

# **Environmental Surveillance Report**

on the  
U.S. Department of Energy

**Rocky Flats Environmental Technology Site**

**Information Exchange**

**FIRST QUARTER 2000**



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**Colorado Department  
of Public Health  
and Environment**

This is a numerical summary of environmental surveillance measurements performed by the Department during the past quarter. Also included are additional data for earlier periods that have not been reported previously.


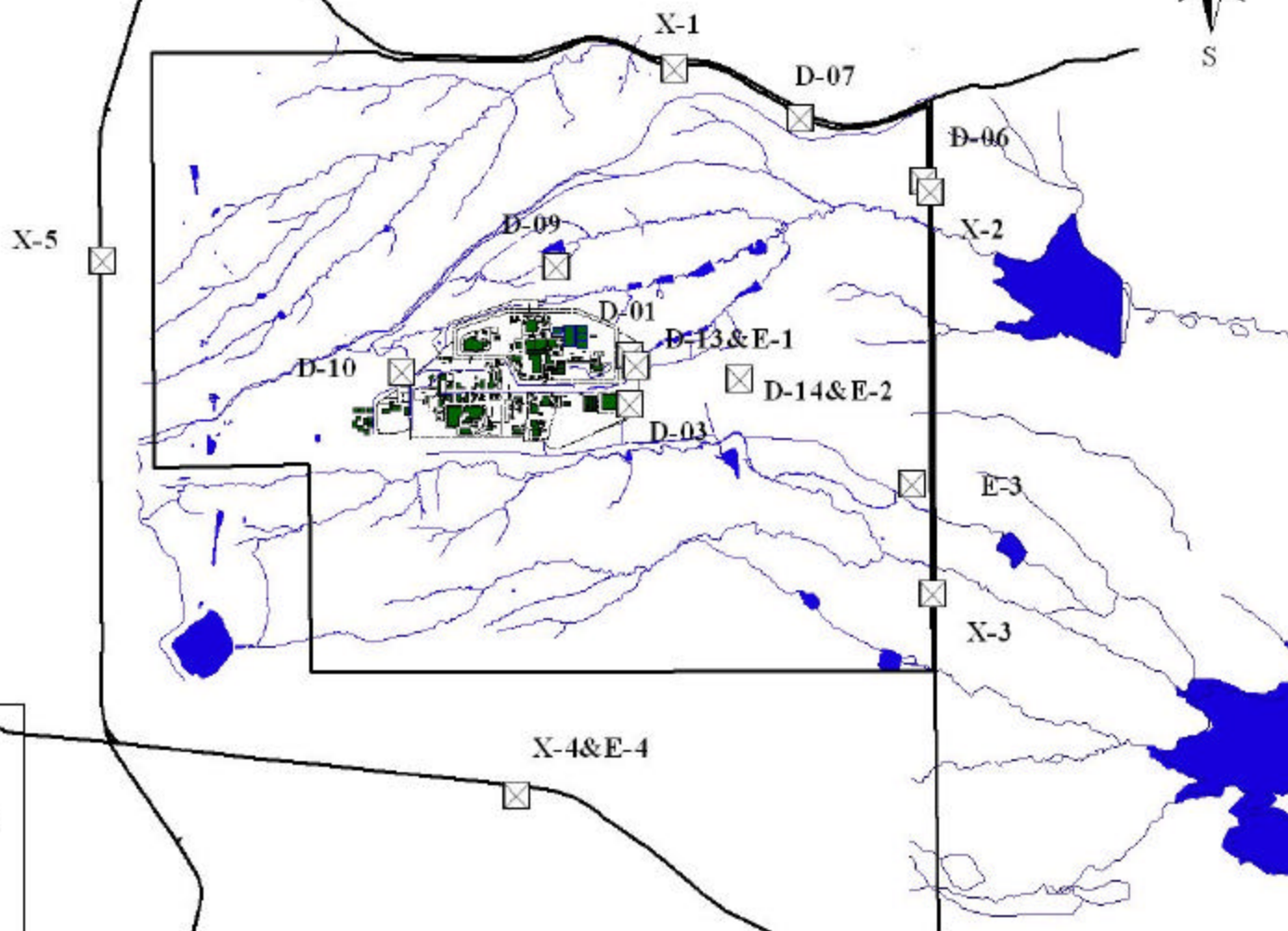
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Colorado Department of Public Health and Environment

Air Monitoring Locations 2000

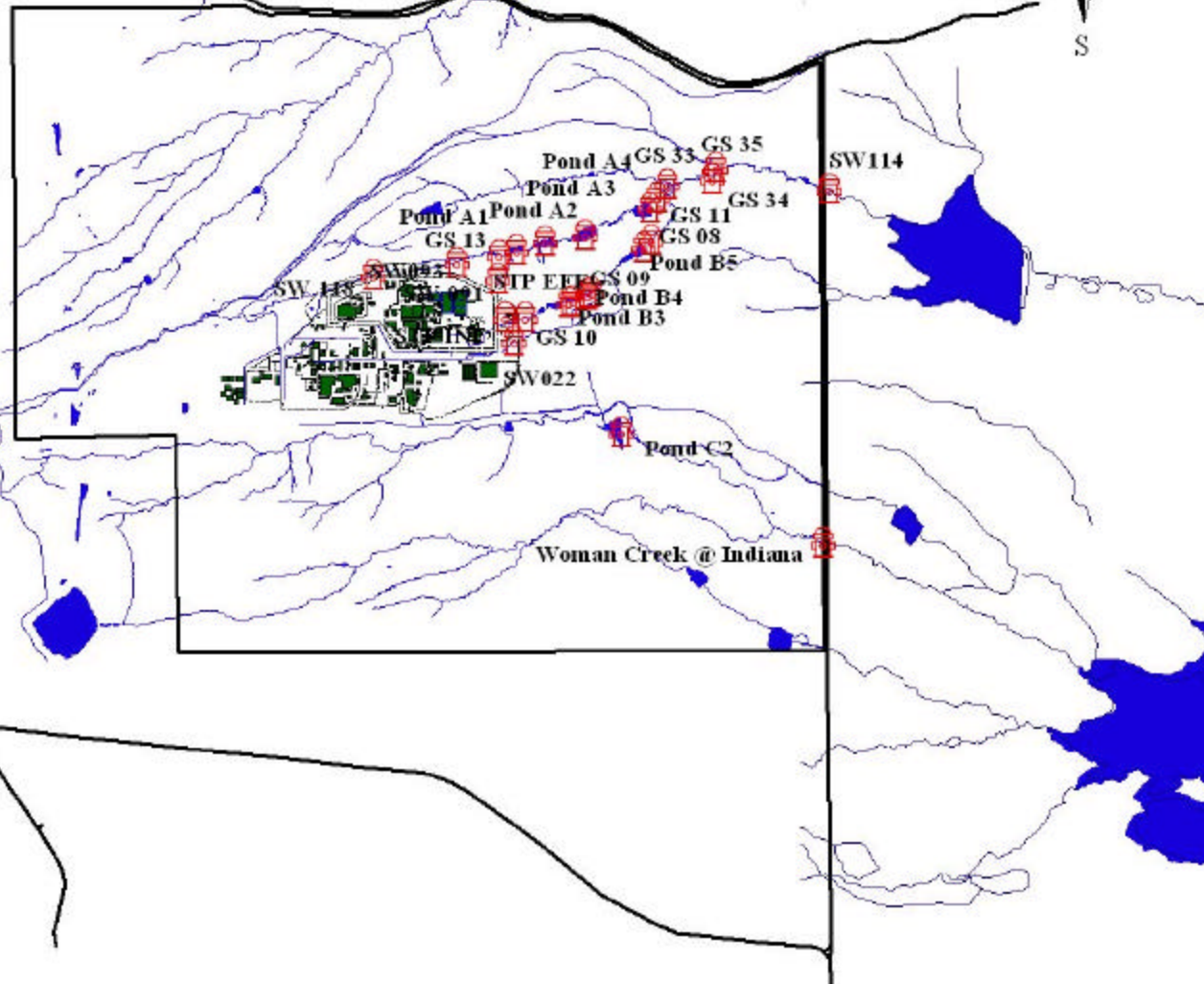


Colorado Department  
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JM Love  
May 11, 2000

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Surface Water Monitoring Locations 2000



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May 11, 2000

# Decision Rules

The data acquired for each quarter is examined using standard methods of evaluation that are described in the Integrated Monitoring Plan (IMP). The methods use a series of decision rules to effectively analyze the data that has been collected, and make determinations about what actions need to be taken. Decision rules are if-then statements pertaining to data quality objectives. The decision rules define, quantitatively and qualitatively, the point at which a decision should be made or action should be taken.

The decisions could involve many different actions including, but not limited to, further analysis of data, implementation of new monitoring stations for source detection, management decisions, or evaluation of remediation alternatives. Any exceedence of an action level for a surface water or air contaminant during the quarter are summarized in this report, along with any actions taken or follow up investigations that are required.

The primary decision rules that pertain to each media are outlined below:

## **A. Air Monitoring**

1. **Ambient Air Quality Monitoring:** Nitrogen Dioxide (NO<sub>2</sub>), Ozone (O<sub>3</sub>) and particulate monitoring is performed by APCD. Particulate monitoring includes monitoring of both fine particulates (PM<sub>10</sub>) and total suspended solids (TSP).

IF: A perimeter monitor detects an NO<sub>2</sub> (annual arithmetic mean) concentration of 0.053 parts per million (ppm), an O<sub>3</sub> (1 hr av. time) concentration of 0.12 ppm, a TSP measurement of 75 µg/m<sup>3</sup> averaged over a 1 year time period or 150 µg/m<sup>3</sup> over a 24-hour time period, or a PM<sub>10</sub> concentration of 50 µg/m<sup>3</sup> annually or 150 µg/m<sup>3</sup> in a 24-hour period (Include these values in a table in the report, too confusing this way)

THEN: The Site's operating permit may potentially be revised to mitigate the exceedence.

2. **Beryllium (Be) Monitoring:** Emission points (stacks) are monitored for Be.

IF: Be emissions from a source exceed 10 g in a 24-hour period

THEN: CDPHE may take enforcement action.

IF: Ambient Be concentrations at monitoring sites exceed 0.01 µg/m<sup>3</sup> over a 30-day Period

THEN: CDPHE may take action to identify the source.

3. **Volatile Organic Compound (VOCs) Monitoring:** Various VOC monitoring stations exist around the perimeter of the site and are maintained by APCD. It is possible that remediation processes could release significant levels of VOCs. VOC data does not tend to vary and the measured concentrations are generally very low. A significant increase from normal levels of any VOC at any monitoring site could indicate a potential problem.

IF: A measured value of any VOC exceeds trends in historical data

THEN: An investigation will be enacted to determine the source of the elevated VOC concentration.

4. Radiological Ambient Air Quality Monitoring: Laboratory and Radiation Services Division (LARS) and Air Pollution Control Division (APCD) air sampling locations are monitored for radiological contaminants, PM<sub>10</sub> and total suspended particulates (TSP).

IF: Measured values of radionuclides exceed typical trends existing in historical data

THEN: Any number of actions may be taken including, but not limited to, analysis of samples for verification, comparison of samples from nearest DOE monitoring sites, ComRad Program samplers, and/or APCD monitoring sites, request for investigation or explanation of elevated results from DOE, calculation of public dose/risk and/or a presentation to CDPHE management.

## **B. Surface Water Monitoring**

1. Source Location: Current surface water monitoring sites monitor for Analytes of Interest (AoIs) and indicator parameters for AoIs. Contaminant levels that exceed historical trends at a certain site could indicate the presence of a new contaminant source. When a new contaminant source is identified by a current monitoring location, it may be necessary to implement additional monitoring sites to identify the exact location of the new source.

IF: A new contaminant source is identified by any monitoring station

THEN: Action should be taken to locate and quantify the source. Mitigation action will be taken pursuant to the Rocky Flats Cleanup Agreement (RFCA) Action Level Framework (ALF).

