

## APPENDIX A

### GLOSSARY OF TERMS AND ACRONYMS<sup>a</sup>

(Words printed in italics refer to a separate definition.)

**903 Pad/903 Area** – an outside area at the Rocky Flats Plant used from 1958 to 1967 for storage of 55-gallon metal drums containing *plutonium*-contaminated waste oil. The drums were removed after leakage and dispersion of contaminated soil were discovered; in 1969, the previous drum storage area was covered with an asphalt pad.

**Actinide** – the heaviest elements, starting with actinium and continuing to the end of the periodic table. *Transuranic* elements are a subset of the actinide elements and include those with atomic numbers larger than *uranium*. Actinide elements are all radioactive.

**Accuracy** – the ability of an *analytical method* to measure the true *concentration* of a *contaminant* (see *bias*, *precision*).

**Activity** – the rate of radioactive decay, expressed as *disintegrations* per second (a unit called the *Becquerel*) or in units of *curies*.

**AEC – Atomic Energy Commission.** The Federal agency overseeing the Rocky Flats Plant operation in the earliest years of its history. In 1975, the AEC became part of the newly formed Energy Research and Development Administration (*ERDA*) (see *DOE*).

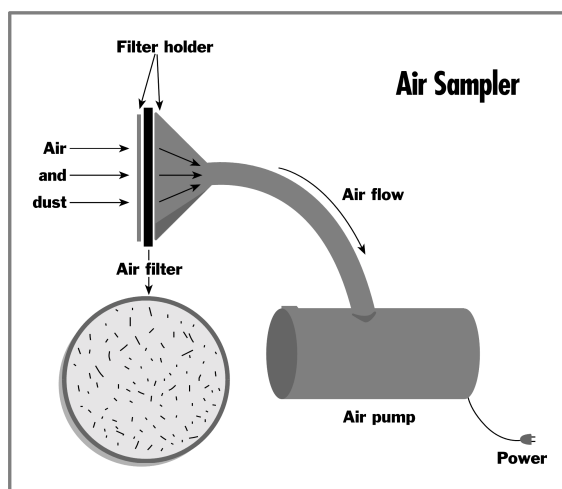
**Aerodynamic diameter (AD)** – the physical diameter of a particle of unit density (1 gram per cubic centimeter) that has the same gravitational settling velocity as the particle of interest.

**Aerosol** – a suspension of solid and/or liquid *particles* in a gas (like air).

**Air filter** – a solid matrix used in an air sampler to collect *particulates* from the air that is drawn by an air pump through the filter. Air filters are least efficient for particle sizes of about 0.3 *microns* and collect smaller and larger *particles* more efficiently.

**Aliquot** – a fraction of a substance taken for sampling purposes.

**Alpha particle (*ionizing radiation*)** – a particle emitted from the nucleus of some radioactive atoms when they decay. An alpha particle is



<sup>a</sup> A units conversion table for radioactivity concentrations is included in [Appendix H](#).

essentially a helium atom nucleus. It carries much more energy than [gamma](#) or [beta radiation](#), and it deposits that energy very quickly while passing through matter. When alpha particles are being measured in an environmental sample, they can be absorbed by the sample itself unless the sample has been prepared to be very thin. Corrections can be applied for this self-absorption of alpha particles in some samples (e.g., air filters). Plutonium-239 emits alpha particles.

**Ambient air monitoring** – [monitoring](#) of the air outside of buildings (see [effluent monitoring](#)).

**Americium (Am)** – a manmade radioactive element (atomic number 95) that is a by-product of the [plutonium](#) recovery process. Historical releases of americium and plutonium from the Rocky Flats Plant have contributed the largest estimated doses to the public.

**Analytical method** – a laboratory test used to detect the amount of a [contaminant](#).

**Anisokinetic sampling** – a mismatch between the air or fluid velocity in the sampling probe and that in the stack releasing airborne effluents. It is a source of [bias](#) in effluent sampling. In contrast, isokinetic sampling, in which the two velocities are equal, results in an unbiased sample of the stack effluent.

