund site, Milan, New Mexico.

[Data uncertainty levels are defined in table 7 of this report. GW, groundwater; EQ, equipment blank; DI, deionized water; NC, no change; D, dissolved; T, total; —, no data; EQ, equipment blank; e, estimated]

Laboratory sample identifier	Client sample identifier	Date collected	Time collected	Original uncorrected result, in µg/L	Final result, in µg/L	Data uncertainty level	Sample type	Sample origin
Volumetric dissolved samples								
1610157-005B	351459107515301 Well P3	10/4/2016	12:30	300	NC	I	D	GW
1610157-001B	351449107514701 CW2	10/4/2016	13:00	52	NC	I	D	GW
1610157-002B	351449107514701 CW2 replicate	10/4/2016	13:05	50	NC	I	D	Replicate
1610157-007B	351421107520901 injectate	10/4/2016	16:45	9.2	NC	I	D	Injectate
1610157-006B	351456107510401 ND	10/4/2016	17:30	150	NC	I	D	GW
1610157-004B	351424107531001 MV	10/5/2016	13:30	36	NC	I	D	GW
1610258-001B	351321107525101 CW15	10/5/2016	15:00	17	NC	I	D	GW

Table 6. Final aqueous selenium concentrations based on sampling adjustments, Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

[Data uncertainty levels are defined in table 7 of this report. GW, groundwater; EQ, equipment blank; DI, deionized water; NC, no change; D, dissolved; T, total; —, no data; EQ, equipment blank; e, estimated]

Laboratory sample identifier	Client sample identifier	Date collected	Time collected	Original uncorrected result, in µg/L	Final result, in µg/L	Data uncertainty level	Sample type	Sample origin
Volumetric dissolved samples—Continued								
1610157-003B	351449107515901 CW1	10/5/2016	16:00	51	NC	I	D	GW
1610193-001B	351524107513601 Well Q	10/6/2016	10:30	470	NC	I	D	GW
1610258-002B	351634107503701 920	10/6/2016	11:05	290	NC	I	D	GW
1610193-003B	351309107515001 CW28	10/6/2016	12:00	56	NC	I	D	GW
1610258-003B	351429107521801 ST	10/6/2016	16:00	210	NC	I	D	GW
1610193-005B	351502107521501 DD	10/6/2016	16:40	140	NC	I	D	GW
1610193-006B	351502107521501 DD replicate	10/6/2016	16:41	130	NC	I	D	Replicate
1610258-004B	351504107514801 CW50	10/6/2016	17:30	1.8[e]	NC	I	D	GW
1610258-005B	351504107514801 CW50 replicate	10/6/2016	17:35	1.8[e]	NC	I	D	Replicate
1610281-002B	351309107520801 Well CW45	10/7/2016	11:00	38	NC	I	D	GW
1610281-003B	351404107513401 Well DD2	10/7/2016	12:40	4.2[e]	NC	I	D	GW
1610281-004B	351424107520101 Well CE7	10/7/2016	15:00	900	NC	I	D	GW
1610281-005B	351317107514601 Well CW18	10/7/2016	16:45	18	NC	I	D	GW
1610281-006B	351443107520401 Well T11	10/7/2016	17:10	160	NC	I	D	GW
1610281-007B	351330107530401 Well CW37	10/8/2016	13:50	81	NC	I	D	GW
1610281-008B	351400107522301 Well ACW	10/8/2016	14:00	70	NC	I	D	GW
Volumetric total samples								
1610157-005A	351459107515301 Well P3	10/4/2016	12:30	280	NC	I	T	GW
1610157-001A	351449107514701 CW2	10/4/2016	13:00	54	NC	I	T	GW
1610157-002A	351449107514701 CW2 replicate	10/4/2016	13:05	55	NC	I	T	Replicate
1610157-007A	351421107520901 injectate	10/4/2016	16:45	11	NC	I	T	Injectate
1610157-006A	351456107510401 ND	10/4/2016	17:30	150	NC	I	T	GW
1610157-004A	351424107531001 MV	10/5/2016	13:30	35	NC	I	T	GW
1610258-001A	351321107525101 CW15	10/5/2016	15:00	20	NC	I	T	GW
1610157-003A	351449107515901 CW1	10/5/2016	16:00	58	NC	I	T	GW
1610193-001A	351524107513601 Well Q	10/6/2016	10:30	460	NC	I	T	GW
1610258-002A	351634107503701 920	10/6/2016	11:05	290	NC	I	T	GW
1610193-003A	351309107515001 CW28	10/6/2016	12:00	59	NC	I	T	GW
1610258-003A	351317107514601 Well CW18	10/6/2016	16:00	190	NC	I	T	GW
1610193-005A	351443107520401 Well T11	10/6/2016	16:40	130	NC	I	T	GW
1610193-006A	351330107530401 Well CW37	10/6/2016	16:41	120	NC	I	T	Replicate
1610258-004A	351400107522301 Well ACW	10/6/2016	17:30	—	—	I	T	GW
1610258-005A	351309107520801 Well CW45	10/6/2016	17:35	—	—	I	T	GW
1610281-002A	351404107513401 Well DD2	10/7/2016	11:00	35	NC	I	T	GW
1610281-003A	351424107520101 Well CE7	10/7/2016	12:40	13	NC	I	T	GW
1610281-004A	351429107521801 ST	10/7/2016	15:00	790	NC	I	T	GW
1610281-005A	351502107521501 DD	10/7/2016	16:45	54	NC	I	T	GW
1610281-006A	351502107521501 DD replicate	10/7/2016	17:10	180	NC	I	T	GW
1610281-007A	351504107514801 CW50	10/8/2016	13:50	73	NC	I	T	GW
1610281-008A	351504107514801 CW50 replicate	10/8/2016	14:00	64	NC	I	T	GW
Micropurge samples								
1610157-010A	351456107510401 ND at 64-ft depth micropurge	10/4/2016	15:34	51	NC	I	T	GW
1610157-008A	351424107531001 MV at 82-ft depth micropurge	10/5/2016	11:18	29	NC	I	T	GW
1610157-009A	351524107513601 Q at 88-ft depth micropurge	10/5/2016	16:50	380	NC	I	T	GW
1610709-003A	351404107513401 DD2 at 72-ft depth micropurge	10/7/2016	10:29	2.4[e]	NC	I	T	GW
1610709-002A	351404107513401 DD2 at 60-ft depth micropurge	10/7/2016	10:37	7.5	NC	I	T	GW
1610709-001A	351443107520401 T11 at 140-ft depth micropurge	10/7/2016	15:54	350	NC	I	T	GW
1610258-007A	351502107521501 DD at 54-ft depth micropurge	10/6/2016	14:30	170	NC	I	T	GW
Passive samples								
1610194-001A	351456107510401 ND S6-42	10/4/2016	13:54	20	69	III	T	GW
1610194-002A	351456107510401 ND S5-50	10/4/2016	13:56	32	111	III	T	GW
1610194-003A	351456107510401 ND S4-57	10/4/2016	13:58	25	87	III	T	GW
1610194-004A	351456107510401 ND S3-60	10/4/2016	14:00	14	48	III	T	GW