2. Wastewater Treatment Plant (WWTP) Influent Radiological Monitoring: The Site has made an effort to eliminate any possible connections between waste streams containing radionuclides and WWTP influent. Therefore, it is assumed that radiologic loads will not significantly increase from baseline values. Radiologic parameters include total plutonium, total americium, total uranium, tritium, as well as alpha and beta activity. Decontamination and decommissioning (D&D) activities could potentially introduce radiologic loads to WWTP influent. The influent is monitored to track sources of contaminants that may be introduced during the cleanup process.

IF: Influent loading for any of the radiologic parameters exceeds baseline values determined from historical data

THEN: Evaluation will be performed to determine the source of contamination.

3. Pond Predischage Monitoring: AoIs and some volatile organic compounds (VOCs) are monitored in the ponds previous to pond discharge so that discharge will not result in exceedence of stream standards.

IF: Predischage monitoring shows exceedence of stream standards

THEN: CDPHE will notify the Site. At this point the Site may evaluate alternative options which avoid immediate discharge including, but not limited to, treatment, storage or disposal.

4. Precipitation Sampling: LARS is involved with sampling precipitation for gross alpha/beta, Pu-239/240, Am-241 and Tritium.

IF: Any measurement of radionuclides in precipitation exceeds the normal variation occurring in historical and baseline measurements

THEN: A series of actions may be taken including, but not limited to, reanalysis of the samples, analysis of individual ambient air filters from the same quarter, request for analysis of nearby filters from DOE, ComRad, or APCD sample sites, request for investigation, request for CDPHE and DOE modeling to determine environmental effects.

Analytes of Interest

Analytes		Air	Water	Purpose of Monitoring
<b>Radionuclide:</b>	Pu	X	X	High level of public concern. Known carcinogen. Known past releases (within the past 8 years) have exceeded RFCA stream standards and action levels. This provides reasonable cause to expect future releases in excess of RFCA Action Levels.
	U	X	X	Known renal toxicity. Past exceedances provide reasonable cause to expect future releases in excess of RFCA stream standards and action levels.
	Am	X	X	Known carcinogen. Known past exceedances provide reasonable cause to expect future releases in excess of RFCA stream standards and action levels.
	Tritium		X	Is an AOI due to past releases to drinking water supplies
<b>Metals:</b>	Be	X	X	Known to cause berylliosis in susceptible individuals when exposed in inhalation. May also cause contact dermatitis. Will be monitored as an indicator of releases from process and waste storage areas.
	Cr		X	Physiological and dermal toxicity. High level of regulatory concern due, in part to the chromic acid of incident of 1989. Low levels can cause significant ecological damage.
	Ag		X	Highly toxic to fish at low levels, if chronic. State of Colorado has temporarily removed its stream standard for silver, while under study. The study has been completed, and the standard will be reinstated at the next triennial review of South Platte stream standards, if not before. Used at RFETS only for photographic development. Routinely accepted by POTWs as municipal waste, but discharge is regulated. May be removed from this list later if data do not support concern.
	Cd		X	Highly toxic to fish at low levels, if chronic. Known human carcinogen (prostate cancer) and depletes physiologic calcium. Used at RFETS in plating processes. Monitoring data for the Interceptor Trench System (ITS) and the proposed discharge of untreated ITS waters into Walnut Creek provide reasonable cause to expect future releases in excess of RFCA Action Levels
	Hardness		X	Required to evaluate metals analyses, due to its effect on solubility to these metals.
<b>Particulates:</b>	Total suspended particulates	X		Monitored to provide information on total airborne particulate levels. Filters also used for metals and radionuclides analyses.
	PM <sub>10</sub> particulates	X		Monitored to provide information on fine airborne particulate levels. Filters also used for metals and radionuclides analyses.
<b>Volatile Organic Compounds:</b>	VOCs	X	X	A variety of volatile organic compounds, some of which are toxic to humans and ecology. Known discharges to air and water as well as groundwater infiltration.



**Real Time Monitoring of Physical and Indicator Parameters:**

(These parameters provide real-time indication for a wide variety of regulated contaminants, and are also required component for monitoring for AoIs. They require no laboratory analysis and are the RFETS most cost effective defensive monitoring.)

pH		X	Toxicity to humans and ecology. Regulatory concern due to chromic acid incident. Real-time monitoring is an inexpensive and effective method of detecting acid spills such as (chromic acid or plutonium nitrate) or failure of treatment systems.
Conductivity		X	Conductivity is an indicator of total dissolved solids, metals, anions, and pH. Real-time monitoring of conductivity is an inexpensive indicator of overall water quality.
Turbidity		X	Turbidity is a general indicator of elevated contaminant levels, and may be correlated with Pu.
NO <sub>3</sub>		X	Past releases near RFCA stream standards and action levels upstream of ponds provide reasonable cause to expect future releases in excess of RFCA stream standards and action levels. ITS discharges are often high in nitrate, and may challenge RFCA action levels.
Flow		X	Required to detect flow events, evaluate contaminant loads and plan pond operations and discharges. Affects nearly every decision rule, and is the most commonly discussed attribute of RFETS surface waters.
Oxides of Nitrogen	X		Monitored due to RFETS historical use of nitric acid.
Ozone	X		Monitored as part of the CDPHE network. Not required or part of monitoring for RFETS.
Wind speed	X		Monitored to provide emergency response modeling information.
Wind direction	X		Monitored to provide emergency response modeling information.
Temperature	X		Monitored to provide emergency response modeling information.

## NATIONAL AMBIENT AIR QUALITY STANDARDS

POLLUTANT	AVERAGING TIME	STANDARD
Carbon Monoxide (CO)		
Primary Standard	1 Hour <sup>(a)</sup>	35 ppm
Primary Standard	8 Hour <sup>(a)</sup>	9 ppm
Ozone (O <sub>3</sub> )		
Primary and Secondary Standards (up to 1997)	1 Hour <sup>(b)</sup>	0.12 ppm
Primary and Secondary Standards (as of July 1997)	8 Hour <sup>(c)</sup>	0.08 ppm
Nitrogen Dioxide (NO <sub>2</sub> )		
Primary and Secondary Standards	Annual Arithmetic Mean	0.053 ppm
Sulfur Dioxide (SO <sub>2</sub> )		
Primary Standard	Annual Arithmetic Mean	0.030 ppm
Primary Standard	24 Hour <sup>(a)</sup>	0.14 ppm
Secondary Standard	3 Hour <sup>(a)</sup>	0.5 ppm
Particulates (PM <sub>10</sub> )		
Primary and Secondary Standards	Annual Arithmetic Mean <sup>(d)</sup>	50 $\mu\text{g}/\text{m}^3$
Primary and Secondary Standards	24 Hour <sup>(b)</sup> prior to July 1997, <sup>(e)</sup> as of July 1997	150 $\mu\text{g}/\text{m}^3$
Fine Particulates (PM <sub>2.5</sub> ) (as of July 1997)		
Primary and Secondary Standards	Annual Arithmetic Mean <sup>(d)</sup>	15.0 $\mu\text{g}/\text{m}^3$
Primary and Secondary Standards	24 Hour <sup>(f)</sup>	65 $\mu\text{g}/\text{m}^3$
Lead (Pb)		
Primary and Secondary Standards	Calendar Quarter Average	1.5 $\mu\text{g}/\text{m}^3$
Total Suspended Particulates (TSP)		
Primary Standard	Annual Geometric Mean <sup>(g)</sup>	75 $\mu\text{g}/\text{m}^3$
Primary Standard	24 Hour <sup>(g)</sup>	260 $\mu\text{g}/\text{m}^3$
Secondary Standard	Annual Geometric Mean <sup>(g)</sup>	60 $\mu\text{g}/\text{m}^3$
Secondary Standard	24 Hour <sup>(g)</sup>	150 $\mu\text{g}/\text{m}^3$

<sup>(a)</sup> Not to be exceeded more than once per year.

<sup>(b)</sup> Statistically estimated number of days with concentrations above this level averaged over a three year period, is not to be more than 1 per year.

<sup>(c)</sup> The three year average of the fourth maximum value for each year is not to exceed this level.

<sup>(d)</sup> The average of three years of annual averages (based on quarterly averages) is not to exceed this level.

<sup>(e)</sup> The three year average of the 99<sup>th</sup> percentile for each year is not to exceed this level.

<sup>(f)</sup> The three year average of the 98<sup>th</sup> percentile for each year is not to exceed this level.

<sup>(g)</sup> The TSP standard was replaced by the PM<sub>10</sub> standard on July 1, 1987. TSP is now a State standard only and was temporarily suspended from 30 August 1993 to 30 October 1995 by the AQCC.

**Colorado Water Quality Control Commission Standards for  
Radioactive Materials at and around RFETS**

	<b>SEGMENT 2</b> Standley Lake	<b>SEGMENT 3</b> Great Western Reservoir	<b>SEGMENTS 4a and 5</b> Woman Creek	<b>SEGMENTS 4a, 4b and 5</b> Walnut Creek
Gross Alpha (pCi/L)	6	5	7	11
Gross Beta (pCi/L)	9	12	8	19
Plutonium (pCi/l)	0.03	0.03	0.15	0.15 *
Americium (pCi/l)	0.03	0.03	0.15	0.15 *
Tritium (pCi/l)	500	500	500	500
Uranium (pCi/L)	3	4	11	10

\* Temporary modifications apply until December 31, 2000. The modification is a narrative standard requiring that the concentration of americium and plutonium be consistent with attaining the numerical water quality standard in Segment 4(b) of Big Dry Creek

**Standards for Inorganics and Metals**

<b>Inorganic/Metal</b>	<b>SEGMENTS 4a &amp; 4b</b>	<b>SEGMENT 5</b>
	<b>Standards (mg/L)</b>	<b>Action Levels (mg/L)</b>
Ammonia	*	*
Beryllium, total recoverable	0.0040	0.0040
Cadmium, dissolved **	0.0015	0.002
Chloride	0.011	0.011
Chromium, total	50	50
Copper**	16	16
Iron, dissolved	300	300
Iron, total	1000	1000
Manganese, dissolved	50	50
Manganese, total	1000	1000
Nitrate	10000	10000
Nitrite	500	500
Phosphate, ortho	?	?
Phosphate, total	?	?
Selenium, total	10	10
Silver, dissolved**	0.59	0.59
Sulfate	250000	250000
Sulfide	20	20

\*There is no unionized ammonia standard for Segment 5 or Segment 4b. A standard of 0.1 mg/L applies to Segment 4a.

\*\*The standards for these metals were calculated using a formula based on hardness. A hardness value of 143 mg/L was used because this is the average hardness found in these waters.

**EPA Method 502.2 for VOCs in Surface Waters**

VOCs	MCL (µg/L)	MDL (µg/L)	PQL (µg/L)	VOCs	MCL (µg/L)	MDL (µg/L)	PQL (µg/L)
1,1,2-Tetrachloroethane	none	0.5	1	Chloroform	none	0.5	1
1,1,1-Trichloroethane	200	0.5	1	Chloromethane	none	0.5	1
1,1,2,2-Tetrachloroethane	none	0.5	1	Dibromochloromethane	none	0.5	1
1,1,2-Trichloroethane	5	0.5	1	Dibromomethane	none	0.5	1
1,1-Dichloroethane	none	0.5	1	Dichlorodifluoromethane	none	0.5	1
1,1-Dichloroethene	7	0.5	1	Dichloromethane	5	0.5	1
1,1-Dichloropropene	none	0.5	1	Ethylbenzene	700	0.5	1
1,2,3-Trichlorobenzene	none	0.5	1	Fluorotrichloromethane	none	0.5	1
1,2,3-Trichloropropane	none	0.5	1	Hexachlorobutadiene	none	0.5	1
1,2,4-Trichlorobenzene	70	0.5	1	Isopropylbenzene	none	0.5	1
1,2,4-Trimethylbenzene	none	0.5	1	Naphthalene	none	0.5	1
1,2-Dichlorobenzene	600	0.5	1	Propylbenzene	none	0.5	1
1,2-Dichloroethane	5	0.5	1	Styrene	100	0.5	1
1,2-Dichloropropane	5	0.5	1	Tetrachloroethene	5	0.5	1
1,3,5-Trimethylbenzene	none	0.5	1	Toluene	1000	0.5	1
1,3-Dichlorobenzene	none	0.5	1	Trichloroethene	5	0.5	1
1,3-Dichloropropane	none	0.5	1	Vinyl chloride	2	0.5	1
1,4-Dichlorobenzene	75	0.5	1	Xylene, (total)	10,000	0.5	1
2,2-Dichloropropane	none	0.5	1	cis-1,2-Dichloroethene	70	0.5	1
2-Chlorotoluene	none	0.5	1	cis-1,3-Dichloropropene	none	0.5	1
4-Chlorotoluene	none	0.5	1	n-Butylbenzene	none	0.5	1
4-Isopropyltoluene	none	0.5	1	sec-Butylbenzene	none	0.5	1
Benzene	5	0.5	1	tert-Butylbenzene	none	0.5	1
Bromobenzene	none	0.5	1	trans-1,2-Dichloroethene	100	0.5	1
Chloroethane	none	0.5	1	trans-1,3-Dichloroethene	none	0.5	1

