

## *Acronyms and Abbreviations*

These acronyms and abbreviations reflect the typical manner in which terms are used for this specific document and may not apply to all situations. Items with an asterisk (\*) are described in the glossary of technical terms, which follows this list.

ACTS	DOE Academies Creating Teacher Scientists	CFC-11	an ozone-depleting refrigerant
AFVs	Alternative Fuel Vehicles	cfm, cfs	cubic feet per minute, per second
AEC	Atomic Energy Commission	CFN	Center for Functional Nanomaterials
AGS	Alternating Gradient Synchrotron	CFR	U.S. Code of Federal Regulations
ALARA*	"As Low As Reasonably Achievable"	Ci*	curie
AMSL	above mean sea level	CO	certificate to operate
AMU	atomic mass unit	COC*	chain-of-custody
AOC*	area of concern	CRM	Cultural Resource Management
APG	Analytical Products Group	CRMP	Cultural Resource Management Plan
ARARs	Applicable, Relevant, and Appropriate Requirements	Cs	cesium
ARPA*	Archeological Resource Protection Act	CSF	Central Steam Facility
ARRA	American Recovery and Reinvestment Act	CTN	Center for Transitional Neuroimaging
AS/SVE*	air sparging/soil vapor extraction	CVO	Contractor Vendor Orientation
AST	aboveground storage tank	CWA*	Clean Water Act
AWQS	Ambient Water Quality Standards	CY	calendar year
BAF	Booster Applications Facility	D <sub>2</sub> O*	heavy water
BGD	belowground duct	DAC	Derived Air Concentration
BGRR	Brookhaven Graphite Research Reactor	DCA	1,1-dichloroethane
BHSO	DOE Brookhaven Site Office	DCE	1,1-dichloroethylene
BLIP	Brookhaven Linac Isotope Producer	DCG*	derived concentration guide
BMRR	Brookhaven Medical Research Reactor	D&D	decontamination and decommissioning
BNL	Brookhaven National Laboratory	DDD	dichlorodiphenyldichloroethane
BOD*	biochemical oxygen demand	DDE	dichlorodiphenyldichloroethylene
Bq*	becquerel	DDT	dichlorodiphenyltrichloroethane
Bq/g	becquerel per gram	DMR	Discharge Monitoring Report
Bq/L	becquerel per liter	DOE*	U.S. Department of Energy
BRAHMS	Broad Range Hadron Magnetic Spectrometer	DOE CH	DOE Chicago Operations Office
BSA	Brookhaven Science Associates	DQO	Data Quality Objective
Btu	British thermal units	DSA	Documented Safety Analysis
CAA*	Clean Air Act	DSB	Duct Service Building
CAAA*	CAA Amendments (1990)	DUV – FEL	Deep UltraViolet – Free Electron Laser
CAC	Community Advisory Council	DWS	Drinking Water Standards
CAP	Clean Air Act Assessment Package	EA*	Environmental Assessment
CBS	chemical bulk storage	EBIS	Electron Beam Ion Source
CCR	Consumer Confidence Report	ECM	Energy Conservation Measures
CCWF	Central Chilled Water Facility	EDB*	ethylene dibromide
CEDR	Consolidated Energy Data Report	EDE*	Effective Dose Equivalent
CEGPA	Community, Education, Government and Public Affairs	EDTA	ethylenediaminetetraacetic acid
CERCLA*	Comprehensive Environmental Response, Compensation and Liability Act	EE/CA	Engineering Evaluation/Cost Analysis
Cf-252	californium-252	EE-IOCPA	Energy Employees Occupational Illness Compensation Program Act
		EIMS*	Environmental Information Management System
		EISA	Energy Independence and Security Act

## APPENDIX A: GLOSSARY

ELAP	Environmental Laboratory Approval Program	H2M	H2M Labs, Inc.
EML	Environmental Measurements Laboratory	HEPA	high efficiency particulate air
EMP	Environmental Monitoring Plan	HFBR	High Flux Beam Reactor
EMS*	Environmental Management System	HFCs	Hydrofluorocarbons
EO	Executive Order	HITL	Heavy Ion Transfer Line
EPA*	U.S. Environmental Protection Agency	HPRS	Health Physics Reporting System
EPCRA*	Emergency Planning and Community Right-to-Know Act	HPSB	High Performance and Sustainable Buildings
EPEAT	Electronic Product Environmental Assessment Tool	HSS	Health, Safety and Security
EPD	Environmental Protection Division	HTO	tritiated water (liquid or vapor)
EPP	Environmentally Preferable Products	HVAC	heating/ventilation/air conditioning
ERP	Environmental Restoration Projects	HWMF	Hazardous Waste Management Facility
ERA	Environmental Resource Associates	I	Iodine
ERD	Environmental Restoration Division	IAEA	International Atomic Energy Agency
ES*	environmental surveillance	IAG	Interagency Agreement
ESPC	Energy Savings Performance Contract	IC	ion chromatography
ESR	Experimental Safety Review	ICP/MS	inductively coupled plasma/mass spectrometry
ES&H	Environment, Safety, and Health	IGA	Investment Grade Audit
ESA*	Endangered Species Act	ISB	Interdisciplinary Science Building
ESH&Q	Environment, Safety, Health, and Quality Directorate	ISMS	Integrated Safety Management System
ESPC	Energy Savings Performance Contract	ISO*	International Organization for Standardization
ESSH	Environmental Safety, Security and Health	K	potassium
FaST	Facility and Student Teams Program	kBq	kilobecquerels (1,000 Bq)
FAMS	Facility area monitors	KeV	kilo (thousand) electron volts
FEMP	Federal Emergency Management Program	Kr	kryptonite
FERN	Foundation for Ecological Research in the Northeast	kWh	kilowatt hours
FFCA*	Federal Facilities Compliance Act	LDR	Land Disposal Restriction
FFA	Federal Facilities Agreement	LED	light emitting diode
FHWMF	Former Hazardous Waste Management Facility	LEED	Leadership in Energy and Environmental Design
FIFRA*	Federal Insecticide, Fungicide, and Rodenticide Act	LIE	Long Island Expressway
FM	Facility Monitoring	LIMS	Laboratory Information Management System
FRP	Facility Response Plan	Linac	Linear Accelerator
FWS*	U.S. Fish & Wildlife Service	LIPA	Long Island Power Authority
FY	fiscal year	LISF	Long Island Solar Farm
GBq	giga (billion or E+09) becquerel	LSTPD	Laboratory Science Teacher Professional Development
GAB	gross alpha and beta	LTRA	Long Term Remedial Action
GC/ECD	gas chromatography/electron capture detector	mA	milli-amperes
GC/MS	gas chromatography/mass spectrometry	MACT	Maximum Available Control Technology
GDS	Groundwater Discharge Standard	MAPEP	Mixed Analyte Performance Evaluation Program
GEL	General Engineering Laboratory, LLC	MAR	Materials-at-risk
GeV	giga (billion) electron volts	MCL	maximum contaminant level
gge	gas gallon equivalent	MDL*	minimum detection limit
GHG	Greenhouse Gas	MEI*	maximally exposed individual
GIS	Geographical Information System	MEOSI	maximally exposed off-site individual
GPG	Groundwater Protection Group	MeV	million electron volts
GSF	gross square feet	MGD	million gallons per day
GWh	gigawatt hour	mg/L	milligrams per liter
GWP	Global warming potential	MMBtu	million British thermal units
		MOA	Memorandum of Agreement
		MPF	Major Petroleum Facility

