

## CHAPTER 9

### GLOSSARY

**absorbed dose** – The energy imparted to matter by ionizing radiation per unit mass of the irradiated material (e.g., biological tissue). The units of absorbed dose are the rad and the gray. (One rad equals 0.01 grays, which equals 100 ergs per gram of material.) (See *gray*, *ionizing radiation*, and *radiation absorbed dose [rad]*.)

**accelerator (particle)** – An apparatus for imparting high velocities by electromagnetic or electrostatic means to charged particles (as electrons) that are generated in the apparatus, accelerated in controlled paths to a state of high energy, and focused continuously until they emerge as a stream of high-speed projectiles. (See *electron*.)

**accident** – In the context of this environmental impact statement, a specific, identifiable, unexpected, unusual, and unintended event or sequence of events that results in undesirable consequences.

**accident sequence** – In regard to nuclear facilities, an initiating event followed by system failures or operator errors that could result in significant core damage, confinement system failure, and/or radionuclide releases.

**acid** – A chemical compound with a pH value lower than 7.0. (See *pH*.)

**actinide** – Any member of the group of elements with atomic numbers 89 (actinium) to 103 (lawrencium), including uranium and plutonium. All members of this group are radioactive. (See *radioactivity*.)

**activation energy** – The minimum amount of energy required to initiate a chemical reaction.

**activation product** – An element that is formed by absorption of neutrons, protons, or other nuclear particles and thus may be radioactive. (See *neutron* and *proton*.)

**active fault** – A fault where another earthquake is likely sometime in the future. Faults are commonly considered to be active if they have moved one or more times in the last 10,000 years. (See *fault*.)

**activity** – (1) A measure of the amount of radiation emitted from a radioactive material, expressed in either curies or becquerels. (See *becquerel* and *curie*.) (2) An action, operation, or effort.

**Acute Exposure Guideline Levels (AEGLs)** – Threshold values published by the National Research Council and National Academy of Sciences for use in chemical emergency planning, prevention, and response programs. AEGLs represent threshold exposure limits for the general population, including susceptible individuals, and are developed for exposure periods of 10 minutes, 30 minutes, 1 hour, 4 hours, and 8 hours. AEGL values are defined for varying degrees of severity of toxic effects, as follows:

**AEGL-1:** The airborne level of concentration of a substance above which the exposed population could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects would not be disabling and would be transient and reversible upon cessation of exposure.

**AEGL-2:** The airborne level of concentration of a substance above which the exposed population could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

**AEGL-3:** The airborne level of concentration of a substance above which the exposed population could experience life-threatening health effects or death.

**additive** – The property whereby the total effect of multiple agents is the sum of effects of the agents acting separately under the same conditions.

**administrative control** – Provisions related to organization and management, procedures, record-keeping, assessment, and reporting that are necessary to ensure safe operation of a facility.

**adsorption** – A “taking up” by physical or chemical forces of the molecules of gases, dissolved substances, or liquids by the surfaces of solids or liquids with which they are in contact.

**AEGL-1, -2, and -3** – See *Acute Exposure Guideline Levels*.

**affected environment** – The existing biological, physical, social, and economic conditions of an area that are subject to direct and/or indirect changes as a result of a proposed human action.

**air pollutant** – Generally, an airborne substance that, in sufficiently high concentrations, could harm living things or cause damage to materials. From a regulatory perspective, air pollutants are substances for which emissions or atmospheric concentrations are regulated or for which maximum guideline levels have been established to enable assessment of their potential for harmful effects on human health and welfare.

**air quality** – The cleanliness of the air as measured by the levels of pollutants relative to the standards or guideline levels established to protect human health and welfare.

**air quality control region** – Geographic subdivisions of the United States that were established to deal with pollution on a regional or local level. Some regions span more than one state.

**ALARA** – See *as low as is reasonably achievable*.

**alkaline** – Having the properties of a soluble mineral salt capable of neutralizing acids.

**alluvium (alluvial)** – Unconsolidated, poorly sorted detrital sediments deposited by streams and ranging in size from clay to gravel.

**alpha activity** – The emission of alpha particles by radioactive materials.

**alpha particle** – A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. It is identical to a helium nucleus and has a mass number of 4 and an electrostatic charge of +2. It has low penetrating power and a short range (a few centimeters in air). (See *alpha radiation*.)

**alpha radiation** – A strongly ionizing, but weakly penetrating, form of radiation consisting of positively charged alpha particles emitted spontaneously from the nuclei of certain elements during radioactive decay. Alpha radiation is the least penetrating of the three common types of ionizing radiation (alpha, beta, and gamma). Even the most energetic alpha particle generally fails to penetrate the dead layers of cells covering the skin and can be easily stopped by a sheet of paper. Alpha radiation is most hazardous when an alpha-emitting source resides inside an organism. (See *alpha particle*.)

**alternative** – One of two or more actions, processes, or propositions from which a decisionmaker will determine the course to be followed. The National Environmental Policy Act of 1969 (NEPA), as amended, states that in preparing an environmental impact statement (EIS), an agency “shall ... study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources” (Title 42 of the *United States Code*, Section 4322(2)(E)). Council on Environmental Quality NEPA-implementing regulations indicate that the alternatives section in an EIS is “the heart of the environmental impact statement” (Title 40 of the *Code of Federal Regulations*, Section 1502.14) and include rules for presenting the alternatives, including no action, and their estimated impacts.

**ambient** – Surrounding.

**ambient air** – The atmosphere surrounding people, plants, and structures.

**ambient air quality standards** – As prescribed by regulations, the level of pollutants in the air that may not be exceeded during a specified time in a defined area. Air quality standards are used to provide a measure of the health-related and visual characteristics of the air.

**amphibian** – Class of cold-blooded, scaleless vertebrates that usually begin life with gills and then develop lungs.

**anadromous** – Fish (such as salmon) that ascend freshwater streams from saltwater bodies of water to spawn.

**ancillary equipment** – Structures associated with tank operations, including miscellaneous underground storage tanks; the waste transfer system (diversion boxes, valve pits, and transfer piping); tank pits; tank risers; in-tank equipment; and miscellaneous facilities used in the treatment, transfer, or storage of tank waste.

**anion** – A negatively charged ion. (See *ion*.)

**annulus** – The space between the inner and outer shells of a double-shell tank.

**antagonistic** – Opposing or counteracting the effects of something else.

**aquatic** – Living or growing in, on, or near water.

**aquatic biota** – The sum total of living organisms within any designated aquatic area.

**aquifer** – An underground geologic formation, group of formations, or part of a formation that is capable of yielding a significant amount of water to wells or springs.

**aquitard** – A semipermeable geologic unit that inhibits the flow of water.

**archaeological sites** – Any location where humans have discarded artifacts or otherwise altered the terrain during prehistoric or historic times.

**area use factor** – The ratio of the size of an organism's home, breeding, or feeding/foraging range to the size of a contamination area; if the home range is larger than the contamination area, then the area use factor is unity.

**aromatic** – Of, related to, or containing the six-carbon ring typical of the benzene series and related organic groups; also, "having an aroma."

**artifact** – An object produced or shaped by human workmanship that is of archaeological or historical interest.

**as low as is reasonably achievable (ALARA)** – An approach to radiation protection used to manage and control worker and public exposures (individual and collective) and releases of radioactive material to the environment to as far below applicable limits as social, technical, economic, practical, and public policy considerations permit. ALARA is not a dose limit; it is instead a process for minimizing doses to as far below limits as is practicable.

**atmospheric dispersion** – The distribution of pollutants from their source into the atmosphere by wind, turbulent air motion attributable to solar heating of Earth's surface, or air movement over rough terrain and variable land and water surfaces.

**Atomic Energy Act** – A law enacted in 1946 and amended in 1954 that placed nuclear production and control of nuclear materials under the oversight of a civilian agency, originally the Atomic Energy Commission.

**Atomic Energy Commission (AEC)** – A five-member commission established by the Atomic Energy Act of 1946 to supervise nuclear weapons design, development, manufacturing, maintenance, modification, and dismantlement. In 1974 AEC was abolished, and all its functions were transferred to the U.S. Nuclear Regulatory Commission and the Administrator of the Energy Research and Development Administration (ERDA). ERDA was later terminated, and functions vested by

law in the Administrator were transferred to the Secretary of Energy.

**atomic number** – The number of positively charged protons in the nucleus of an atom or the number of electrons on an electrically neutral atom.

**attainment area** – An area that the U.S. Environmental Protection Agency has designated as in compliance with one or more of the National Ambient Air Quality Standards for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may be in attainment for some pollutants but not for others. (See *National Ambient Air Quality Standards*, *nonattainment area*, and *particulate matter*.)

**attenuate** – In the context of this environmental impact statement: (1) To reduce the concentration over time of a chemical (usually through adsorption, degradation, dilution, and/or transformation) or radionuclide (through radioactive decay). (See *adsorption* and *radioactive decay*.) (2) To dissipate, e.g., certain geologic strata tend to dissipate (attenuate) seismic energy.

**backfill** – Excavated earth or other material transferred into an open trench, cavity, or other opening in the earth.

**background radiation** – Radiation from cosmic sources; naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material); and atmospheric fallout (e.g., from the testing of nuclear explosive devices).

**barrier** – Any material or structure that prevents or substantially delays movement of constituents toward the accessible environment, especially an engineered structure used to isolate contaminants from the environment in accordance with appropriate regulations. (See *cap*, *Hanford barrier*, and *modified RCRA Subtitle C barrier*.)

**basalt** – The most common volcanic rock, dark gray to black in color, high in iron and

magnesium, low in silica, and typically found in lava flows.

**base** – A chemical compound with a pH value higher than 7.0. (See *pH*.)

**baseline** – The existing environmental conditions against which the impacts of the proposed actions and their alternatives can be compared.

**basin** – Geologically, a circular or elliptical downwarp or depression in Earth's surface that collects sediment. Younger sedimentary beds occur in the center of basins. Topographically, a depression into which water from the surrounding area drains.

**becquerel** – A unit of radioactivity equal to one disintegration per second. Thirty-seven billion becquerels equal 1 curie. (See *curie*.)

**bedrock** – The solid rock that lies beneath soil and other loose surface materials.

**BEIR V** – The fifth in a series of committee reports from the National Research Council on the biological effects of ionizing radiation, published in 1990. (See *BEIR VII*.)

**BEIR VII** – The seventh in a series of committee reports from the National Research Council on the biological effects of ionizing radiation, published in 2006. BEIR VII updates BEIR V, using epidemiologic and experimental research information accumulated since the BEIR V report to develop the best possible risk estimate for exposure experienced by radiation workers and members of the general public. (See *BEIR V*.)

**benchmark** – Dose or concentration known or accepted to be associated with a specific level of effect.

**benthic** – Relating to plants and animals dwelling at the bottom of oceans, lakes, rivers, and other surface waters.

**beryllium** – An extremely lightweight element with the atomic number 4. It is metallic and is used in nuclear reactors as a neutron reflector. (See *neutron* and *nuclear reactor*.)

**best available technology (BAT)** –

(1) Economically achievable pollution control methods that allow point sources to comply with the effluent limitations required by the Clean Water Act. Taken into account in identifying the BAT are the age of the equipment and facilities involved; process employed; engineering aspects of various control techniques; process changes; cost of achieving such effluent reduction; non-water-quality environmental impacts (including energy requirements); and other factors deemed appropriate by the U.S. Environmental Protection Agency (EPA) Administrator. (2) Available techniques, processes, or knowledge the EPA Administrator finds are available to comply with the provisions of the Safe Drinking Water Act after examining their efficacy under field and laboratory conditions and considering the costs. For the purpose of setting maximum contaminant levels for synthetic organic chemicals, any BAT must be at least as effective as granular activated carbon. (See *maximum contaminant level*.)