**EPA Method 515.1 for Chlorinated Acid Herbicides**

Contaminant	MDL (µg/L)	PQL (µg/L)	Contaminant	MDL (µg/L)	PQL (µg/L)
Acifluorfen	0.3	3	3,5-Dichlorobenzoic acid	0.8	8
Bentazon	0.4	4	Dichloroprop	0.3	3
Cloramben	1.2	12	Dinoseb	0.6	6
2,4-D	0.3	3	4-Nitrophenol	0.8	8
Dalapon	0.7	7	Pentachlorophenol	0.6	6
2,4-DB	0.5	5	Picloram	0.5	5
DCPA	0.4	4	2,4,5-T	0.3	3
Dicamba	0.3	3	2,4,5-TP	0.3	3

**EPA Method 525.2 for SVOCs in Surface Waters**

SVOCs	MCL (µg/L)	MDL (µg/L)	PQL (µg/L)	SVOCs	MCL (µg/L)	MDL (µg/L)	PQL (µg/L)
1,2,4-Trichlorobenzene	none	5	10	Benzo(a)anthracene	none	5	10
1,2-Dichlorobenzene	none	5	10	Benzo(a)anthracene	0.2	5	10
1,3-Dichlorobenzene	none	5	10	Benzo(b)fluoranthene	none	5	10
1,4-Dichlorobenzene	none	5	10	Benzo(ghi)perylene	none	5	10
2,4,5-Trichlorophenol	none	5	10	Benzo(k)fluoranthene	none	5	10
2,4,6-Trichlorophenol	none	5	10	Butyl benzyl phthalate	none	5	10
2,4-Dichlorophenol	none	5	10	Chrysene	none	5	10
2,4-Dimethylphenol	none	5	10	Di-n-butylphthalate	none	5	10
2,4-Dinitrophenol	none	25	10	Di-n-octylphthalate	none	5	10
2,4-Dinitrotoluene	none	5	10	Dibenz(a,h)anthracene	none	5	10
2-Chloronaphthalene	none	5	10	Dibenzofuran	none	5	10
2-Methyl-4,6-dinitrophenol	none	25	50	Diethyl phthalate	none	5	10
2-Chlorophenol	none	5	10	Dimethyl phthalate	none	5	10
2-Methylnaphthalene	none	5	10	Hexachlorobutadine	none	5	10
2-Methylphenol	none	5	10	Hexachlorocyclopentadiene	50	5	10
2-Nitroaniline	none	5	10	Hexachloroethane	none	5	10
2-Nitrophenol	none	5	10	Indeno(1,2,3-cd)pyrene	none	5	10
3,3-Dichlorobenzidine	none	5	10	Isophorone	none	5	10
3-Nitroaniline	none	25	50	N-Nitosodi-n-propylamine	none	5	10
4-Bromophenylphenylether	none	5	10	N-Nitrosodiphenylamine	none	5	10
4-Chloro-3-methylphenol	none	10	20	Naphthalene	none	5	10
4-Chloroaniline	none	10	20	Nitrobenzene	none	5	10
4-Chlorophenylphenylether	none	5	10	Pentachlorophenol	1	25	10
4-Methylphenol	none	5	10	Phenanthrene	none	5	10
4-Nitroaniline	none	25	50	Phenol	none	5	10
4-Nitrophenol	none	25	50	Pyrene	none	5	10
Acenaphthene	none	5	10	bis(2-Chloroethoxy)methane	none	5	10
Acenaphthylene	none	5	10	bis(2-Chloroethyl) ether	none	5	10
Anthracene	none	5	10	bis(2-Ethylhexyl) phthalate	6	5	10

## Description of Air Sampling this Quarter

Table A contains the complete gross alpha /gross beta results for both the 4<sup>th</sup> quarter 1999 and the 1<sup>st</sup> quarter 2000. Data from the fourth quarter, 1999 show no obvious anomalies relative to historical data. Data from the first quarter, 2000 show that the site as a whole had a relatively high concentration of airborne radioactivity during the week of January 25 through February 1. The highest alpha activity ( $0.060 \pm 0.007$ ) was found at the D-14 sampler in the buffer zone east of the 903 Pad. Analysis of a second portion of the filter showed alpha activity of  $0.010 \pm 0.003$ . It is suspected that the first portion of the filter analyzed contained a "hot particle" of some material, possibly naturally occurring. The analyst who performed this work was in training and did not realize the significance of the higher-than-normal result. The filter was inadvertently discarded, so no additional analysis was possible. The training issue has been resolved and no repeat of the problem should occur.

Isotopic analysis of air samples for the 3<sup>rd</sup> quarter 1998 is complete, but some of the samples were contaminated with Am-243, the tracer isotope used in the analysis. While we have not been able to determine the cause, it appears that the samples were contaminated shortly after collection, at a time when training and quality issues were being experienced in the lab. Repeated analysis of these samples has demonstrated consistently high tracer recovery, invalidating the results for Am-241. Plutonium measurements appear to be unaffected, but due to the americium problem, the data are highly questionable. This issue has been addressed through procedure review and training. The problem has not been observed in any of the samples analyzed since, and no further problems of this type are expected.

Results of isotopic analysis of 2<sup>nd</sup> quarter 1999 samples are complete and appear in Table B. Analysis of 3<sup>rd</sup> quarter 1999 samples is nearly complete, and results to date also appear in Table B. These measurements are not significantly different than those seen in the past.

Oxides of nitrogen and ozone data (Table D) show no significant abnormal trends for the first quarter of 2000. Average oxides of nitrogen levels are slightly higher than typical historical values for the period, though still very low. Ozone concentrations for the quarter are at typical wintertime levels.

Particulate concentrations for the first quarter of 2000 are presented in Table E, but are not complete at this time. Total suspended particulate data in particular are not complete. For the data that are currently available, PM10 levels are at typical to slightly lower than typical levels, and TSP levels are typical for the period. Complete particulate data for the quarter will be presented in the next report. Volatile organic compound analyses (Table G) for the first quarter of 2000 show no abnormal concentrations. All levels are near historical averages.

Also appearing in this report are data relating to the controlled buffer zone test burn on April 6, 2000. These include gross alpha/gross beta results for the week of April 4-11, 2000 from Laboratory and Radiation Control Division samplers as well as mass concentration results from Air Pollution Control Division samplers. These data are presented below as a special "Controlled Burn" table. All of these results show no obvious anomalies relative to historical data.

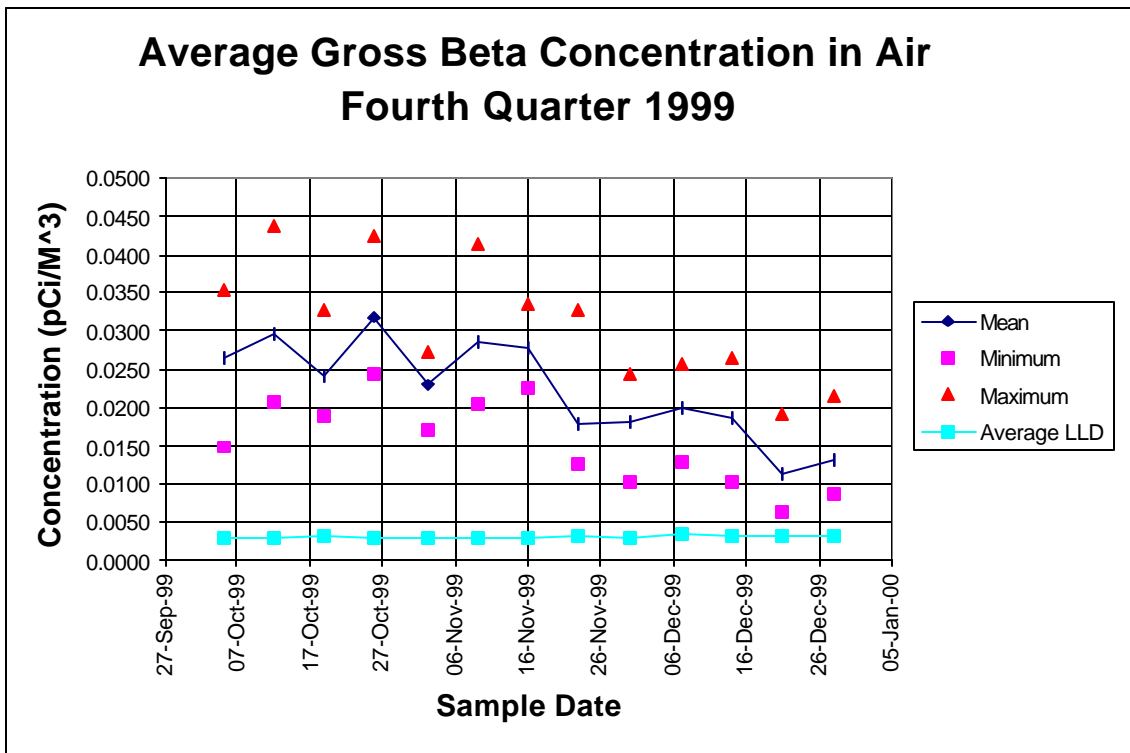
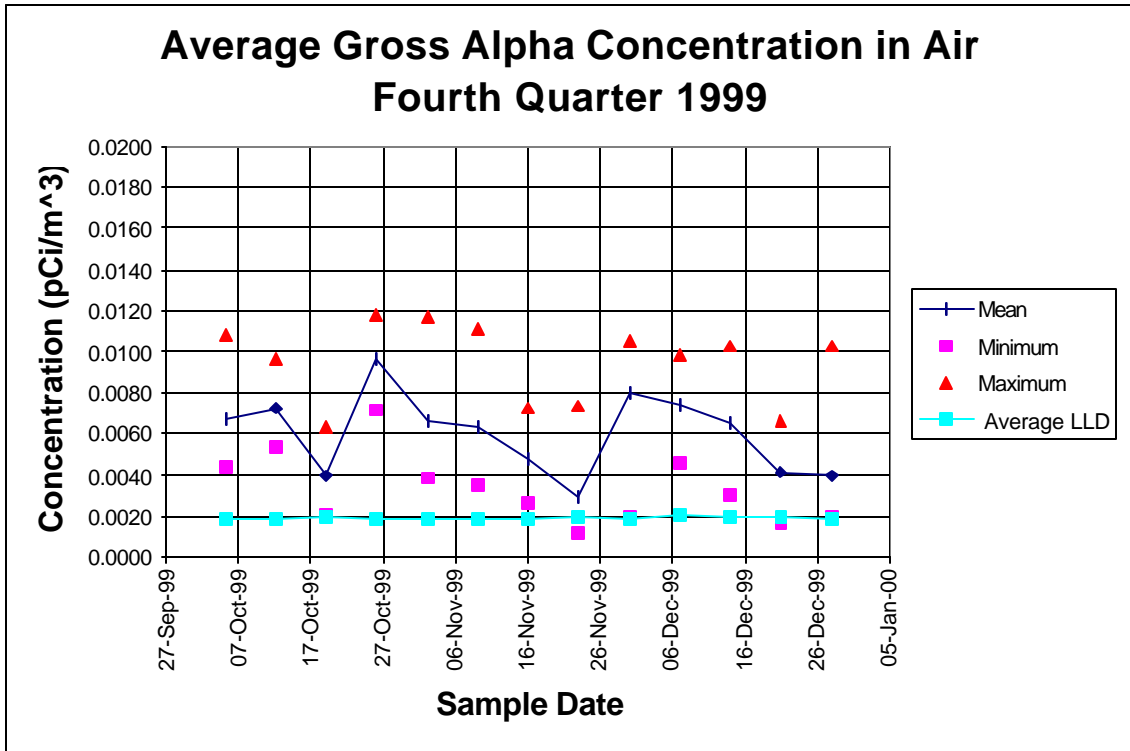
**Controlled Burn Data  
Buffer Zone --- April 6, 2000**