**Atomic number** – the number of protons in the nucleus of an atom.

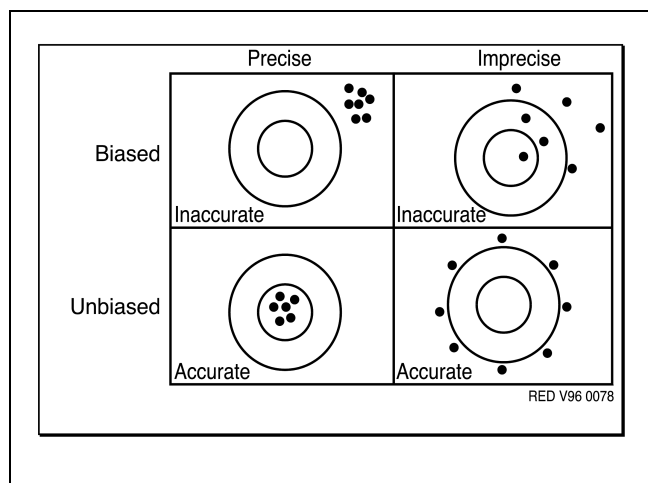
**Background radioactivity** – radioactive elements in the natural environment including those in the crust of the earth (like radioactive potassium, [uranium](#), and [thorium isotopes](#)) and those produced by cosmic rays.

**Beryllium (Be)** – solid metallic element extracted from the mineral beryl. Beryllium is used in nuclear weapons and was processed at the Rocky Flats Plant.

**Beta particle** ([ionizing radiation](#)) – an electron ejected from the nucleus of a decaying atom. Energetic beta particles penetrate the dead skin layer. The beta particle is not stopped in matter as quickly as an [alpha particle](#).

**Bias** – a systematic distortion of measurements that makes the results inaccurate. Accuracy is a measure of how close a value is to the true number, or a measure of the correctness of a measurement. Precision refers to the ability of an [analytical method](#) to reproduce the same result upon repeated trials.

**Biota** – living plants and animals.



**Blanks** – samples containing extremely low [concentrations](#) of a [contaminant](#), which are used to assess [contamination](#) from laboratory equipment and other steps in an analytical procedure.

**Bq** – abbreviation for the [radioactivity](#) unit, Becquerel (*see* [curie](#)).

**Buffer zone** – the 6150-acre (2490-hectare) area between the Rocky Flats inner [security fence](#), which encloses the [industrial area](#), and the current [site boundary](#). The buffer zone is considered part of [onsite](#) areas (*see* [offsite](#)).

**Carbon tetrachloride (CCl<sub>4</sub>)** – clear, colorless, nonflammable liquid solvent used in a wide range of industrial and chemical applications. At Rocky Flats, this solvent was used to clean [plutonium](#) processing machinery and instruments.

**Cascade impactor** – a type of air sampler designed to separately collect different [particle](#) sizes.

**CDPHE** – Colorado Department of Public Health and Environment. The State agency that initiated and manages this study. Previously called the Colorado Department of Health (CDH).

**cfm** – cubic feet per minute, a measure of the rate of flow of a liquid or gas.

**Chemical symbols** – abbreviations for different elements and compounds. Examples of symbols for elements include U for [uranium](#), Pu for [plutonium](#), O for oxygen, C for carbon, and Cl for chlorine. Examples of symbols for compounds include CCl<sub>4</sub> for [carbon tetrachloride](#) and PuO<sub>2</sub> for plutonium dioxide.

**ChemRisk** – a division of McLaren/Hart Environmental Engineering, the *contractor* selected in July 1990 for the Phase I Rocky Flats Toxicologic Review and Dose Reconstruction.

**Collection efficiency** – the percentage of the total amount of a [contaminant](#) present in ambient air that is collected by an air sampler. Collection efficiency is strongly dependent upon the size of the [particles](#) that carry the [contamination](#) and other factors, such as wind speed.

**Compositing** – a combining of samples before analysis, usually done to improve [sensitivity](#) and/or reduce analytical cost. A quarterly composite of air filters is comprised of all filters collected within 3 months.

**Concentration** – the amount of a material of interest in a given volume or mass.

**Contaminant** – a substance, often a potentially hazardous material, that is present as an impurity in another substance. For example, [plutonium](#) is a contaminant in the air around the 903 Area at the Rocky Flats Plant. *See* [Materials of concern](#).

**Contamination** – unwanted [radioactive](#) or other material or the [deposition](#) of radioactive material in the environment or other place where it may make surfaces or equipment unsuitable for some specific use.

**Contractor** – in this report, contractor refers to the company operating the Rocky Flats Plant for the Federal Government. For most of its history, this was Dow Chemical Company (1952–1974), followed by Rockwell International (1975–1989), then EG&G Rocky Flats (1990–March 1995), and Kaiser-Hill Company (April 1995–present). (The study period for this Rocky Flats dose reconstruction is 1952–1989.)