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MPN	most probable number	NYSHPO	NYS Historic Preservation Office
MPO	Modernization Project Office	O <sub>3</sub> *	ozone
mrem	milli (thousandth of a) rem	O&M	Operation and Maintenance
MRI	Magnetic Resonance Imaging	ODS	ozone-depleting substances
MRC	Medical Research Center	OFIs	opportunities for improvement
MSL*	mean sea level	OHSAS	Occupational Health and Safety Assessment Series
mSv	millisievert	OMC	Occupational Medical Clinic
MTBE	methyl tertiary butyl ether	ORC	oxygen-releasing compound
MW	megawatt	ORNL	Oak Ridge National Laboratory
µg/L	micrograms per liter	ORPS*	Occurrence Reporting and Processing System
NA	not analyzed	OSHA	Occupational Health and Safety Administration
NCRP	National Council on Radiation Protection and Measurements	OSSP	Open Space Stewardship Program
ND	not detected	OU*	operable unit
NEAR	Neighbors Expecting Accountability and Remediation	P2*	pollution prevention
NELAC	National Environmental Laboratory Accreditation Conference	PAAA*	Price-Anderson Act Amendment
NELAP	National Environmental Laboratory Accreditation Program	PAF	Process Assessment Form
NEPA*	National Environmental Policy Act	Pb	lead
NESHAPs*	National Emission Standards for Hazardous Air Pollutants	PBT	persistent, bioaccumulative, and toxic
ng/J	nano (one-billionth) gram per Joule	PCBs*	polychlorinated biphenyls
NHPA*	National Historic Preservation Act	PCE	tetrachloroethylene (or perchloroethylene)
NIST	National Institute for Standards and Technology	pCi/g	picocuries per gram
nm	nanometer	PE	performance evaluation
NNSS	Nevada National Security Site	PET	positron emission tomography
NO <sub>2</sub>	nitrogen dioxide	PFCs	Perfluorocarbons
NOV	Notice of Violation	PIC	potential impact category
NO <sub>x</sub> *	nitrogen oxides	ppb	parts per billion
NOEC	no observable effect concentration	ppm	parts per million
NPDES	National Pollutant Discharge Elimination System	PPTRS	Pollution Prevention Tracking System
NR	not required	PRAP	Proposed Remedial Action Plan
NRMP	Natural Resource Management Plan	PUE	Power Utilization Effectiveness
NS	not sampled	PV	photovoltaic
NSERC	Northeast Solar Energy Research Center	QA*	quality assurance
NSF-ISR	NSF-International Strategic Registrations, Ltd.	QAPP	Quality Assurance Program Plan
NSLS	National Synchrotron Light Source	QC*	quality control
NSLS-II	National Synchrotron Light Source II	QCU	quantum chromodynamics
NSPS	new source performance standards	QM	Quality Management
NSRC	Nanoscale Science Research Centers	R-11 (etc.)	ozone-depleting refrigerant
NSRL	NASA Space Radiation Laboratory	RA*	removal action
NT	not tested	RACT	Reasonably Available Control Technology
NTS	Nevada Test Site	RATA	Relativistic accuracy test
NYCRR*	New York Codes, Rules, and Regulations	RCRA*	Resource Conservation and Recovery Act
NYISO	New York Independent System Operator	RD/RA	Remedial Design/Remedial Action
NYPA	New York Power Authority	REC	Renewable Energy Credit
NYS	New York State	RF	resuspension factor
NYSDEC	NYS Department of Environmental Conservation	RHIC	Relativistic Heavy Ion Collider
NYSDOH	NYS Department of Health	ROD*	Record of Decision
		RPD	relative percent difference
		RSB	Research Support Building
		RTF	Radiation Therapy Facility

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RWMB	Radioactive Waste Management Basis	TBq	tera (trillion, or E+12) becquerel
RWP	Radiological Work Permit	TCA	1,1,1-trichloroethane
S&M	surveillance and maintenance	TCAP	Transportation Safety and Operations Compliance Assurance Process
SARA*	Superfund Amendments and Reauthorization Act	TCE*	trichloroethylene
SBMS*	Standards Based Management System	TCLP	toxicity characteristic leaching procedure
SCDHS	Suffolk County Department of Health Services	TEAM	Transformational Energy Action Management
SCR	Special Case Resource	TED	Total Effective Dose
SCSC	Suffolk County Sanitary Code	TEDE	Total Effective Dose Equivalent
SDL	Source Development Laboratory	TKN	Total Kjeldahl nitrogen
SDWA*	Safe Drinking Water Act	TLD*	thermoluminescent dosimeter
SER	Site Environmental Report	TPL	Target Processing Laboratory
SI	International System (measurement units)	TRE	Toxic Reduction Evaluation
SNS	standard not specified	TRI	Toxic Release Inventory
SO <sub>2</sub>	sulfur dioxide	TSCA*	Toxic Substances Control Act
SOP	standard operating procedure	TVDG	Tandem Van de Graaff
SPCC	Spill Prevention Control and Countermeasures	TVOC*	total volatile organic compounds
SPDES*	State Pollutant Discharge Elimination System	UESC	Utility Energy Services Contract
Sr	strontium	UIC*	underground injection control
SSP	Site Sustainability Plan	UST*	underground storage tank
SSPP	Strategic Sustainability Performance Plan	VOC*	volatile organic compound
STAR	Solenoid Tracker at RHIC	VUV*	very ultraviolet
STEM	Scanning Transmission Electron Microscope	WAC	waste acceptance criteria
STL	Severn Trent Laboratories, Inc.	WBS	Work Breakdown Structure
STP	Sewage Treatment Plant	WCPP	Waste Certification Program Plan
SU	standard unit	WCF	Waste Concentration Facility
SUNY	State University of New York	WET	Whole Effluent Toxicity
Sv*	sievert; unit for assessing radiation dose risk	WLA	Waste Loading Area
SVE*	soil vapor extraction	WM	Waste Management
SVOC*	semivolatile organic compound	WMF	Waste Management Facility
t <sub>1/2</sub> *	half-life	WTP	Water Treatment Plant
TAG	Technical Advisory Group		

## Technical Terms

These definitions reflect the typical manner in which the terms are used for this specific document and may not apply to all situations. Bold-face words in the descriptions are defined in separate entries.

### A

**AA (atomic absorption)** – A spectroscopy method used to determine the elemental composition of a sample. In this method, the sample is vaporized and the amount of light it absorbs is measured.

**accuracy** – The degree of agreement of a measurement with an accepted reference or true value. It can be expressed as the difference between two values, as a percentage of the reference or true value, or as a ratio of the measured value and the reference or true value.

**activation** – The process of making a material radioactive by bombardment with neutrons, protons, or other high energy particles.

**activation product** – A material that has become radioactive by bombardment with neutrons, protons, or other high energy particles.

**activity** – Synonym for radioactivity.

**Administrative Record** – A collection of documents established in compliance with **CERCLA**. Consists of information the CERCLA lead agency uses in its decision on the selection of response actions. The Administrative Record file should be established at or near the facility and made available to the public. An Administrative Record can also be the record for any enforcement case.

**aerobic** – An aerobic organism is one that lives, acts, or occurs only in the presence of oxygen.

**aerosol** – A gaseous suspension of very small particles of liquid or solid.

**ALARA (As Low As Reasonably Achievable)** – A phrase that describes an approach to minimize exposures to individuals and minimize releases of radioactive or other harmful material to the **environment** to levels as low as social, technical, economic, practical, and public policy considerations will permit. ALARA is not a dose limit, but a process with a goal to keep dose levels as far below applicable limits as is practicable.

**alpha radiation** – The emission of alpha particles during radioactive decay. Alpha particles are identical in makeup to the nucleus of a helium atom and have a positive charge. Alpha radiation is easily stopped by materials as thin as a sheet of paper and has a range in air of only an inch or so. Despite its low penetration ability, alpha radiation is densely ionizing and therefore very damaging when ingested or inhaled. Naturally occurring radioactive sources such as radon emit alpha radiation.

