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### Program Overview

Metro Wastewater Reclamation District (Metro District) applies biosolids to their properties near Deer Trail, Colorado. These biosolids applications could affect the quality of water in alluvial and bedrock aquifers, streambed sediments, soils, and crops. Water quality can be directly affected through:

- Contaminated recharge water, or
- Infiltration of water through contaminated soils or sediments (remobilization).

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### USGS

*The U.S. Geological Survey is a science organization that provides the Nation with reliable, impartial information to describe and understand the Earth. The national USGS home page: <http://www.usgs.gov>*

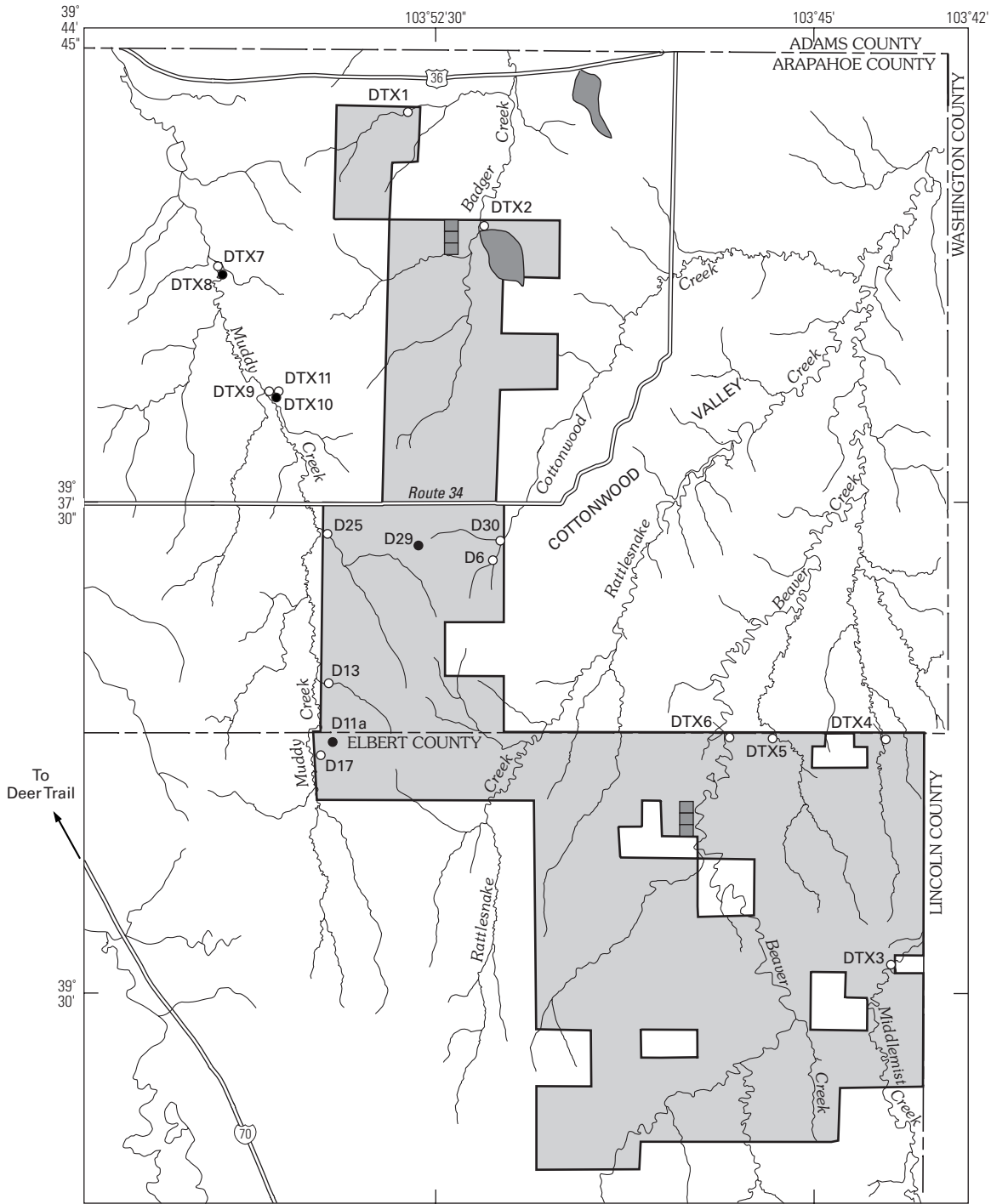
### *This USGS program:*

The Internet address for this program, including links for data and reports, is:  
<http://co.water.usgs.gov/projects/CO406/CO406.html>