Site	Period	Gross alpha pCi/m <sup>3</sup>	Gross beta pCi/m <sup>3</sup>	Mass ug/m <sup>3</sup>
D-1	4/4-11/2000 (week)	0.0018	0.0263	
D-3	4/4-11/2000 (week)	0.0048	0.0226	
D-6	4/4-11/2000 (week)	0.0050	0.0248	
D-7	4/4-11/2000 (week)	0.0038	0.0253	
D-9	4/4-11/2000 (week)	0.0039	0.0240	
D-10	4/4-11/2000 (week)	0.0041	0.0277	
D-13	4/4-11/2000 (week)	0.0030	0.0222	
D-14	4/4-11/2000 (week)	0.0055	0.0343	
E-1-T	4/4-11/2000 (week)	0.0028	0.0215	
E-1-P	4/4-11/2000 (week)	---	---	
E-2-T	4/4-11/2000 (week)	---	---	
E-2-P	4/4-11/2000 (week)	0.0027	0.0174	
E-3-T	4/4-11/2000 (week)	0.0018	0.0218	
E-3-P	4/4-11/2000 (week)	0.0021	0.0136	
E-4-T	4/4-11/2000 (week)	0.0030	0.0166	
X-1-PM10	4/6/2000 (day)			VOID
X-2-PM10-P	4/6/2000 (day)			VOID
X-2-PM10-C	4/6/2000 (day)			13
X-3-PM10	4/6/2000 (day)			15
X-4-PM10	4/6/2000 (day)			14
X-5-PM10	4/6/2000 (day)			5
X-1-TSP-P	4/6/2000 (day)			**
X-1-TSP-C	4/6/2000 (day)			**
X-2-TSP	4/6/2000 (day)			**
X-3-TSP	4/6/2000 (day)			**
X-4-TSP	4/6/2000 (day)			**
X-5-TSP	4/6/2000 (day)			**

\*\* The sample is currently undergoing re-calculation due to a program calculation error.

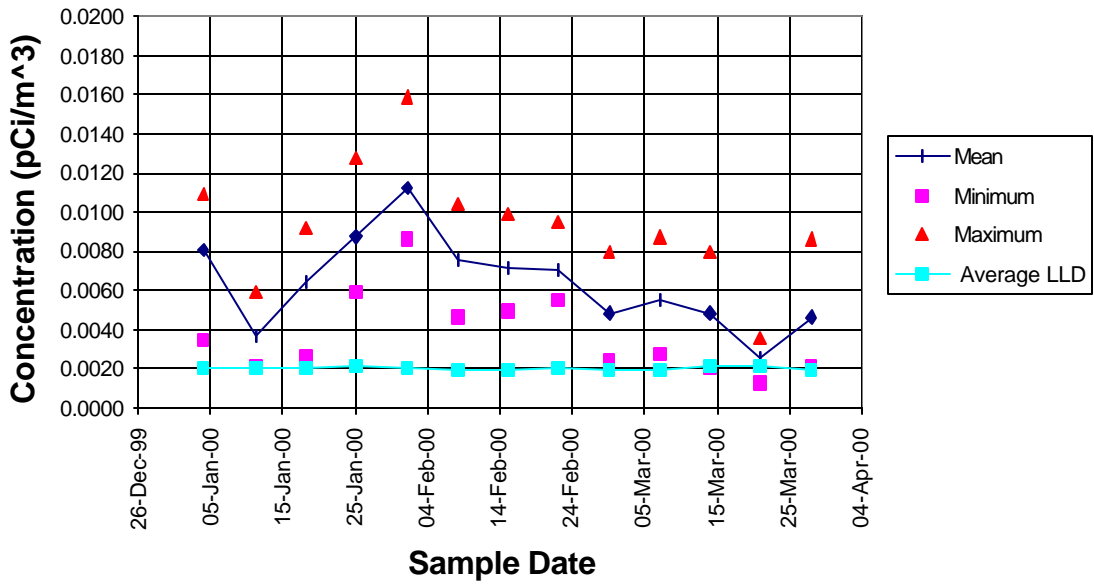
## 2. Graphical Presentation

Graphs of pertinent and abnormal data from air monitoring are presented in this section.

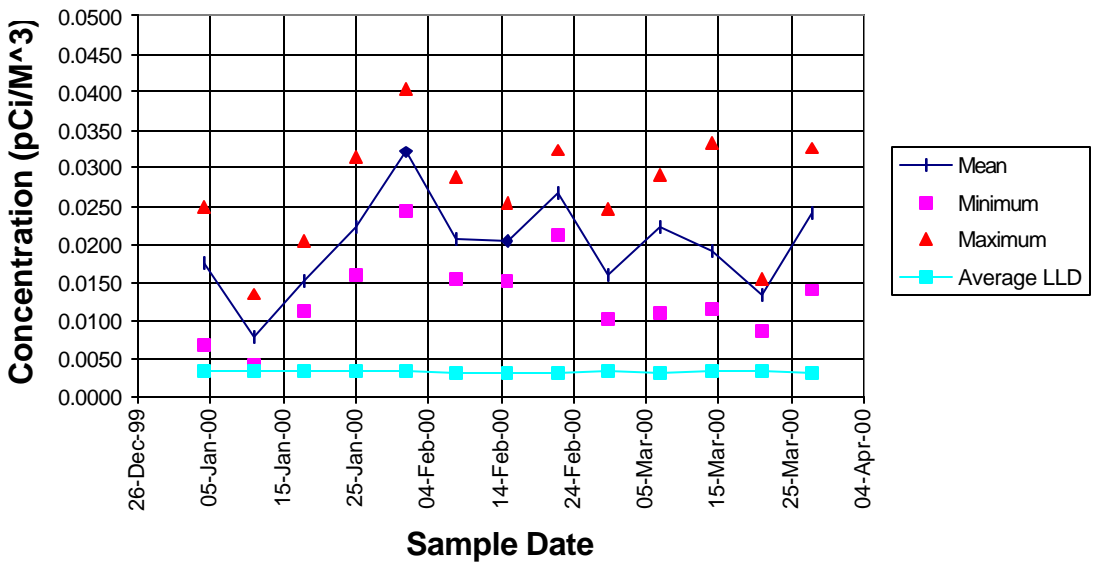




### Average Gross Alpha Concentration in Air First Quarter 2000

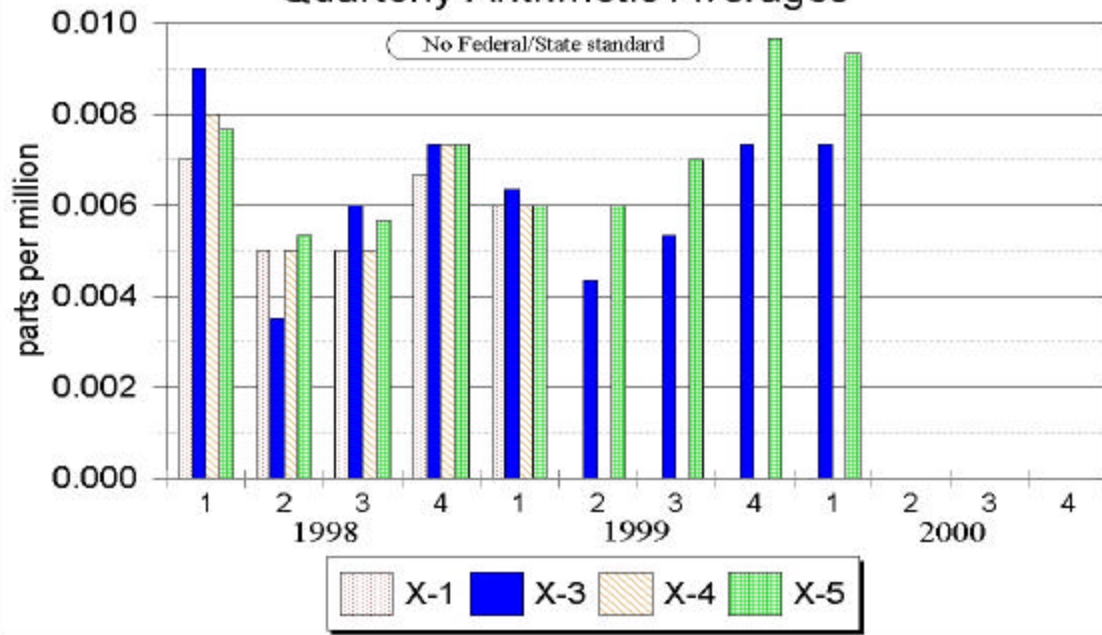


### Average Gross Beta Concentration in Air First Quarter 2000



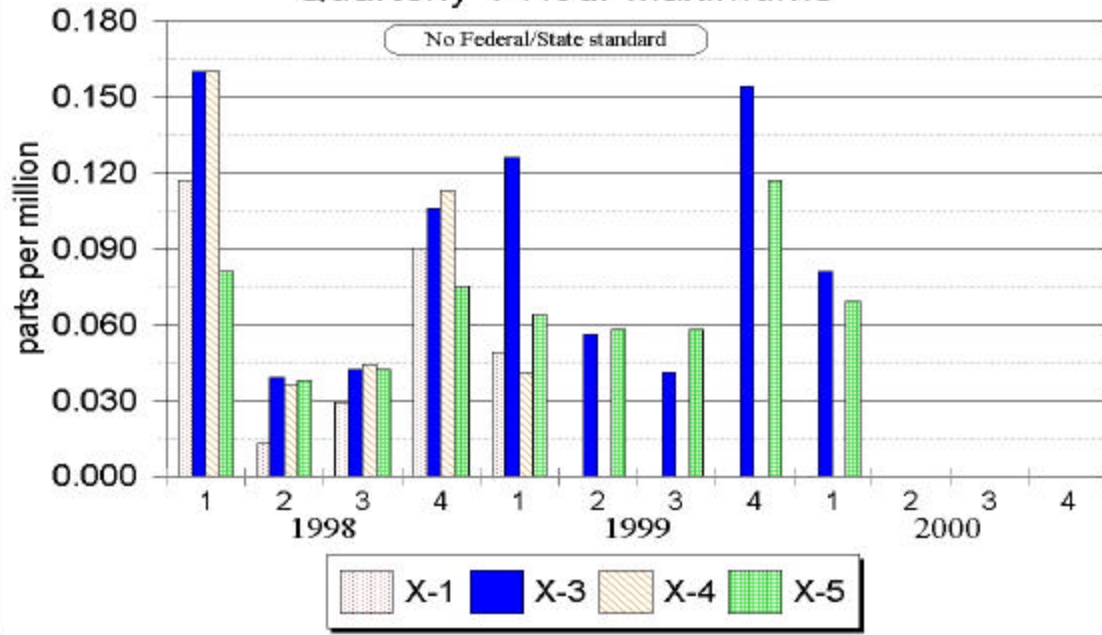
# Nitric Oxide (NO)