Table 6. Final aqueous selenium concentrations based on sampling adjustments, Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

[Data uncertainty levels are defined in table 7 of this report. GW, groundwater; EQ, equipment blank; DI, deionized water; NC, no change; D, dissolved; T, total; —, no data; EQ, equipment blank; e, estimated]

Laboratory sample identifier	Client sample identifier	Date collected	Time collected	Original uncorrected result, in µg/L	Final result, in µg/L	Data uncertainty level	Sample type	Sample origin
Passive samples—Continued								
1610194-005A	351456107510401 ND S3-60 replicate	10/4/2016	14:01	14	48	III	T	Replicate
1610194-006A	351456107510401 ND S2-64	10/4/2016	14:02	13	45	III	T	GW
1610194-007A	351456107510401 ND S1-68	10/4/2016	14:04	13	45	III	T	GW
1610194-008A	351424107531001 MV S8-67	10/5/2016	9:34	4.3[e]	15[e]	III	T	GW
1610194-009A	351424107531001 MV S7-76	10/5/2016	9:36	8.5	29	III	T	GW
1610194-010A	351424107531001 MV S6-82	10/5/2016	9:38	8.5	29	III	T	GW
1610194-011A	351424107531001 MV S5-87	10/5/2016	9:40	9.6	33	III	T	GW
1610194-012A	351424107531001 MV S5-87 replicate	10/5/2016	9:41	9.4	33	III	T	Replicate
1610194-013A	351424107531001 MV S4-91	10/5/2016	9:42	9.2	32	III	T	GW
1610194-014A	351424107531001 MV S3-95	10/5/2016	9:44	8.2	28	III	T	GW
1610194-015A	351424107531001 MV S2-98	10/5/2016	9:46	8.6	30	III	T	GW
1610194-016A	351424107531001 MV S1-102	10/5/2016	9:50	1.8[e]	6[e]	III	T	GW
1610194-017A	351524107513601 Q S8-57	10/5/2016	15:45	110	381	III	T	GW
1610194-018A	351524107513601 Q S7-74	10/5/2016	15:47	110	381	III	T	GW
1610194-019A	351524107513601 Q S6-78	10/5/2016	15:48	110	381	III	T	GW
1610194-020A	351524107513601 Q S5-82	10/5/2016	15:49	120	415	III	T	GW
1610194-021A	351524107513601 Q S4-85	10/5/2016	15:50	120	415	III	T	GW
1610194-022A	351524107513601 Q S4-85 replicate	10/5/2016	15:51	120	415	III	T	Replicate
1610194-023A	351524107513601 Q S3-88	10/5/2016	15:52	120	415	III	T	GW
1610194-024A	351524107513601 Q S2-93	10/5/2016	15:53	120	415	III	T	GW
1610194-025A	351524107513601 Q S1-97	10/6/2016	15:54	130	450	III	T	GW
1610194-026A	351502107521501 DD S1-68	10/6/2016	12:59	39	135	III	T	GW
1610194-027A	351502107521501 DD S2-63	10/6/2016	12:58	45	156	III	T	GW
1610194-028A	351502107521501 DD S3-60	10/6/2016	12:57	46	159	III	T	GW
1610194-029A	351502107521501 DD S4-54	10/6/2016	12:56	48	166	III	T	GW
1610194-030A	351502107521501 DD S5-50	10/6/2016	12:54	61	211	III	T	GW
1610194-031A	351502107521501 DD S5-50 replicate	10/6/2016	12:55	43	149	III	T	Replicate
1610194-032A	351502107521501 DD S6-45	10/6/2016	12:53	25	87	III	T	GW
1610706-001A	351443107520401 T11 S11-115	10/7/2016	14:40	7.9	27	III	T	GW
1610706-002A	351443107520401 T11 S5-170	10/7/2016	14:47	22	76	III	T	GW
1610706-003A	351443107520401 T11 S1-190	10/7/2016	14:51	58	201	III	T	GW
1610706-004A	351443107520401 T11 S7-154	10/7/2016	14:44	20	69	III	T	GW
1610706-005A	351443107520401 T11 S10-134	10/7/2016	14:41	36	125	III	T	GW
1610706-006A	351443107520401 T11 S6-164	10/7/2016	14:45	19	66	III	T	GW
1610706-007A	351443107520401 T11 S4-175	10/7/2016	14:48	38	132	III	T	GW
1610706-008A	351443107520401 T11 S9-140	10/7/2016	14:42	88	305	III	T	GW
1610706-009A	351443107520401 T11 S8-148	10/7/2016	14:43	16	55	III	T	GW
1610706-010A	351443107520401 T11 S2-185	10/7/2016	14:50	38	132	III	T	GW
1610706-011A	351443107520401 T11 S3-180	10/7/2016	14:49	55	190	III	T	GW
1610706-012A	351443107520401 T11 S6-164 replicate	10/7/2016	14:46	23	80	III	T	Replicate
1610706-013A	351404107513401 DD2 S3-78	10/7/2016	8:53	3.3[e]	11[e]	III	T	GW
1610706-014A	351404107513401 DD2 S8-60	10/7/2016	8:47	1.7[e]	6[e]	III	T	GW
1610706-015A	351404107513401 DD2 S6-67	10/7/2016	8:49	2.8[e]	10[e]	III	T	GW
1610706-016A	351404107513401 DD2 S7-63	10/7/2016	8:48	1.5[e]	5[e]	III	T	GW
1610706-017A	351404107513401 DD2 S4-75	10/7/2016	8:51	1.9[e]	7[e]	III	T	GW
1610706-018A	351404107513401 DD2 S1-90	10/7/2016	8:55	2.7[e]	9[e]	III	T	GW
1610706-019A	351404107513401 DD2 S10-48	10/7/2016	8:45	—	—	III	T	GW
1610706-020A	351404107513401 DD2 S9-56	10/7/2016	8:46	1.6[e]	6[e]	III	T	GW
1610706-021A	351404107513401 DD2 S4-75 replicate	10/7/2016	8:52	2.1[e]	7[e]	III	T	Replicate
1610706-022A	351404107513401 DD2 S5-72	10/7/2016	8:50	1.9[e]	7[e]	III	T	GW
1610706-023A	351404107513401 DD2 S2-84	10/7/2016	8:54	—	—	III	T	GW