**best management practices (BMPs)** –

Structural, nonstructural, and managerial techniques, other than techniques for effluent limitations, used to prevent or reduce pollution of surface water. They are the most effective and practical means to control pollutants that are compatible with the productive use of the resource to which they are applied. BMPs are used in both urban and agricultural areas. BMPs can include activity schedules; practice prohibitions; maintenance procedures; treatment requirements; operating procedures; and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

**beta emitter** – A radioactive substance that decays by releasing a beta particle.

**beta particle** – A particle emitted in the radioactive decay of many radionuclides. A beta particle is identical to an electron. It has a short range in air and a limited ability to penetrate other materials; it can be stopped by clothing or a thin sheet of metal.

**beyond-design-basis accident** – An accident postulated for the purpose of generating large consequences by exceeding the functional and performance requirements for safety structures, systems, and components. (See *design-basis accident*.)

**beyond-design-basis events** – Postulated disturbances in process variables resulting from external events or multiple component or system failures that can potentially lead to beyond-design-basis accidents. (See *design-basis events*.)

**bioaccumulation factor** – The ratio of the concentration of a chemical in an organism to its concentration in a medium to which the organism is exposed.

**bioconcentration factor** – The ratio of the concentration of a chemical in an aquatic organism to the concentration of the chemical in the surface water, sediment, or soil to which that organism is exposed.

**biodiversity** – The diversity of life forms and their levels of organization.

**biomagnification** – The process by which the concentration of some chemicals increases with the increasing trophic level; thus, the concentration in a predator exceeds the concentration in its prey. (See *trophic level*.)

**biota (biotic)** – The plant and animal life of a region.

**biotransfer factor** – The ratio of the concentration of a substance in an organism to the concentration of that substance in food that is ingested per unit time.

**blanket assembly** – The material in an accelerator wherein the generated neutrons are moderated to permit their absorption (capture) in the target material to produce a new isotope.

**block** – U.S. Census Bureau term for small areas bounded on all sides by visible features or political boundaries; used in tabulation of census data.

**body burden** – The total amount of a substance in the cells and tissues of an organism.

**boron-10** – An isotope of the element boron that has a high-capture cross section for neutrons. It is used in nuclear reactor absorber rods for reactor control. (See *isotope* and *nuclear reactor*.)

**borrow** – Excavated material that has been taken from one area to be used as raw material or fill at another location.

**borrow area (pit, site)** – An area designated as the excavation site for geologic resources such as rock/basalt, sand, gravel, or soil to be used elsewhere for fill.

**bound** – To use simplifying assumptions and analytical methods in an analysis of impacts or risks such that the result overestimates or describes an upper limit on (i.e., “bounds”) potential impacts or risks.

A *bounding analysis* is an analysis designed to overestimate, or determine the upper limit to, potential impacts or risks.

A *bounding accident* is a hypothetical accident, the calculated consequences of which equal or exceed the consequences of all other potential accidents for a particular activity or facility.

**bounded** – Having the greatest consequences of any assessment of impacts associated with normal or abnormal operations.

**buffering capacity** – The ability of chemicals in solution (usually a weak acid or base and its salt) to minimize changes in the hydrogen ion concentration upon addition of an acid or base. (See *ion*.)

**bulk vitrification** – A supplemental thermal treatment process that converts low-activity waste into a solid glass form by drying that waste, mixing it with soil, and applying electrical current to the mix within a large steel container. (See *low-activity waste*.)

**burial ground** – A place for burying low-level radioactive waste and mixed low-level radioactive waste so as to prevent the escape of

hazardous chemicals radiation, and the dispersion thereof, into the environment. (See *hazardous chemical*, *low-level radioactive waste*, and *mixed low-level radioactive waste*.)

**byproduct material** – Any radioactive material (except special nuclear material [SNM]) yielded in, or made radioactive by exposure to radiation during, the process of producing or utilizing SNM; also, the tailings or waste produced by the extraction or concentration of uranium or thorium from any ore that is processed primarily for its source material content.

Byproduct material is exempt from regulation under the Resource Conservation and Recovery Act (RCRA). However, the exemption applies only to the actual radionuclides dispersed or suspended in the waste substance. Any nonradioactive hazardous waste component of the waste is subject to regulation under RCRA. (See *radioisotope* or *radionuclide*.)

**caisson** – Any of the cylindrical, steel-reinforced concrete underground vaults that are designed to store remote-handled waste in the low-level radioactive waste burial grounds. (See *burial ground* and *remote-handled waste*.)

**calcination** – A process that uses heat to evaporate water from radioactive waste and de-nitrate fission products to assist in stabilizing the waste form produced. (See *fission* and *radioactive waste*.)

**cancer** – The name given to a group of diseases characterized by uncontrolled cellular growth where the cells have invasive characteristics that enable the disease to transfer from one organ to another.

**candidate species** – *Federal*: Species native to the United States for which the U.S. Fish and Wildlife Service or the National Marine Fisheries Service has sufficient information on biological vulnerability and threats to justify proposing to add them to the threatened or endangered species list, but cannot do so immediately because other species have a higher priority for listing. The Services determine the listing priority of candidate taxa

in accordance with general guidelines published in the *Federal Register*.

*Washington State:* Current information indicates the probable appropriateness of listing as endangered or threatened (*Washington Administrative Code* 232-12-297). (See *endangered species* and *threatened species*.)

**canister** – A general term for a container, usually cylindrical, used in the handling, storage, transportation, or disposal of waste.

**canyon** – In the nuclear industry, a large, heavily shielded concrete building that contains a remotely operated nuclear materials processing facility.

**cap** – A cap used to cover a radioactive burial ground with soil, rock, vegetation, or other materials as part of the facility closure process. The cap is designed to reduce migration of radioactive and hazardous materials in the waste by infiltration of water or intrusion of humans, plants, or animals from the surface. In this environmental impact statement, the modified Resource Conservation and Recovery Act Subtitle C barrier was selected as a cap for low-level radioactive waste and mixed low-level radioactive waste disposal grounds. Also called a cover cap or barrier. (See *barrier*, *burial ground*, *low-level radioactive waste*, and *mixed low-level radioactive waste*.)

**capable fault** – A fault that has exhibited one or more of the following characteristics: (1) movement at or near the ground surface at least once within the past 35,000 years or movement of a recurring nature within the past 500,000 years; (2) macroseismicity as determined instrumentally and as reflected in records of sufficient precision to demonstrate a direct relationship with the fault; and (3) a structural relationship with another capable fault according to characteristic 1 or 2 above such that movement on one could reasonably be expected to be accompanied by movement on the other. (See *fault* and *macroseismicity*.)

**capacity (electric)** – An electric power plant's maximum power output.

**capacity factor** – The ratio of the annual average power production of a power plant to its rated capacity.

**capping** – As applied to radioactive and mixed-waste disposal facilities, the process of covering a burial ground with soil, rock, vegetation, or other materials as part of the facility closure process.

**carbonate** – A salt or ester of carbonic acid.

**carbon dioxide** – A colorless, odorless gas that is a normal component of ambient air and a product of fossil fuel combustion, animal expiration, and the decay or combustion of animal or vegetable matter.

**carbon monoxide** – A colorless, odorless, poisonous gas produced by incomplete fossil fuel combustion.

**carcinogen** – A substance or agent that produces or incites cancerous growth.

**cask** – A heavily shielded container used to store or ship radioactive materials.

**cast stone** – A nonthermal waste stabilization process that may be performed at ambient temperatures and pressures and involves mixing the waste with grout formers (e.g., Portland cement, fly ash, and slag) and conditioners to produce a solid waste form.

**Category 1 low-level radioactive waste (LLW)** – LLW containing radionuclide concentrations within the maximum limits defined for this waste type in the *Hanford Site Solid Waste Acceptance Criteria*. These limits are site-specific and define the lowest activity category of LLW. Category 1 waste typically does not require special packaging or treatment for disposal by shallow land burial. (See *low-level radioactive waste*.)

**Category 3 low-level radioactive waste (LLW)** – LLW containing radionuclide concentrations greater than those defined for Category 1 waste, but within the maximum limits defined for Category 3 waste in the *Hanford Site Solid Waste Acceptance Criteria*.

These limits are site-specific and are established using the performance assessment for a particular disposal facility. Category 3 waste typically requires special packaging or treatment for disposal by shallow land burial. (See *low-level radioactive waste*.)

**cation** – A positively charged ion. (See *ion*.)

**cell** – See *hot cell*.

**Central Plateau** – The elevated area in the center of the Hanford Site where the 200-East and 200-West Areas are located.

**chain reaction** – A reaction that initiates its own repetition. In nuclear fission, a chain reaction occurs when a neutron induces a nucleus to fission and the fissioning nucleus releases one or more neutrons, which induce other nuclei to fission. (See *fission, neutron, and nucleus*.)

**Chalfont container 9975** – A shielded Type B container with primary and secondary containment features that is used to store or ship radioactive materials. (See *cask* and *Type B packaging*.)

**characteristic waste** – Solid waste that is classified as hazardous waste because it exhibits any of the following properties or characteristics: ignitability, corrosivity, reactivity, or toxicity, as described in Title 40 of the *Code of Federal Regulations*, Sections 261.20 through 261.24. (See *hazardous waste, solid waste, and waste characterization*.)

**characterization** – See *waste characterization*.

**chemical oxidation** – A chemical reaction in which a molecule or atom loses electrons, thereby increasing its oxidation state, often by adding oxygen. Typical oxidizing agents include ozone, peroxides, persulfates, and permanganates and are commonly used for oxidation of organic constituents. (See *oxidation*.)

**chemical reduction** – A chemical reaction in which a molecule or atom gains electrons, thereby decreasing its oxidation state. Typical

reducing agents include chemicals such as sulfites, polyethylene glycol, hydrosulfide, or ferrous salts. When used for reduction of hexavalent chromium to the trivalent state, the reduced forms of this contaminant are much less mobile in the environment because of their low solubility and high adsorption to soils. Microbiological reduction of these waste constituents also has been found to occur naturally in sediment and aquifer environments; with the addition of chemical food sources to enhance microbe growth rates, reductive biological remediation is becoming more economical. (See *hexavalent, hexavalent chromium, trivalent, and valence*.)

**chronic exposure** – A continuous or intermittent exposure of an organism to a stressor (e.g., a toxic substance or ionizing radiation) over an extended period of time or significant fraction (often 10 percent or more) of the organism's lifespan. Generally, chronic exposure is considered to produce effects that can be observed only after a time following initial exposure. These may include impaired reproduction or growth, genetic effects, congenital defects, cancer, precancerous lesions, benign tumors, cataracts, and skin changes.

**cladding** – The outer metal jacket of a nuclear fuel element or target. It prevents fuel corrosion and retains fission products during nuclear reactor operation and subsequent storage, as well as providing structural support. Zirconium alloys, stainless steel, and aluminum are common cladding materials. In general, a metal coating bonded onto another metal. (See *fission products* and *target*.)

**Class I area** – A specifically designated area where the degradation of air quality is stringently restricted (e.g., many national parks, wilderness areas). (See *nuclear reactor* and *Prevention of Significant Deterioration*.)

**Class II area** – Most of the country that is not designated as Class I is designated as Class II. Class II areas are generally cleaner than air quality standards require, and moderate increases in new pollution are allowed after a regulatory-mandated impacts review.

**clastic** – Refers to rock or sediment made up primarily of broken fragments of preexisting rocks or minerals.

**clay** – The name for a family of finely crystalline sheet silicate minerals that commonly form as a product of rock weathering. Also, any particle smaller than or equal to about 0.002 millimeters (0.00008 inches) in diameter.

**Clean Air Act** – This act mandates and provides for enforcement of regulations to control air pollution from various sources.