**air stripping** – A process for removing **VOCs** from contaminated water by forcing a stream of air through the water in a vessel. The contaminants evaporate into the air stream. The air may be further treated before it is released into the atmosphere.

**ambient air** – The surrounding atmosphere, usually the outside air, as it exists around people, animals, plants, and structures. It does not include the air immediately adjacent to emission sources.

**analyte** – A constituent that is being analyzed.

**anneal** – To heat a material and then cool it. In the case of thermoluminescent dosimeters (TLDs), this is done to reveal the amount of radiation the material had absorbed.

**anion** – A negatively charged ion, often written as a superscript negative sign after an element symbol, such as Cl<sup>-</sup>.

**anthropogenic** – Resulting from human activity; anthropogenic radiation is human-made, not naturally occurring.

**AOC (area of concern)** – Under **CERCLA**, this term refers to an area where releases of hazardous substances may have occurred or a location where there has been a release or threat of a release of a hazardous substance, pollutant, or contaminant (including **radionuclides**). AOCs may include, but need not be limited to, former spill areas, landfills, surface impoundments, waste piles, land treatment units, transfer stations, wastewater treatment units, incinerators, container storage areas, scrap yards, cesspools, tanks, and associated piping that are known to have caused a release into the environment or whose integrity has not been verified.

**aquifer** – A water-saturated layer of rock or soil below the ground surface that can supply usable quantities of **groundwater** to wells and springs. Aquifers can be a source of water for domestic, agricultural, and industrial uses.

**ARPA (Archaeological Resources Protection Act)** This law, passed in 1979, has been amended four times. It protects any material remains of past human life or activities that are of archaeological interest. Known *and potential* sites of interest are protected from uncontrolled excavations and pillage, and artifacts found on public and Indian lands are banned from commercial exchange.

**AS/SVE (air sparging/soil vapor extraction)** – A method of extracting **volatile organic compounds** from the **groundwater**, in place, using compressed air. (In contrast, air stripping occurs in a vessel.) The vapors are typically collected using a soil vapor extraction system.

## B

**background** – A sample or location used as reference or control to compare BNL analytical results to those in areas that could not have been impacted by BNL operations.

**background radiation** – Radiation present in the environment as a result of naturally occurring radioactive materials in the Earth, cosmic radiation, or human-made radiation sources, including fallout.

**beta radiation** – Beta radiation is composed of charged particles emitted from a nucleus during radioactive decay. A negatively charged beta particle is identical to an electron. A positively charged beta particle is called a positron. Beta radiation is more penetrating than alpha radiation, but it may be stopped by materials such as aluminum or Lucite™ panels. Naturally occurring radioactive elements such as potassium-40 emit beta radiation.

**blank** – A sample (usually reagent-grade water) used for quality control of field sampling methods, to demonstrate that cross contamination has not occurred.

**blowdown** – Water discharged from either a boiler or cooling tower in order to prevent the build-up of inorganic matter within the boiler or tower and to prevent scale formation (i.e., corrosion).

**BOD (biochemical oxygen demand)** – A measure of the amount of oxygen in biological processes that breaks down organic matter in water; a measure of the organic pollutant load. It is used as an indicator of water quality.

**Bq (becquerel)** – A quantitative measure of radioactivity. This alternate measure of activity is used internationally and with increasing frequency in the United States. One Bq of activity is equal to one nuclear decay per second.

**bremstrahlung** – Translates as “fast braking” and refers to electromagnetic radiation produced by the sudden retardation of a charged particle in an intense electric field.

## C

**CAA (Clean Air Act), CAA Amendments (CAAA)** – The original Clean Air Act was passed in 1963, but the U.S. air pollution control program is based on the 1970 version of the law. The 1990 Clean Air Act Amendments (CAAA) are the most far-reaching revisions of the 1970 law. In common usage, references to the CAA typically mean to the 1990 amendments. (*source*: EPA’s “Plain English Guide to the Clean Air Act” glossary, accessed 3-7-05)

**caisson** – A watertight container used in construction work under water or as a foundation.

**cap** – A layer of natural or synthetic material, such as clay or gunite, used to prevent rainwater from penetrating and spreading contamination. The surface of the cap is generally mounded or sloped so water will drain off.

**carbon adsorption/carbon treatment** – A treatment system in which contaminants are removed from groundwater, surface water, and air by forcing water or air through tanks containing activated carbon (a specially treated material that attracts and holds or retains contaminants).

**carbon tetrachloride** – A poisonous, nonflammable, colorless liquid, CCl<sub>4</sub>.

**CERCLA (Comprehensive Environmental Response, Compensation and Liability Act)** – Pronounced “sir-klah” and commonly known as Superfund, this law was enacted by Congress on December 11, 1980. It created a tax on the chemical and petroleum industries and provided broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites; provided for liability of persons responsible for releases of hazardous waste at these sites; and established a trust fund to provide for cleanup when no responsible party could be identified.

The law authorizes two kinds of response actions: short-term removals, where actions may be taken to address releases or threatened releases requiring prompt response, and long-term remedial response actions that permanently and significantly reduce the dangers associated with releases or threats of releases of hazardous substances that are serious, but not immediately life threatening. These actions can be conducted only at sites listed on EPA’s National Priorities List (NPL). CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) on October 17, 1986, accessed 03-7-05)

**CFR (Code of Federal Regulations)** – A codification of all regulations developed and finalized by federal agencies in the Federal Register. The CFR is arranged by “title,” with Title 10 covering energy- and radiation-related issues, and Title 40 covering protection of the environment. Subparts within the titles are included in citations, as in “40 CFR Subpart H.”

**characterization** – Facility or site sampling, monitoring, and analysis activities to determine the extent and nature of contamination. Characterization provides the basis of necessary technical information to select an appropriate cleanup alternative.

**Ci (curie)** – A quantitative measure of radioactivity. One Ci of activity is equal to 3.7E+10 decays per second. One curie has the approximate activity of 1 gram of radium. It is named after Marie and Pierre Curie, who discovered radium in 1898.

**Class GA groundwater** – New York State Department of Environmental Conservation classification for high quality groundwater, where the best intended use is as a source of drinking water supply.

**closure** – Under RCRA regulations, this term refers to a hazardous or solid waste management unit that is no longer operating and where potential hazards that it posed have been addressed (through clean up, immobilization, capping, etc.) to the satisfaction of the regulatory agency.

**CO<sub>2</sub> equivalent (CO<sub>2</sub>e)** – The universal unit of measurement to indicate the GWP of each of the six GHGs expressed in terms of the GWP of one unit of CO<sub>2</sub>. It is used to evaluate the release (or the avoided release) of differ-



ent GHG emissions against a common basis, and is commonly expressed as metric tons carbon dioxide equivalent (MtCO<sub>2</sub>e), which is calculated by multiplying the metric tons of GHG by its GWP.

**COC (chain-of-custody)** – A method for documenting the history and possession of a sample from the time of collection, through analysis and data reporting, to its final disposition.

**cocktail** – a mixture of chemicals used for **scintillation** counting.

**collective Effective Dose Equivalent** – A measure of health risk to a population exposed to radiation. It is the sum of the **EDEs** of all individuals within an exposed population, frequently considered to be within 50 miles (80 kilometers) of an environmental release point. It is expressed in **person-rem** or **person-sievert**.

**Committed Effective Dose Equivalent** – The total **EDE** received over a 50-year period following the internal deposition of a **radionuclide**. It is expressed in **rems** or **sieverts**.

**composite sample** – A sample of an environmental medium containing a certain number of sample portions collected over a period of time, possibly from different locations. The constituent samples may or may not be collected at equal time intervals over a predefined period of time, such as 24 hours.