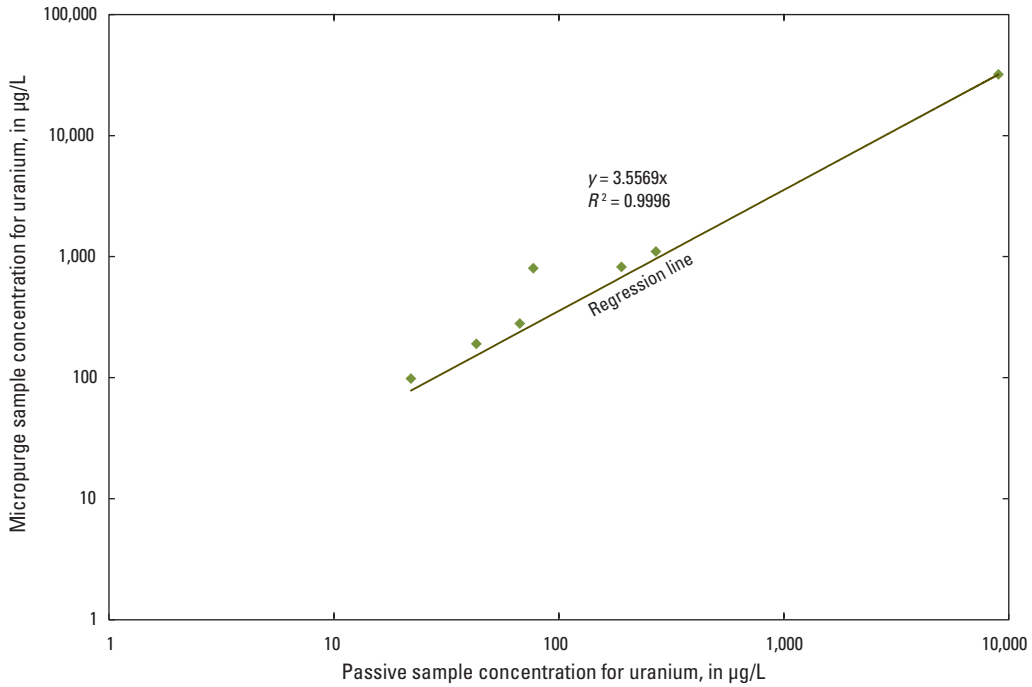

Figure 2. Comparison between passive sampling results and micropurge results for uranium from same sample depths at the Homestake Mining Company Superfund site, Milan, New Mexico. The linear regression line plots slightly below several data points when specifying an intercept of zero. A very small value (at one-half the detection level or less) could be assigned to the equation as an intercept value to adjust the line slightly upward but the difference was generally very minor with a relative percent difference of less than a few percentage points. µg/L, microgram per liter.

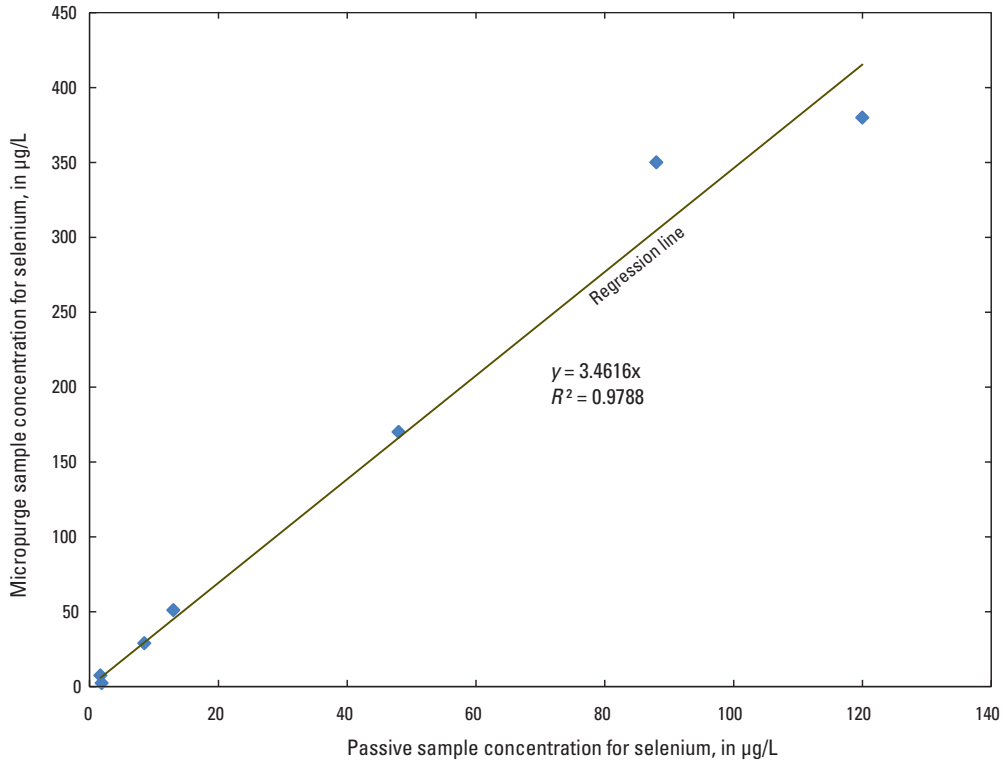

Figure 3. Comparison between passive sampling results and micropurge results for selenium from same sample depths, Homestake Mining Company Superfund site, Milan, New Mexico. µg/L, microgram per liter.