**Clean Air Act Amendments of 1990** – Amendments expanding the U.S. Environmental Protection Agency's enforcement powers and adding restrictions on air toxics, ozone-depleting chemicals, stationary and mobile emission sources, and emissions implicated in acid rain and global warming.

**clean closure** – The premise of clean closure is that all hazardous waste has been removed from a given Resource Conservation and Recovery Act (RCRA)-regulated unit and any releases at or from the unit have been remediated so that further regulatory control under RCRA Subtitle C is not necessary to protect human health and the environment. Under State of Washington requirements (*Washington Administrative Code* 173-303-64) for closure of a tank system, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components (e.g., liners), contaminated soils, and structures and equipment contaminated with waste and must manage them as dangerous waste as required.

**cleanup** – Refers to the full range of projects and activities undertaken to address environmental and legacy waste issues associated with the Hanford Site.

**Clean Water Act of 1972, 1987** – This act regulates the discharge of pollutants from a point source into navigable waters of the United States in compliance with a National Pollutant Discharge Elimination System permit

and regulates discharges to or dredging of wetlands.

**closure** – Refers to the deactivation and stabilization of a waste treatment, storage, or disposal unit (such as a waste treatment tank, waste storage building, or landfill) or hazardous materials storage unit (such as an underground storage tank). For storage units, closure typically includes removal of all residues, contaminated system components, and contaminated soil. For radioactive and hazardous waste disposal units (i.e., where waste is left in place), closure typically includes site stabilization and emplacement of surface barriers. Specific requirements for the closure process are found in the regulations applicable to many types of waste management units and hazardous material storage facilities. For the State of Washington, hazardous waste disposal unit closure regulations are found at *Washington Administrative Code* 173-303-610.

**Code of Federal Regulations (CFR)** – All Federal regulations that are in effect are published in codified form in the CFR.

**collective dose** – The sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation. Collective dose is expressed in units of person-rem or person-sieverts. (See *dose*, *ionizing radiation*, *person-rem*, and *person-sievert*.)

**commercial light-water reactor** – The term used to describe commercially operated power-producing U.S. nuclear reactors that use “light” (as opposed to heavy) water for cooling and neutron moderation. (See *neutron* and *nuclear reactor*.)

**committed dose equivalent** – The dose equivalent received by an individual's organs or tissues during the 50 years following an intake of radioactive material. It does not include contributions from radiation sources external to the body. Committed dose equivalent is expressed in units of rem or sieverts. (See *ionizing radiation*, *roentgen equivalent man [rem]*, and *sievert*.)

**committed effective dose equivalent** – The dose value obtained by multiplying the committed dose equivalents for the organs or tissues that are irradiated and the weighting factors applicable to those organs or tissues and summing all the resulting products. Committed effective dose equivalent is expressed in units of rem or sieverts. (See *committed dose equivalent*, *roentgen equivalent man [rem]*, *sievert*, and *weighting factor*.)

**community** – (*biotic definition*) All plants and animals occupying a specific area under relatively similar conditions.

(*environmental justice definition*) A group of people or a site within a spatial scope exposed to risks that potentially threaten health, ecology, or land values or exposed to industry that stimulates unwanted noise, smell, industrial traffic, particulate matter, or other nonaesthetic impacts.

**Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)** – A Federal law (also known as Superfund) enacted in 1980 and reauthorized in 1986 (Title 42 of the *United States Code*, Section 9601 et seq.) that provides the legal authority for emergency response and cleanup of hazardous substances released into the environment and for the cleanup of inactive waste sites.

**conformity** – Conformity is defined in the Clean Air Act as the action's compliance with an implementation plan's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards and achieving expeditious attainment of such standards. Such activities will not cause or contribute to any new violation of any standard in any area; increase the frequency or severity of any existing violation of any standard in any area; or delay timely attainment of any standard, any required interim emission reduction, or other milestones in any area.

**contact-handled waste** – Radioactive waste or waste packages whose external dose rate is low enough to permit contact-handling by humans

during normal waste management activities (e.g., waste with a surface dose rate not exceeding 200 millirem per hour). (See *remote-handled waste*.)

**container** – In regard to radioactive waste, the outside envelope in the waste package that provides the primary containment function of the waste package, which is designed to meet the containment requirements of Title 10 of the *Code of Federal Regulations*, Part 60.

**containment design basis** – For a nuclear reactor, those bounding conditions for the design of the containment, including temperature, pressure, and leakage rate. Because the containment is provided as an additional barrier to mitigate the consequences of accidents involving the release of radioactive materials, the containment design basis may include an additional specified margin above those conditions expected to result from the plant design-basis accidents to ensure that the containment design can mitigate unlikely or unforeseen events. (See *bound*, *design basis*, *nuclear reactor*, and *reactor containment*.)

**contamination** – The deposition of undesirable material in air, soils, water, or ecological resources or on the surfaces of structures, areas, objects, or personnel.

**control rod** – A rod containing material such as boron that is used to control the power of a nuclear reactor. By absorbing excess neutrons, a control rod prevents the neutrons from causing further fissions, i.e., increasing power. (See *boron-10*, *fission*, *neutron*, and *nuclear reactor*.)

**coolant** – A substance, either gas or liquid, circulated through a nuclear reactor or processing plant to remove heat.

**cooperating agency** – “Any Federal agency (other than a lead agency) that has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment. A state or local agency of similar qualification

or, when the effects are on a reservation, an Indian tribe, may, by agreement with the lead agency, become a cooperating agency” (Title 40 of the *Code of Federal Regulations*, Section 1508.5).

**core zone** – A portion of the Central Plateau within the Hanford Site, encompassing the 200-East and 200-West Areas, that lies within the Industrial-Exclusive land use designation established under the 1999 *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*.

**Core Zone Boundary** – The perimeter of the core zone that is used as a line of analysis for groundwater transport calculations.

**credible accident** – An accident with a probability of occurrence greater than or equal to once in 1 million years.

**crib** – An underground structure designed to distribute liquid waste, usually through a perforated pipe, to the soil directly or to a connected tile field. Cribs use the filtration and ion exchange properties of the soil to contain radionuclides. A crib is operated only if radionuclide contamination observed in the groundwater beneath the crib is below a prescribed limit. (See *ion* and *radioisotope or radionuclide*.)

**criteria pollutant** – An air pollutant that is regulated by National Ambient Air Quality Standards. The U.S. Environmental Protection Agency must describe the characteristics and potential health and welfare effects that form the basis for setting or revising the standard for each regulated pollutant. Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and two size classes of particulate matter: less than or equal to 2.5 and 10 micrometers (0.0001 and 0.0004 inches) in diameter. New pollutants may be added to or removed from the list of criteria pollutants as more information becomes available. (See *National Ambient Air Quality Standards*.)

**critical habitat** – Habitat essential to the conservation of an endangered or threatened species that has been designated as critical by

the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act (Title 16 of the *United States Code*, Parts 1551 through 1599) and its implementing regulations (Title 50 of the *Code of Federal Regulations* [CFR], Part 424). The lists of critical habitats can be found in 50 CFR, Section 17.95 (fish and wildlife); 50 CFR, Section 17.96 (plants); and 50 CFR, Part 226 (marine species). (See *endangered species* and *threatened species*.)

**criticality** – The condition in which a system is capable of sustaining a nuclear chain reaction (a reaction that initiates its own repetition). In nuclear fission, a chain reaction occurs when a neutron induces a nucleus to fission and the fissioning nucleus releases one or more neutrons, which induce other nuclei to fission.

**critical mass** – The smallest mass of fissionable material that will support a self-sustaining nuclear chain reaction. (See *criticality* and *fission*.)

**critical organ** – The body organ receiving a radionuclide or radiation dose that would result in the greatest overall damage to the body. Specifically, that organ in which the dose equivalent would be most significant due to a combination of the organ’s radiological sensitivity and the dose distribution throughout the body. (See *dose*, *dose equivalent*, *ionizing radiation*, and *radioisotope or radionuclide*.)

**cryptogamic (microbiotic) crusts** – Earth crusts that generally occur in the top 1 to 4 millimeters (0.039 to 0.157 inches) of soil and are formed by living organisms and their byproducts, creating a crust of soil particles bound together by organic materials.

**cullet** – Small (pea-sized) pieces of glass formed when hot molten glass is quenched in a water bath.

**cultural resources** – Archaeological sites, historical sites, architectural features, traditional use areas, and American Indian sacred sites. (See *archaeological sites* and *historic resources*.)

**cumulative impacts** – Impacts on the environment that result from incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of the agency or person undertaking such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions that take place over a period of time (Title 40 of the *Code of Federal Regulations*, Section 1508.7).

**curie** – A unit of radioactivity equal to 37 billion disintegrations per second (i.e., 37 billion becquerels); also, a quantity of any radionuclide or mixture of radionuclides having 1 curie of radioactivity.

**dangerous waste** – Solid waste designated in *Washington Administrative Code* 173-303-070 through 173-303-100 as dangerous, extremely hazardous, or mixed waste. (See *mixed waste*.)

**daphnid** – A group of simple animals related to insects, nearly microscopic in size and found in freshwater habitats.

**day-night average sound level** – The 24-hour, A-weighted equivalent sound level expressed in decibels. A 10-decibel penalty is added to sound levels between 10:00 P.M. and 7:00 A.M. to account for increased annoyance due to noise during night hours. (See *decibel, A-weighted*.)

**deactivation** – Placing a facility in a stable and known condition, including removal of hazardous and radioactive materials, to ensure adequate protection of workers, public health and safety, and the environment, thereby limiting the long-term cost of surveillance and maintenance. Actions include the removal of fuel, draining and/or de-energizing nonessential systems, removal of stored radioactive and hazardous materials, and related actions. Deactivation does not include all decontamination necessary for the dismantlement and demolition phase of decommissioning (e.g., removing contamination remaining in fixed structures and equipment after deactivation).

As applied to waste treatment, removal of the hazardous characteristics of a waste due to its

ignitability, corrosivity, and/or reactivity. (See *decontamination* and *reactivity*.)

**decay (radioactive)** – See *radioactive decay*.

**decay heat (radioactivity)** – The heat produced by the decay of radionuclides. (See *radioisotope* or *radionuclide*.)

**decibel (dB)** – A unit for expressing the relative intensity of sounds on a logarithmic scale where zero is below human perception and 130 is above the threshold of pain to humans. For traffic and industrial noise measurements, the A-weighted decibel, a frequency-weighted noise unit, is widely used.

**decibel, A-weighted (dBA)** – A unit of frequency-weighted sound pressure level, measured by the use of a metering characteristic and the “A” weighting specified by the American National Standards Institute in ANSI S1.4-1983 (R1594), which accounts for the frequency of the human ear.

**deciduous** – Trees that shed leaves at a certain season.

**decommissioning** – The process of closing and securing a nuclear facility or nuclear material storage facility to provide adequate protection from radiation exposure and to isolate radioactive contamination from the human environment. It takes place after deactivation and includes surveillance, maintenance, decontamination, and/or dismantlement. These actions are taken at the end of the facility’s life to retire it from service with adequate regard for the health and safety of workers and the public and protection of the environment. The ultimate goal of decommissioning is unrestricted release or restricted use of the site. (See *deactivation*, *decontamination*, and *ionizing radiation*.)

**decontamination** – The removal or reduction of residual chemical, biological, or radiological contaminants and hazardous materials by mechanical, chemical, or other techniques to achieve a stated objective or end condition.

**depleted uranium** – Uranium whose content of the fissile isotope uranium-235 is less than the 0.7 percent (by weight) found in natural uranium, so that it contains more uranium-238 than natural uranium.

**deposition** – In geology, the laying down of potential rock-forming materials; sedimentation. In atmospheric transport, the settling out on ground and building surfaces of atmospheric aerosols and particles (“dry deposition”) or their removal from the air to the ground by precipitation (“wet deposition” or “rainout”).