**Correlation coefficient** – a statistic that describes the degree of association between two sets of data. In this study, the correlation coefficient is used to compare predicted and observed [concentrations](#) of a material at various times or locations in the environment. The correlation coefficient can range from –1 to +1. Relatively large values for the correlation coefficient are obtained when the data are positively correlated, that is, large values of the first data set (e.g., predictions) are associated with large values of the second data set (e.g., observed measurements). Large negative correlation coefficients are obtained when large values of one data set are associated with small values of another data set. If the sets of data are unrelated, the correlation coefficient would be near zero.

**Counting error** – the uncertainty in the measurement of an amount of [radioactivity](#) because of the random nature of radioactive decay and electronic noise in the detector (instrument background). Counting error decreases when the sample and background are counted for a long time and when instrument background is minimized.

**cpm** – counts per minute.

**CSU** – Colorado State University. Located in Fort Collins, Colorado, CSU has conducted a number of environmental research projects to understand the fate and transport of materials released from Rocky Flats.

**Curie** – a traditional unit used to describe an amount of [radioactivity](#). The curie is equal to  $3.7 \times 10^{10}$  [disintegrations](#) per second (dps). The internationally recognized unit of radioactivity is the [Becquerel](#) (Bq), which is 1 dps. Because of its historical context, this report uses traditional units for radioactivity. For environmental samples, the microcurie ( $10^{-6}$  Ci), the picocurie ( $10^{-12}$  Ci), or the femtocurie ( $10^{-15}$  Ci) are often used. A units conversion table for radioactivity [concentrations](#) is included in [Appendix H](#).

**Deposition** – the transfer of [particles](#) from ambient air to ground and vegetation surfaces or from water to [sediment](#).

**Deposition velocity** – the proportion of the rate of [deposition](#) of [radioactive material](#) on the ground to the [concentration](#) of the material in the air at a specified reference height. The dry deposition velocity is a function of the [particle](#) size and density of the radioactive material (the larger the particle size, the greater the deposition velocity); the nature of the surface (e.g., snow-covered, lawn, tree-covered); and meteorological variables (e.g., the higher the wind speed, the higher the deposition velocity).

**Detection level** – the lowest amount of a [contaminant](#) that can be detected with a certain degree of confidence by an [analytical method](#). For [radioactivity](#) measurements, “detection level” is the same as “minimum detectable activity” (see [minimum detectable concentration](#)).

**Disintegration** – one decay of a radioactive atom (see [dpm](#)).

**DOE** – U.S. Department of Energy. The DOE is responsible for the sites in the U.S. at which weapons materials have been produced or handled, including the Rocky Flats Plant. Generally, private [contractors](#), such as DuPont, Westinghouse, or Dow Chemical Company, have operated the weapons facilities for the DOE (see [ERDA](#), [AEC](#)).

**Dose** – a general term denoting the quantity of [radiation](#) or energy that is absorbed by the body. There are technical terms with specific definitions, such as absorbed dose, equivalent dose, and effective dose. Other dose terms will be defined in [Radiological Assessments Corporation](#) reports that present dose results.

**Dose reconstruction** – a study in which historical information is used to estimate the amounts of toxic materials released from a facility, how the materials could have moved [offsite](#), and the [exposure](#) of the public to those materials. Dose reconstruction involves past releases, not present or future releases. The study period for this Rocky Flats dose reconstruction is 1952–1989.

**Dow Chemical Company** – the [contractor](#) operating the Rocky Flats Plant from startup through 1974.

**dpm** – abbreviation for [disintegrations](#) per minute, a rate of radioactive decay. There are 2.22 dpm per picocurie (see [curie](#)).

**Dustfall** – a term used in the past by the Rocky Flats site survey team to describe a type of sample collected by sticky paper or [gummed film](#). The sample collected [deposition](#) of weapons [fallout](#) as well as deposition of [particulates](#) released from Rocky Flats.

**Effluent** – a gas or liquid that flows from a process, building, or site into the surrounding environment.

**Effluent monitoring** – the measurement of a [contaminant](#) or other property (e.g., flow rate) in the effluent (air or liquid discharged) from a building or holding pond.

**EG&G Rocky Flats** – the [contractor](#) operating Rocky Flats from 1990 through 1995.

**EML** – Environmental Measurements Laboratory (see [HASL](#)).

**Environmental monitoring** – the measurement of material in the environment at regular time intervals. [Monitoring](#) for [contaminants](#) often involves collecting an environmental sample (like stream water), preparing the sample in the laboratory, and analyzing the prepared sample using an analytical instrument.