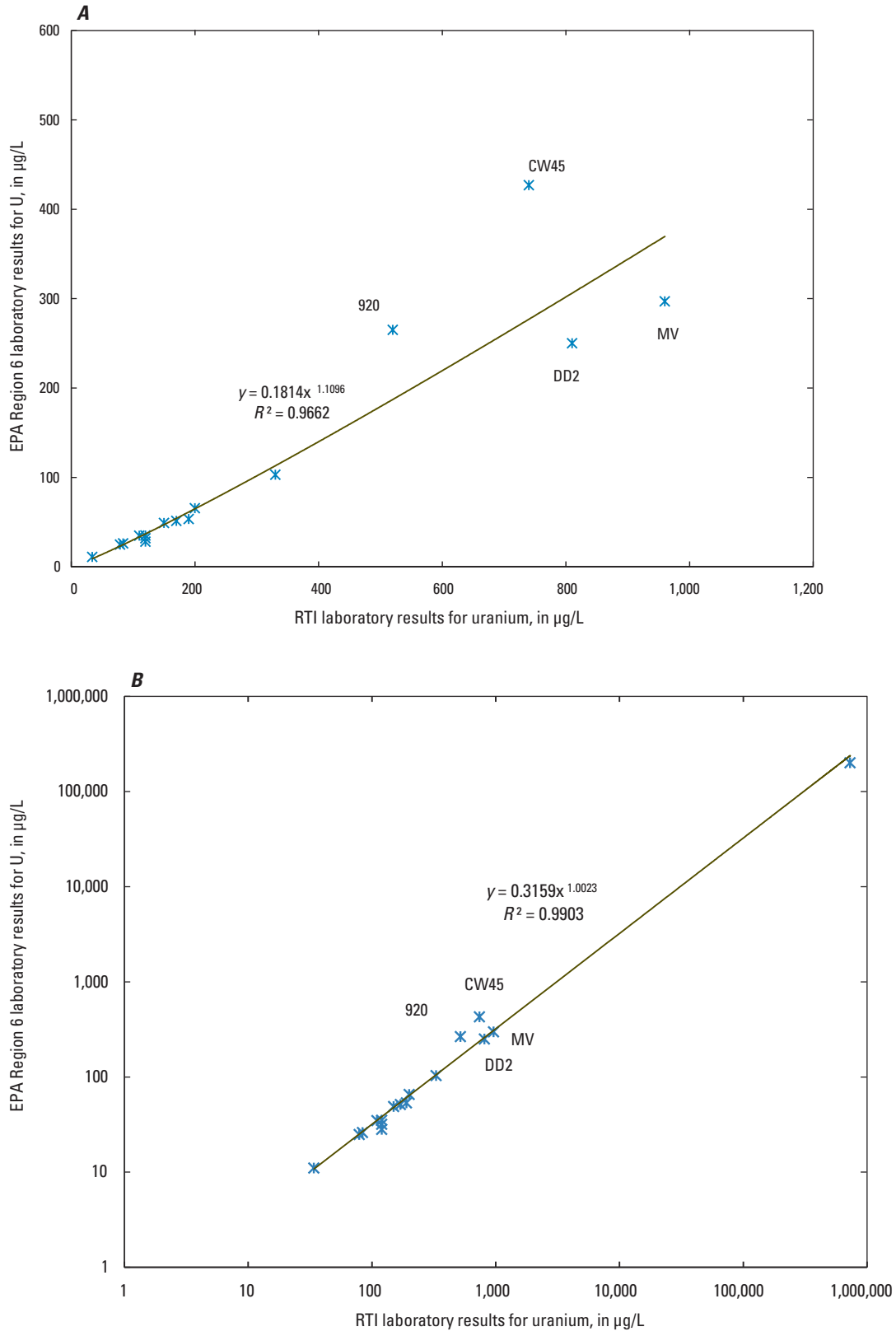

Figure 4. Comparison between uranium results as analyzed by RTI Laboratories, Inc., and the U.S. Environmental Protection Agency Region 6 laboratory, *A*, without and *B*, with a blind sample for the Homestake Mining Company Superfund site, Milan, New Mexico. Wells where comparisons have larger residuals are labeled. µg/L, microgram per liter.

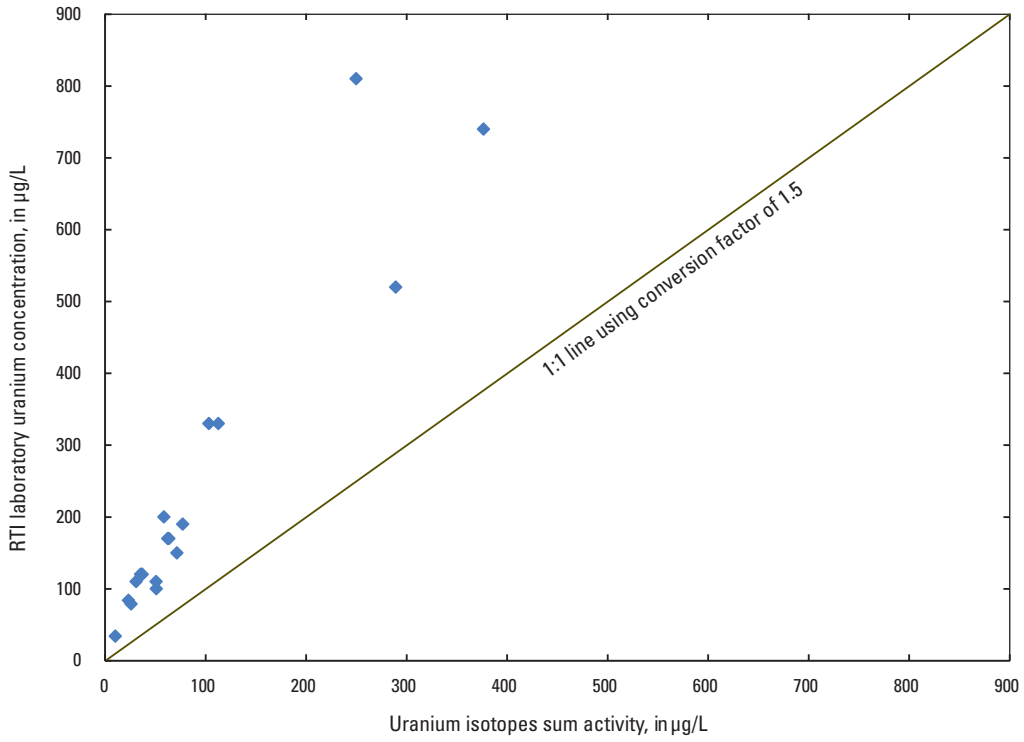

Figure 5. Comparison between uranium mass as analyzed by RTI Laboratories, Inc., and the sum of uranium isotopes after converting for activities for the Homestake Mining Company Superfund site in Milan, New Mexico. µg/L, microgram per liter.