**confidence interval** – A numerical range within which the true value of a measurement or calculated value lies. In the SER, radiological values are shown with a 95 percent confidence interval: there is a 95 percent probability that the true value of a measurement or calculated value lies within the specified range. *See also* “Uncertainty” discussion in Appendix B.

**conservative** – Estimates that err on the side of caution because all possibly deleterious components are included at generous or high values.

**contamination** – Unwanted radioactive and/or hazardous material that is dispersed on or in equipment, structures, objects, air, soil, or water.

**control** – *See background.*

**cooling water** – Water used to cool machinery and equipment. *Contact* cooling water is any wastewater that contacts machinery or equipment to remove heat from the metal; *noncontact* cooling water has no direct contact with any process material or final product. *Process wastewater* cooling water is water used for cooling that may have become contaminated through contact with process raw materials or final products.

**cover boards** – Sheets of plywood placed on the ground near ponds to serve as attractive habitat for salamanders, as part of a population study.

**curie** – *See Ci.*

**CWA (Clean Water Act)** – Growing public awareness and concern for controlling water pollution led to enactment of the Federal Water Pollution Control Act Amendments

of 1972. As amended in 1977, this law became commonly known as the Clean Water Act. It established the basic structure for regulating discharges of pollutants into the waters of the United States, giving **EPA** the authority to implement pollution control programs such as setting wastewater standards for industry. The CWA also continued requirements to set water quality standards for all contaminants in surface waters and made it unlawful for any person to discharge any pollutant from a **point source** into navigable waters unless a permit was obtained. The CWA also funded the construction of sewage treatment plants and recognized the need for planning to address the critical problems posed by **nonpoint source pollution**.

Revisions in 1981 streamlined the municipal construction grants process. Changes in 1987 phased out the construction grants program. Title I of the Great Lakes Critical Programs Act of 1990 put into place parts of the Great Lakes Water Quality Agreement of 1978, signed by the U.S. and Canada; the two nations agreed to reduce certain toxic pollutants in the Great Lakes. Over the years many other laws have changed parts of the CWA, accessed 03-7-05).

## D

**D<sub>2</sub>O** – *See heavy water.*

**daughter, progeny** – A given **nuclide** produced by radioactive decay from another nuclide (the “parent”). *See also radioactive series.*

**DCG (derived concentration guide)** – The concentration of a **radionuclide** in air or water that, under conditions of continuous exposure for one year by a single pathway (e.g., air inhalation, absorption, or ingestion), would result in an effective dose equivalent of 100 mrem (1 mSv). The values were established in **DOE Order 5400.5**.

**decay product** – A **nuclide** resulting from the radioactive disintegration of a **radionuclide**, being formed either directly or as a result of successive transformations in a radioactive series. A decay product may be either radioactive or stable.

**decontamination** – The removal or reduction of **radioactive** or hazardous contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques to achieve a stated objective or end condition.

**disposal** – Final placement or destruction of waste.

**DOE (Department of Energy)** – The federal agency that promotes scientific and technical innovation to support the national, economic, and energy security of the United States. DOE has responsibility for 10 national laboratories and for the science and research conducted at these laboratories, including Brookhaven National Laboratory.

**DOE Order 231.1A** – This order, Environment, Safety, and Health Reporting, is dated 8/19/03. It replaces the 1995 version, Order 231.1, as well as the “ORPS” order, DOE Order 232.1A, Occurrence Reporting and Processing of Operations Information, dated 7/21/97, and Order 210.1,

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Performance Indicator..., dated 9/27/95.

**DOE Order 450.1** – This order, Environmental Protection Program, is dated 1/15/03. It replaces DOE Order 5400.1, General Environmental Protection Program, dated 11/9/88.

**DOE Order 5400.5** – This order, Radiation Protection of the Public and the Environment, was first published by DOE in 1990 and was modified in 1993. It established the standards and requirements for operations of DOE and DOE contractors with respect to protecting the public and the **environment** against undue risk from radiation.

**dose** – See **EDE**.

**dosimeter** – A portable detection device for measuring exposure to ionizing radiation. See Chapter 8 for details.

**downgradient** – In the direction of **groundwater** flow from a designated area; analogous to “downstream.”

**DQO (Data Quality Objective)** – The Data Quality Objective (DQO) process was developed by EPA for facilities to use when describing their environmental monitoring matrices, sampling methods, locations, frequencies, and measured parameters, as well as methods and procedures for data collection, analysis, maintenance, reporting, and archiving. The DQO process also addresses data that monitor quality assurance and quality control.

**drift fence** – A stretch of temporary fencing to prevent an animal population from leaving the area, used at BNL as part of a population study.

**dry weight** – The dry weight concentration of a substance is after a sample is dried for analysis. Dry weight concentrations are typically higher than wet weight values.

**D-waste** – Liquid waste containing radioactivity.

## E

**EA (Environmental Assessment)** – A report that identifies potentially significant effects from any federally approved or funded project that might change the physical **environment**. If an EA identifies a “significant” potential impact (as defined by NEPA), an Environmental Impact Statement (EIS) must be researched and prepared.

**EDB (ethylene dibromide)** – A colorless, nonflammable, heavy liquid with a sweet odor; slightly soluble in water. Although the U.S. Department of Health and Human Services has determined that ethylene dibromide may reasonably be anticipated to be a carcinogen, it is still used to treat felled logs for bark beetles; to control wax moths in beehives; as a chemical intermediary for dyes, resins, waxes, and gums; to spot-treat milling machinery; and to control Japanese beetles in ornamental plants.

**EDE (Effective Dose Equivalent)** – A value used to express the health risk from radiation exposure to tissue in terms of an equivalent whole body exposure. It is a “normalized” value that allows the risk from radiation exposure received by a specific organ or part of the body to be compared with the risk due to whole-body exposure. The EDE equals the sum of the doses to different organs of the body multiplied

by their respective **weighting factors**. It includes the sum of the EDE due to radiation from sources external to the body and the committed effective dose equivalent due to the internal deposition of **radionuclides**. EDE is expressed in **rems** or **sieverts**.

**effluent** – Any liquid discharged to the environment, including stormwater **runoff** at a site or facility.

**EIMS (Environmental Information Management System)** – A database system used to store, manage, verify, protect, retrieve, and archive BNL’s environmental data.

**EM (environmental monitoring)** – Sampling for contaminants in air, water, sediment, soil, food stuffs, plants, and animals, either by directly measuring or by collecting and analyzing samples.

**emissions** – Any gaseous or particulate matter discharged to the atmosphere.

**EMS (Environmental Management System)** – The BNL EMS meets the requirements of the **ISO 14001 EMS standard**, with emphasis on compliance assurance, pollution prevention, and community outreach. An extensive environmental monitoring program is one component of BNL’s EMS.

**environment** – Surroundings (including air, water, land, natural resources, flora, fauna, and humans) in which an organization operates, and the interrelation of the organization and its surroundings.

**environmental aspect** – Elements of an organization’s activities, products, or services that can interact with the surrounding air, water, land, natural resources, flora, fauna, and humans.

**environmental impact** – Any change to the surrounding air, water, land, natural resources, flora, and fauna, whether adverse or beneficial, wholly or partially resulting from an organization’s activities, products, or services.

**environmental media** – Includes air, **groundwater**, surface water, soil, flora, and fauna.

**environmental monitoring or surveillance** – See **EM**.

**EPA (U. S. Environmental Protection Agency)** – The federal agency responsible for developing and enforcing environmental laws. Although state or local regulatory agencies may be authorized to administer environmental regulatory programs, EPA generally retains oversight authority.