**Environmental transport** – the mechanisms by which substances can be carried from their source to other points in the environment. Surface water runoff and air dispersion by wind are examples of environmental transport mechanisms.

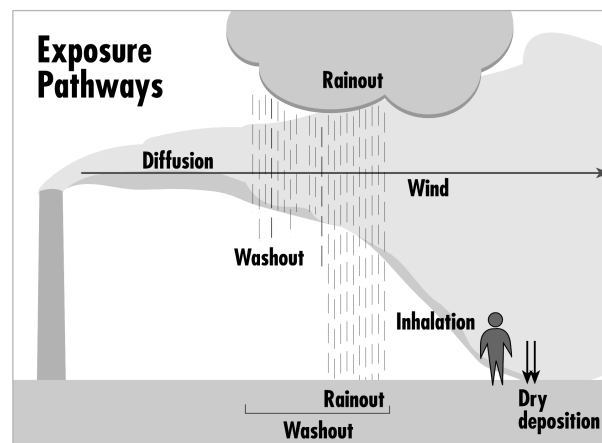
**EPA** – U.S. Environmental Protection Agency.

**ERDA** – Energy Research and Development Administration (see [AEC](#), [DOE](#)).

**Exposure** (to hazardous substances) – conditions or circumstances causing humans or other living things to come into contact with toxic materials.

**Exposure pathways** – the means by which humans are exposed to toxic substances. The key exposure pathways are air and water, with most exposures via inhalation, drinking water, crops, other foods, and direct [radiation](#).

**Fallout** – airborne [particles](#) containing [radioactive material](#) that fall through the atmosphere and are deposited on the earth's surface following the detonation of nuclear explosives (see [deposition](#), [dustfall](#)).



**fCi** – femtocurie (see [curie](#)).

**FIDLER** – Field Instrument for the Determination of Low-Energy Radiation.

**Flux** – the amount of a [contaminant](#) moving through a defined area per unit time.

**Gamma radiation** ([ionizing radiation](#)) – high energy electromagnetic [radiation](#) emitted from a decaying atomic nucleus. Gamma rays are similar to medical x-rays, but they are emitted at very specific energies characteristic of their decaying atoms. They penetrate tissue more effectively than [beta](#) or [alpha](#) particles, leaving ions in their path to potentially cause cell damage. Gamma rays travel relatively long distances in air and leave a low density of ionization damage in their track through tissue. Gamma-emitting [radionuclides](#) are hazards from outside the body because their radiation penetrates to living tissue, but they are of less concern than alpha-emitters when ingested or inhaled because their ionizing energy is deposited less effectively in tissue.

**GBq** – abbreviation for the [radioactivity](#) unit, gigabecquerel, or  $10^9$  Bq (see [Bq](#)).

**GM** – geometric mean. A measure of the central point of a distribution; typically used to describe [skewed](#) distributions (e.g., lognormal distributions).

**Grab samples** – samples, usually of relatively small volume, that are taken at random or at preselected frequencies. These samples define the [concentration](#) of a [contaminant](#) at the specific time when they are collected and differ from continuous or proportional samples that reflect a time-averaged concentration.

**Great Western Reservoir (GWR)** – a reservoir in northeastern Jefferson County about 1.5 miles (2.4 kilometers) east of the Rocky Flats Plant. The GWR has an earthen dam that was built in 1904 and originally was designed to supply water for irrigation. The lake is owned and operated by the city of Broomfield, which is located 2 miles (3.2 kilometers) to the northeast of GWR and has supplied water to the city of Broomfield since 1955. The full capacity of the lake is about 3250 acre-feet. At the present time, most of the inflow to the reservoir comes from a canal flowing from the southeast, which does not pass through the Rocky Flats Plant. Walnut Creek, which flows from the plant, previously flowed into the GWR, but in 1992 it was diverted around the reservoir.

**Gross alpha measurements** – the total (or gross) amount of [alpha particles](#) in an environmental sample. Besides materials released from the Rocky Flats Plant, like [plutonium](#) and [americium](#), naturally occurring substances in the environment, like [uranium](#) and [thorium](#), emit alpha particles and would contribute to the gross alpha measurement.

**GSD** – geometric standard deviation. A measure of the spread of a [skewed](#) distribution. A large GSD indicates a wide range of measured or calculated values.