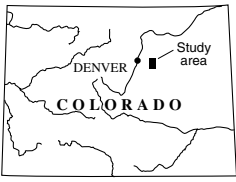
The Internet address for just the data is:  
<http://co.water.usgs.gov/projects/CO406/data.html>  
or <http://water.usgs.gov/co/nwis>



**Water levels are measured at each USGS monitoring well in this program each month and at the time of sampling. Water levels in well DTX4 (South property) have been below the screened interval for about a year, so the well is dry and can't be sampled. The October 2001 sample was the last at well DTX4, so there are no data for well DTX4 in this report.**



To Deer Trail



- EXPLANATION**
- Metro Wastewater Reclamation District property
  - DTX1○ USGS alluvial monitoring well
  - D29● USGS bedrock monitoring well
  - Streambed-sediment sampling area
  - Soil-sampling area

**USGS Expanded Monitoring Program sites and Metro District's biosolids-application properties (1999 property boundaries) near Deer Trail, Colorado**

## Program Overview

*Continued from page 1*

Water quality can be indirectly affected through:

- Tilling that mobilizes or changes subsurface chemical constituents, or
- Contributions to natural processes such as nitrification.

Contaminated ground water or surface water could contaminate:

- Other aquifers, such as bedrock water-supply aquifers or alluvial aquifers,
- Other surface-water bodies (ponds or streams), or
- Streambed sediments.

Biosolids must meet metals and radioactivity regulations, or else agronomic loading rates will be incorrect and soils could be overloaded. Soil quality could either be improved by biosolids applications through increased nutrients and organic matter, or degraded through excessive nutrients or metals.

The U.S. Geological Survey (USGS) has designed and begun a new monitoring program to address concerns from a stakeholder group about the biosolids and the quality of the environment in the vicinity of the biosolids-application areas. The new USGS monitoring program near Deer Trail is referred to as the "USGS Expanded Monitoring Program" and began in January 1999.

This monitoring program is distinct from, but builds on, another USGS program that monitored shallow groundwater quality on the Metro District Central Farm from 1993-1998. The new program (1999-2005) considers environmental-quality issues for shallow and deep ground water, surface water (bed sediments), biosolids, soils, and crops. The new expanded monitoring program includes all three Metro District properties (North, Central, and South Farms) and related private-property locations. Both programs, however, use USGS and Metro District funds. In addition, the new monitoring program also uses funds from the North Kiowa Bijou Groundwater Management District. Both programs are designed, carried out, and interpreted independently by USGS, and quality-assured USGS data and reports will be released to the public and the Metro District at the same time. By definition and design, all USGS monitoring programs are independent and unbiased.

The objectives of the new Expanded Monitoring Program are to: (1) Evaluate the combined effects of biosolids applications, land use, and natural processes on alluvial aquifers, the bedrock aquifer, streambed sediments, soils, and crops by comparing chemical data to

- State or Federal regulatory limits,
- Data from a site where biosolids are not applied (a control site), or
- Earlier data from the same site (trends).

(2) Monitor biosolids for metals and radioactivity, and compare the concentrations with regulatory limits. (3) Determine the aquifer hydrology in this area.

The approach is unique for each component of the Expanded Monitoring Program. However, appropriate USGS methods and technologies will be applied to each component.