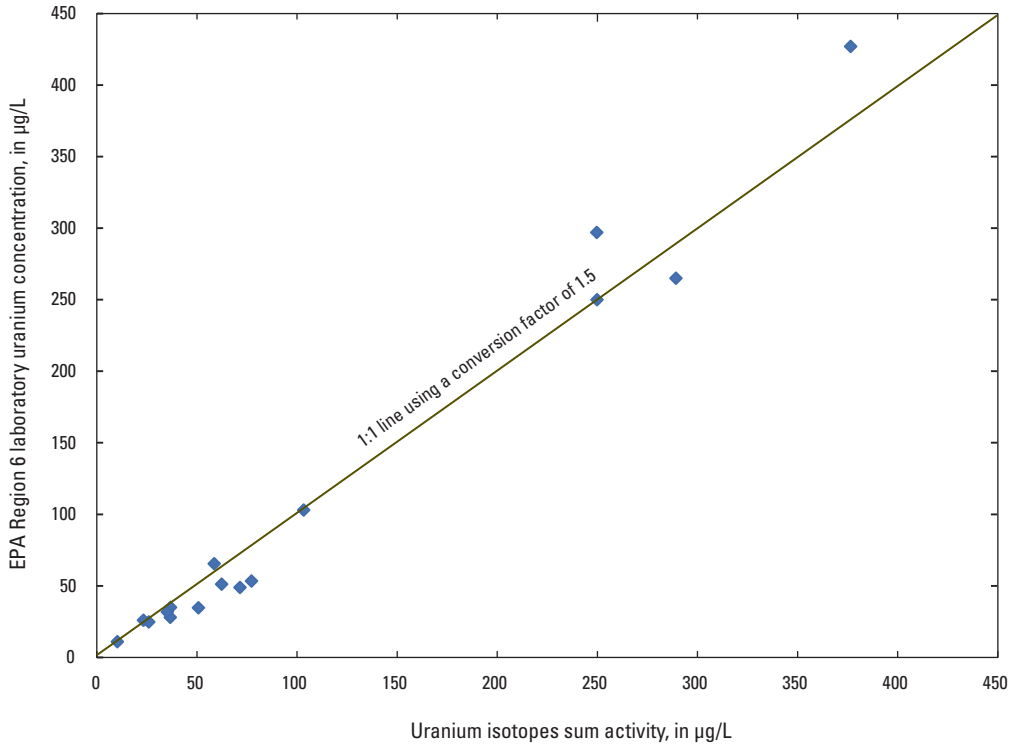

Figure 6. Comparison between uranium mass as analyzed by U.S. Environmental Protection Agency (EPA) Region 6 laboratory and the sum of uranium isotopes after converting for activities for the Homestake Mining Company Superfund site in Milan, New Mexico. µg/L, microgram per liter.

Converted Concentrations

Concentrations from passive samplers were converted to equivalent purge sample concentrations based on results from the bench testing and comparison of results from passive sampling to those from micropurge sampling at the same depths. For analytical adjustments, concentrations from all samples (volumetric [total and dissolved], micropurge, and passive) were converted from the original RTI results to results more representative of EPA lab concentrations.

Adjustments to Passive Sampling Results

Relative differences from the original RTI results between purge (micropurge) and passive sampling results for uranium and selenium are believed to be robust (applicable throughout the concentrations and wells sampled). This relative difference for uranium was used to adjust passive sampling results. Passive sampler concentrations of uranium were multiplied by a factor of 3.55 (1/0.2811) to adjust results to an equivalent micropurge concentration for uranium. Passive sampler concentrations of selenium were multiplied by a factor of 3.46 (1/0.2888) to adjust results to an equivalent micropurge concentration for selenium.

Laboratory Analytical Adjustments

To provide a larger dataset, uranium results from RTI were converted to a calculated uranium concentration based on a nonlinear power regression and corresponding residual analysis based on results from the EPA lab. Conversion steps included the following:

1. Comparing uranium concentration from RTI to that from the EPA lab (dissolved samples only).

2. Performing regression analysis and examining residuals between predicted (converted uranium based on regression analysis) and observed concentrations (from the EPA lab).

Regression analysis and examination of residuals was performed with and without inclusion of the blind sample (table 2.1). Nine of the 16 residuals improved with inclusion of the blind sample; the final converted uranium concentrations used the regression with the blind sample included. The regression expression follows a power law where uranium (*RTI U*) is converted by $0.3159\times(RTI\ U)^{1.0023}$; this regression had an R^2 of 0.9903.

Residual errors between the adjusted uranium concentrations and EPA lab results are generally robust (concentration independent). The mean RPD was 0.13 percent. Residuals from 10 of the 17 samples had a RPD less than 10 percent. The largest residual was for well CW–45 (RPD of -57.1 percent, converted value is less than the value measured by the EPA lab). Other large residuals were for well 920 (RPD of -45.6 percent) and well CW–18 (RPD of 31.1 percent; the converted value was more than the value measured by the EPA lab).

The converted uranium concentrations are presented in table 5. The correction was applied to all purge samples for total and dissolved concentrations of samples not analyzed by the EPA lab. For dissolved samples analyzed by the EPA lab, results of that analysis are provided. For total samples that had a corresponding dissolved sample analyzed by the EPA lab, a ratio of total to dissolved from the original RTI was used and multiplied by the dissolved concentration result from the EPA lab. There were no laboratory adjustments of concentrations for selenium (table 6; Harte and others, 2018).