**EPCRA (Emergency Planning and Community Right-to-Know Act)** – Also known as Title III of SARA, EPCRA was enacted by Congress as the national legislation on community safety, to help local groups protect public health, safety, and the environment from chemical hazards. To implement EPCRA, Congress required each state to appoint a State Emergency Response Commission (SERC). The SERCs were required to divide their states into Emergency Planning Districts and to name a Local Emergency Planning Committee for each district

Broad representation by fire fighters, health officials, government and media representatives, community groups,



industrial facilities, and emergency managers ensures that all necessary elements of the planning process are represented.

**ES (environmental surveillance)** – Sampling for contaminants in air, water, sediment, soil, food stuffs, plants, and animals, either by directly measuring or by collecting and analyzing samples.

**ESA (Endangered Species Act)** – This provides a program for conserving threatened and endangered plants and animals and their habitats. The FWS maintains the list of 632 *endangered* species (326 are plants) and 190 *threatened* species (78 are plants). Species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees. Anyone can petition FWS to include a species on this list. The law prohibits any action, administrative or real, that results in a “taking” of a listed species *or* adversely affects habitat. Likewise, import, export, interstate, and foreign commerce of listed species are all prohibited. EPA’s decision to register pesticides is based in part on the risk of adverse effects on endangered species as well as environmental fate (how a pesticide will affect habitat). Under FIFRA, EPA can issue emergency suspensions of certain pesticides to cancel or restrict their use if an endangered species will be adversely affected.

**evapotranspiration** – A process by which water is transferred from the soil to the air by plants that take the water up through their roots and release it through their leaves and other aboveground tissue.

**exposure** – A measure of the amount of ionization produced by x-rays or gamma rays as they travel through air. The unit of radiation exposure is the roentgen (R).

## F

**fallout** – Radioactive material, made airborne as a result of aboveground nuclear weapons testing, that has been deposited on the Earth’s surface.

**FFCA (Federal Facility Compliance Act)** – Formerly, the federal government maintained that it was not subject to fines and penalties under solid and hazardous waste law because of the doctrine of “sovereign immunity.” The State of Ohio challenged this in *Ohio v. the Department of Energy (1990)*. The U.S. Circuit Court of Appeals found in favor of the State (June 11, 1990), writing that the federal government’s sovereign immunity is waived under both the CWA sovereign immunity provision and RCRA’s citizen suit provision. The Circuit Court decision was overturned by the Supreme Court on April 21, 1992, in *DOE v. Ohio*, which held that the waiver of sovereign immunity in RCRA and CWA is not clear enough to allow states to impose civil penalties directly. After the high court’s ruling, the consensus among lawmakers was that a double standard existed: the same government that developed laws to protect human health and the environment and required compliance in the private sector, was itself not assuming the burden of compliance. As a result, Congress enacted the FFCA (October 6, 1992, Pub. Law 102-386), which

effectively overturned the Supreme Court’s ruling. In the legislation Congress specifically waived sovereign immunity with respect to RCRA for federal facilities.

Under section 102, FFCA amends section 6001 of RCRA to specify that federal facilities are subject to “all civil and administrative penalties and fines, regardless of whether such penalties or fines are punitive or coercive in nature.” These penalties and fines can be levied by EPA or by authorized states. In addition, FFCA states that “the United States hereby expressly waives any immunity otherwise applicable to the United States.” Although federal agents, employees, and officers are not liable for civil penalties, they are subject to criminal sanctions. No departments, agencies, or instrumentalities are subject to criminal sanctions. Section 104 (1) and (2) require EPA to conduct annual RCRA inspections of all federal facilities.

**FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act)** – The primary focus of this law was to provide federal control of pesticide distribution, sale, and use. EPA was given authority under FIFRA not only to study the consequences of pesticide usage but also to require users (farmers, utility companies, and others) to register when purchasing pesticides. Through later amendments to the law, users also must take exams for certification as applicators of pesticides. All pesticides used in the U.S. must be registered (licensed) by EPA. Registration assures that pesticides will be properly labeled and that if used in accordance with specifications, will not cause unreasonable harm to the environment.

**FS (feasibility study)** – A process for developing and evaluating remedial actions using data gathered during the remedial investigation. The FS defines the objectives of the remedial program for the site and broadly develops remedial action alternatives, performs an initial screening of these alternatives, and performs a detailed analysis of a limited number of alternatives that remain after the initial screening stage.

**FWS (U.S. Fish & Wildlife Service)** – The U.S. Fish and Wildlife Service is the principal federal agency responsible for conserving, protecting, and enhancing fish, wildlife, plants, and their habitats for the continuing benefit of the people of the United States. FWS manages the 95-million-acre National Wildlife Refuge System, which encompasses 544 national wildlife refuges, thousands of small wetlands, and other special management areas. It also operates 69 national fish hatcheries, 64 fishery resources offices, and 81 ecological services field stations. The agency enforces federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, and helps foreign and Native American tribal governments with their conservation efforts. It also oversees the Federal Assistance Program, which distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state

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fish and wildlife agencies.

**fugitive source** – Unanticipated sources of volatile hazardous air pollutants due to leaks from valves, pumps, compressors, relief valves, connectors, flanges, and various other pieces of equipment.

### G

**gamma radiation** – Gamma radiation is a form of electromagnetic radiation, like radio waves or visible light, but with a much shorter wavelength. It is more penetrating than **alpha** or **beta** radiation, capable of passing through dense materials such as concrete.

**gamma spectroscopy** – This analysis technique identifies specific **radionuclides**. It measures the particular energy of a radionuclide's gamma radiation emissions. The energy of these emissions is unique for each nuclide, acting as a "fingerprint."

**geotextile** – A product used as a soil reinforcement agent and as a filter medium. It is made of synthetic fibers manufactured in a woven or loose manner to form a blanket-like product.

**grab sample** – A single sample collected at one time and place.

**Green Building** – Construction that adheres to guidelines established by the Green Building Council, a coalition of leaders from across the building industry working to promote structures that are environmentally responsible, profitable, and healthy places to live and work.

**greenhouse gas (GHG)** – Carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>).

**global warming potential (GWP)** – A factor describing the radiative forcing impact of one unit of a given GHG relative to one unit of CO<sub>2</sub>.

**groundwater** – Water found beneath the surface of the ground (subsurface water). Groundwater usually refers to a zone of complete water saturation containing no air.

**gunite** – A mixture of cement, sand, and water sprayed over a mold to form a solid, impermeable surface. Formerly a trademarked name, now in general usage.

### H

**half-life (t<sub>1/2</sub>)** – The time required for one-half of the atoms of any given amount of a radioactive substance to disintegrate; the time required for the activity of a radioactive sample to be reduced by one half.

**halon** – An ozone-depleting fire suppressant; suffixes (-1301, etc.) indicate variants.

**hazardous waste** – Toxic, corrosive, reactive, or ignitable materials that can injure human health or damage the environment. It can be liquid, solid, or sludge, and include heavy metals, organic solvents, reactive compounds, and corrosive materials. It is defined and regulated by **RCRA**,

Subtitle C.

**heat input** – The heat derived from combustion of fuel in a steam generating unit. It does not include the heat from preheated combustion air, recirculated flue gases, or the exhaust from other sources.

**heavy water (D<sub>2</sub>O)** – A form of water containing deuterium, a nonradioactive isotope of hydrogen.

**herpetofaunal** – Relating to the study of reptiles.

**hot cell** – Shielded and air-controlled facility for the remote handling of radioactive material.

**hydrofluorocarbons (HFCs)** – One of six primary GHGs primarily used as refrigerants; a class of gases containing hydrogen, fluorine, and carbon, and possessing a range of GWP values from 12 to 11,700.