**Gummed film, gummed paper** – a flat, sticky [monitoring medium](#) historically used (especially in the 1950s and 1960s) to collect [deposition](#) of radioactive [particles](#) in the environment. The film was replaced periodically and taken to the laboratory for analysis.

**Half-life, radioactive** – the time required for half the atoms of a radioactive substance to disintegrate. During one half-life, the number of radioactive atoms in a material is reduced by one-half. Each [radionuclide](#) has a unique half-life. Tritium decays with a half-life of 12.3 years, and plutonium-239 decays with a half-life of about 24,000 years.

**HAP** – Health Advisory Panel. A 12-member panel appointed by the governor of Colorado to oversee this study.

**HASL** – Health and Safety Laboratory. Located in New York City and operated by the U.S. Department of Energy and its predecessors, it is known for long-term global [monitoring](#) of radionuclides in the environment and for developing analytical techniques for measuring [radioactivity](#) in environmental [media](#). Later became known as the Environmental Measurements Laboratory (EML).

**Health physics** – an interdisciplinary science focused on the radiation protection of humans and the environment. Health physics combines the elements of physics, biology, chemistry, statistics, and electronic instrumentation to protect individuals from the effects of [radiation](#).



**Holding ponds** – a series of small unlined ponds or on-channel reservoirs constructed to hold wastewater from the Rocky Flats operations for a time before release to the [offsite](#) creeks. From the 1950s to the 1970s, there was one pond on North Walnut Creek (A-1), four ponds in sequence on South Walnut Creek (B-series ponds), and one pond (C-1) on Woman Creek. Additional ponds on North Walnut Creek, South Walnut Creek, and Woman Creek were constructed in the mid-1970s and 1980s. The ponds played an important role in liquid effluent handling and had an impact on decreasing the levels of [radioactivity](#) that were released to the creeks and ultimately to the [Great Western Reservoir](#) and [Standley Lake](#) (see [solar ponds](#)).

**Hot spot** – a generalized term usually used in reference to a comparatively high and unexpected [contaminant concentration](#) in soil as compared to the concentration in adjacent soil.

**ICRP** – International Commission on Radiological Protection.

**Industrial area** – in this study, refers to the area within the inner [security fence](#) of the Rocky Flats Plant (see [buffer zone](#), [offsite](#), [onsite](#)).

**Ingestion** – [radionuclides](#) or chemicals taken into the body by eating or drinking are taken in by ingestion.

**Inhalation** – [radionuclides](#) or chemicals taken into the body by breathing are inhaled.

**in situ** – meaning in its natural position. Measurements taken *in situ* are made at the field location, not the laboratory.

**Inventory** – the total amount of a [contaminant](#) in a defined space, e.g., the amount of [plutonium](#) in the [sediment](#) of a reservoir.

**Ionizing radiation** – radiation that has enough energy to create ions (ionized atoms, which are chemically active) inside living cells. These ions can damage key substances in cells, including the DNA containing the record of the cell's characteristics. Such damage can lead to cancer or other defects.

**Isokinetic sampling** – see [anisokinetic sampling](#).

**Isopleths** – lines on a map connecting points that are estimated to have the same [concentration](#) of a [contaminant](#).

**Isotopes** – different forms of elements having the same atomic number (number of protons) but different numbers of neutrons. Different isotopes of a particular element generally have identical chemical properties. Plutonium-239 and plutonium-240 are isotopes of [plutonium](#) that cannot be distinguished from one another by typical [analytical methods](#).

**kilo** – a prefix that multiplies a basic unit by 1000. For example, 1 kilogram = 1000 grams.



**Kriging** – a generic name for a group of statistical estimation techniques that are designed to minimize statistical error-variance. Researchers have used kriging techniques to produce [isopleths](#) of [plutonium concentrations](#) in soil around the Rocky Flats Plant.

**Liter (L)** – a metric unit of volume equivalent to about 1.1 quarts.

**Lognormal distribution** – obtained if the logarithms of a set of values are distributed according to a normal distribution (*see* [skewed](#)).

**Long-lived activity** – in this report, refers to [radioactivity](#) with [half-lives](#) greater than 1 week.

**Mass loading** – the mass concentration of dust or [particulates](#) in air. This value can be used to determine the [concentration](#) of a [contaminant](#) in air as a result of [resuspension](#) if the concentration of the contaminant in the surface layer of the soil is known.

**Materials (or contaminants) of concern** – the chemicals, [radionuclides](#), or other hazardous substances identified as most likely to cause health effects as a result of past use at a site or release to the environment.