Uncertainty Analysis

The uncertainty analysis incorporates the combined uncertainty as reported in equations 1 and 2 for uranium. For RTI, the standard deviation of sample replicates is 10.6 percent for uranium as reported in RPD (table 7; Harte and others, 2018). The standard deviation of the fit of the converted uranium is 21.4 percent as reported in RPD. The U_c of uranium concentrations for micropurge and volumetric samples for the laboratory adjustment after substituting these two values into equation 1 is 23.9 percent as reported in RPD. The accuracy of the final converted uranium concentrations for micropurge and volumetric samples is therefore ±23.9 percent as reported in RPD. The U_c of uranium concentrations for passive samples includes uncertainty related to sample conversion. The standard deviation of the fit of the converted concentration of the passive sampler data concentration is 38.4 percent as reported in RPD. The U_c of uranium concentrations for passive samplers after substituting these three values into equation 2 is ±45.2 percent as reported in RPD.

The standard deviation of sample replicates for selenium concentrations for purge samples (volumetric and micropurge; equation 3) is 8.5 percent as reported in RPD (table 7; Harte and others, 2018). The standard deviation of the fit of the converted selenium concentration data is 35.4 percent as reported in RPD. The U_c of selenium concentrations for passive samples is 36.4 percent as reported in RPD.

Converted Data Assumptions and Limitations

This section summarizes important assumptions and limitations related to converted concentration data for uranium (all concentrations including volumetric, micropurge, and passive samples) and selenium (passive sample concentrations only). For uranium concentrations related to laboratory adjustments, assumptions included the following:

- The precision of data as reported by RTI, which is represented as a relative concentration difference, is consistent over the time of the laboratory analysis.

Table 7. Individual standard deviation and combined standard uncertainty for uranium and selenium concentrations, Homestake Mining Company Superfund site, Milan, New Mexico.

[As reported in relative percent difference (RDP) for laboratory and sample adjustments. Uncertainty levels are ranked from low (I) to high (IV). RTI, RTI Laboratories, Inc.; NA, not available]

Sample and laboratory group	RTI, standard deviation of replicates, in ±RPD	Standard deviation of the converted to measured, in ±RPD		Combined standard uncertainty, in ±RPD	Equation number in report	Uncertainty level
		Laboratory conversion fit	Sample conversion for passive samplers			
Uranium						
Micropurge and volumetric concentration	10.6	21.4	NA	23.9	1	I (EPA) or II (converted)
Passive samples	10.6	21.4	38.4	45.2	2	IV
Selenium						
Micropurge and volumetric concentration	8.5	NA	NA	8.5	3	I
Passive samples	8.5	NA	35.4	36.4	4	III

- Uranium data accuracy as reported by RTI is problematic but correctable.
- The relation between results from RTI and the EPA lab is robust for all samples.
- The relative differences between total and dissolved concentrations of samples, as reported by RTI, are representative of sampled water.
- Samples that were reanalyzed by RTI and the EPA lab were representative of initial sample conditions without ex-situ concentration changes for the analysis period.

For uranium and selenium concentrations related to sample adjustments (passive samplers), assumptions included the following:

- Performance of nylon screen passive samplers was independent over the range of concentrations exposed to in the well water. (This is supported by Henry's law as shown by Divine and others, 2005.)
- The results of micropurge samples are representative of well water conditions at the time of exposure (deployment period) of the samplers.
- The passive samplers that were compared with the micropurge samples from the same depths are representative of this relation at other depths.

The primary limitations are related to the level of uncertainty for the final converted uranium concentrations for all sample types and for selenium concentrations for passive samples. Concentration data are grouped by level of uncertainty as listed in tables 5 and 6 and described in table 7 (Harte and others, 2018). The highest level of uncertainty is for the uranium concentrations for the passive samples (level IV; table 7), and the lowest for selenium concentrations for purge samples (level I; table 7), which were not adjusted. Samples for uranium, analyzed by the EPA, are also assigned an uncertainty level of I.

Summary

In 2016, the U.S. Geological Survey, in cooperation with the U.S. Environmental Protection Agency, collected data on isotopes, age dating, and geochemistry including aqueous uranium concentrations of samples from 20 locations at the Homestake Mining Company Superfund site near Milan, New Mexico. The 20 sampled locations included 19 groundwater wells and 1 treatment plant where treated water is used for injection into aquifers. At six of the wells, multiple samples were collected by several different sampling methods (passive, micropurge, and volumetric).

Adjustments in aqueous uranium and selenium concentrations of groundwater from nylon screen passive samplers were done for all 55 samples collected at 6 wells. These adjustments were with 7 of the 55 passive samples. The comparison of results showed a linear relation with a slope of 3.55 and a coefficient of determination of (R^2) of 0.9996 for uranium and a slope of 3.46 and an R^2 of 0.9788 for selenium. Passive sampler results were adjusted upward by a factor of 3.55 for uranium and 3.46 for selenium.

Aqueous uranium concentrations from an original laboratory analysis of groundwater samples were found to be two to five times greater than historical concentrations at all wells. This difference prompted followup laboratory analysis, multiple comparisons between laboratory results, and post-analytical adjustments. The comparison of results between the original laboratory (123 samples) and an external laboratory (U.S. Environmental Protection Agency Region 6 lab) for a subset of 16 samples showed a power law expression of 0.3159 multiplied by the original uranium value to the

power of 1.0023, with an R^2 of 0.9903. All original laboratory analytical results for uranium excluding the subset of 16 were adjusted by this relation. The 16 samples sent to the external laboratory were assigned values from the external laboratory.

Adjustments in aqueous uranium concentrations of water from all samples and for selenium for passive samples allow for a more comprehensive assessment of groundwater geochemistry than would have been otherwise possible. The methods described in this report also identify the level of uncertainty in the adjusted values that should be considered when interpreting results.

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Glossary

bench test A controlled laboratory experiment.

blind sample A sample of known concentration sent in to laboratory as a check on analysis accuracy.

coefficient of determination A regression parameter that describes the proportion of the variance in the dependent variable that is predictable from the independent variable.

combined standard uncertainty The square root of a sum of variances or deviation of differences about the mean.

inductively coupled plasma mass spectrometry An analytical method for detecting metals and several nonmetals at low concentrations.

laboratory control sample Known concentrations of analytes added to blank water.

matrix spikes and matrix spike duplicates Randomly chosen samples that have known concentrations of analytes added to samples prior to sample preparation and analysis. Processed along with the unspiked samples. Used to assess the accuracy and precision of the lab method; can also indicate the amount of matrix interference.

micropurge sample An instantaneous grab sample of well water from a discrete depth after minimal flushing of the pump and discharge lines.

passive sample Passive sampling is defined as the collection of a water sample from a well without the use of purging by a pump or a bailer (Interstate Technology and Regulatory Council Diffusion Sampler Team, 2006; ASTM International, 2014).

relative percent difference Difference between two results multiplied by 100 and divided by the average of the two results.

volumetric sample A flow-weighted sample that is collected after extracting a volume of water typically equivalent to three saturated well volumes. A saturated well volume is determined from the height of the well water column from the static water level to the bottom of the well multiplied by the area of the well.