Progress reports such as this one were prepared quarterly for the first 2.5 years of the program and now are prepared twice each year and distributed to the stakeholders and other concerned people, as well as available to the general public on the Internet (<http://co.water.usgs.gov>). Each progress report will summarize progress from the previous quarters and plans for the current quarters; chemical data will be included twice each year. A USGS report will be prepared annually and made available after each year of the monitoring program: the reports will include data for that year, any interpretations for that year, and statistical analysis for the data to date. A comprehensive USGS report will be prepared and available after five years of monitoring that includes complete statistical analyses and interpretations. In addition, the USGS will meet with the stakeholders once a year to discuss the Expanded Monitoring Program results and to consider possible changes to the Expanded Monitoring Program.

## Questions & Answers

Q: Are the USGS Expanded Monitoring Program near Deer Trail annual data reports for 1999 and 2000 available to the public?

A: Not yet. We are waiting to publish those reports until all the data are finalized. We hope to finish finalizing these data and publish these reports soon.

Q: Colorado is affected by a drought. Have any of the other USGS monitoring wells near Deer Trail gone dry besides well DTX4?

A: Although ground-water levels have declined, only USGS well DTX4 in this monitoring program has gone dry.

## Alluvial Ground Water

### Approach

Six monitoring wells were installed near the Metro District property boundaries in the major alluvial aquifers. These six wells plus five USGS monitoring wells from the previous project will be sampled approximately quarterly for full inorganic chemistry and annually for radioactivity. Data will be reviewed and statistically tested for exceedance of regulatory limits and for trends.

### Progress Last Period (January-June 2002)

Ground-water levels were measured January 7, February 1, March 6, April 15, May 3, and May 31, 2002. Ground water was sampled for chemistry in January and April 2002. Ground-water data were compiled and reviewed. More reviews of the interpretive hydrogeology report for ground water 1993-99 (which includes data and interpretations for some sites included in the expanded monitoring program) were completed. The annual report for 1999 received USGS final approval in late January 2002.

### Plans for the Current Period (July-December 2002)

Ground-water levels will be measured the first week of each month. Ground water will be sampled the first month of each quarter, weather permitting. Data will be compiled and reviewed. Changes suggested by review comments will be incorporated into the various draft reports. A draft annual report of 2001 data is being prepared and will be available at the September 2002 stakeholder meeting.

## Bedrock Ground Water

### Approach

A structure map of the base of the bedrock aquifer was compiled and used to determine locations for two sets of new, paired wells (one alluvial well and one nearby dual-completion bedrock well comprise each pair). The well pairs were installed where both the Muddy Creek alluvial aquifer and the Laramie-Fox Hills aquifer are present (along the margin of the bedrock aquifer) near the Metro District properties. Water-level data from each well pair will be used to determine aquifer hydrology and interaction at those two locations. The two new bedrock wells (DTX8, DTX10), along with one USGS bedrock well from the previous project (D29), will be sampled approx-

imately quarterly for full inorganic chemistry and annually for radioactivity. Data will be reviewed and statistically tested for exceedance of regulatory limits and for trends.

### Progress Last Period (January-June 2002)

Ground-water levels were measured January 7, February 1, March 6, April 15, May 3, and May 31, 2002. Ground water was sampled for chemistry in January and April 2002. Ground-water data were compiled and reviewed. More reviews of the interpretive hydrogeology report for ground water 1993-99 (which includes data and interpretations for some sites included in the expanded monitoring program) were completed. The annual

*Continued on page 5*



***Quality assurance of the continuous-recorder sites includes calibration checks at the field site on all the sensors each year.***

## ***Bedrock Ground Water***

*Continued from page 4*

report for 1999 received USGS final approval in late January 2002.

### **Plans for the Current Period (July-December 2002)**

Ground-water levels will be measured the first week of each month. Ground water will be sampled the first month of each quarter, weather permitting. Data will be compiled and reviewed. Changes suggested by review comments will be incorporated into the various draft reports. A draft annual report of 2001 data is being prepared and will be available at the September 2002 stakeholder meeting.