**derived concentration guide** – The concentration of a radionuclide in air or water that, under conditions of continuous exposure for 1 year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation), would result in an effective dose equivalent of 100 millirem. (See *dose equivalent*, *millirem*, and *radioisotope or radionuclide*.)

**dermal** – Of or pertaining to the skin or other external body covering.

**design basis** – For nuclear facilities, information that identifies the specific functions to be performed by a structure, system, or component and the specific values (or ranges of values) chosen for controlling parameters for reference bounds for design. These values may be (1) restraints derived from generally accepted state-of-the-art practices for achieving functional goals; (2) requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals; or (3) requirements derived from Federal safety objectives, principles, goals, or requirements. (See *bound*.)

**design-basis accident** – An accident postulated for the purpose of establishing functional and performance requirements for safety structures, systems, and components. (See *beyond-design-basis accident*.)

**design-basis events** – Postulated disturbances in process variables that can potentially lead to

design-basis accidents. (See *beyond-design-basis events*.)

**detector** – A device used to convert the energy of incident radiation into another form (such as light, an electrical signal, or a trace in a chemical emulsion) to observe or measure radiation.

A *particle detector* is any device used to sense the passage of atomic or subatomic particles or to measure their properties. For many particle detectors, this involves observing and measuring the electromagnetic or ionizing radiation released as particles interact with a gaseous, liquid, or solid medium or an electromagnetic field. The term also may refer to a collection of particle detection devices designed to allow physicists to reconstruct particle events. (See *ionizing radiation*.)

**deterministic analysis** – A single calculation using only a single value for each of the model parameters. A deterministic system is governed by definite rules of system behavior leading to cause-and-effect relationships and predictability. Deterministic calculations do not account for uncertainty in the physical relationships or parameter values. Typically, deterministic calculations are based on best estimates of the involved parameters. (See *stochastic analysis*.)

**dewatering** – The removal of water. Saturated soils are “dewatered” to make construction of building foundations easier.

**dip** – A measure of the angle between the flat horizon and the slope of a sedimentary layer, fault plane, metamorphic foliation, or other geologic structure.

**direct jobs** – The number of workers required at a site to implement an alternative.

**disassociation** – The action of becoming separated.

**discharge** – In surface-water hydrology, the amount of water issuing from a spring or in a stream that passes a specific point in a given period of time.

**disintegration** – Any transformation of a nucleus, whether spontaneous or induced by irradiation, in which the nucleus emits one or more particles or photons. (See *nucleus* and *photon*.)

**disposal** – As generally used in this environmental impact statement, the placement of waste with no intent to retrieve. Statutory or regulatory definitions of disposal may differ.

**disposal groups** – Specific combinations of waste capacities allocated to the River Protection Project Disposal Facility and 200-East (or both 200-East and 200-West) Area Integrated Disposal Facility(ies) over varying operational timeframes, based on the different types and amounts of waste generated under the three sets of alternatives analyzed in this environmental impact statement.

**disposition** – The ultimate “fate” or end use of a surplus U.S. Department of Energy facility following transfer of the facility to the Office of the Assistant Secretary for Environmental Management.

**DOE orders** – Requirements internal to the U.S. Department of Energy that establish policy and procedures, including those for compliance with applicable laws.

**dose** – The accumulated radiation or hazardous substance delivered to the whole body or a specified tissue or organ within a specified time and originating from an external or internal source. (See *absorbed dose*, *dose [chemical]*, *dose [radiological]*, *exposure*, and *ionizing radiation*.)

**dose (chemical)** – The amount of a substance administered to, taken up by, or assimilated by an organism. It is often expressed in terms of the amount of substance per unit mass of the organism, tissue, or organ of concern.

**dose (radiological)** – A generic term that means absorbed dose, effective dose equivalent, committed effective dose equivalent, or total effective dose equivalent, as defined elsewhere in this glossary.

**dose commitment** – The total dose equivalent a body, organ, or tissue would receive during a specified period of time (e.g., 50 years) as a result of intake (as by ingestion or inhalation) of one or more radionuclides from a defined release. (See *dose equivalent* and *radioisotope or radionuclide*.)

**dose equivalent** – A measure of radiological dose that correlates with biological effect on a common scale for all types of ionizing radiation. Defined as a quantity equal to the absorbed dose in tissue multiplied by a quality factor (the biological effectiveness of a given type of radiation) and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and the sievert. (See *dose*, *ionizing radiation*, *roentgen equivalent man [rem]*, and *sievert*.)

**dose rate** – The radiation dose delivered per unit of time (e.g., rem per year). (See *dose*, *ionizing radiation*, and *roentgen equivalent man [rem]*.)

**double-shell tank** – A large reinforced concrete underground container with two steel liners to provide containment and backup containment of liquid waste. The space between the liners has instruments that detect leaks from the inner liner.

**drinking water standards** – The maximum permissible levels of constituents or characteristics in a drinking water supply as specified by the Safe Drinking Water Act (Title 42 of the *United States Code*, Section 300(f) et seq.).

**dynamic time-varying model** – A representation of a system with state variables that change in value over time due to changes in parameters or inputs.

**easting** – The difference in longitude between two positions as a result of movement to the east.

**ecological risk assessment** – Evaluation of the likelihood of adverse effects on animals and plants as a result of actual or potential stressors in the environment.

**ecology** – A branch of science dealing with the interrelationships of living organisms with one another and with their nonliving environment.

**ecosystem** – A community of organisms and their physical environment that interact as an ecological unit.

**edaphic** – Of or relating to the soil.

**effective dose equivalent** – The dose value obtained by multiplying the dose equivalents received by specified tissues or organs of the body by the appropriate weighting factors applicable to the tissues or organs irradiated, and then summing all of the resulting products. It includes the dose from radiation sources internal and external to the body. The effective dose equivalent is expressed in units of rem or sieverts. (See *committed dose equivalent*, *committed effective dose equivalent*, *dose*, *ionizing radiation*, *roentgen equivalent man [rem]*, and *sievert*.)

**effervescent** – Giving off gas bubbles.

**efficacy** – A measure of the probability and intensity of beneficial effects.

**effluent** – A waste stream flowing into the atmosphere, surface water, groundwater, or soil; frequently applied to waste discharged to surface water.

**electrometallurgical treatment** – A technique for collecting, concentrating, and immobilizing fission products and transuranic elements from metallic spent nuclear fuel by removing the uranium in the spent fuel with an electrochemical cell. The treatment alters the chemical and physical nature of spent nuclear fuel to reduce its toxicity, volume, and mobility and render it suitable for transport, storage, or disposal. (See *hot cell* and *spent nuclear fuel*.)

**electron** – An elementary particle with a mass of  $9.107 \times 10^{-28}$  grams (or 1/1,837 of a proton) and a negative charge. Electrons surround the positively charged nucleus and determine the chemical properties of the atom.

**element occurrence** – An element occurrence of a plant community is one that meets minimum standards set by the Washington State Natural Heritage Program, established by the Natural Area Preserves Act (*Revised Code of Washington*, Chapter 79.70), for ecological condition, size, and surrounding landscape. Element occurrences are generally considered to be of significant conservation value from a state and/or regional perspective.

**eluate** – An adsorbed substance that has been removed from an adsorbent solution. (See *adsorption*.)

**Emergency Response Planning Guidelines (ERPGs)** – Values developed by the American Industrial Hygiene Association to assist emergency response personnel in planning for catastrophic releases to the community. ERPG values are defined for varying degrees of severity of toxic effects, as follows:

**ERPG-1:** The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.

**ERPG-2:** The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

**ERPG-3:** The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

**emission** – A material discharged into the atmosphere from a source operation or activity.

**emission standard** – A requirement established by the state or the U.S. Environmental Protection Agency that limits the quantity, rate, or concentration of air

pollutant emissions on a continuous basis, including any requirement relating to (1) operation or maintenance of a source to ensure continuous emission reduction and (2) any design, equipment, work practice, or operational standard.

**endangered species** – *Federal*: Species that are in danger of extinction throughout all or a significant portion of their ranges and that have been listed as endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following procedures outlined in the Endangered Species Act (Title 16 of the *United States Code*, Parts 1551 through 1599) and its implementing regulations (Title 50 of the *Code of Federal Regulations* [CFR], Part 424). The lists of endangered species can be found in 50 CFR, Section 17.11 (wildlife); 50 CFR, Section 17.12 (plants); and 50 CFR, Section 222.23(a) (marine organisms).

*Washington State*: Any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state within the foreseeable future if factors contributing to its decline continue (*Washington Administrative Code* 232-12-297; Washington State Natural Heritage Program, established by the Natural Area Preserves Act [*Revised Code of Washington*, Chapter 79.70]). (See *candidate species* and *threatened species*.)

**engineered safety features** – For a nuclear facility, features that prevent, limit, or mitigate the release of radioactive material from its primary containment. (See *radioactivity* and *reactor containment*.)

**enriched uranium** – Uranium with a content of the fissile isotope uranium-235 greater than the 0.7 percent (by weight) found in natural uranium. (See *highly enriched uranium*, *natural uranium*, and *uranium*.)

**entombment** – A process whereby aboveground structures are decontaminated and dismantled, belowground structures are grouted and left in place, and an infiltration barrier is placed over the contaminated material.

**entrainment** – The involuntary capture and inclusion of organisms in streams of flowing water; a term often applied to the cooling water systems of power plants and nuclear reactors. The organisms involved may include phyto- and zooplankton, fish eggs and larvae (ichthyoplankton), shellfish larvae, and other forms of aquatic life. (See *nuclear reactor*.)

**Environment, Safety, and Health Program** – In the context of the U.S. Department of Energy (DOE), encompasses those requirements, activities, and functions in the conduct of all DOE and DOE-controlled operations that are concerned with: impacts on the biosphere; compliance with environmental laws, regulations, and standards controlling air, water, and soil pollution; limiting the risks to the well-being of both the operating personnel and the general public; and protecting property against accidental loss and damage. Typical activities and functions related to this program include, but are not limited to, environmental protection, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, process and facility safety, nuclear safety, emergency preparedness, quality assurance, and radioactive and hazardous waste management.

**environmental assessment (EA)** – A concise public document that a Federal agency prepares under the National Environmental Policy Act (NEPA) to provide sufficient evidence and analysis to determine whether a proposed agency action would require preparation of an environmental impact statement (EIS) or a Finding of No Significant Impact. A Federal agency may also prepare an EA to aid its compliance with NEPA when no EIS is necessary or to facilitate its preparation of an EIS when one is necessary.

An EA must include brief discussions of the (1) need for the proposal, (2) alternatives, (3) environmental impacts of the proposed actions and alternatives, and (4) a list of agencies and persons consulted. (See *environmental impact statement*, *Finding of No Significant Impact*, and *National Environmental Policy Act of 1969*.)

**environmental impact statement (EIS)** – The detailed written statement that is required by Section 102(2)(C) of the National Environmental Policy Act (NEPA) for a proposed major Federal action that could significantly affect the quality of the human environment. A U.S. Department of Energy (DOE) EIS is prepared in accordance with applicable requirements of the Council on Environmental Quality's NEPA regulations (Title 40 of the *Code of Federal Regulations* [CFR], Parts 1500–1508) and the DOE NEPA regulations found in 10 CFR, Part 1021. The statement includes, among other information, discussions of the environmental impacts of the proposed actions and the range of reasonable alternatives; the adverse environmental effects that cannot be avoided should the proposal be implemented; the relationship between short-term use of the environment and long-term productivity; and any irreversible and irretrievable commitments of resources.

**environmental justice** – The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, and socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, or commercial operations or the execution of Federal, state, local, or tribal programs or policies. Executive Order 12898 directs Federal agencies to make achieving environmental justice part of their missions by identifying and addressing disproportionately high and adverse effects of agency programs, policies, and activities on minority and low-income populations. (See *low-income population* and *minority population*.)