**hydrology** – The science dealing with the properties, distribution, and circulation of natural water systems.

### I

**inert** – Lacking chemical or biological action.

**influent** – Liquid (such as stormwater runoff or wastewater) flowing into a reservoir, basin, or treatment plant.

**intermittent river** – A stream that dries up on occasion, usually as a result of seasonal factors or decreased contribution from a source such as a wastewater treatment plant.

**ionizing radiation** – Any radiation capable of displacing electrons from atoms or molecules, thereby producing ions. High doses of ionizing radiation may produce severe skin or tissue damage. *See also alpha, beta, gamma radiation; x-rays.*

**ISO 14001 EMS standard** – The International Organization for Standardization (ISO) sets standards for a wide range of products and management operations. Following the success of the ISO 9000 Standards for quality management, ISO introduced the 14000 series for environmental management. BNL was the first DOE Office of Science laboratory to obtain third-party registration to this globally recognized environmental standard.

**isotope** – Two or more forms of a chemical element having the same number of protons in the nucleus (the same atomic number), but having different numbers of neutrons in the nucleus (different atomic weights). Isotopes of a single element possess almost identical chemical properties.

### L

**leaching** – The process by which soluble chemical components are dissolved and carried through soil by water or some other percolating liquid.

**light water** – As used in this document, tap water, possibly filtered.

**liquid scintillation counter** – An analytical instrument used to quantify tritium, carbon-14, and other beta-emitting **radionuclides**. *See also scintillation.*

## M

**matrix, matrices** – The natural context (e.g., air, vegetation, soil, water) from which an environmental sample is collected.

**MDL (minimum detection limit)** – The lowest level to which an analytical parameter can be measured with certainty by the analytical laboratory performing the measurement. While results below the MDL are sometimes measurable, they represent values that have a reduced statistical confidence associated with them (less than 95 percent confidence).

**MEI (maximally exposed individual)** – The hypothetical individual whose location and habits tend to maximize his/her radiation dose, resulting in a dose higher than that received by other individuals in the general population.

**metamorphic** – In the state of changing from larval to mature forms.

**mixed waste** – Waste that contains both a hazardous waste component (regulated under Subtitle C of RCRA) and a radioactive component.

**monitoring** – The collection and analysis of samples or measurements of effluents and emissions for the purpose of characterizing and quantifying contaminants, and demonstrating compliance with applicable standards.

**monitoring well** – A well that collects **groundwater** for the purposes of evaluating water quality, establishing groundwater flow and elevation, determining the effectiveness of treatment systems, and determining whether administrative or engineered controls designed to protect groundwater are working as intended.

**MSL (mean sea level)** – The average height of the sea for all stages of the tide. Used as a benchmark for establishing groundwater and other elevations.

## N

**NEPA (National Environmental Policy Act)** – Assures that all branches of government give proper consideration to the environment before any land purchase or any construction projects, including airports, buildings, military complexes, and highways. Project planners must assess the likely impacts of the project by completing an Environmental Assessment (EA) and, if necessary, an Environmental Impact Statement (EIS).

**NESHAPs (National Emissions Standards for Hazardous Air Pollutants)** – Standards that limit emissions from specific sources of air pollutants linked to serious health hazards. NESHAPs are developed by EPA under the CAA. Hazardous air pollutants can be chemical or radioactive. Their sources may be human-made, such as vehicles, power plants, and industrial or research processes, or natural, such as radioactive gas in soils.

**neutrino** – A small, neutral particle created as a result of particle decay. Neutrinos were believed to be massless, but recent studies have indicated that they have small, but finite,

mass. Neutrinos interact very weakly.

**NHPA (National Historic Preservation Act)** – With passage of the National Historic Preservation Act in 1966, Congress made the federal government a full partner and a leader in historic preservation. The role of the federal government is fulfilled through the National Park Service. State participation is through State Historic Preservation Offices. “Before 1966, historic preservation was mainly understood in one-dimensional terms: the proverbial historic shrine or Indian burial mound secured by lock and key—usually in a national park—set aside from modern life as an icon for study and appreciation. NHPA largely changed that approach, signaling a much broader sweep that has led to the breadth and scope of the vastly more complex historic preservation mosaic we know today.”

**nonpoint source pollution** – Nonpoint source pollution occurs when rainfall, snowmelt, or irrigation water runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, and coastal waters or introduces them into **groundwater**. Nonpoint source pollution also includes adverse changes to the hydrology of water bodies and their associated aquatic habitats. After Congress passed the Clean Water Act in 1972, the nation’s water quality community emphasized **point source** pollution (coming from a discrete conveyance or location, such as industrial and municipal waste discharge pipes). Point sources were the primary contributors to the degradation of water quality then, and the significance of nonpoint source pollution was poorly understood. Today, nonpoint source pollution remains the largest source of water quality problems. It is the main reason that approximately 40 percent of surveyed rivers, lakes, and estuaries are not clean enough to meet basic uses such as fishing or swimming.

**NO<sub>x</sub>** – Nitrogen oxides are gases consisting of one molecule of nitrogen and varying numbers of oxygen molecules. Nitrogen oxides are produced, for example, by the combustion of fossil fuels in vehicles and electric power plants. In the atmosphere, NO<sub>x</sub> can contribute to the formation of smog, impair visibility, and have health consequences. NO<sub>x</sub> are considered “criteria air pollutants” under the CAA.

**nuclide** – A species of atom characterized by the number of protons and neutrons in the nucleus.

**NYCRR (New York Codes, Rules, and Regulations)** The NYCRR primarily contains state agency rules and regulations adopted under the State Administrative Procedure Act. There are 22 Titles: one for each state department, one for miscellaneous agencies and one for the Judiciary. Title 6 addresses environmental conservation, so many references in the SER are to “6 NYCRR.”

## O

**O<sub>3</sub>** – *See* ozone.

**on site** – The area within the boundaries of a site that is controlled with respect to access by the general public.

**opacity** – Under the Clean Air Act (CAA), a measurement of the degree to which smoke (emissions other than water vapor) reduces the transmission of light and obscures the view of an object in the background.

**ORPS (Occurrence Reporting and Processing System)** A system for identifying, categorizing, notifying, investigating, analyzing, and reporting to DOE events or conditions discovered at the BNL site. It was originally established by DOE Order 232.1, which has been replaced by **DOE Order 231.1A**.

**OU (operable unit)** – Division of a contaminated site into separate areas based on the complexity of the problems associated with it. Operable units may address geographical portions of a site, specific site problems, or initial phases of an action. They may also consist of any set of actions performed over time, or actions that are concurrent, but located in different parts of a site. An OU can receive specific investigation and a particular remedy may be proposed. A Record of Decision (**ROD**) is prepared for each OU.

**outfall** – The place where wastewater is discharged.

**oxides of nitrogen (NO<sub>x</sub>)** – *See* NO<sub>x</sub>.

**ozone (O<sub>3</sub>)** – A very reactive type of oxygen formed naturally in the upper atmosphere which provides a shield for the earth from the sun's ultraviolet rays. At ground level or in the lower atmosphere, it is pollution that forms when oxides of nitrogen and hydrocarbons react with oxygen in the presence of strong sunlight. Ozone at ground level can lead to health effects and cause damage to trees and crops.

## P

**P2 (pollution prevention)** – Preventing or reducing the generation of pollutants, contaminants, hazardous substances, or wastes at the source, or reducing the amount for treatment, storage, and disposal through recycling. Pollution prevention can be achieved through reduction of waste at the source, segregation, recycle/reuse, and the efficient use of resources and material substitution. The potential benefits of pollution prevention include the reduction of adverse environmental impacts, improved efficiency, and reduced costs.