***USGS ground-water samples are collected by pumping water into a special “clean room” chamber inside the back of the truck at the field site.***



***The quality assurance program for the ground-water component includes participation in the USGS National Field Quality Assurance (NFQA) Program, where the field crew and instruments used to collect field-parameter data are tested each year. As in previous years, the NFQA results for this year (spring 2002) for this field crew and these instruments were good.***



***The ground-water “equipment blank” sample also is processed in the back of the sampling truck, but the truck is parked in Denver at the USGS preparatory laboratory. The “equipment blank” sample is designed to indicate contamination from the sampling equipment only, not the field site.***

## ***Surface-Water Sediments***

### **Approach**

Surface-water contamination is a concern for the stakeholders, but

streams flow off the Metro District properties only during runoff when surface-water sampling is impractical. Therefore, possible surface-water contamination from metals will be evalu-

*Continued on page 6*

## Surface-Water Sediments

*Continued from page 5*

ated by sampling streambed sediments soon after storms. Two small drainage basins were selected for similar characteristics but different land use—one drainage in a biosolids-application field and another drainage in a farmed field (not on the Metro District properties) that does not receive biosolids. A downstream part of each of the two drainage basins will be sampled after the same storms, three to four times per year for inorganic constituents (including metals, total nitrogen, and total phosphorous) and organic carbon, and one time per year for radioactive constituents. Data will be reviewed and statistically tested to determine if concentrations are significantly different between the two drainage basins.

## Progress Last Period (January-June 2002)

The site was carefully monitored for runoff-producing rainfall. Runoff was sufficient to enable streambed-sediment sampling once in the designated basins: June 4, 2002. The annual report for 1999 received USGS final approval in late January 2002.

## Plans for the Current Period (July-December 2002)

The site will be monitored for runoff-producing rainfall. Sampling may take place, depending on the weather. Data will be compiled and reviewed. Changes suggested by review comments will be incorporated into the various draft reports. A draft annual report of 2001 data is being prepared and will be available at the September 2002 stakeholder meeting.

## Biosolids

### Approach

Biosolids samples will be taken as a 24-hour composite from the Metro District plant and analyzed by USGS. Biosolids will be sampled and analyzed once each quarter during most of the program, and once each month for 6 months when the Lowry Landfill Superfund Site water transfer begins. Data will be reviewed and compared to Federal regulatory limits.

## Progress Last Period (January-June 2002)

Quarterly samples of biosolids were collected in January and April 2002. Each sample was a 24-hour composite from the conveyor belt at the Metro District facility. The material was placed in two acid-washed, one-gallon

*Continued on page 7*



***The USGS sampled streambed sediments June 4, 2002. This is the first year since this project began in 1999 that sufficient rain fell in June for a bed-sediment sample to be collected during that month.***



## Biosolids

*Continued from page 6*

plastic bottles and transported to the USGS in Denver. There, the sample was air-dried then ground to less than 150 micrometers. The samples were submitted to the laboratories for chemical analyses. The annual report for 1999 received USGS final approval in late January 2002. A presentation about monitoring programs for biosolids-applied sites was made at a biosolids workshop held in Weld County, Colorado, May 2, 2002.

### Plans for the Current Period (July-December 2002)

Quarterly biosolids samples will be collected in July and October 2002. Samples will be dried, ground, and submitted to the laboratories. Data will be compiled and reviewed. A draft annual report of 2001 data is being prepared and will be available at the September 2002 stakeholder meeting.



***The streambed-sediment samples from June 4, 2002, were sieved and bottled in the USGS preparatory laboratory in Denver.***

## Soils

### Approach

One site was selected for characterizing and monitoring the chemical composition of soil on the Metro District property in Arapahoe County, and one site was selected on the Metro District property in Elbert County. Each site consists of three 20-acre (933 feet by 933 feet) fields separated by 100-foot buffer zones. The center 20-acre field at each site will have biosolids applied after the initial soil sampling. The other two 20-acre fields at each site will not have biosolids applied and will be used as “control” fields to monitor the natural variability of soil composition for the duration of the study. All three 20-acre fields at each site will be farmed in the normal fashion and have crops planted and harvested. Soils from each of the six fields will be sampled before biosolids are applied to the two center fields and then again after each harvest. Samples will be analyzed for arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, plutonium, and gross alpha and beta activity. Data will be examined after 5 years to determine if concentration has changed with time.