**eolian** – Pertaining to, caused by, or carried by the wind.

**ephemeral stream** – A stream that flows only after a period of heavy precipitation.

**epicenter** – The point on Earth's surface directly above the focus of an earthquake.

**epidemiology** – Study of the occurrence, causes, and distribution of disease or other health-related states and events in human populations, often as related to age, sex, occupation, ethnic, and economic status, to identify and alleviate health problems and promote better health.

**equilibrium partitioning** – Process of achieving a steady state between the activity of chemicals (usually approximated as concentration) in the various component phases—water, sediment, and organisms.

**equivalent sound (pressure) level** – The equivalent, steady sound level that, if continuous during a specified time period, would contain the same total energy as the actual time-varying sound.  $L_{eq}(1-h)$  and  $L_{eq}(24-h)$  are the 1-hour and 24-hour equivalent sound levels, respectively.

**erg** – An absolute unit of work representing the work done by a force of 1 dyne acting through a displacement of 1 centimeter in the direction of the force. (A dyne is a unit of force equal to the force that would accelerate a free mass of 1 gram 1 centimeter per second per second.)

**erosion** – Removal of material by water, wind, or ice.

**ERPG-1, -2, and -3** – See *Emergency Response Planning Guideline*.

**ester** – Any of a class of chemical compounds that, when hydrolyzed, yield an organic or inorganic acid and an alcohol or phenol and hence may be classified by either their acid constituent or their alcohol or phenol constituent.

**Evolutionarily Significant Unit** – A distinctive group of Pacific salmon, steelhead, or sea-run cutthroat trout.

**excavation** – A cavity in the earth formed by cutting, digging, or scooping using heavy construction equipment.

**experimental, nonessential population (Federal)** – The term “experimental population” means any population (including any offspring arising solely therefrom) authorized, per procedures outlined in the Endangered Species Act (Title 16 of the *United States Code*, Parts 1551 through 1599), for release outside the current range of such species, but only when, and at such times as, the population is wholly separate geographically from nonexperimental populations of the same species. An experimental population determined to be not essential to the continued existence of a species shall be treated, except when it occurs in an area within the National Wildlife Refuge System or the National Park System, as a species proposed to be listed as an endangered species or a threatened species.

**exposure** – The condition of being subject to the effects of, or acquiring a dose of, a potential stressor such as a hazardous chemical agent or ionizing radiation; also, the process by which an organism acquires a dose of a chemical such as mercury or a physical agent such as ionizing radiation. Exposure can be quantified as the amount of the agent available at various boundaries of the organism (e.g., skin, lungs, gut) and available for absorption. (See *ionizing radiation*.)

**exposure limit** – The level of exposure to a hazardous chemical (set by law or a standard) at which or below which adverse human health effects are not expected to occur. (See *reference concentration* and *reference dose*.)

**exposure pathway** – The course a chemical or physical agent takes from the source to the exposed organism. An exposure pathway describes a mechanism by which chemicals or physical agents at or originating from a release site reach an individual or population. Each exposure pathway includes a source or release from a source, an exposure route, and an exposure point. If the exposure point differs from the source, a transport/exposure medium such as air or water is also included. (See *exposure*.)

**external dose or exposure** – The portion of the dose equivalent received from radiation sources outside the body (i.e., “external sources”). (See *dose equivalent* and *ionizing radiation*.)

**extrusion** – A type of process in which a material (e.g., metal or plastic) is forced through a die, or very small hole, to give it a certain shape.

**Fast Flux Test Facility (FFTF)** – A liquid-metal (sodium)-cooled and -moderated nuclear test reactor at the Hanford Site. It was fueled with a mixture of plutonium-uranium dioxide and had a 400-megawatt power level. It is presently being deactivated. (See *nuclear reactor*.)

**fault** – A fracture or a zone of fractures within a rock formation along which vertical, horizontal, or transverse slippage has occurred. A normal fault occurs when the hanging wall has been depressed in relation to the footwall. A reverse fault occurs when the hanging wall has been raised in relation to the footwall.

**fill material** – Soil, rock, gravel, or other matter that is placed at a specified location to bring the ground surface up to a desired elevation.

**Finding of No Significant Impact (FONSI)** – A Federal agency, having prepared an environmental assessment of an action, issues this public document that briefly presents the reasons the action has no potential to have a significant effect on the human environment and, thus, will not require preparation of an environmental impact statement. (See *environmental assessment* and *environmental impact statement*.)

**fissile material** – Although sometimes used as a synonym for fissionable material, this term has acquired a more restricted meaning, namely, any material fissionable by thermal (slow) neutrons. The three primary fissile materials are uranium-233, uranium-235, and plutonium-239. (See *fission* and *neutron*.)

**fission** – A nuclear transformation that is typically characterized by the splitting of a

heavy atomic nucleus into at least two other nuclei, the emission of one or more neutrons, and the release of a relatively large amount of energy. Fission of heavy atomic nuclei can occur spontaneously or be induced by neutron bombardment. (See *neutron*.)

**fission products** – Radioactive elements or compounds formed by the fission of heavy elements, plus the nuclides formed by the radioactive decay of those elements or compounds. (See *fission* and *nuclide*.)

**fissionable material** – Commonly used as a synonym for fissile material, the meaning of this term has been extended to include material that can be fissioned by fast neutrons, such as uranium-238. (See *neutron*.)

**floodplain** – The lowlands and relatively flat areas adjoining inland and coastal waters and the flood-prone areas of offshore islands. Floodplains include, at minimum, that area with at least a 1 percent chance of being inundated by a flood in any given year.

The *probable maximum flood* is the hypothetical flood considered to be the most severe reasonably possible flood, based on comprehensive hydrometeorological application of maximum precipitation and other hydrological factors favorable for maximum flood runoff (e.g., sequential storms and snowmelts). It is usually several times larger than the maximum recorded flood.

**fluvial** – Produced by the action of flowing water.

**flux** – Rate of flow through a unit area; in nuclear reactor operation, the apparent flow of neutrons in a defined energy range. (See *neutron flux* and *nuclear reactor*.)

**food chain multiplier** – A numerical factor quantifying the increase in concentration of a substance in an organism resulting from the accumulation and biomagnification of the substance through the food web.

**food web** – The network of feeding relationships in an ecosystem. (See *ecosystem*.)

**formation** – In geology, the primary unit of formal stratigraphic mapping or description. Most formations possess certain distinctive features.

**French drain** – A rock-filled encasement with an open bottom to allow seepage of liquid waste into the ground.

**fuel assembly** – A cluster of fuel rods or plates; also called a fuel element. Approximately 200 fuel assemblies make up a nuclear reactor core. (See *nuclear reactor*.)

**fuel rod** – A nuclear reactor component that includes the fissile material. (See *fissile material*.)

**fugitive emissions** – (1) Emissions that do not pass through a stack, vent, chimney, or similar opening where they could be captured by a control device. (2) Any air pollutant emitted to the atmosphere other than from a stack. Sources of fugitive emissions include pumps; valves; flanges; seals; area sources such as ponds, lagoons, landfills, and piles of stored material (e.g., coal); and road construction areas or other areas where earthwork occurs.

**fusion** – The combining of two light atomic nuclei (such as hydrogen isotopes or lithium) to form a heavier atomic nucleus. Fusion is accompanied by the release of large amounts of energy. (See *nucleus*.)

**g** – In measuring earthquake ground motion, the acceleration (the rate of change in velocity) experienced relative to that due to Earth's gravity (i.e., approximately equal to 980 centimeters per second squared).

**gamma radiation** – High-energy, short-wavelength electromagnetic radiation emitted from the nucleus of an atom during radioactive decay. Gamma radiation frequently accompanies alpha and beta emissions and always accompanies fission. Gamma rays are very penetrating and are best stopped or shielded by dense materials, such as lead or depleted uranium. Gamma rays are similar to x-rays, but are usually more energetic. (See

*alpha radiation, beta particle, ionizing radiation, nucleus, and radioactive decay.*)

**generator** – Within the context of this environmental impact statement, generators refer to organizations within the U.S. Department of Energy (DOE) or managed by DOE whose act or process produces low-level radioactive waste (LLW), mixed LLW, or transuranic waste.

**genetic effects** – Inheritable changes (chiefly mutations), produced by exposure to ionizing radiation or other chemical or physical agents, of the parts of cells that control biological reproduction and inheritance. (See *ionizing radiation*.)

**GENII** – A computer code used to predict the radiological impacts on individuals and populations associated with the release of radioactive material into the environment during normal operations and postulated accidents.

**geologic repository** – A place to dispose of radioactive waste deep beneath Earth's surface.

**geology** – The science that studies the materials, processes, environments, and history of Earth, including rocks and their formation and structure.

**gigaelectron volts** – One thousand million electron volts (MeV). (See *MeV*.)

**glovebox** – A large enclosure that separates workers from equipment used to process hazardous material while allowing the workers to be in physical contact with the equipment. Gloveboxes are normally constructed of stainless steel, with large acrylic/lead glass windows. Workers access equipment using heavy-duty, lead-impregnated rubber gloves, the cuffs of which are sealed in portholes in the glovebox windows.

**graded approach** – A process by which the level of analysis, documentation, and actions necessary to comply with a requirement are commensurate with (1) the relative importance to safety, safeguards, and security; (2) the

magnitude of any hazard involved; (3) the life-cycle stage of a facility; (4) the programmatic mission of a facility; (5) the particular characteristics of a facility; and (6) any other relevant factor.

**grading** – Any stripping, cutting, filling, stockpiling, or combination thereof that modifies the land surface.

**gravel pit No. 30** – This gravel pit, located between the 200-East and 200-West Areas, is an approximately 54-hectare (134-acre) borrow site containing a large quantity of aggregate (sand and gravel) suitable for multiple uses. Gravel pit No. 30 provides aggregate for onsite concrete batch plants in support of the construction of new facilities, including those at the Waste Treatment Plant adjacent to the 200-East Area.

**gray** – The International System of Units (SI) unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (1 gray is equal to 100 rad). The joule is the SI unit of energy and is equivalent to 10 million ergs. (See *absorbed dose, erg, joule, and radiation absorbed dose [rad]*.)

**greater-than-Category 3 (GTC3) low-level radioactive waste (LLW)** – LLW that exceeds the maximum radionuclide concentration limits as defined for Category 3 LLW. (See *Category 3 low-level radioactive waste*.)

**greater-than-Class C (GTCC) low-level radioactive waste (LLW)** – LLW generated by the commercial sector that exceeds U.S. Nuclear Regulatory Commission (NRC) concentration limits for Class C LLW, as specified in "Licensing Requirements for Land Disposal of Radioactive Waste" (Title 10 of the *Code of Federal Regulations*, Part 61).

In addition to the GTCC LLW generated as a result of NRC- or agreement-state-licensed activities, the U.S. Department of Energy (DOE) generates waste containing concentrations of radionuclides that are similar to GTCC LLW. This waste is referred to as "DOE GTCC-like waste."

**ground shine** – The radiation dose received from an area on the ground where radioactivity has been deposited by a radioactive plume or cloud. (See *dose* and *ionizing radiation*.)

**groundwater** – Water below the ground surface in a zone of saturation.

**grout** – A fluid mixture of cement-like materials and liquid waste that sets up as a solid mass and is used for waste fixation, immobilization, and stabilization.

**habitat** – The environment occupied by individuals of a particular species, population, or community.

**half-life (radiological)** – The time in which one-half of the atoms of a particular radioactive isotope disintegrate to another nuclear form. Half-lives vary from millionths of a second to billions of years. (See *radioisotope* or *radionuclide*.)