## Quarterly Arithmetic Averages



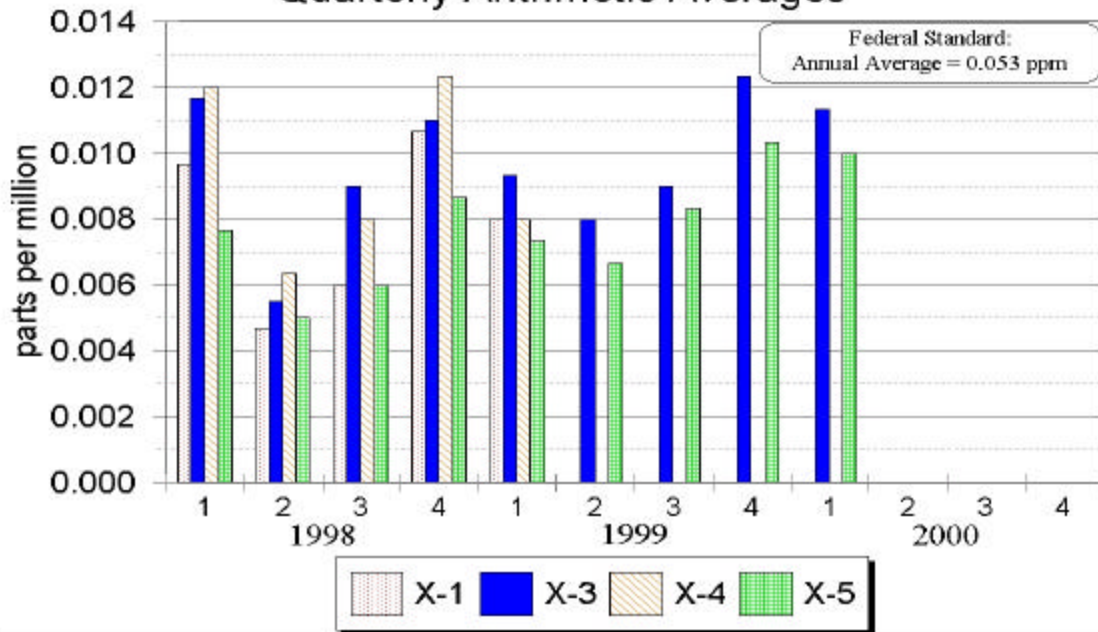
# Nitric Oxide (NO)

## Quarterly 1-Hour Maximums



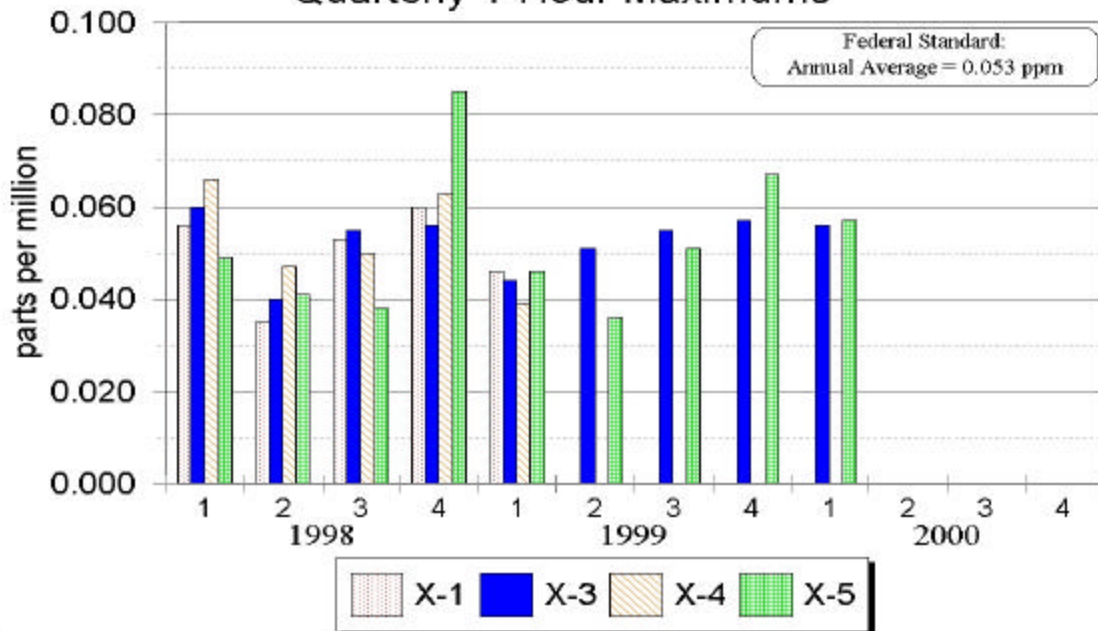
# Nitrogen Dioxide (NO2)

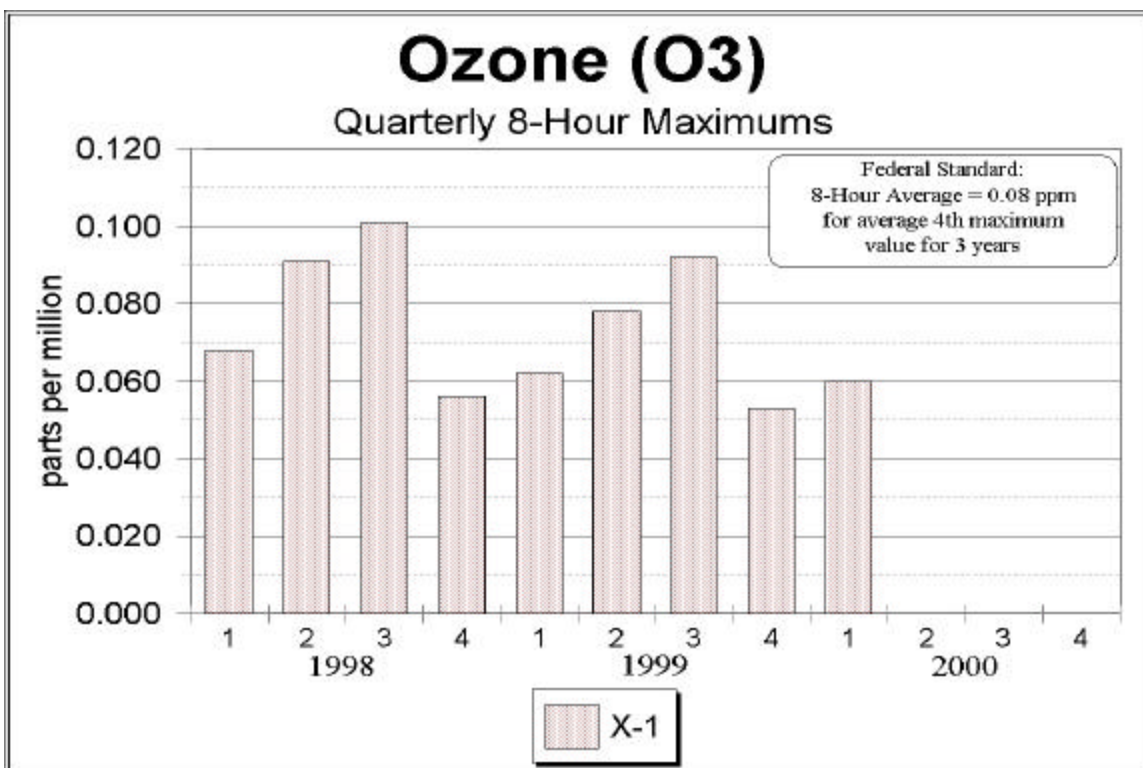
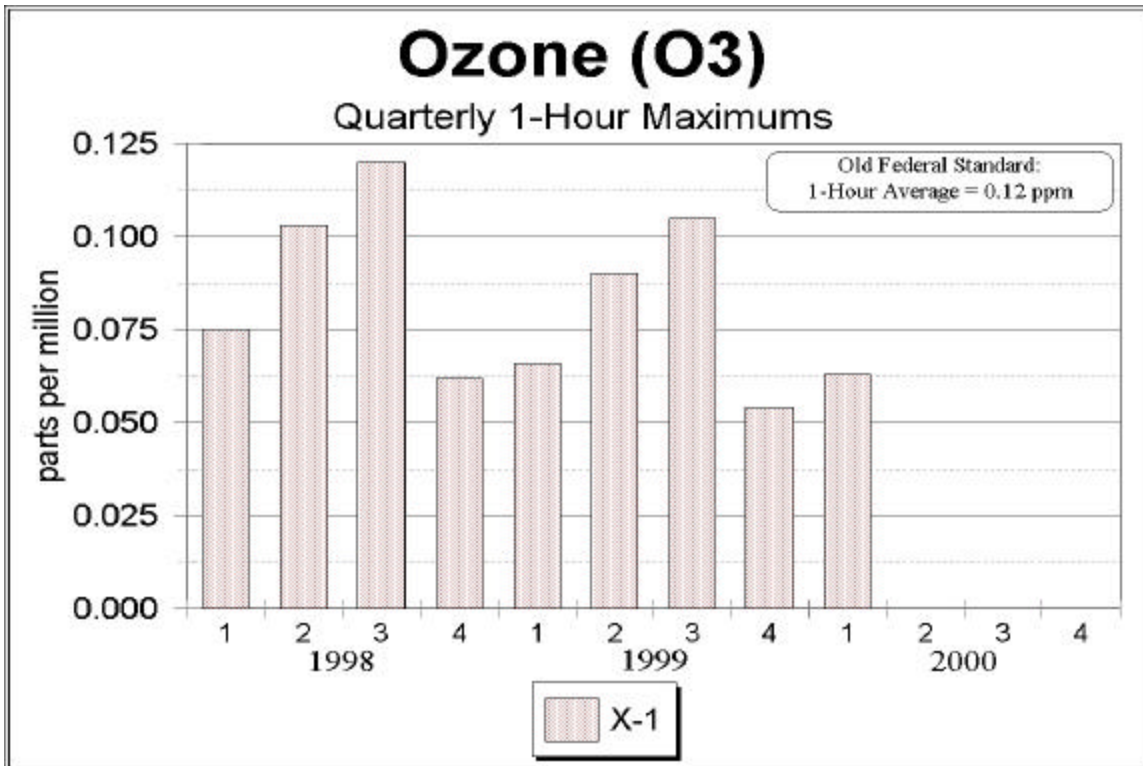
## Quarterly Arithmetic Averages