**PAAA (Price-Anderson Act Amendments)** – The Price-Anderson Act (PAA) was passed in 1957 to provide for prompt compensation in the case of a nuclear accident. The PAA provided broad financial coverage for damage, injury, and costs, and required DOE to indemnify contractors. The amended act of 1988 (PAAA) extended indemnification for 15 years and required DOE to establish and enforce nuclear safety rules. The PAAA Reauthorization, passed in December of 2002, extended current indemnification levels through 2004. 10 CFR 820 and its Appendix A provide DOE enforcement procedure and policy.

**Parshall flume** – An engineered channel used to measure the flow rate of water. It was named after the inventor, who worked for the U.S. government as an irrigation research engineer.

**PCBs (polychlorinated biphenyls)** – A family of organic compounds used from 1926 to 1979 (when they were banned by **EPA**) in electrical transformers, lubricants, carbonless copy paper, adhesives, and caulking compounds. PCBs are extremely persistent in the environment because they do not break down into different and less harmful chemicals. PCBs are stored in the fatty tissues of humans and animals through the bioaccumulation process.

**percent recovery** – For analytical results, the ratio of the measured amount, divided by the known (spiked) amount, multiplied by 100.

**perfluorocarbons (PFCs)** – One of the six primary GHGs consisting of a class of gases containing carbon and fluorine typically emitted as by-products of industrial and manufacturing processes, and possessing GWPs ranging from 5,700 to 11,900.

**permit** – An authorization issued by a federal, state, or local regulatory agency. Permits are issued under a number of environmental regulatory programs, including **CAA**, **CWA**, **RCRA**, and **TSCA**. Permits grant permission to operate, to discharge, to construct, and so on. Permit provisions may include emission/effluent limits and other requirements such as the use of pollution control devices, monitoring, record keeping and reporting. Also called a “license” or “certificate” under some regulatory programs.

**pH** – A measure of hydrogen ion concentration in an aqueous solution. Acidic solutions have a pH less than 7, neutral solutions have a pH of 7, and basic solutions have a pH greater than 7 and up to 14.

**plume** – A body of contaminated **groundwater** or polluted air flowing from a specific source. The movement of a groundwater plume is influenced by such factors as local groundwater flow patterns, the character of the aquifer in which groundwater is contained, and the density of contaminants. The movement of an air contaminant plume is influenced by the ambient air motion, the temperatures of the ambient air and of the plume, and the density of the contaminants.

**point source** – Any confined and discrete conveyance (e.g., pipe, ditch, well, or stack) of a discharge.

**pollutant** – Any hazardous or radioactive material naturally occurring or added to an environmental medium, such as air, soil, water, or vegetation.

**potable water** – Water of sufficient quality for use as drinking water without endangering the health of people, plants, or animals.

**precision** – A statistical term describing the dispersion of data around a central value, usually represented as a variance, standard deviation, standard error, or confidence interval.



**putrescible waste** – Garbage that contains food and other organic biodegradable materials. There are special management requirements for this waste in 6 NYCRR Part 360.

## Q

**QA (quality assurance)** – In environmental monitoring, any action to ensure the reliability of monitoring and measurement data. Aspects of QA include procedures, inter-laboratory comparison studies, evaluations, and documentation.

**QC (quality control)** – In environmental monitoring, the routine application of procedures to obtain the required standards of performance in monitoring and measurement processes. QC procedures include calibration of instruments, control charts, and analysis of replicate and duplicate samples.

**qualifier** – A letter or series of letter codes in a graph or chart indicating that the associated value did not meet analytical requirements or was estimated.

**quenching** – Anything that interferes with the conversion of decay energy to electronic signal in the photomultiplier tubes of detection equipment, usually resulting in a reduction in counting efficiency.

## R

**R (roentgen)** – A unit of exposure to ionizing radiation. It is the amount of gamma or x-rays required to produce ions carrying one electrostatic unit of electrical charge in one cubic centimeter of dry air under standard conditions. It is named after the German scientist Wilhelm Roentgen, who discovered x-rays.

**RA (removal actions, “removals”)** – Interim actions that are undertaken to prevent, minimize, or mitigate damage to the public health or environment that may otherwise result from a release or threatened release of hazardous substances, pollutants, or contaminants pursuant to CERCLA, and that are not inconsistent with the final remedial action. Under CERCLA, EPA may respond to releases or threats of releases of hazardous substances by starting an RA to stabilize or clean up an incident or site that immediately threatens public health or welfare. Removal actions are less comprehensive than remedial actions. However, removal actions must contribute to the efficiency of future remedial actions.

**radiation** – Some atoms possess excess energy, causing them to be physically unstable. Such atoms become stable when the excess energy is released in the form of charged particles or electromagnetic waves, known as radiation.

**radiation event** – A single detection of a charged particle or electromagnetic wave.

**radioactive series** – A succession of nuclides, each of which transforms by radioactive disintegration into the next until a stable nuclide results. The first member of the series is called the parent and the intermediate members are called daughters or progeny.

**radioactivity** – The spontaneous transition of an atomic nucleus from a higher energy to a lower energy state. This transition is accompanied by the release of a charged particle or electromagnetic waves from the atom. Also known as “activity.”

**radionuclide** – A radioactive element characterized by the number of protons and neutrons in the nucleus. There are several hundred known radionuclides, both artificially produced and naturally occurring.

**RCRA (Resource Conservation and Recovery Act)** Pronounced “rick-rah,” this act of Congress gave EPA the authority to control the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of nonhazardous wastes. The 1986 amendments to RCRA enabled EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances. RCRA focuses only on active and future facilities and does not address abandoned or historical sites (see CERCLA). In 1984, amendments to RCRA called the Hazardous and Solid Waste Amendments (HSWA, pronounced “hiss-wa”) required phasing out the land disposal of hazardous waste. Some other mandates of this strict law include increased enforcement authority for EPA, more stringent hazardous waste management standards, and a comprehensive underground storage tank (UST) program.

**recharge** – The process by which water is added to a zone of saturation (aquifer) from surface infiltration, typically when rainwater soaks through the earth to reach an aquifer.

**recharge basin** – A basin (natural or artificial) that collects water. The water will infiltrate to the aquifer.

**release** – Spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of a hazardous substance, pollutant, or contaminant into the environment. The National Contingency Plan also defines the term to include a threat of release.

**rem** – Stands for “roentgen equivalent man,” a unit by which human radiation dose is assessed (see also Sv). The rem is a risk-based value used to estimate the potential health effects to an exposed individual or population. 100 rem = 1 sievert.

**remedial (or remediation) alternatives** – Options considered under CERCLA for decontaminating a site such as an operable unit (OU) or area of concern (AOC). Remedial actions are long-term activities that prevent the possible release, or stop or substantially reduce the actual release, of substances that are hazardous but not immediately life-threatening. See also feasibility study (FS) and Record of Decision (ROD).

**residual fuel** – Crude oil, Nos. 1 and 2 fuel oil that have a nitrogen content greater than 0.05 weight percent, and all fuel oil Nos. 4, 5, and 6, as defined by the American Society of Testing and Materials in ASTM D396-78, *Standard Specifications for Fuel Oils*, (c. 2001).



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**riparian** – An organism living on the bank of a river, lake, or tidewater.

**ROD (Record of Decision)** – A document that records a regulatory agency's decision for the selected remedial action. The ROD also includes a responsiveness summary and a bibliography of documents that were used to reach the remedial decision. When the ROD is finalized, remedial design and implementation can begin.

**roentgen** – *See R.*

**RPD (relative percent difference)** – A measure of precision, expressed by the formula:  $RPD = [(A-B)/(A+B)] \times 200$ , where A equals the concentration of the first analysis and B equals the concentration of the second analysis.

**runoff** – The movement of water over land. Runoff can carry pollutants from the land into surface waters or uncontaminated land.