**Hanford barrier** – A horizontal, multilayered, above-grade soil structure used as a representative surface barrier (cap) for closure at a Hanford Site landfill. The barrier's function is to isolate the waste site from the environment by preventing or reducing the likelihood of wind erosion; water infiltration; or plant, animal, or human intrusion.

**Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement)** – An agreement signed in 1989 by the U.S. Department of Energy, the U.S. Environmental Protection Agency, and the Washington State Department of Ecology that identifies milestones for key environmental restoration and waste management actions.

**Hazard Index** – (*ecological definition*) The sum of the individual Hazard Quotients of constituents within a class that exert effects with the same toxicological mechanism or endpoint and are additive in effect.

(*human health definition*) A summation of the Hazard Quotients for all chemicals now being used at a site, as well as those proposed to be added, to yield the cumulative levels for the

site. A Hazard Index value of 1.0 or less means that no adverse human health effects (noncancer) are expected to occur. (See *Hazard Quotient*.)

**Hazard Quotient** – The value used as an assessment of non-cancer-associated toxic effects of chemicals, e.g., kidney or liver dysfunction. It is a ratio of the estimated exposure to that level of exposure at which it is expected that adverse health effects would begin to be produced. It is independent of a cancer risk, which is calculated for only those chemicals identified as carcinogens.

**hazardous air pollutants** – Air pollutants that are not covered by ambient air quality standards, but may present a threat of adverse human health or environmental effects. Those specifically listed in Title 40 of the *Code of Federal Regulations*, Section 61.01, are asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. More broadly, hazardous air pollutants include any of the 189 pollutants listed in or pursuant to Section 112(b) of the Clean Air Act.

**hazardous chemical** – Under Title 29 of the *Code of Federal Regulations*, Part 1910, Subpart Z, hazardous chemicals are defined as “any chemical that is a physical hazard or a health hazard.” Physical hazards include combustible liquids, compressed gases, explosives, flammables, organic peroxides, oxidizers, pyrophorics, and reactives. A health hazard is any chemical for which there is good evidence that acute or chronic health effects occur in exposed employees. Hazardous chemicals include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, agents that act on the hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes.

**hazardous material** – A material, including a hazardous substance, as defined by Title 49 of the *Code of Federal Regulations*, Section 171.8, that poses a risk to health, safety, or property when transported or handled.

**hazardous substance** – Any substance subject to the reporting and possible response provisions of the Clean Water Act and the Comprehensive Environmental Response, Compensation, and Liability Act.

**hazardous waste** – A category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in Title 40 of the *Code of Federal Regulations* (CFR), Sections 261.20 through 261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity), or it must be specifically listed by the U.S. Environmental Protection Agency in 40 CFR, Sections 261.31 through 261.33. Hazardous waste may also include solid waste designated by Washington State in *Washington Administrative Code* 173-303-070 through 173-303-100 as dangerous or extremely hazardous waste.

**heavy-haul truck** – A truck that exceeds normally applicable vehicle weight limits for highway travel. State authorities may issue special permits allowing trucks to exceed weight limits to carry “nondivisible loads,” such as spent nuclear fuel casks, on public highways. Roadways and bridges may need to be upgraded to carry such vehicles. (See *legal-weight truck* and *spent nuclear fuel*.)

As used in this environmental impact statement, “heavy-haul truck” means a truck with a gross vehicle weight (truck and cargo weight) of more than 58,500 kilograms (129,000 pounds).

**heavy metal** – In the context of nuclear technology, “heavy metal” means all uranium, plutonium, or thorium placed into a nuclear reactor. (See *nuclear reactor*.)

**heavy metals** – Metallic and semimetallic elements that are generally highly toxic to plants and animals and tend to accumulate in food chains are referred to collectively as “heavy metals.” Heavy metals include lead, mercury, cadmium, chromium, and arsenic.

**hexavalent** – Having a valence of six. (See *hexavalent chromium* and *valence*.)

**hexavalent chromium** – Hexavalent chromium compounds are a group of chemical substances that contain the metallic element chromium in its positive-6 valence (hexavalent) state. (See *hexavalent* and *valence*.)

**high-efficiency particulate air filter** – An air filter capable of removing at least 99.97 percent of particles 0.3 micrometers (about 0.00001 inches) in diameter. These filters include a pleated fibrous medium (typically fiberglass) that is capable of capturing very small particles.

**high-integrity container** – A container that provides additional confinement for remote-handled Category 3 low-level radioactive waste (LLW) and some contact-handled Category 3 LLW and is typically constructed of concrete or other durable material.

**high-level radioactive waste** – As defined in the *Radioactive Waste Management Manual* (U.S. Department of Energy Manual 435.1-1), highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation. (See *fission products*, *radioactive waste*, and *spent nuclear fuel*.)

**highly enriched uranium** – Uranium whose content of the fissile isotope uranium-235 has been increased through enrichment to 20 percent or more (by weight). (See *depleted uranium*, *enriched uranium*, and *natural uranium*.)

**HIGHWAY** – A computer code used for predicting routes for transporting radioactive material in the United States and calculating route-specific population density statistics.

**historic resources** – (1) Archaeological sites, architectural structures, and objects produced

after the advent of written history or dating to the time of the first European-American contact in an area. (See *archaeological sites*.)

(2) As defined by the National Historic Preservation Act of 1966, as amended (Title 16 of the *United States Code*, Part 470 et seq.), any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the National Register of Historic Places, including artifacts, records, and material remains related to such a property or resource.

**Holocene** – An epoch of the Quaternary period that began at the end of the Pleistocene, or the “Ice Age,” about 10,000 years ago and continues to the present. It is named from the Greek words “holos” (entire) and “ceno” (new).

**hot cell** – A shielded facility that requires the use of remote manipulators for handling radioactive materials.

**hydraulic head** – A specific measurement of the potential for water to flow, expressed in units of length relative to a vertical datum. For an unconfined aquifer (as modeled in this environmental impact statement [EIS]), the hydraulic head is nearly equivalent to the water table elevation. In this EIS, hydraulic head is expressed in meters relative to the North American Vertical Datum of 1988 (NAVD88).

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

**hydrophobic** – Lacking an affinity for water.

**immobilization** – Placing waste within a material such as concrete or glass to reduce (immobilize) the dispensability and leachability of the radioactive or hazardous components within the waste.

**immobilized high-level radioactive waste (IHLW)** – High-level radioactive waste as defined in the *Radioactive Waste Management Manual* (U.S. Department of Energy Manual 435.1-1) that has been immobilized (vitrified) by processing it through the Waste Treatment Plant. (See *vitrification*.)

**immobilized low-activity waste (ILAW)** – (1) Waste immobilized by the Waste Treatment Plant or processed by supplemental treatment (i.e., bulk vitrification, cast stone, steam reforming). After receiving the necessary approvals, ILAW could be managed as low-level radioactive waste incidental to reprocessing, as defined in U.S. Department of Energy Manual 435.1-1. Because it is produced from treatment of Hanford Site tank waste, it also could be managed as a mixed waste. (See *cast stone*, *low-activity waste*, and *vitrification*.) (2) Waste that contains mostly nonradioactive chemical constituents.

**incident-free risk** – The radiological or chemical impacts resulting from emissions during normal operations and normal transportation of packages aboard vehicles. This includes the radiation or hazardous chemical exposure of specific population groups and workers. (See *exposure*, *hazardous chemical*, and *ionizing radiation*.)

**indirect jobs** – Within a regional economic area, jobs generated or lost in related industries as a result of a change in direct employment.

**infrastructure** – The basic facilities, services, and utilities needed for the functioning of an industrial facility. Transportation and electrical systems are part of the infrastructure.

**ingestion** – The action of taking solids or liquids into the digestive system.

**inhalation** – The action of taking airborne material into the respiratory system.

**injection well** – A well that takes water from the surface into the ground, either through gravity or by mechanical means.

**injector** – A device that provides protons for an accelerator by heating hydrogen gas to a plasma state in which the hydrogen atoms lose their electrons, thereby giving the hydrogen nuclei a positive charge. An electric voltage removes the protons from the injector. (See *proton*.)

**inorganic** – Of or pertaining to chemical substances that do not contain carbon except for compounds such as carbonates, carbides, cyanides, carbon dioxide, and carbon monoxide.

**institutional control** – The period of time when a site is under active governmental controls. Institutional controls may include administrative or legal controls, physical barriers or markers, and methods to preserve information and data and to inform current and future generations of hazards and risks.

**Integrated Disposal Facility** – A permitted landfill on the Hanford Site with two separate, expandable cells—one for the disposal of low-level radioactive waste and another for the disposal of mixed low-level radioactive waste.

**intensity (of an earthquake)** – A measure of the effects (due to ground shaking) of an earthquake at a particular location, based on observed damage to structures built by humans, changes in Earth’s surface, and reports of how people felt the earthquake. Earthquake intensity is measured in numerical units on the Modified Mercalli Intensity Scale. (See *magnitude [of an earthquake]* and *Modified Mercalli Intensity Scale*.)

**interbedded (geological)** – Occurring between beds (layers) or lying in a bed parallel to other beds of a different material.

**interim status facility (under the Resource Conservation and Recovery Act [RCRA])** – A hazardous waste management (treatment, storage, or disposal) facility that is subject to RCRA permit requirements and was in existence on the effective date of the law or its implementing regulations. Such facilities are considered to have been issued a permit on an interim basis if they met the requirements for notification and submitted a permit application. Such facilities are required to meet the interim status standards described in Title 40 of the *Code of Federal Regulations*, Part 265, until they have been issued a final permit or until their interim status is withdrawn.

**internal dose** – That portion of the dose equivalent received from radioactive material taken into the body (i.e., “internal sources”). (See *dose equivalent*.)

**in-trench grouting** – Involves placing the waste on a cement pad or on spacers, installing reinforcement steel and forms around the waste, and covering the waste with fresh concrete to encapsulate the waste within a concrete barrier.

**invertebrate** – Of or pertaining to animals that do not have a backbone.

**involved worker** – A worker participating in a proposed action. (See *noninvolved worker*.)

**ion** – An atom that has too many or too few electrons, causing it to be electrically charged. (See *electron*.)

**ion exchange** – A unit physiochemical process that removes anions and cations, including radionuclides, from liquid streams (usually water) for the purpose of purification or decontamination. (See *anion*, *cation*, and *radioisotope or radionuclide*.)

**ion exchange resin** – An organic polymer that functions as an acid or base. These resins are used to remove ionic material from a solution. Cation exchange resins are used to remove positively charged particles (cations); anion exchange resins are used to remove negatively charged particles (anions). (See *acid*, *base*, and *polymer*.)

**ionizing radiation** – Alpha particles, beta particles, gamma rays, high-speed electrons, high-speed protons, and other particles or electromagnetic radiation that can displace electrons from atoms or molecules, thereby producing ions. (See *alpha radiation*, *beta particle*, *electron*, *gamma radiation*, *ion*, and *proton*.)

**irradiated** – Exposed to ionizing radiation. The condition of nuclear reactor fuel elements and other materials in which atoms bombarded with nuclear particles have undergone nuclear changes. (See *ionizing radiation*.)

**isotope** – Any of two or more variations of an element in which the nuclei have the same number of protons (i.e., the same atomic number) but different numbers of neutrons so that their atomic masses differ. Isotopes of a single element possess almost identical chemical properties, but often different physical properties (e.g., carbon-12 and -13 are stable; carbon-14 is radioactive). (See *neutron*, *nucleus*, and *proton*.)

**joule** – A metric unit of energy, work, or heat, equivalent to 1 watt-second, 0.737 foot-pounds, or 0.239 calories.

**joule-heated melter** – See *melter*.

**lacustrine** – Of or pertaining to lakes.

**land disposal restrictions** – The restrictions and requirements for land disposal of hazardous or dangerous waste as specified in Title 40 of the *Code of Federal Regulations*, Part 268 (Resource Conservation and Recovery Act), and *Washington Administrative Code* 173-303-140 (Washington State Dangerous Waste Regulations).