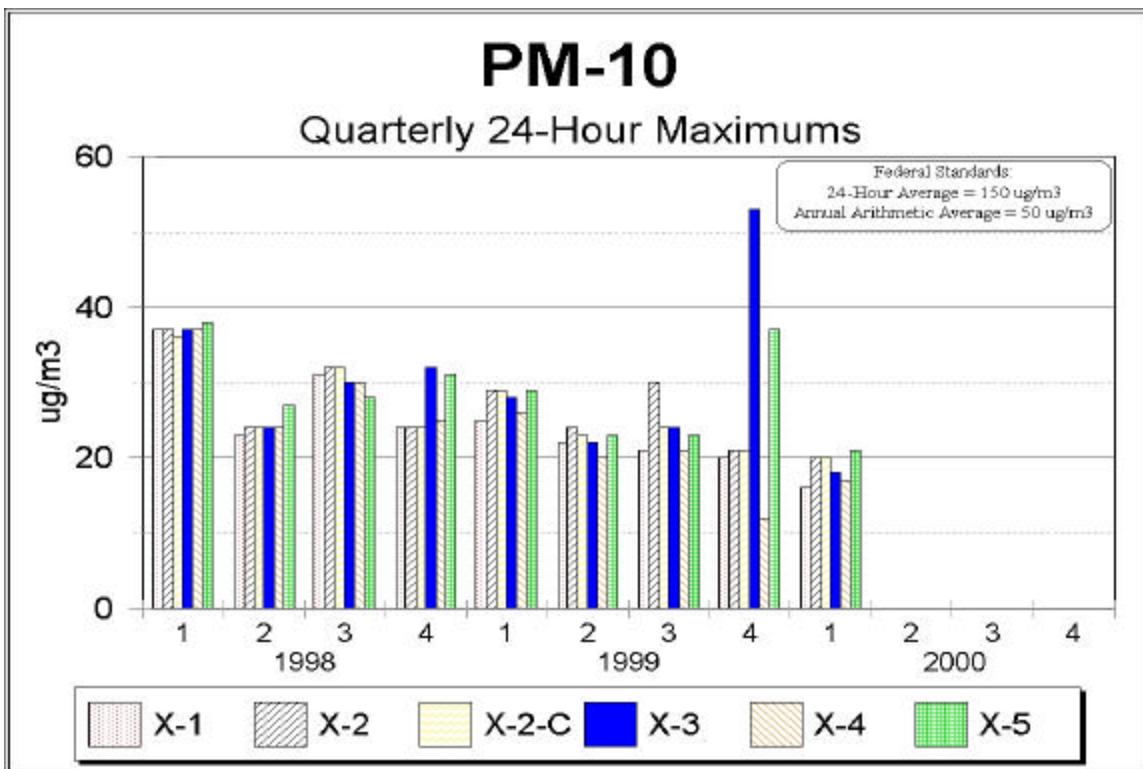
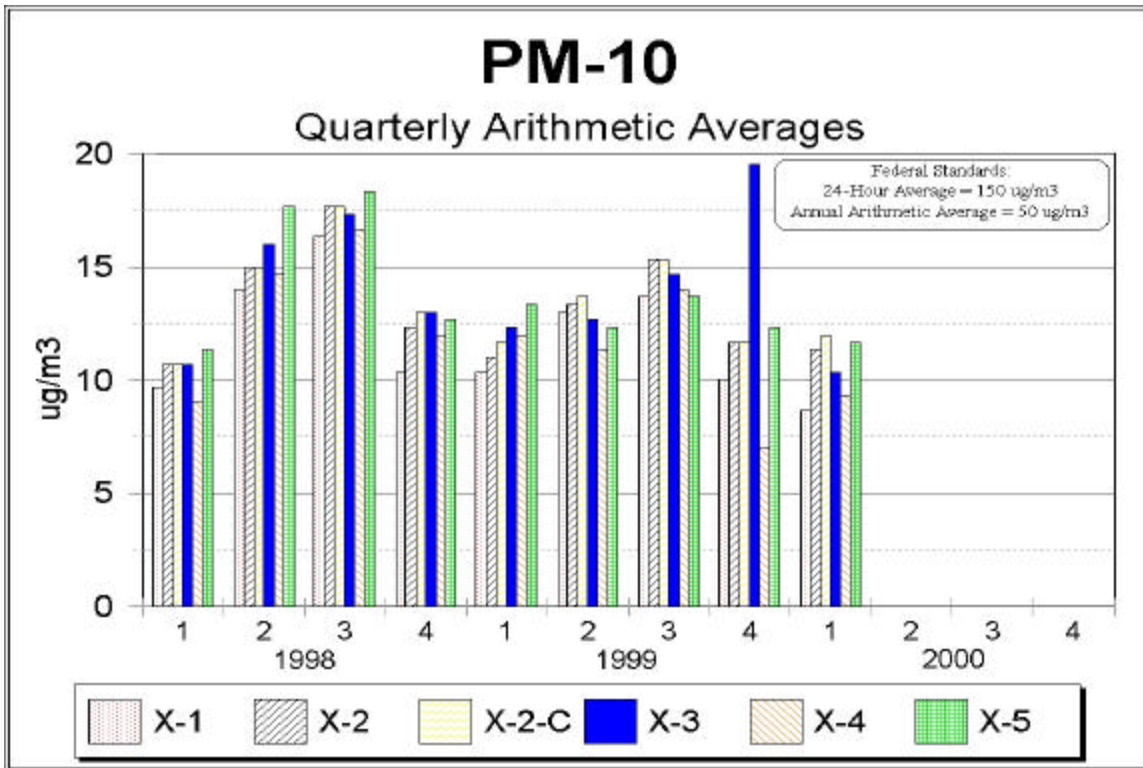


# Nitrogen Dioxide (NO2)

## Quarterly 1-Hour Maximums







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### 3. Tabular Data

Tables of current data are presented in this section.

## Environmental Surveillance Report

**TABLE A: GROSS ALPHA AND GROSS BETA RADIOACTIVITY CONCENTRATIONS  
IN SUSPENDED AIRBORNE PARTICULATE MATERIAL**

**FOURTH QUARTER 1999**

Location	Sampler Type	Number of Samples	Gross Alpha			Gross Beta			
			Mean pCi/m <sup>3</sup>	Max pCi/m <sup>3</sup>	Min pCi/m <sup>3</sup>	Mean pCi/m <sup>3</sup>	Max pCi/m <sup>3</sup>	Min pCi/m <sup>3</sup>	
<b>GROUND LEVEL SAMPLERS</b>									
Security area:	D-1	TSP	12	0.0063	0.0105	0.0022	0.0215	0.0342	0.0124
	D-3	TSP	12	0.0072	0.0108	0.0052	0.0273	0.0403	0.0111
Buffer zone:	D-9	TSP	13	0.0054	0.0085	0.0024	0.0218	0.0294	0.0123
	D-10	TSP	13	0.0061	0.0092	0.0023	0.0235	0.0342	0.0086
	D-13	TSP	12	0.0073	0.0117	0.0034	0.0249	0.0435	0.0102
	D-14	TSP	13	< 0.0064	0.0118	0.0008	0.0207	0.0356	0.0099
Perimeter:	D-6	TSP	7	0.0072	0.0111	0.0035	0.0268	0.0422	0.0147
	D-7	TSP	10	< 0.0061	0.0095	0.0005	0.0218	0.0412	0.0111
<b>ELEVATED SAMPLERS</b>									
Buffer zone:	E-1-T	TSP	12	< 0.0063	0.0103	0.0018	0.0232	0.0341	0.0102
	E-2-T	TSP	13	< 0.0062	0.0112	0.0014	0.0239	0.0365	0.0121
	E-1-P	PM10	13	0.0049	0.0093	0.0013	0.0175	0.0248	0.0077
	E-2-P	PM10	13	0.0049	0.0094	0.0012	0.0178	0.0247	0.0062
Perimeter:	E-3-T	TSP	13	< 0.0055	0.0098	0.0020	0.0229	0.0302	0.0102
	E-3-P	PM10	12	0.0046	0.0096	0.0017	0.0179	0.0256	0.0082
	E-4-T	TSP	10	< 0.0048	0.0089	0.0003	< 0.0197	0.0328	0.0102

pCi/m<sup>3</sup> = Picocuries per cubic meter

TSP = Total Suspended Particulates

PM10 = Particulate Material < 10 microns in diameter



# Environmental Surveillance Report

**TABLE A: GROSS ALPHA AND GROSS BETA RADIOACTIVITY CONCENTRATIONS  
IN SUSPENDED AIRBORNE PARTICULATE MATERIAL**

**FIRST QUARTER 2000**

Location		Sampler Type	Number of Samples	Gross Alpha			Gross Beta		
				Mean pCi/m <sup>3</sup>	Max pCi/m <sup>3</sup>	Min pCi/m <sup>3</sup>	Mean pCi/m <sup>3</sup>	Max pCi/m <sup>3</sup>	Min pCi/m <sup>3</sup>
<b>GROUND LEVEL SAMPLERS</b>									
Security area:	D-1	TSP	9	0.0078	0.0111	0.0030	0.0230	0.0317	0.0151
	D-3	TSP	12	< 0.0071	0.0105	0.0017	0.0205	0.0338	0.0085
Buffer zone:	D-9	TSP	8	< 0.0059	0.0080	0.0023	0.0202	0.0250	0.0116
	D-10	TSP	12	0.0062	0.0095	0.0024	0.0214	0.0333	0.0080
	D-13	TSP	13	< 0.0061	0.0120	0.0018	0.0205	0.0343	0.0080
	D-14	TSP	11	< 0.0059	0.0120	0.0019	0.0204	0.0305	0.0041
Perimeter:	D-6	TSP	12	< 0.0069	0.0133	0.0033	0.0215	0.0406	0.0071
	D-7	TSP	8	0.0069	0.0128	0.0026	0.0255	0.0330	0.0086
<b>ELEVATED SAMPLERS</b>									
Buffer zone:	E-1-T	TSP	11	0.0067	0.0113	0.0028	0.0198	0.0335	0.0077
	E-2-T	TSP	11	0.0079	0.0159	0.0030	0.0223	0.0350	0.0065
	E-1-P	PM10	13	< 0.0055	0.0104	0.0012	0.0167	0.0287	0.0064
	E-2-P	PM10	12	0.0055	0.0086	0.0028	0.0176	0.0266	0.0130
Perimeter:	E-3-T	TSP	11	< 0.0066	0.0121	0.0016	0.0191	0.0314	0.0070
	E-3-P	PM10	5	0.0044	0.0086	0.0017	0.0140	0.0220	0.0087
	E-4-T	TSP	8	0.0062	0.0126	0.0026	0.0207	0.0362	0.0084

pCi/m<sup>3</sup> = Picocuries per cubic meter

TSP = Total Suspended Particulates  
PM10 = Particulate Material < 10 microns in diameter

## Environmental Surveillance Report

**TABLE B: ALPHA SPECTROMETRIC ANALYSIS AND LONG-LIVED GROSS ALPHA RADIOACTIVITY  
CONCENTRATIONS IN SUSPENDED AIRBORNE PARTICULATE MATERIAL**

**SECOND QUARTER 1999**

Location	Sampler Type	<sup>239+240</sup> Pu pCi/m <sup>3</sup>	<sup>241</sup> Am pCi/m <sup>3</sup>	<sup>239+240</sup> Pu / <sup>241</sup> Am pCi/m <sup>3</sup>	<sup>234</sup> U / <sup>238</sup> U pCi/m <sup>3</sup>	Long-Lived Gross Alpha pCi/m <sup>3</sup>
D-1	TSP / Continuous	0.000017 " 0.000005	< 0.000009	---	---	0.0053
D-3	TSP / Continuous	0.000065 " 0.000008	< 0.000007	---	1.95 " 1.21	< 0.0036
D-6	TSP / Continuous	0.000005 " 0.000002	< 0.000005	---	1.02 " 0.41	< 0.0040
D-7	TSP / Continuous	< 0.000003	< 0.000004	---	---	< 0.0033
D-13	TSP / Continuous	0.000037 " 0.000005	< 0.000006	---	0.88 " 0.35	< 0.0048
E-1-T	TSP / Continuous	0.000011 " 0.000004	< 0.000005	---	---	< 0.0042
E-1-P	PM10 / Continuous	< 0.000003	< 0.000001	---	---	< 0.0030
E-3-T	TSP / Continuous	< 0.000003	< 0.000005	---	1.27 " 0.54	< 0.0045
E-3-P	PM10 / Continuous	< 0.000001	< 0.000002	---	---	< 0.0027
E-4-T	TSP / Continuous	< 0.000002	< 0.000009	---	0.84 " 0.34	< 0.0041

pCi/m<sup>3</sup> = Picocuries per cubic meter

TSP = Total Suspended Particulates

PM10 = Particulate Material < 10 microns in diameter

TSP - CL = Collocated Sampler - Total Suspended Particulates

PM10 - CL = Collocated Sampler - Particulate Material < 10 microns in diameter

## Environmental Surveillance Report

**TABLE B: ALPHA SPECTROMETRIC ANALYSIS AND LONG-LIVED GROSS ALPHA RADIOACTIVITY  
CONCENTRATIONS IN SUSPENDED AIRBORNE PARTICULATE MATERIAL**