### Progress Last Period (January-June 2002)

Chemical analyses were completed for the soils collected from the Elbert County site on November 29-December 1, 2000 and from the Arapahoe County site on June 11, 2002. The annual report for 1999 received USGS final approval in late January 2002.

### Plans for the Current Period (July-December 2002)

Soils will be sampled from both the Arapahoe and Elbert County sites during fall 2002. Data will be compiled and reviewed. A draft annual report of 2001 data is being prepared and will be available at the September 2002 stakeholder meeting.

## Crops

### Approach

Crops from each of the six 20-acre soil-monitoring fields will be chemically analyzed after harvest. Analyses will include arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc.

### Progress Last Period (January-June 2002)

The annual report for 1999 received USGS final approval in late January 2002. There was no other activity during this period.

### Plans for the Current Period (July-December 2002)

Samples of wheat will be collected from the Arapahoe and Elbert County sites. These samples will be dried, ground, and submitted to the laboratories for chemical analysis. A draft annual report of 2001 data is being prepared and will be available at the September 2002 stakeholder meeting.

***If you have changes to the mailing list, please contact the Elbert County Environmental Health Officer (see page 12) or Tracy Yager (see page 12). Elbert County maintains the mailing list for these quarterly reports and for all meeting notices.***

***If you have questions about the Expanded Monitoring Program, please contact Tracy Yager (see page 12). Commonly asked questions will be included in each Progress Report.***

USGS ground-water data, January-June 2002

[Standards from Colorado Department of Public Health and Environment, 1997. Basic standards for ground water, 5CCR 1002-41: July 14, 1997, 56 p. Data are preliminary and subject to revision. All data from filtered samples; mg/L, milligrams per liter; µg/L, micrograms per liter; <, less than; E, value estimated by laboratory; ER, value is an estimate because reanalysis for that constituent has been requested]

Well	Sample date	Time	Nitrate plus										
			nitrite as nitrogen, mg/L	Arsenic, µg/L	Cadmium, µg/L	Chromium, µg/L	Copper, µg/L	Lead, µg/L	Mercury, µg/L	Molybdenum, µg/L	Nickel, µg/L	Selenium, µg/L	Zinc, µg/L
DTX3	1/8/02	1015	6.67	< 2.0	< .04	< .8	2.4	< .08	< .01	.6	.15	11.9	2
DTX3	4/9/02	1005	5.80	< 2.0	E .02	< .8	3.3	< .08	< .01	.5	1.08	15.6	2
D17	1/7/02	1335	.910	ER22.4	.04	< .8	.4	< .08	< .01	5.6	.25	7.1	< 1
D17	4/3/02	1520	1.20	E 1.1	E .02	< .8	.6	< .08	< .01	5.9	1.03	6.6	2
DTX5	1/8/02	1235	.084	< 2.0	< .07	< 1.6	4.5	< .20	< .01	1.0	< .10	< 2.0	4
DTX5	4/9/02	1140	E .031	< 2.0	.10	< .8	6.2	< .20	< .01	.9	15.7	< 2.0	3
DTX6	1/8/02	1415	.324	< 2.0	< .07	< 1.6	6.7	< .20	< .01	.7	< .10	< 2.0	6
DTX6	4/9/02	1300	.255	< 2.0	< .07	< .8	8.2	< .20	< .01	.7	12.1	E 1.6	5
D13	1/9/02	1450	< .037	E 1.2	< .04	< .8	1.8	< .08	< .01	1.0	< .06	3.0	1
D13	4/9/02	1530	< .037	< 2.0	.07	< .8	2.1	< .08	< .01	1.0	5.61	< 2.0	1
D29	1/7/02	1115	< .037	< 2.0	< .07	< 1.6	6.1	< .20	< .01	1.2	4.62	6.6	28
D29	4/3/02	1330	< .037	< 2.0	< .04	< .8	9.6	E .04	< .01	1.4	7.94	< 2.0	9
D6	1/14/02	1015	15.2	E 3.3	< .30	E 2.8	24.6	E .29	< .01	4.0	14.5	13.2	27
D6	4/4/02	1215	15.0	2.3	.11	< .8	45.3	< .08	< .01	6.0	16.0	10.9	34
D30	1/14/02	1220	< .037	< 2.0	< .10	< 2.4	5.9	< .20	< .01	3.0	5.08	< 2.0	6
D30	4/9/02	1430	< .037	< 2.0	< .10	< .8	9.5	< .20	< .01	2.8	15.7	< 2.0	7
D25	1/7/02	1515	2.35	4.0	.18	< 2.4	7.1	< .20	< .01	8.2	< .10	< 2.0	6
D25	4/5/02	1350	2.19	2.6	.20	< .8	8.7	< .08	< .01	9.5	5.46	< 2.0	8
DTX10A	1/11/02	1245	< .037	< 2.0	< .07	< 1.6	4.0	< .20	< .01	1.1	< .10	2.6	3
DTX10A	4/5/02	1035	< .037	< 2.0	< .07	< .8	7.0	< .20	< .01	1.4	< .10	< 2.0	6
DTX8A	1/9/02	1250	< .037	< 2.0	< .04	< .8	1.9	< .08	< .01	.6	< .06	4.1	2
DTX8A	4/10/02	1055	< .037	< 2.0	< .04	< .8	2.3	< .08	< .01	.6	4.24	< 2.0	2
DTX2	1/11/02	1015	< .037	E 1.0	E .05	< 2.4	4.4	< .20	< .01	1.6	3.30	3.1	5
DTX2	4/10/02	1335	< .037	< 2.0	E .05	< .8	6.8	< .20	< .01	1.7	17.9	< 2.0	5
DTX1	1/9/02	1020	1.27	2.2	.12	< 1.6	6.5	< .20	< .01	6.2	9.23	3.5	5
DTX1	4/10/02	1500	1.20	2.7	.17	< .8	7.3	< .20	< .01	6.1	19.5	E 1.9	4
Human Health Standard			10	10	5	100	1,000	50	2	None	100	50	5,000
Agricultural Standard			100	100	10	100	200	100	10	None	200	20	2,000