**mCi** – millicurie (*see* [curie](#)).

**MDA** – minimum detectable activity (*see* [detection level](#)).

**MDC** – minimum detectable [concentration](#) (*see* [definition](#) below).

**Media** – a type of environmental sample, such as air, soil, vegetation, or water.

**Median** – the central point of a distribution. Half of the values are larger than the median value and half are smaller (*see* [percentiles](#)).

**Micron (μ)** – a micrometer or micron is a unit of length equal to one-millionth ( $10^{-6}$ ) of a meter. A human hair, for reference, is about 100 microns thick.

**Minimum detectable concentration (or activity)** – the lowest [concentration](#) of a [contaminant](#) (or amount of [radioactivity](#)) that can be detected with a certain degree of confidence by an [analytical method](#) ([detection level](#)).

**Model** – when determining the risks to humans from past operations of a plant, such as the Rocky Flats Plant, it is rare to find actual measurements of [offsite dose](#). Therefore, doses from past releases must be estimated using models. For example, models are used to simulate environmental movements of [radionuclides](#) and chemicals released from a facility's stacks. Models calculate how materials disperse as they move with the winds, how they deposit on food crops, how they are inhaled or ingested by people, and the resulting doses. Some models are complex, requiring information such as weather conditions, type of crops, and eating habits. Other models are relatively simple.

**Monitoring** – obtaining measurements at regular time intervals.

**Naturally occurring radionuclides** – *radionuclides* that are naturally present in the environment and are two general types: primordial and cosmogenic. Most primordial radionuclides are *isotopes* of the heavy elements of the three radioactive series headed by uranium-238, thorium-232, and uranium-235. Cosmogenic radionuclides are produced by interactions in the atmosphere or in the earth; three of these [tritium (hydrogen-3), carbon-14, and sodium-22] are isotopes of major elements in the body.

**Nautical mile** – equals 6,080 feet or 1,853.2 meters.

**NCRP** – National Council on Radiation Protection and Measurements

**Offsite** – the area beyond the current *site boundary*, that defines the *buffer zone* of the Rocky Flats Plant.

**Onsite** – includes both the *industrial area* within the *security fence* of the Rocky Flats Plant and the *buffer zone*.

**Operable units (OUs)** – specific sections or areas of a hazardous waste site that are undergoing remedial investigation. The OUs are typically defined by similar physical properties and/or geography. There were 16 operable units at the Rocky Flats Plant; those of particular interest for the historic dose reconstruction study are OU1 - 881 hillside; OU2 - 903 Pad, mound, and east trenches; OU3 - *offsite* areas; OU4 - *solar ponds*; OU5 - Woman Creek; and OU6 - Walnut Creek. The Rocky Flats Cleanup Agreement, which was approved July 19, 1996, grouped the contaminated areas into three OUs — the *industrial area*, the *buffer zone* and *offsite* area (*see RI/FS*).

**Outlier** – in statistics, refers to a value that is very different from other measurements in a group, i.e., its value is far from the average and does not fit within the distribution of other values.

**Particle** – a small piece of solid material with a diameter larger than a single gas molecule (about 0.0015 *micron*) but smaller than about 500 micron (0.5 millimeters). Larger solid materials in soils are categorized as coarse sand (sizes ranging from 0.5 up to 2 milli-meters) or gravel (sizes between 2 and 64 millimeters).

**Particulates** – small solid *particles* suspended in air or water. The amount of total suspended particulates in air is often abbreviated TSP. Small particulates in air (less than 10  $\mu$  in *aerodynamic diameter*) are called PM-10.

**pCi** – picocurie (*see curie, pico*).

**Pedogenic** – relating to or involved in soil formation.

**Percentiles** – a large set of data defined so when it is arranged from its smallest to its largest value, it is divided by its percentiles into 100 classes containing nearly equal numbers of data. The exact rules for defining the percentile numbers are complicated, but the effect is that approximately 5% of the data are less than or equal to the 5th percentile, and approximately 95% of the data are greater than or equal to the 5th percentile (similar statements hold for the other percentiles). The [median](#) is defined as the 50th percentile, which divides the data (approximately) into halves (if there are an odd number of data, the middle value is the median; if there are an even number, the average of the two middle values is the median). Observations above the 95th percentile and below the 5<sup>th</sup> percentile have only a 5% probability of occurrence.