**THIRD QUARTER 1999**

Location	Sampler Type	<sup>239+240</sup> Pu pCi/m <sup>3</sup>	<sup>241</sup> Am pCi/m <sup>3</sup>	<sup>239+240</sup> Pu / <sup>241</sup> Am pCi/m <sup>3</sup>	<sup>234</sup> U / <sup>238</sup> U pCi/m <sup>3</sup>	Long-Lived Gross Alpha pCi/m <sup>3</sup>
D-1	TSP / Continuous	0.000008 ± 0.000002	0.000004 ± 0.000002	2.0 ± 1.1	1.28 ± 0.47	< 0.0058
D-3	TSP / Continuous	0.000126 ± 0.000012	0.000009 ± 0.000003	14.0 ± 4.9	1.03 ± 0.63	0.0058
D-6	TSP / Continuous	< 0.000003	< 0.000006	---	0.83 ± 0.33	< 0.0057
D-7	TSP / Continuous	< 0.000004	< 0.000005	---	---	0.0060
D-13	TSP / Continuous	0.000037 ± 0.000005	< 0.000004	---	0.95 ± 0.31	0.0073
E-1-T	TSP / Continuous	0.000011 ± 0.000005	0.000004 ± 0.000002	2.8 ± 1.9	0.80 ± 0.25	0.0063
E-1-P	PM10 / Continuous	0.000002 ± 0.000001	< 0.000001	---	---	0.0047
E-3-T	TSP / Continuous	< 0.000002	< 0.000002	---	0.80 ± 0.40	< 0.0054
E-3-P	PM10 / Continuous	< 0.000002	< 0.000002	---	0.60 ± 0.36	0.0044
E-4-T	TSP / Continuous	< 0.000002	< 0.000002	---	0.86 ± 0.30	< 0.0049

pCi/m<sup>3</sup> = Picocuries per cubic meter

TSP = Total Suspended Particulates

PM10 = Particulate Material < 10 microns in diameter

TSP - CL = Collocated Sampler - Total Suspended Particulates

PM10 - CL = Collocated Sampler - Particulate Material < 10 microns in diameter

# Environmental Surveillance Report

**TABLE D: INORGANIC GASEOUS COMPOUNDS IN AIR**

**FIRST QUARTER 2000**

Compound	North Site (X-1) (Hourly values)			Southeast Site (X-3) (Hourly values)			West Site (X-5) (Hourly values)		
	Avg ppm	Max ppm	# Hours	Avg ppm	Max ppm	# Hours	Avg Ppm	Max ppm	# Hours
<b><u>JANUARY 2000</u></b>									
Nitric Oxide (NO)	---	---	---	0.009	0.069	487	0.010	0.069	688
Nitrogen Dioxide (NO <sub>2</sub> )	---	---	---	0.013	0.045	487	0.010	0.048	688
Ozone (O <sub>3</sub> )	0.026	0.048	730	---	---	---	---	---	---
<b><u>FEBRUARY 2000</u></b>									
Nitric Oxide (NO)	---	---	---	0.007	0.081	663	0.009	0.053	649
Nitrogen Dioxide (NO <sub>2</sub> )	---	---	---	0.011	0.052	663	0.009	0.057	649
Ozone (O <sub>3</sub> )	0.033	0.058	694	---	---	---	---	---	---
<b><u>MARCH 2000</u></b>									
Nitric Oxide (NO)	---	---	---	0.006	0.067	699	0.009	0.066	709
Nitrogen Dioxide (NO <sub>2</sub> )	---	---	---	0.010	0.056	699	0.011	0.057	709
Ozone (O <sub>3</sub> )	0.036	0.063	741	---	---	---	---	---	---

ppm = Parts per million  
N/A = Not available

# Environmental Surveillance Report

## TABLE E: SUSPENDED PARTICULATE MATERIAL IN AIR

### FIRST QUARTER 2000

Item	North Site (X-1) (Daily values)			Northeast Site (X-2) (Daily values)			Southeast Site (X-3) (Daily values)			South Site (X-4) (Daily values)			West Site (X-5) (Daily values)		
	Avg ug/m <sup>3</sup>	Max ug/m <sup>3</sup>	#	Avg ug/m <sup>3</sup>	Max ug/m <sup>3</sup>	#	Avg ug/m <sup>3</sup>	Max ug/m <sup>3</sup>	#	Avg ug/m <sup>3</sup>	Max ug/m <sup>3</sup>	#	Avg ug/m <sup>3</sup>	Max ug/m <sup>3</sup>	#
<b>JANUARY 2000</b>															
TSP-P	27	40	2	29	38	3	22	24	3	35	55	6	40	80	3
PM10-P	9	16	6	12	18	6	11	17	6	10	17	6	12	21	5
TSP-CL	31	51	6												
PM10-CL				12	18	6									
<b>FEBRUARY 2000</b>															
TSP-P	39	39	1	25	32	2	21	21	1	23	35	4	43	54	3
PM10-P	9	16	4	13	20	4	11	18	4	10	16	4	12	19	4
TSP-CL	23	37	4												
PM10-CL				12	20	4									
<b>MARCH 2000</b>															
TSP-P	22	22	1	23	23	1	20	25	2	23	35	5	N/A	N/A	0
PM10-P	8	11	2	9	13	6	9	12	6	8	11	5	11	19	6
TSP-CL	N/A	N/A	0												
PM10-CL				9	13	6									

ug/m<sup>3</sup> = Micrograms per cubic meter  
 N/A = Not available

TSP = Total Suspended Particulates (P = primary, CL = collocated)  
 PM10 = Particulate Matter < 10 microns in diameter (P = primary, CL = collocated)

# Environmental Surveillance Report

**TABLE F: METALS IN AIR**

**FIRST QUARTER 2000**

Metal	North Site (X-1) (Quarterly composites) ug/m <sup>3</sup>	Northeast Site (X-2) (Quarterly composites) ug/m <sup>3</sup>	Southeast Site (X-3) (Quarterly composites) ug/m <sup>3</sup>	South Site (X-4) (Quarterly composites) ug/m <sup>3</sup>	West Site (X-5) (Quarterly composites) ug/m <sup>3</sup>
Beryllium -- TSP-P	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011
Beryllium -- PM10-P	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011
Beryllium -- TSP-CL	< 0.0011				
Beryllium -- PM10-CL		< 0.0011			
Uranium -- TSP					
Uranium -- PM10					
Uranium -- TSP-CL					
Uranium -- PM10-CL					

ug/m<sup>3</sup> = Micrograms per cubic meter

N/A = Not available

TSP = Total Suspended Particulates (P = primary, CL = collocated)

PM10 = Particulate Matter < 10 microns in diameter (P = primary, CL = collocated)

# Environmental Surveillance Report

## TABLE G: VOLATILE ORGANIC COMPOUNDS IN AIR

### FIRST QUARTER 2000

Compound	CAS #	TLV ppm	North site (X-1) (Daily averages)		Northeast site (X-2) (Daily averages)		Southeast site (X-3) (Daily averages)		South site (X-4) (Daily averages)		West site (X-5) (Daily averages)	
			Avg ppb	Max ppb	Avg ppb	Max ppb	Avg ppb	Max ppb	Avg ppb	Max ppb	Avg ppb	Max ppb
Freon 134a	811-97-2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Freon 22	75-45-6	1000	0.00	0.00	0.02	0.10	0.00	0.07	0.00	0.00	0.01	0.07
Freon 112	75-71-8	1000	0.47	0.66	0.36	0.51	0.32	0.50	0.40	0.65	0.23	0.36
Chloromethane	74-87-3	50	0.17	0.55	0.09	0.28	0.10	0.25	0.14	0.35	0.11	0.33
Freon 114	76-14-2	1000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vinyl chloride	75-01-4	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,3-Butadiene	106-99-0	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloroethane	75-00-3	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Freon 123	306-83-2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Freon 11	75-69-4	1000	0.08	0.14	0.12	0.18	0.13	0.22	0.12	0.18	0.06	0.09
Vinylidene chloride	75-35-4	5	0.01	0.13	0.01	0.03	0.01	0.03	0.01	0.03	0.00	0.04
Dichloromethane	75-09-2	50	0.01	0.05	0.04	0.12	0.05	0.15	0.04	0.15	0.01	0.06
Freon 113	76-13-1	1000	0.09	0.11	0.09	0.10	0.08	0.10	0.09	0.11	0.05	0.07
Methyl tert-butyl ether	1634-04-4	40	0.01	0.20	0.02	0.10	0.01	0.09	0.02	0.13	0.00	0.00
1,1-Dichloroethane	75-34-3	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ppb = Parts per billion  
 ppm = Parts per million  
 nd = Not detected

N/A = Not available  
 TLV = ACGIH Threshold Limit Value  
 CAS # = Chemical Abstracts Service number

## Environmental Surveillance Report

**TABLE G: VOLATILE ORGANIC COMPOUNDS IN AIR (continued)**

**FIRST QUARTER 2000**

Compound	CAS #	TLV Ppm	North site (X-1) (Daily averages)		Northeast site (X-2) (Daily averages)		Southeast site (X-3) (Daily averages)		South site (X-4) (Daily averages)		West site (X-5) (Daily averages)	
			Avg ppb	Max ppb	Avg ppb	Max ppb	Avg ppb	Max ppb	Avg ppb	Max ppb	Avg ppb	Max Ppb
Chloroform	67-66-3	10	0.02	0.12	0.02	0.07	0.02	0.06	0.02	0.08	0.01	0.08
1,2-Dichloroethane	107-06-2	10	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00
1,1,1-Trichloroethane	71-55-6	350	0.08	0.13	0.06	0.09	0.05	0.08	0.07	0.11	0.05	0.07
Carbon tetrachloride	56-23-5	5	0.14	0.18	0.11	0.14	0.10	0.14	0.13	0.16	0.08	0.11
Benzene	71-43-2	0.1	0.23	0.44	0.32	0.53	0.29	0.50	0.28	0.48	0.13	0.31
Trichloroethene	79-01-6	50	0.01	0.08	0.02	0.09	0.02	0.08	0.03	0.12	0.00	0.03
1,1,2-Trichloroethane	79-00-5	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Toluene	108-88-3	50	0.29	0.63	0.38	0.83	0.36	0.92	0.31	0.75	0.12	0.31
Tetrachloroethene	127-18-4	25	0.02	0.08	0.03	0.06	0.02	0.06	0.03	0.06	0.01	0.03
Chlorobenzene	108-90-7	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ehtyl benzene	100-41-4	100	0.04	0.16	0.04	0.12	0.04	0.11	0.05	0.15	0.03	0.08
m- + p-Xylene	N/A	100	0.09	0.30	0.10	0.36	0.11	0.40	0.10	0.53	0.04	0.12
Styrene	100-42-5	50	0.01	0.09	0.01	0.05	0.01	0.05	0.01	0.06	0.00	0.04
1,1,2,2-Tetrachloroethane	79-34-5	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
o-Xylene	95-47-6	100	0.04	0.11	0.04	0.10	0.04	0.12	0.04	0.15	0.02	0.05

ppb = Parts per billion  
ppm = Parts per million  
nd = Not detected

N/A = Not available  
TLV = ACGIH Threshold Limit Value  
CAS # = Chemical Abstracts Service number



## **Description of Precipitation and Surface Water Sampling Done This Quarter**

### **Precipitation**

**Analysis of 1<sup>st</sup> quarter 2000 samples is incomplete. These data will appear in the next report.**

### **Surface Water**

For surface water, sampling for the 1st quarter of 2000 was done as follows:

3 samples of the Sewage Treatment Plant Influent were collected, on 1/12/2000, 2/16/2000 and 3/15/2000;

1 Sewage Treatment Plant Effluent sample was collected, on 2/16/2000;

1 pre-discharge sample was collected from Pond A-4 - on 2/28/2000;

2 pre-discharge samples were collected from Pond B-5 - on 1/10/2000 and 2/28/2000;

1 sample was collected from Walnut Creek at Indiana Street, on 3/23/2000;

1 sample was collected from Woman Creek at Indiana Street, on 3/15/2000.

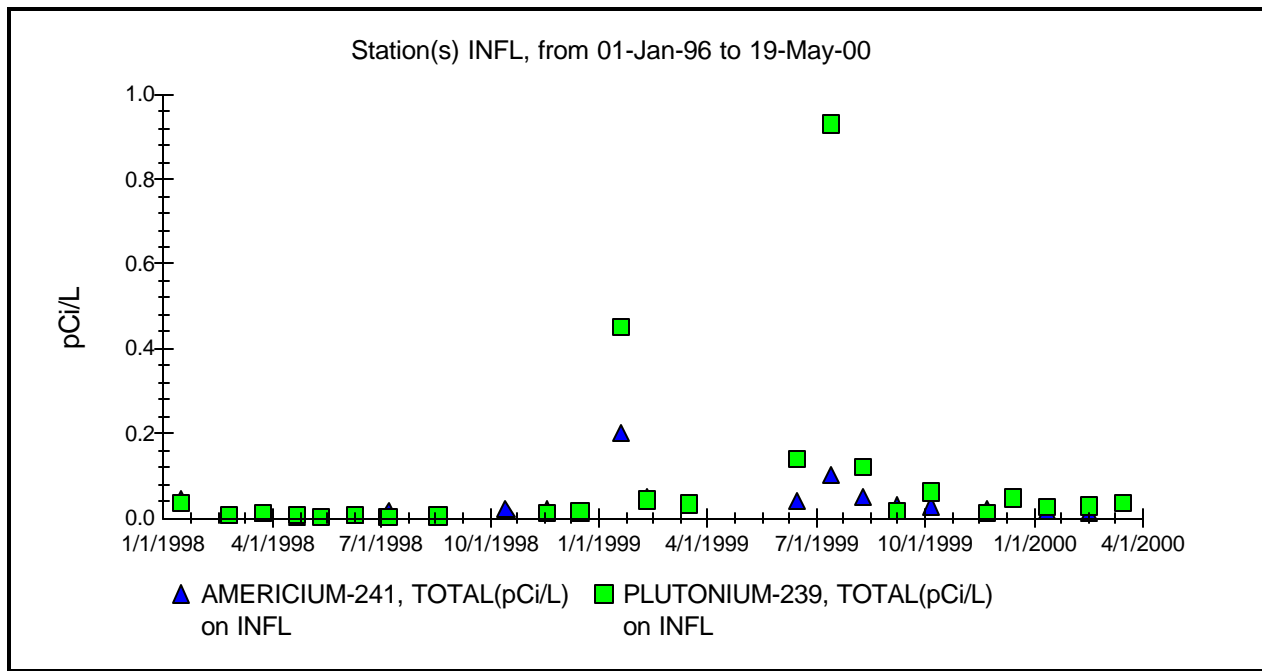
The results of these sampling events are shown in Table H (all but organic results) and Table I (organic results). In general, the results were all below levels of concern.