**USGS ground-water data for plutonium, 2002**

[Standards from Colorado Department of Public Health and Environment, 1997, Basic standards for ground water, 5CCR 1002-41: July 14, 1997, 56 p. Data are preliminary and subject to revision. All data from unfiltered samples; pCi/L, picocuries per liter; analytical uncertainty (defined on page 12) reported is the two-sigma total propagated analytical uncertainty]

Well	Sample Date	Sample time	Plutonium-238, pCi/L	Plutonium-238, analytical uncertainty, pCi/L	Plutonium-238, minimum detectable concentration, pCi/L	Plutonium-239+240, pCi/L	Plutonium-239+240, analytical uncertainty, pCi/L	Plutonium-239+240, minimum detectable concentration, pCi/L
DTX3	1/8/02	1015	-0.0008	.0017	0.0117	0	.0051	0.0056
D17	1/7/02	1335	.0003	.0038	0.0113	-0.0013	.0019	0.0113
DTX5	1/8/02	1235	-0.0018	.0025	0.0152	.010	.010	0.012
DTX6	1/8/02	1415	.006	.012	0.016	.012	.016	0.016
D13	1/9/02	1450	-0.0022	.0025	0.0141	0	.0044	0.0049
D29	1/7/02	1115	0	.0077	0.0085	0	.0076	0.0085
D6	1/14/02	1015	.08	.12	0.12	0	.10	0.12
D30	1/14/02	1220	.009	.018	0.024	.026	.031	0.024
D25	1/7/02	1515	.0049	.0098	0.0132	0	.012	0.013
DTX10A	1/11/02	1245	-0.0042	.0042	0.0224	-0.0021	.0030	0.0179
DTX8A	1/9/02	1250	0	.0048	0.0053	.0004	.0045	0.0134
DTX2	1/11/02	1015	.005	.014	0.031	0	.011	0.012
DTX1	1/9/02	1020	-0.0017	.0034	0.0242	.012	.018	0.033
Human Health Standard			none found			0.15		
Agricultural Standard			none found			none found		