**PHS** – Public Health Service.

**pico** – a prefix that multiplies a basic unit by 1/1,000,000,000,000 or  $1 \times 10^{-12}$ . For example, 1 picocurie equals  $1 \times 10^{-12}$  curie, or one-trillionth of a [curie](#).

**Plume** – the [concentration](#) profile of an airborne or waterborne release of material as it spreads from its source. A plume from a coal-fired power plant, for example, may be visible for some distance from its stack, with the concentration of its components decreasing with distance from the stack and from the centerline of the plume. After the plume becomes invisible because of dilution, it continues to be diluted with increasing time and distance. Atmospheric dispersion [models](#) of this process predict concentrations within a plume far downwind and far beyond the point at which a plume becomes invisible. Similar modeling for releases from nuclear facilities can estimate the impacts of releases long past by reconstructing [exposure](#) and [dose](#) estimates.

**Plume depletion** – the processes that reduce the amount of material in a *plume* of airborne *effluent*. As material in a plume falls to or is deposited on the ground, the airborne [concentration](#) of plume gets smaller (or is depleted) as it travels downwind from the source.

**Plutonium (Pu)** – silvery, white radioactive metal (atomic number 94) used at Rocky Flats in casting, rolling and forming, and machining and final assembly of nuclear weapons components. Its most important [isotope](#) is plutonium-239, produced by neutron irradiation of uranium-238. Plutonium decays by emitting [alpha particles](#) and has a 24,000 year half-life.

**PM-10** – see [particulates](#).

**Point source** – refers to a source of [radiation](#) or a release point for [contaminants](#) that is sufficiently small (in physical dimension) to be practically considered a point in space rather than an area.

**Precision** – the ability of an [analytical method](#) to reproduce the same result upon repeated trials (see [bias](#)).

**Profile** – see [vertical profile](#).

**QA/QC** – quality assurance/quality control. Programs established to assure accurate and reproducible results from [environmental monitoring](#).

**RAC** – *Radiological Assessments Corporation*. The contractor selected in October 1992 to conduct the Phase II Toxicity Assessment and Risk Characterization. In 1998 *Radiological Assessments Corporation* changed its name to *Risk Assessment Corporation*. For consistency throughout the project, all reports were published by *Radiological Assessments Corporation*.

**Radiation** – energy moving in the form of *particles* or waves. Familiar radiations are heat, light, radio waves, and microwaves. [Ionizing radiation](#) is a very high frequency form of electromagnetic radiation. It is invisible and cannot be sensed without the use of detecting equipment.

**Radioactive contamination** – [radioactive material](#) distributed over an area, equipment, or individual.

**Radioactive material** – contains unstable (radioactive) atoms that give off [radiation](#) as they decay.

**Radioactivity** – spontaneous transformation of an unstable atom, often resulting in the emission of [radiation](#). This process is referred to as decay or [disintegration](#) of an atom.

**Radiological** – related to [radioactive materials](#) or [radiation](#). The radiological sciences focus on the measurement and effects of radiation.

**Radionuclide** – a radioactive [isotope](#), for example, plutonium-239 or tritium. Plutonium-239 emits [alpha particle](#) radiation when it decays; tritium emits low-energy beta particles. The isotope is an element that may make up part of another substance or chemical compound.

**RCRA** – Resource Conservation and Recovery Act. Provides cradle-to-grave control of hazardous waste by imposing management requirements on generators and transporters of hazardous waste and on owners and operators of storage, treatment, and disposal facilities. RCRA regulations are enforced by the Colorado Department of Public Health and Environment under the authority of the U.S. Environmental Protection Agency.

**Receptors** – people, waters, food plants, or animals potentially affected by a release of a hazardous material.

**Resuspension** – the reentry into the air of [particles](#) that were previously deposited onto the soil.

**RFP** – acronym for Rocky Flats Plant, the name used during most of its history. The site is now called the Rocky Flats Environmental Technology Site.

**RI/FS** – Remedial Investigation/Feasibility Study. A process, initiated by the U.S. Environmental Protection Agency, designed to investigate the extent of site [contamination](#).

potential risks to health and the environment, and the best methods for cleaning up a site. This comprehensive, long-term environmental investigation is currently underway at the Rocky Flats Plant.

**Rockwell International** – the [contractor](#) operating the Rocky Flats Plant from 1974 through 1989.

**Security fence** – the high, chain-link fence that encompasses the [industrial area](#) of the Rocky Flats Plant and prevents uncontrolled access (see [buffer zone](#), [onsite](#)).