**landfill closure** – Landfill closure typically includes site stabilization and emplacement of a surface barrier, followed by a postclosure care period.

**landscape character** – The arrangement of a particular landscape as formed by the variety and intensity of the landscape features (land, water, vegetation, and structures) and the four basic elements (form, line, color, and texture). These factors give an area a distinctive quality that distinguishes it from its immediate surroundings.

**land use designations** – Land use designations at the Hanford Site were established by the U.S. Department of Energy under the 1999 *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* Record of Decision, amended in September 2008. Changes to land use are subject to procedures identified in that environmental impact statement.

**Industrial:** An area that is suitable and desirable for activities such as reactor operations; rail and barge transport facilities; mining; manufacturing; food processing; assembly, warehouse, and distribution operations; and other industrial uses.

**Industrial-Exclusive:** An area that is suitable and desirable for treatment, storage, and disposal of hazardous, dangerous, radioactive, and nonradioactive wastes and related activities.

**Conservation (Mining):** An area reserved for management and protection of archaeological, cultural, ecological, and natural resources. Limited and managed mining (e.g., quarrying for sand, gravel, basalt, and topsoil for governmental purposes only) could occur as a special use within appropriate areas (a permit would be required). Limited public access would be consistent with resource conservation. This designation includes related activities.

**larval** – Of or pertaining to the juvenile form of certain kinds of animals.

**latent cancer fatality** – Death from cancer occurring sometime after, and postulated to be due to, exposure to ionizing radiation or other carcinogens.

**leachate** – As applied to mixed low-level radioactive waste trenches, any liquid, including any suspended components in the liquid, that has percolated through, or drained from, hazardous waste. (See *mixed low-level radioactive waste*.)

**legal-weight truck** – A truck that meets vehicle weight limits for U.S. interstate highways. Under Federal regulations (Title 23 of the *Code of Federal Regulations*, Section 658.17), the total loaded weight of a tractor-trailer combination is limited to 34,874 kilograms (80,000 pounds). Some states allow heavier vehicles on highways within the state.

**license amendment** – Changes to an existing reactor's operating license that are approved by the U.S. Nuclear Regulatory Commission.

**light water** – The common form of water (a molecule with two hydrogen atoms and one oxygen atom, H<sub>2</sub>O), in which the hydrogen atoms consist completely of the normal hydrogen isotope (one proton), with no additional neutrons. (See *isotope* and *proton*.)

**light-water reactor** – A nuclear reactor in which circulating light water is used to cool the reactor core and to moderate (reduce the energy of) the neutrons created in the core by the fission reactions. (See *fission*, *neutron*, and *nuclear reactor*.)

**loam** – Soil material that is composed of 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**lobe** – A lobe is a section of a barrier that covers a contiguous area of tank farms. Three barrier lobes are anticipated in the 200-West Area, and two much larger lobes are anticipated in the 200-East Area.

**long-lived radionuclide** – A radioactive isotope with a half-life of generally greater than 30 years. (See *half-life [radiological]*, *isotope*, and *radioisotope or radionuclide*.)

**loss-of-coolant accident** – An accident that results from a loss of reactor coolant because of a break in the reactor coolant system. (See *nuclear reactor*.)

**lost workdays** – The total number of workdays (consecutive or not) during which employees were away from work or limited to restricted work activity because of an occupational injury or illness.

**low-activity waste (LAW)** – Waste that remains after as much radioactivity as technically and economically practical has been separated from high-level radioactive waste that, when solidified, may be disposed of as low-level radioactive waste in a near-surface facility. In its final form, such solid LAW would not exceed Title 10 of the *Code of Federal Regulations* (CFR), Section 61.55, Class C radioisotope limits and would meet

performance objectives comparable to those in 10 CFR, Part 61, Subpart C.

**low-enriched uranium** – Uranium whose content of the fissile isotope uranium-235 has been increased through enrichment to more than 0.7 percent, but less than 20 percent, by weight. Most nuclear-power reactor fuel contains low-enriched uranium containing 3 to 5 percent uranium-235.

**low-income person** – A person living in a household that reports an annual income less than the United States official poverty level, as reported by the U.S. Census Bureau.

**low-income population** – Low-income populations, as defined in terms of U.S. Census Bureau annual statistical poverty levels (Current Population Reports, Series P60 on Consumer Income), may consist of groups or individuals who either live in geographic proximity to one another or are geographically dispersed or transient (such as migrant workers or American Indians), where either type of group experiences common conditions of environmental exposure or effect. (See *environmental justice* and *minority population*.)

**low-level radioactive waste** – Radioactive waste that is not high-level radioactive waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in Section 11e(2) of the Atomic Energy Act of 1954, as amended), or naturally occurring radioactive material.

**macroencapsulation** – Treatment method applicable to debris waste as defined by the Resource Conservation and Recovery Act. Refers to application of surface-coating materials such as polymeric organics (e.g., resins and plastics) or of a jacket of inert material to reduce surface exposure to potential leaching media.

**macroseismicity** – Seismicity at a level that implies significant, coherent, sustained tectonic activity, as defined by the International Atomic Energy Agency. Associated earthquakes are generally of magnitude 3.5 or greater and instrumentally determined with records of

sufficient precision to demonstrate a direct relationship with the causative fault.

**magnitude (of an earthquake)** – A term used to quantify the total energy released by an earthquake, in contrast to “intensity,” which describes its effects at a particular place. Magnitude is determined by taking the common logarithm (base 10) of the largest ground motion recorded on a seismograph during the arrival of a seismic wave and applying a standard correction factor for distance to the epicenter. The three common types of magnitude are Richter (or local) ( $M_L$ ), P body wave ( $m_b$ ), and surface wave ( $M_s$ ). Additional magnitude scales, notably the moment magnitude ( $M_w$ ), have been introduced to increase uniformity in the representation of an earthquake’s size.

*Moment magnitude* is defined as the rigidity of the rock multiplied by the area of faulting, multiplied by the amount of slip. A one-unit increase in magnitude (for example, from magnitude 6 to magnitude 7) represents a 30-fold increase in the amount of energy released. (See *intensity [of an earthquake]*.)

**mammal** – Warm-blooded, hairy vertebrates whose offspring are fed by milk secreted by the female.

**maximally exposed individual (MEI)** – A hypothetical individual whose location and habits result in the highest total radiological or chemical exposure (and thus dose) from a particular source for all exposure routes (e.g., inhalation, ingestion, direct exposure). As used in this environmental impact statement, the MEI refers to an individual located off site, unless characterized otherwise in terms of time or location.

**maximum contaminant level (MCL)** – The U.S. Environmental Protection Agency (EPA) standards for drinking water quality under the Safe Drinking Water Act. The MCL for a given substance is the maximum permissible concentration of that substance in water delivered by a public water system. The primary MCLs (Title 40 of the *Code of Federal Regulations* [CFR], Part 141) are intended to

protect public health and are federally enforceable. They are based on health factors, but are also required by law to reflect the technological and economic feasibility of removing the contaminant from the water supply. Secondary MCLs (40 CFR, Part 143) are set by EPA to protect the public welfare. These secondary drinking water regulations control substances in drinking water that primarily affect aesthetic qualities (such as taste, odor, and color), which are related to public acceptance of water. These regulations are not federally enforceable, but are intended as guidelines for the states.

**mayflies** – An insect that spends its larval stage on the bottom of a lake or stream and emerges into the terrestrial environment as a flying adult.

**megawatt** – A unit of power equal to 1 million watts. *Megawatt-thermal* is commonly used to describe heat produced, while *megawatt-electric* describes electricity produced.

**melter** – The type of melters used in the Waste Treatment Plant (WTP) to treat tank waste are joule-heated melters. Joule heating involves placing electrodes into a material (a slurry of tank waste mixed with glass-forming materials) and applying electrical potential. This results in an electrical current and resistance heating. WTP melters include (1) high-level radioactive waste (HLW) melters used to treat the HLW stream, with a theoretical maximum capacity (TMC) of producing 3 metric tons of glass (MTG) per day, and (2) low-activity waste (LAW) melters used to treat the LAW stream, with a TMC of producing 15 MTG per day.

**meteorology** – The science dealing with the atmosphere and its phenomena, especially as related to weather.

**MeV (million electron volts)** – A unit used to quantify energy. In this environmental impact statement, it describes a particle’s kinetic energy, which is an indicator of particle speed.

**microbial crust** – A surface layer of microbes that becomes harder than the underlying soil horizon.

**microbiotic crusts** – See *cryptogamic (microbiotic) crusts*.

**microencapsulation** – Encapsulation of waste components in the atomic structure of compounds or materials such as glass, cement, or polymer waste forms.

**migration** – The natural movement of a material through the air, soil, or groundwater; also, seasonal movement of animals from one area to another.

**Migratory Bird Treaty Act** – This act states that it is unlawful to pursue, take, attempt to take, capture, possess, or kill any migratory bird or any part, nest, or egg of any such bird other than permitted activities.

**millirem** – One-thousandth of 1 rem. (See *roentgen equivalent man [rem]*.)

**minority** – Individuals who are members of the following population groups: American Indian or Alaska Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.

**minority population** – Minority populations exist where either (1) the minority population of the affected area exceeds 50 percent or (2) the minority population percentage of the affected area is meaningfully greater than that in the general population or in some other appropriate unit of geographic analysis (such as a governing body's jurisdiction, a neighborhood, census tract, or other similar unit). "Minority populations" include either a single minority group or the total of all minority persons in the affected area. They may consist of groups of individuals living in geographic proximity to one another or a geographically dispersed/transient set of individuals (such as migrant workers or American Indians), where either type of group experiences common conditions of environmental exposure or effect. (See *environmental justice, low-income population, and minority*.)

**Miocene** – A geologic epoch of the upper Tertiary period, spanning between about 24 million and 5 million years ago.

**miscellaneous underground storage tanks** – These tanks were used for waste storage in the past, and some are currently being used for a variety of purposes. The tanks vary in capacity from 3,407 to 189,270 liters (900 to 50,000 gallons) and are considered part of the Hanford Site tank waste system.

**mitigation** – Mitigation includes (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or (5) compensating for an impact by replacing or providing substitute resources or environments.

**mixed low-level radioactive waste** – Low-level radioactive waste determined to contain source, special nuclear, or byproduct material that is subject to the Atomic Energy Act of 1954, as amended, as well as a hazardous component subject to the Resource Conservation and Recovery Act, as amended, or *Washington Administrative Code* 173-303-140. (See *dangerous waste and hazardous waste*.)

**mixed oxide fuel** – Nuclear reactor fuel made with a physical blend of different fissionable materials, such as uranium dioxide and plutonium dioxide. (See *nuclear reactor*.)

**mixed waste** – Waste that contains source, special nuclear, or byproduct material that is subject to the Atomic Energy Act of 1954, as amended, as well as a hazardous component subject to the Resource Conservation and Recovery Act.

**moderator** – A material used to decelerate neutrons in a nuclear reactor from high energies to low energies. (See *neutron* and *nuclear reactor*.)

**Modified Mercalli Intensity** – A level on the Modified Mercalli Intensity Scale. A measure of the perceived intensity of earthquake ground

shaking, with 12 divisions from I (not felt except by a very few people) to XII (damage total). It is a unitless expression of observed effects. (See *Modified Mercalli Intensity Scale*.)

**Modified Mercalli Intensity Scale** – A standard of relative measurement of earthquake intensity, developed to fit construction conditions in most of the United States. It is a 12-step scale, with values from I (not felt except by a very few people) to XII (damage total). A *Modified Mercalli Intensity* is a numerical value on the Modified Mercalli Intensity Scale.