## S

**sampling** – The extraction of a prescribed portion of an effluent stream or environmental media for purposes of inspection or analysis.

**SARA (Superfund Amendments and Reauthorization Act)** – This Act of Congress in 1986 reauthorized CERCLA to continue cleanup activities around the country. Several site-specific amendments, definitions clarifications, and technical requirements were added to the legislation, including additional enforcement authorities. Title III of SARA also authorized EPCRA.

**SBMS (Standards-Based Management System)** – A document management tool used to develop and integrate systems, and to demonstrate BNL's conformance to requirements to perform work safely and efficiently.

**scintillation** – Flashes of light produced in a phosphor by a radioactive material.

**Scope 1 emissions** – Direct greenhouse gas emissions from sources that are owned or controlled by a Federal agency.

**Scope 2 emissions** – Indirect greenhouse gas emissions resulting from the generation of electricity, heat, or steam purchased by a Federal agency.

**Scope 3 emissions** – Greenhouse gas emissions from sources not owned or directly controlled by a Federal agency, but related to agency activities such as vendor supply chains, delivery services, and employee travel and commuting.

**SDWA (Safe Drinking Water Act)** – The Safe Drinking Water Act was established to protect the quality of drinking water in the United States. It focuses on all waters actually or potentially designed for drinking use, whether from above ground or underground sources. The SDWA authorized EPA to establish safe standards of purity and required all owners or operators of public water systems to comply with health-related standards. State governments assume regulatory power from EPA.

**sediment** – The layer of soil and minerals at the bottom of surface waters, such as streams, lakes, and rivers.

**sensitivity** – The minimum amount of an analyte that can be repeatedly detected by an instrument.

**sievert** – *See Sv.*

**skyspine** – Radiation emitted upward from an open-topped, shielded enclosure and reflected downward, resulting in the possibility that flora and fauna (including humans) outside the shielded enclosure can be exposed to radiation.

**sludge** – Semisolid residue from industrial or water treatment processes.

**sole source aquifer** – An area defined by EPA as being the primary source of drinking water for a particular region. Includes the surface area above the sole source aquifer and its recharge area.

**SPDES (State Pollutant Discharge Elimination System)** This permit program is delegated to the states, but the effluent limitations and other requirements are set by the federal government. 6 NYCRR Section 750-1.11(a) concerns the provisions of SPDES permits and lists the citations for the various effluent limitations from the Federal Register and the CFR.

**stable** – Nonradioactive.

**stakeholder** – People or organizations with vested interests in BNL and its environment and operations. Stakeholders include federal, state, and local regulators; the public; DOE; and BNL staff.

**stripping** – A process used to remove volatile contaminants from a substance (*see also air stripping*).

**sulfur hexafluoride (SF<sub>6</sub>)** – One of six primary GHGs, consisting of a single sulfur atom and six fluoride atoms, a GWP of 23,900, and primarily used in electrical transmission and distribution systems.

**sump** – A pit or tank that catches liquid runoff for drainage or disposal.

**Sv (sievert)** – A unit for assessing the risk of human radiation dose, used internationally and with increasing frequency in the United States. One sievert is equal to 100 rem.

**SVE (soil vapor extraction)** – An *in situ* (in-place) method of extracting VOCs from soil by applying a vacuum to the soil and collecting the air, which can be further treated to remove the VOCs, or discharged to the atmosphere.

**SVOC** – A general term for volatile organic compounds that vaporize relatively slowly at standard temperature and pressure. *See also* VOC.

**synoptic** – Relating to or displaying conditions as they occur over a broad area.

## T

**t<sub>1/2</sub> (half-life)** – The time required for one-half of the atoms of any given amount of a radioactive substance to disintegrate; the time required for the activity of a radioactive sample to be reduced by one half.

**TCE (trichloroethylene, also known as trichloroethene)** A stable, colorless liquid with a low boiling point. TCE has

many industrial applications, including use as a solvent and as a metal degreasing agent. TCE may be toxic when inhaled or ingested, or through skin contact, and can damage vital organs, especially the liver. *See also* **VOC**.

**Tier III reports** – Reports, required by **SARA**, that are prepared to document annual emissions of toxic materials to the environment. These are also known as TRI Section 313 reports.

**TLD (thermoluminescent dosimeter)** – A device used to measure radiation dose to occupational workers or radiation levels in the environment.

**tritium** – The heaviest and only radioactive nuclide of hydrogen, with a **half-life** of 12.3 years and a very-low-energy radioactive decay (tritium is a **beta** emitter).

**TSCA (Toxic Substances Control Act)** – Enacted by Congress in 1976, TSCA empowers **EPA** to track the 75,000 industrial chemicals produced or imported into the United States. EPA repeatedly screens these chemicals and can require reporting or testing of any that may pose an environmental or human health hazard. EPA can ban the manufacture or import of chemicals that pose an unreasonable risk.

**TVOC (total volatile organic compounds)** – A sum of all individual **VOC** concentrations detected in a given sample.

## U

**UIC (underground injection control)** – A hole with vertical dimensions greater than its largest horizontal dimensions; used for disposal of wastewater.

**UST (underground storage tank)** – A stationary device, constructed primarily of nonearthen material, designed to contain petroleum products or hazardous materials. In a UST, 10 percent or more of the volume of the tank system is below the surface of the ground.

**upgradient/upslope** – A location of higher **groundwater** elevation; analogous to “upstream.”

## V

**vadose** – Relating to water in the ground that is above the permanent groundwater level.

**vernal pool** – A small, isolated, and contained basin that holds water on a temporary basis, most commonly during winter and spring. It has no aboveground outlet for water and is extremely important to the life cycle of many amphibians (such as the tiger salamander), as it is too shallow to support fish, a major predator of amphibian larvae.

**VOC (volatile organic compound)** – A general term for organic compounds capable of a high degree of vaporization at standard temperature and pressure. Because VOCs readily evaporate into the air, the potential for human exposure is greatly increased. Due to widespread industrial use, VOCs are commonly found in soil and groundwater.

**VUV** – Stands for “very ultraviolet” and refers to a beam-line at the NSLS with wavelengths at the far ultraviolet end of the spectrum.

## W

**waste minimization** – Action that avoids or reduces the generation of waste, consistent with the general goal of minimizing current and future threats to human health, safety, and the environment. Waste minimization activities include recycling, improving energy usage, reducing waste at the source, and reducing the toxicity of hazardous waste. This action is associated with pollution prevention, but is more likely to occur after waste has been generated.

**water table** – The water-level surface below the ground where the unsaturated zone ends and the saturated zone begins. It is the level to which a well that is screened in the unconfined aquifer will fill with water.

**watershed** – The region draining into a river, a river system, or a body of water.

**weighting factor** – A factor which, when multiplied by the dose equivalent delivered to a body organ or tissue, yields the equivalent risk due to a uniform radiation exposure of the whole body. *See also* **EDE**.

**wet weight** – The wet weight concentration of a substance is before a sample is dried for analysis (in other words, in its “natural” state), and is the form most likely to be consumed. Wet weight concentrations are typically lower than dry weight values.

**wind rose** – A diagram that shows the frequency of wind from different directions at a specific location.

## X

**x-rays** – A form of electromagnetic **radiation** with short wavelength, generated when high-energy electrons strike matter or when lower-energy **beta** radiation is absorbed in matter. **Gamma** radiation and x-rays are identical, except for the source.

## Z

**zeolite** – A naturally occurring group of more than 100 minerals, formed of silicates and aluminum, with unique and diverse crystal properties. Zeolites can perform ion exchange, filtering, odor removal, and chemical sieve and gas absorption tasks. Synthetic zeolites are now used for most applications.

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