**Sediment** – solid material deposited in the bottom of a lake, reservoir, or other surface water.

**Sensitivity** – ability of an [analytical method](#) to detect small [concentrations](#) of a [contaminant](#).

**Sink** – an environmental [medium](#) that retains a [contaminant](#) unless a disturbance releases it again. For example, soil is a sink for deposited [plutonium](#) from airborne releases.

**Site boundary** – the outer edge of the Government-owned [buffer zone](#) that surrounds the Rocky Flats Plant. The current site boundary to the east of the plant is Indiana Street (see [security fence](#), [offsite](#)).

**Skewed** – statistical term referring to a distribution of values that is not symmetrical around the mean value. A statistically normal distribution (bell-shaped curve) is not skewed.

**Solar evaporation ponds** – asphalt-lined, [onsite](#) ponds intended to hold and treat (by evaporation) chemically contaminated process wastes meeting the radioactive standards for onsite storage but not meeting the drinking water standards for chemical [contaminants](#) (see [holding ponds](#)).

**Source term** – the quantity and form of [contaminants](#) released to the environment from a facility over time.

**Spatial trend** (or spatial distribution) – how a [contaminant](#) is distributed in the environment, for example, with distance away from the facility. Two-dimensional trends in measurements are sometimes illustrated with [isopleths](#).

**Spiked samples** – samples to which a known amount of the [contaminant](#) has been purposefully added to assess the accuracy of an [analytical method](#).

**Standley Lake (SL)** – a reservoir in northeastern Jefferson county about 3 miles (4.8 kilometers) southeast of the Rocky Flats Plant. The lake was formed by an earthen dam on Big Dry Creek and originally was constructed in about 1910 to supply water for irrigation. Standley Lake has provided irrigation water storage and municipal water to the city of Westminster since 1965. About two thirds of the lake water is a municipal water supply, and the other one-third is for irrigation. The full capacity of the lake is about 43,000 acre-feet; the mean depth is about 36 feet

(11 meters), and the maximum depth is 96 feet (29 meters). Historically, Woman Creek, which drains the southern side of the Rocky Flats Plant, flowed intermittently into Standley Lake.

**Thorium (Th)** – a naturally occurring, radioactive element (atomic number 90) that occurs in rocks and soils, most abundantly as an [isotope](#) with an atomic weight of 232 (thorium-232).

**Time trend (or temporal trend)** – describes how the [concentration](#) of a [contaminant](#) changes over time at the same place.

**TLLa** – total long-lived [alpha](#) activity.

**Toxicity assessment** – an evaluation of the types of health effects usually caused by specific substances and the quantity (or [dose](#)) required to cause the effects.

**Toxicologic review** – an evaluation of the presence, use, and possible releases of toxic substances and the resulting potential for [exposure](#) or hazard to occur.

**Transuranic** – elements heavier than [uranium](#).

**Tritium** – a naturally occurring [radionuclide](#) of hydrogen. Tritium occurs naturally from cosmic ray interactions within the upper atmosphere. Large quantities of tritium that completely overshadowed naturally produced tritium were released by the weapons testing program. Tritium has been released accidentally from the Rocky Flats Plant on several occasions.

**TRU** – transuranic (*see [definition](#) above*).

**True bearing** – directional bearing relating to true north, not magnetic north.

**Uncertainty** – a general term used to describe the level of confidence in a given measurement or estimated quantity. Uncertainty depends on the amount and quality of the data available. Uncertainties in the results of this study arise primarily from [bias](#) and imprecision in available measurements, absence of measurements at some times and places, lack of knowledge about some physical processes and operational procedures, and the approximate nature of mathematical [models](#) used to predict the transport of released materials.

**UNSCEAR** – United Nations Scientific Committee on the Effects of Atomic Radiation.

**Uranium (U)** – a naturally occurring radioactive metal with atomic number 92, the heaviest natural element. Small amounts are present in soil, coal and rock materials, water, plants, and animals. Uranium and its alloys were used at Rocky Flats to make weapon parts.

**USGS** – U.S. Geological Survey.

**Validation** – the comparison of predicted [concentrations](#) of a material in the environment, based on [source term](#) reconstruction and environmental transport [models](#), with historical measured concentrations.

**Venting** – leaking of [radioactive materials](#) to the air from an underground weapons test.

**Vertical profile (or vertical distribution)** – a description of the [concentration](#) of a [contaminant](#) as a function of height above the ground (in air) or depth (in [sediment](#) or soil).