**USGS streambed-sediment data for radioactivity, 2001**

[Data are preliminary and subject to revision. pCi/g, picocuries per gram; analytical uncertainty (defined on page 12) reported is the two-sigma total propagated analytical uncertainty]

Site	Sample date	Alpha radioactivity, pCi/g	Alpha radioactivity, analytical uncertainty, pCi/g	Beta radioactivity, pCi/g	Beta radioactivity, analytical uncertainty, pCi/g	Plutonium-238, pCi/g	Plutonium-238, analytical uncertainty, pCi/g	Plutonium-238, minimum detectable concentration, pCi/g	Plutonium-239+240, analytical uncertainty, pCi/g	Plutonium-239+240, minimum detectable concentration, pCi/g
Biosolids applied	7/27/01	8.3	2.4	7.4	1.6	.0064	.0092	0.0087	.0062	.0092
Biosolids applied	8/17/01	9.5	2.6	10	2.2	-0.00026	.00052	0.01300	.0030	.0065
No biosolids	7/27/01	10.3	2.6	9.6	1.9	0	.0097	0.0107	-0.00032	.0063
No biosolids	8/17/01	10.7	2.7	9.8	2.1	0	.015	0.016	.005	.012

## USGS streambed-sediment data, 2001

[Data are preliminary and subject to revision. Sampling sites are shown on page 2. mg/kg, milligrams per kilogram; g/kg, grams per kilogram; µg/g, micrograms per gram; ER, value is an estimate because reanalysis for that constituent has been requested; <, less than]

Site	Sample date	Total nitrogen, mg/kg	Phosphorous, mg/kg	Carbon, inorganic, g/kg	Carbon, total, g/kg	Carbon, organic, g/kg	Aluminum, µg/g	Arsenic, µg/g	Cadmium, µg/g
Biosolids applied	07/27/01	1,100	720	4.4	13	8.3	17,000	1.59	.2
Biosolids applied	8/17/01	1,400	580	4.3	16	11	15,000	1.41	.2
Biosolids applied	9/01/01	850	1,100	6.0	14	8.2	18,000	1.23	.2
No biosolids	7/27/01	1,400	580	4.5	18	14	15,000	1.58	.2
No biosolids	8/17/01	850	620	3.6	10	6.4	15,000	1.33	< .2
No biosolids	9/01/01	580	650	5.4	11	5.7	10,000	1.19	.1

Site	Sample date	Chromium, µg/g	Copper, µg/g	Lead, µg/g	Mercury, µg/g	Molybdenum, µg/g	Nickel, µg/g	Selenium, µg/g	Zinc, µg/g
Biosolids applied	07/27/01	14	18	18	.02	.1	18	.22	60
Biosolids applied	8/17/01	16	22	16	.02	ER12	ER .2	.31	60
Biosolids applied	9/01/01	18	14	16	.03	.7	16	.16	60
No biosolids	7/27/01	13	17	17	.02	.1	18	.34	60
No biosolids	8/17/01	14	18	14	.02	< .4	11	.25	50
No biosolids	9/01/01	10	10	12	.02	.1	12	.26	40



***The USGS drilled new boreholes near wells D6 and D25 and plugged well D9 in February 2002. The boreholes were used to collect core samples and examine lithology and were completed as wells. Well D9 was installed by the USGS in 1993 in the headwaters part of the Badger Creek drainage basin, but did not provide enough water for a complete sample. After the Metro District acquired their north property, the well was no longer located near a property boundary so was no longer a priority for sampling.***

**USGS biosolids data, June--October 2001**

[Data are preliminary and subject to revision. ppm, parts per million; pCi/g, picocuries per gram; +/-, plus or minus the analytical uncertainty]

Constituent or Property	July 2001	October 2001
Arsenic, ppm	2.1	1.7
Cadmium, ppm	2.6	2.7
Copper, ppm	610	630
Lead, ppm	63	61
Mercury, ppm	2.0	1.7
Molybdenum, ppm	28	33
Nickel, ppm	25	24
Selenium, ppm	12	12
Zinc, ppm	680	700
Gross Alpha radioactivity, pCi/g	54 +/- 12	49 +/- 11
Gross Beta radioactivity, pCi/g	31 +/- 7	28 +/- 6
Plutonium 238, pCi/g	-0.004 +/- 0.019	-0.004 +/- 0.12
Plutonium 239 + 240, pCi/g	0.009 +/- 0.012	0.000 +/- 0.012