Appendixes 1–3

Appendix 1. Depths and Methods of Sampling at the Homestake Mining Company Superfund Site Near Milan, New Mexico

Table 1.1. Depths and methods of well sampling, Homestake Mining Company Superfund site, Milan, New Mexico.

[Data in this table are replicated from Harte and others (2018). Data in bold are sample comparisons for same depths. ft, foot; bls, below land surface; T, total; D, dissolved; —, no data; NA, not applicable; Dup, replicate sample; QAQC, quality assurance and control]

Well identifier	Sample type	Site identification number	Name	Depth of sample, in ft bls	Sample method
351459107515301 Well P3	T	351459107515301	P3	—	Volumetric
351459107515301 Well P3	D	351459107515301	P3	—	Volumetric
351449107514701 CW2	T	351449107514701	CW2	—	Volumetric
351449107514701 CW2	D	351449107514701	CW2	—	Volumetric
351456107510401 ND Micropurge	T	351456107510401	ND Micropurge	64	Micropurge
351421107520901 Injectate	T	351421107520901	Injectate	NA	Volumetric
351421107520901 Injectate	D	351421107520901	Injectate	NA	Volumetric
351456107510401 ND	T	351456107510401	ND	49	Volumetric
351456107510401 ND	D	351456107510401	ND	49	Volumetric
351424107531001 MV Micropurge	T	351424107531001	MV Micropurge	82	Micropurge
351424107531001 MV	T	351424107531001	MV	71	Volumetric
351424107531001 MV	D	351424107531001	MV	71	Volumetric
351321107525101 CW15	T	351321107525101	CW15	—	Volumetric
351321107525101 CW15	D	351321107525101	CW15	—	Volumetric
351449107515901 CW1	T	351449107515901	CW1	—	Volumetric
351449107515901 CW1	D	351449107515901	CW1	—	Volumetric
351524107513601 Q Micropurge	T	351524107513601	Q Micropurge	88	Micropurge
351524107513601 Well Q	T	351524107513601	Well Q	68.1	Volumetric
351524107513601 Well Q	D	351524107513601	Well Q	68.1	Volumetric
351634107503701 920	T	351634107503701	920	—	Volumetric
351634107503701 920	D	351634107503701	920	—	Volumetric
351309107515001 CW28	T	351309107515001	CW28	—	Volumetric
351309107515001 CW28	D	351309107515001	CW28	—	Volumetric
351502107521501 DD Micropurge	T	351502107521501	DD Micropurge	54	Micropurge
351429107521801 ST	T	351429107521801	ST	—	Volumetric
351429107521801 ST	D	351429107521801	ST	—	Volumetric
351502107521501 DD	T	351502107521501	DD	54	Volumetric
351502107521501 DD	D	351502107521501	DD	54	Volumetric
351504107514801 CW50	T	351504107514801	CW50	—	Volumetric
351504107514801 CW50	D	351504107514801	CW50	—	Volumetric
351404107513401 DD2 at 72-ft depth	T	351404107513401	DD2 Micropurge at 72-ft depth	72	Micropurge
351404107513401 DD2 at 60-ft depth	T	351404107513401	DD2 Micropurge at 60-ft depth	60	Micropurge
351309107520801 Well CW45	T	351309107520801	Well CW45	—	Volumetric
351309107520801 Well CW45	D	351309107520801	Well CW45	—	Volumetric
351404107513401 Well DD2	T	351404107513401	Well DD2	50	Volumetric
351404107513401 Well DD2	D	351404107513401	Well DD2	50	Volumetric
351424107520101 Well CE7	T	351424107520101	Well CE7	—	Volumetric
351424107520101 Well CE7	D	351424107520101	Well CE7	—	Volumetric
351443107520401 T11 Micropurge at 140-ft depth	T	351443107520401	T11 Micropurge at 140-ft depth	140	Micropurge
351317107514601 Well CW18	T	351317107514601	Well CW18	—	Volumetric
351317107514601 Well CW18	D	351317107514601	Well CW18	—	Volumetric
351443107520401 Well T11	T	351443107520401	Well T11	140	Volumetric
351443107520401 Well T11	D	351443107520401	Well T11	140	Volumetric
351330107530401 Well CW37	T	351330107530401	Well CW37	—	Volumetric
351330107530401 Well CW37	D	351330107530401	Well CW37	—	Volumetric
351400107522301 Well ACW	T	351400107522301	Well ACW	—	Volumetric
351400107522301 Well ACW	D	351400107522301	Well ACW	—	Volumetric
351456107510401 ND S6-42	T	351456107510401	ND S6-42	42	Passive
351456107510401 ND S5-50	T	351456107510401	ND S5-50	50	Passive

Table 1.1. Depths and methods of well sampling, Homestake Mining Company Superfund site, Milan, New Mexico.—Continued

[Data in this table are replicated from Harte and others (2018). Data in bold are sample comparisons for same depths. ft, foot; bls, below land surface; T, total; D, dissolved; —, no data; NA, not applicable; Dup, replicate sample; QAQC, quality assurance and control]