In addition to the above routine sampling, special nitrate sampling in the Walnut Creek drainage continued. A summary of the data, which will cover a full 12 months of monitoring, will be provided in the 2<sup>nd</sup> Quarter 2000 ESR.

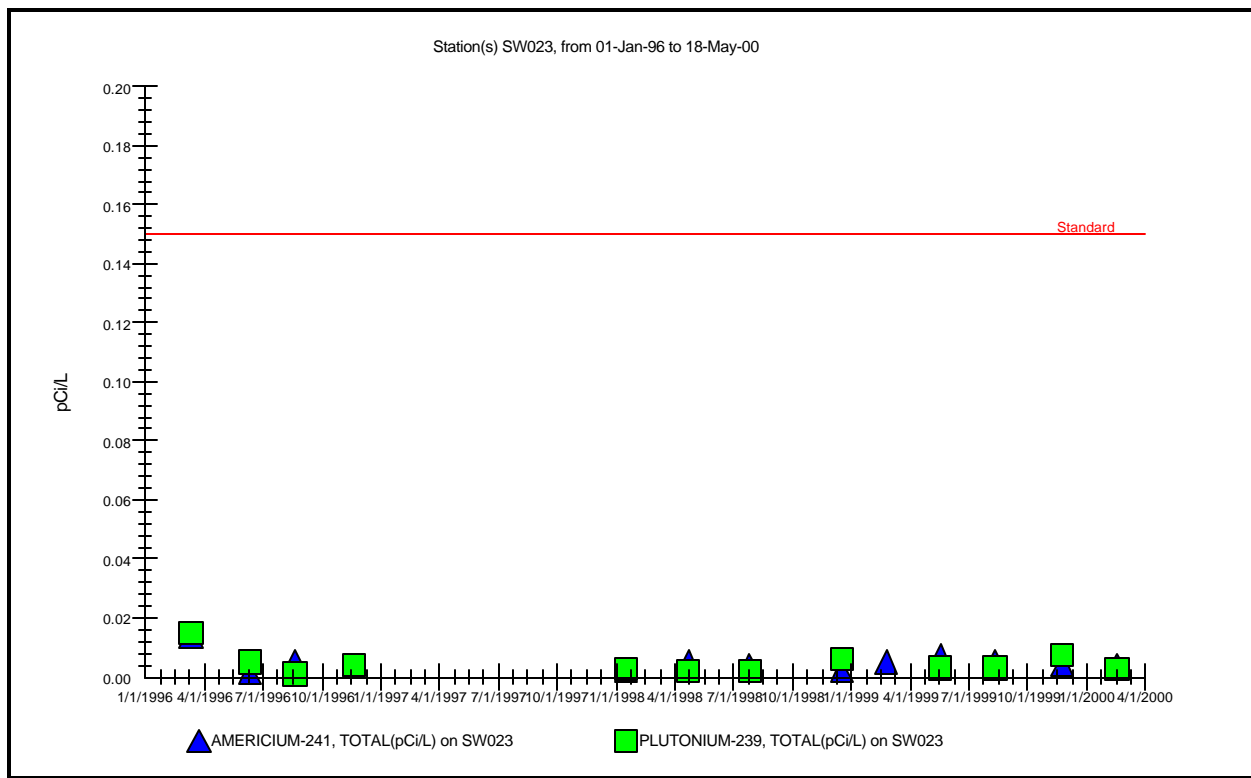
### **Notable Surface Water Results**

None of the results presented in Table H. exceed water quality standards or are of immediate concern. To present the results for the most critical analytes - americium and plutonium, in context with historical values, graphs of the stations sampled this quarter are presented below (no Am or Pu analyses are performed for Indiana Street stations).

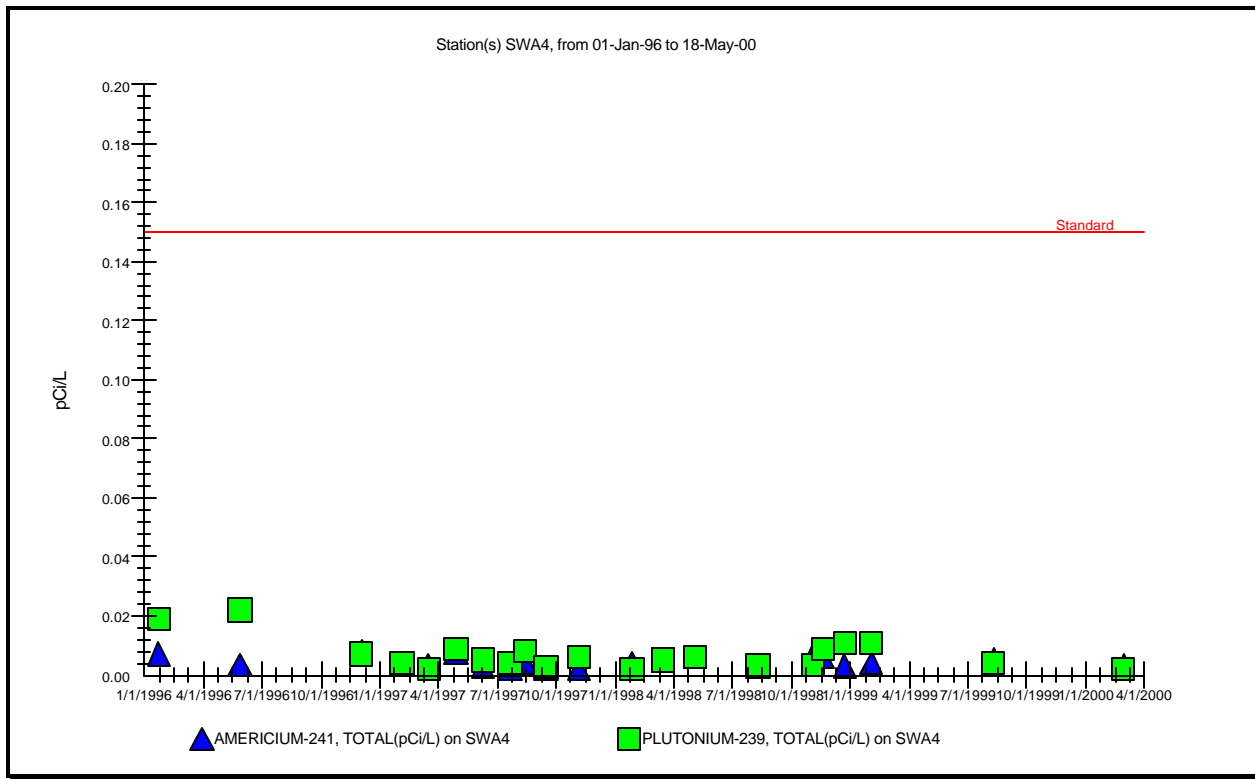
## Graphs of Selected Surface Water Results



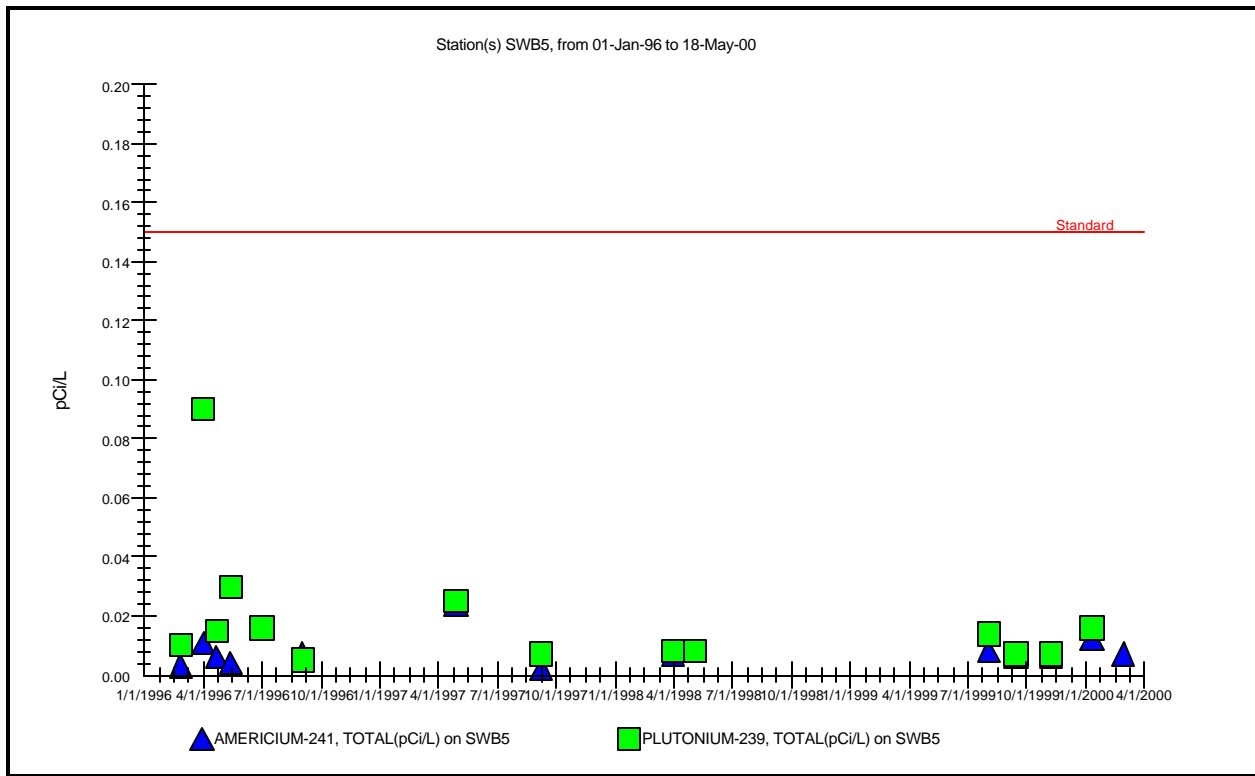
**Figure SW1 - Am and Pu Concentrations in STP Influent**



**Figure SW2 - Am and Pu Concentrations in STP Effluent**



**Figure SW3 - Am and Pu Concentrations in Pond A4**



**Figure SW4 - Am and Pu Concentrations in Pond B5**

## GLOSSARY

Am	Americium
APCD	Air Pollution Control Division
AQCC	Air quality control commission
B	Found in blank
Be	Beryllium
CAS	Chemical abstracts service number
CDPHE	Colorado Department of Public Health and Environment
EPA	Environmental Protection Agency
H	Exceeds holding time
J	Detected but below practical quantitative limit
LARS	Laboratory and Radiation Services
MCL	Maximum contaminant level (below MCL is safe)
MDL	Minimum detection level
Nd	Not detected
pCi/l	Picocuries per liter
PM	Particulate material
ppb	Parts per billion
ppm	Parts per million
PQL	Practical quantitative level
Pu	Plutonium
QNS	Quantity not sufficient
RFETS	Rocky Flats Environmental Technology Site
RFPU	Rocky Flats Program Unit
SVOC	Semivolatile organic compounds
TLV	ACGIH Threshold limit value
TSP	Total Suspended Particulate
TSS	Total suspended solids
ug/m <sup>3</sup>	Micrograms per cubic meter
U	Uranium
VOCs	Volatile organic compounds
WQCC	Water Quality Control Commission
WQCD	Water Quality Control Division