**USGS soil data for samples collected June 11, 2001, at the Arapahoe County site and November 29–December 1, 2000, at the Elbert County site**

[Data are preliminary and subject to revision. mg/kg, milligrams per kilogram; <, less than; pCi/g, picocuries per gram; +/-, plus or minus the analytical uncertainty]

Constituent or Property	Units	Arapahoe County, North (control) field	Arapahoe County, Middle (biosolids application) field	Arapahoe County, South (control) field	Elbert County, North (control) field	Elbert County, Middle (biosolids application) field	Elbert County, South (control) field
Arsenic	mg/kg	8.0	8.1	7.7	12.5	16.6	17.2
Cadmium	mg/kg	0.2	0.3	0.2	0.2	0.2	0.2
Copper	mg/kg	14.3	17.0	15.0	24.5	25.8	19.3
Lead	mg/kg	18	19	18	25.5	28	25
Mercury	mg/kg	0.03	0.03	0.03	0.04	0.04	0.04
Molybdenum	mg/kg	0.7	0.8	0.7	1.2	1.7	1.4
Nickel	mg/kg	15	16	15	24	22	17
Selenium	mg/kg	0.4	0.4	0.4	1.0	1.2	1.0
Zinc	mg/kg	55	58	54	91	87	73
Gross alpha	pCi/g	25 +/- 7	30 +/- 8	19 +/- 6	22 +/- 7	23 +/- 7	24 +/- 7
Gross beta	pCi/g	25 +/- 5	20 +/- 5	25 +/- 5	26 +/- 5	26 +/- 5	26 +/- 5
Plutonium 238	pCi/g	-0.01 +/- 0.02	0.006 +/- 0.015	-0.009 +/- 0.018	-0.002 +/- 0.016	0.004 +/- 0.011	0.000 +/- 0.014
Plutonium 239+240	pCi/g	0.005 +/- 0.015	0.002 +/- 0.013	0.002 +/- 0.013	0.018 +/- 0.020	0.018 +/- 0.019	0.000 +/- 0.011

## Definitions

*Analytical uncertainty*—The possible range of the true value or error term contributed by bias and variability of the laboratory measurement technique. All laboratory data have associated uncertainty. Each sample value should be thought of as a range in concentration defined by the reported value plus or minus the analytical uncertainty. The true concentration usually is somewhere in this range, but not a precisely known point. For most analyses, the analytical uncertainty is not calculated for each sample but is estimated from bias and variability data derived from analyses of quality-assurance samples like blanks and replicates. For radioactivity data, the analytical uncertainty is calculated individually for each sample for each analyte based on analytical and statistical variables.

*Biosolids*—Solid organic matter recovered from a sewage-treatment process that meets regulatory criteria for beneficial use, such as for fertilizer. Metro District applies Grade I, Class B biosolids at Deer Trail. Regulations require that land-applied biosolids must meet or exceed Grade II, Class B. Grade I exceeds Grade II.

*Composited sample*—A sample made by combining individual subsamples into a single sample. Each streambed-sediment sample from this program usually is a field-composited sample because the sample contains sediments from more than one depositional area of the streambed.

*Less than (<)*—A designation for analytical results to indicate that a constituent was not present or was present at very low levels that the laboratory could not reliably determine. Note that the actual amount of this constituent in that sample is unknown and could be any amount between zero and the “less than” value.

*Runoff*—The rain that hits the ground and flows over the land surface into valleys instead of infiltrating into the soil. Runoff can wash particles of soil, rock, plants, and biosolids from the land surface into the streambeds of the valleys.

*Stakeholder*—Any person or group (including the Metro District) interested or concerned about the Expanded Monitoring Program.

## Contacts

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***Fourth annual stakeholder  
meeting:  
September 25, 2002, at the school  
in Agate, Colorado***

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