Well identifier	Sample type	Site identification number	Name	Depth of sample, in ft bls	Sample method
351456107510401 ND S4-57	T	351456107510401	ND S4-57	57	Passive
351456107510401 ND S3-60	T	351456107510401	ND S3-60	60	Passive
351456107510401 ND S3-60 Dup	T	351456107510401	ND S3-60 replicate	60	Passive/QAQC
351456107510401 ND S2-64	T	351456107510401	ND S2-64	64	Passive
351456107510401 ND S1-68	T	351456107510401	ND S1-68	68	Passive
351424107531001 MV S8-67	T	351424107531001	MV S8-67	67	Passive
351424107531001 MV S7-76	T	351424107531001	MV S7-76	76	Passive
351424107531001 MV S6-82	T	351424107531001	MV S6-82	82	Passive
351424107531001 MV S5-87	T	351424107531001	MV S5-87	87	Passive
351424107531001 MV S5-87 Dup	T	351424107531001	MV S5-87 replicate	87	Passive/QAQC
351424107531001 MV S4-91	T	351424107531001	MV S4-91	91	Passive
351424107531001 MV S3-95	T	351424107531001	MV S3-95	95	Passive
351424107531001 MV S2-98	T	351424107531001	MV S2-98	98	Passive
351424107531001 MV S1-102	T	351424107531001	MV S1-102	102	Passive
351524107513601 Q S8-57	T	351524107513601	Q S8-57	57	Passive
351524107513601 Q S7-74	T	351524107513601	Q S7-74	74	Passive
351524107513601 Q S6-78	T	351524107513601	Q S6-78	78	Passive
351524107513601 Q S5-82	T	351524107513601	Q S5-82	82	Passive
351524107513601 Q S4-85	T	351524107513601	Q S4-85	85	Passive
351524107513601 Q S4-85 Dup	T	351524107513601	Q S4-85 replicate	85	Passive/QAQC
351524107513601 Q S3-88	T	351524107513601	Q S3-88	88	Passive
351524107513601 Q S2-93	T	351524107513601	Q S2-93	93	Passive
351524107513601 Q S1-97	T	351524107513601	Q S1-97	97	Passive
351502107521501 DD S1-68	T	351502107521501	DD S1-68	68	Passive
351502107521501 DD S2-63	T	351502107521501	DD S2-63	63	Passive
351502107521501 DD S3-60	T	351502107521501	DD S3-60	60	Passive
351502107521501 DD S4-54	T	351502107521501	DD S4-54	54	Passive
351502107521501 DD S5-50	T	351502107521501	DD S5-50	50	Passive
351502107521501 DD S5-50 Dup	T	351502107521501	DD S5-50 replicate	50	Passive/QAQC
351502107521501 DD S6-45	T	351502107521501	DD S6-45	45	Passive
351443107520401 T11 S11-115	T	351443107520401	T11 S11-115	115	Passive
351443107520401 T11 S5-170	T	351443107520401	T11 S5-170	170	Passive
351443107520401 T11 S1-190	T	351443107520401	T11 S1-190	190	Passive
351443107520401 T11 S7-154	T	351443107520401	T11 S7-154	154	Passive
351443107520401 T11 S10-134	T	351443107520401	T11 S10-134	134	Passive
351443107520401 T11 S6-164	T	351443107520401	T11 S6-164	164	Passive
351443107520401 T11 S4-175	T	351443107520401	T11 S4-175	175	Passive
351443107520401 T11 S9-140	T	351443107520401	T11 S9-140	140	Passive
351443107520401 T11 S8-148	T	351443107520401	T11 S8-148	148	Passive
351443107520401 T11 S2-185	T	351443107520401	T11 S2-185	185	Passive
351443107520401 T11 S3-180	T	351443107520401	T11 S3-180	180	Passive
351443107520401 T11 S6-164 Dup	T	351443107520401	T11 S6-164 replicate	164	Passive/QAQC
351404107513401 DD2 S3-78	T	351404107513401	DD2 S3-78	78	Passive
351404107513401 DD2 S8-60	T	351404107513401	DD2 S8-60	60	Passive
351404107513401 DD2 S6-67	T	351404107513401	DD2 S6-67	67	Passive
351404107513401 DD2 S7-63	T	351404107513401	DD2 S7-63	63	Passive
351404107513401 DD2 S4-75	T	351404107513401	DD2 S4-75	75	Passive
351404107513401 DD2 S1-90	T	351404107513401	DD2 S1-90	90	Passive
351404107513401 DD2 S10-48	T	351404107513401	DD2 S10-48	48	Passive
351404107513401 DD2 S9-56	T	351404107513401	DD2 S9-56	56	Passive
351404107513401 DD2 S4-75 Dup	T	351404107513401	DD2 S4-75 replicate	75	Passive/QAQC
351404107513401 DD2 S5-72	T	351404107513401	DD2 S5-72	72	Passive
351404107513401 DD2 S2-84	T	351404107513401	DD2 S2-84	84	Passive

Appendix 2. Uranium Concentrations Near the Homestake Mining Company Superfund Site Near Milan, New Mexico

Table 2.1. Original and adjusted aqueous uranium concentrations based on sampling and analytical adjustments for well samples, Homestake Mining Company Superfund site, Milan, New Mexico.

[Available for download as a comma delimited (CSV) file at https://doi.org/10.3133/ofr20181055.]

Appendix 3. Uranium Concentrations From a Rerun Analysis by RTI Laboratories, Inc. for the Homestake Mining Company Superfund Site Near Milan, New Mexico

Table 3.1. Uranium concentrations from a rerun analysis by RTI Laboratories, Inc. for well samples, Homestake Mining Company Superfund site, Milan, New Mexico.

[Data in this table are replicated from Harte and others (2018). T, total (unfiltered); D, dissolved (filtered); µg/L, microgram per liter]

Well	Sample method	Sample type	Original result, in µg/L	Rerun result, in µg/L
920	Volumetric	T	810	910
CE7	Volumetric	T	67,000	68,355
CW45	Volumetric	T	1,300	1,475
DD	Micropurge	T	280	308
DD	Volumetric	D	330	334
DD	Volumetric	T	320	364
DD2	Volumetric	T	810	884
MV	Micropurge	T	1,100	1,332
MV	Volumetric	D	960	1,031
MV	Volumetric	T	870	978
ND	Micropurge	T	98	113
ND	Volumetric	D	79	87.7
ND	Volumetric	T	78	84.3
P3	Volumetric	D	84	98.1
P3	Volumetric	T	84	90.5
Q	Micropurge	T	190	218
Q	Volumetric	D	200	225
Q	Volumetric	T	200	217
ST	Volumetric	T	29,000	[a]20,305
T11	Volumetric	T	33,000	33,722

[a]Value sample was a partial analysis.

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Publishing support provided by the
Pembroke Publishing Service Center

USGS

Harte and others—**Uranium and Selenium Concentrations From Groundwater, Homestake Mining Company Superfund Site, Milan, N. Mex.**—Open-File Report 2018–1055

ISSN 2331-1258 (online)
https://doi.org/10.3133/ofr20181055