**modified RCRA Subtitle C barrier** – Landfill cover described by Resource Conservation and Recovery Act regulations that also accounts for the unique climatic conditions at the Hanford Site. The design includes layers for foundation and slope, gas collection, low-permeability barrier, drainage, and cover soil.

**modular facility** – As used in this environmental impact statement, a modular disposal facility would consist of a number of expandable segments or areas within an overall master facility. Each module would be designed to handle certain waste types or forms. For example, remote-handled waste might be in a different area or “module” than standard packages of contact-handled low-level radioactive waste (LLW) or mixed LLW.

**molar** – A chemical term relating to the mole, or gram-molecular weight. A 1-molar solution would have 1 mole of solute per liter of solution.

**mole ratio (molar ratio)** – The mole ratio is the fraction created when a mole of one element is measured against a molar gram of carbon (e.g., 1 mole of nitrogen/1 mole of carbon). A mole is the amount of a substance that contains as many atoms, molecules, ions, or other elementary units as the number of atoms in 0.012 kilograms of carbon-12. The number is  $6.0225 \times 10^{23}$ , or Avogadro’s number. Also called *gram molecule*.

**monitor species** – *Idaho State*: Plant taxa that are common within a limited range or taxa that are uncommon but have no identifiable threats.

*Washington State*: Animal species that are not considered species of concern, but are monitored for status and distribution. They require management, survey, or data emphasis because they (1) were classified as endangered, threatened, or sensitive within the last 5 years; (2) require habitat that is of limited availability during some of their life cycle; (3) are indicators of environmental quality; or (4) have unresolved taxonomic questions. They are managed by the Washington Department of Fish and Wildlife, as needed, to prevent them from becoming endangered, threatened, or sensitive (*Washington Administrative Code* 232-12-297).

**National Ambient Air Quality Standards** – Standards defining the highest allowable levels of certain pollutants in the ambient air (outdoor air to which the public has access). Because the U.S. Environmental Protection Agency must establish the criteria for setting these standards, the regulated pollutants are called criteria pollutants. Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and two size classes of particulate matter: less than or equal to 2.5 and 10 micrometers (0.0001 and 0.0004 inches, respectively) in diameter. Primary standards are established to protect public health; secondary standards are established to protect public welfare (e.g., visibility, crops, animals, buildings). (See *criteria pollutant*.)

**National Emission Standards for Hazardous Air Pollutants (NESHAPs)** – Emission standards set by the U.S. Environmental Protection Agency for air pollutants that are not covered by National Ambient Air Quality Standards and may, at sufficiently high levels, cause increased fatalities, irreversible health effects, or incapacitating illness. These standards are given in Title 40 of the *Code of Federal Regulations*, Parts 61 and 63. NESHAPs are given for many specific categories of sources (e.g., equipment leaks, industrial process cooling towers, drycleaning

facilities, petroleum refineries). (See *hazardous air pollutants*.)

**National Environmental Policy Act of 1969 (NEPA)** – This act is the basic national charter for protection of the environment. It establishes policy, sets goals (Section 101), and provides means for carrying out policy (Section 102). Section 102(2) contains “action-forcing” provisions to ensure that Federal agencies follow the letter and spirit of the act. For major Federal actions significantly affecting the quality of the human environment, Section 102(2)(C) of NEPA requires Federal agencies to prepare a detailed statement that analyzes the environmental impacts of the proposed actions and other specified information.

**National Historic Preservation Act** – This act provides for placement of property resources with significant national historic value on the National Register of Historic Places. It does not require any permits; however, pursuant to Federal code, if a proposed action might impact a historic property resource, it mandates consultation with the proper agencies.

**National Pollutant Discharge Elimination System (NPDES)** – A provision of the Clean Water Act that prohibits discharge of pollutants into waters of the United States unless a special permit is issued by the U.S. Environmental Protection Agency; a state; or, where delegated, a tribal government on an American Indian reservation. The NPDES permit lists either permissible discharges, the level of cleanup technology required for wastewater, or both.

**National Priorities List (NPL)** – The U.S. Environmental Protection Agency’s (EPA’s) list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under the Comprehensive Environmental Response, Compensation, and Liability Act. The list is based primarily on the score a site receives from the Hazard Ranking System described in Title 40 of the *Code of Federal Regulations*, Part 300, Appendix A. EPA must update the NPL at least once a year. (See *Comprehensive*

*Environmental Response, Compensation, and Liability Act of 1980*.)

**National Register of Historic Places** – The official list of the Nation’s historic resources that are worthy of preservation. The National Park Service maintains the list under direction of the Secretary of the Interior. Buildings, structures, objects, sites, and districts are included in the National Register for their importance in American history, architecture, archaeology, culture, or engineering. Properties included in the National Register range from large-scale, monumentally proportioned buildings to smaller-scale, regionally distinctive buildings. Listed properties are not just of nationwide importance; most are primarily significant at the state or local level. Procedures for listing properties in the National Register are found in Title 36 of the *Code of Federal Regulations*, Part 60.

**natural uranium** – Uranium with the naturally occurring distribution of uranium isotopes (about 0.7 weight-percent uranium-235, with the remainder essentially uranium-238). (See *depleted uranium, enriched uranium, highly enriched uranium, low-enriched uranium, and uranium*.)

**neptunium** – A mostly manmade element with the atomic number 93. Pure neptunium is a silvery metal. The neptunium-237 isotope has a half-life of 2.14 million years. When neptunium-237 is bombarded by neutrons, it is transformed to neptunium-238, which in turn undergoes radioactive decay to become plutonium-238. When neptunium-237 undergoes radioactive decay, it emits alpha particles and gamma rays. (See *alpha particle, beta particle, gamma radiation, neutron, and radioactive decay*.)

**neutralization** – Changing the pH of a solution to near 7 by adding an acidic or basic material.

**neutron** – An uncharged elementary particle with a mass slightly greater than that of the proton. Neutrons are found in the nucleus of every atom heavier than hydrogen-1. (See *nucleus and proton*.)

**neutron flux** – The product of neutron number density and velocity (energy), giving an apparent number of neutrons flowing through a unit area per unit time. (See *neutron*.)

**nitrate** – A compound containing nitrogen, typically seen as a negative anion composed of one nitrogen and three oxygen atoms.

**nitrogen** – A natural element with the atomic number 7. It is a diatomic, colorless, odorless gas that constitutes about four-fifths of the volume of the atmosphere.

**nitrogen oxides** – The oxides of nitrogen, primarily nitrogen oxide and nitrogen dioxide. These are produced by the combustion of fossil fuels and can constitute an air pollution problem. Nitrogen dioxide emissions contribute to acid deposition and formation of atmospheric ozone. (See *acid*, *oxide*, and *ozone*.)

**noise** – Any sound that is undesirable because it interferes with speech and hearing, is intense enough to damage hearing, or is otherwise annoying or undesirable.

**nonattainment area** – An area that the U.S. Environmental Protection Agency has determined does not meet one or more of the National Ambient Air Quality Standards for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may meet the standards for some pollutants, but not for others. (See *National Ambient Air Quality Standards* and *particulate matter*.)

**noninvolved worker** – A worker on the site of an action, but not participating in the action. (See *involved worker*.)

**nonstandard (waste packaging)** – Specially designed waste containers or packages used for large or odd-shaped low-level radioactive waste (LLW), mixed LLW, transuranic waste, or items with high dose rates or other unique conditions. (See *standard [waste packaging]*.)

**normal operations** – All normal (incident-free) conditions, as well as those abnormal

conditions that frequency estimation techniques indicate typically occur with a frequency greater than 0.1 events per year. As used in this environmental impact statement, normal operations refers to routine waste management activities, e.g., waste treatment activities (including processing), packaging and repackaging, storage, and final disposal of waste, excluding accident conditions (except minor process upsets).

**northing** – The difference in latitude between two positions as a result of movement to the north.

**Notice of Intent** – An announcement of the initiation of an environmental impact scoping process. The Notice of Intent is usually published in both the *Federal Register* and a local newspaper. The scoping process includes holding at least one public meeting and requesting written comments on issues and environmental concerns that an environmental impact statement should address.

**nuclear criticality** – See *criticality*.

**nuclear facility** – A facility that is subject to requirements intended to control potential nuclear hazards. Defined in U.S. Department of Energy directives as “any nuclear reactor or any other facility whose operations involve radioactive materials in such form and quantity that a significant nuclear hazard potentially exists to the employees or the general public.”

**nuclear fuel cycle** – The path followed by nuclear fuel in its various states from mined ore to waste disposal. The basic fuel materials for the generation of nuclear power are the elements uranium and thorium.

**nuclear grade** – Material of a quality that is adequate for use in a nuclear application.

**nuclear material** – Composite term applied to (1) special nuclear material; (2) source material such as uranium or thorium or ores containing uranium or thorium; and (3) byproduct material, which is any radioactive material that is made radioactive by exposure to the radiation

incident to the process of producing or using special nuclear material.

**nuclear radiation** – Particles (alpha, beta, neutrons) or photons (gamma) emitted from the nucleus of unstable radioactive atoms as a result of radioactive decay. (See *alpha particle, beta particle, gamma radiation, neutron, nucleus, and radioactive decay.*)

**nuclear reactor** – A device that sustains a controlled nuclear-fission chain reaction that releases energy in the form of heat. (See *chain reaction.*)

**nucleus** – The positively charged central portion of an atom that composes nearly all of the atomic mass and consists of protons and neutrons, except in hydrogen, in which it consists of one proton only. (See *neutron and proton.*)

**nuclide** – A species of atom characterized by the constitution of its nucleus (the number of protons and neutrons and the energy content). (See *neutron, nucleus, and proton.*)

**occlusion** – A blocking or obstruction of something.

**Occupational Safety and Health Administration** – Oversees and regulates workplace health and safety; created by the Occupational Safety and Health Act of 1970.

**offsite/off site** – Outside of the site boundary.

**omnivore** – An animal that eats both plant and animal matter.

**onsite/on site** – Within the site boundary.

**operable unit** – A term for each of a number of separate activities undertaken as part of a Superfund site cleanup. A typical operable unit would be removal of drums and tanks from the surface of a site. (See *Comprehensive Environmental Response, Compensation, and Liability Act of 1980.*)

**operational waste** – Solid waste that is generated to support cleanup activities, including contaminated personnel protective

clothing, disposable laboratory supplies, and failed tools and equipment.

**order of magnitude** – As used in this environmental impact statement, an order of magnitude is taken as a power (or factor) of 10.

**outfall** – The discharge point of a drain, sewer, or pipe as it empties into a body of water.

**overpack** – Any container into which another container (usually a waste container) is placed. An overpack might be used to provide shielding and structural support (e.g., during transportation), provide additional physical containment for the contents of the inner container, or enclose a damaged container.

**oxidation** – The combination of a substance with oxygen or the loss of electrons by an oxidized species in a reaction.

**oxide** – A compound of oxygen and another element.

**ozone** – The triatomic form of oxygen. In the stratosphere, ozone protects Earth from the Sun's ultraviolet rays, but in lower levels of the atmosphere, ozone is considered an air pollutant.

**package** – For radioactive materials, the packaging and its radioactive contents.

**packaging** – In regard to hazardous or radionuclide materials, the assembly of components necessary to ensure compliance with Federal regulations for storage and transport. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle tie-down system and auxiliary equipment may be designated part of the packaging.

**parameter** – A term in a model or equation representing a measurable property or quantity of fixed or variable value.

**particulate matter (PM)** – Any finely divided solid or liquid material other than uncombined (i.e., pure) water. A subscript denotes the

upper limit of the diameter of the particles included. Thus, PM<sub>2.5</sub> includes only particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers (0.0001 inches); PM<sub>10</sub>, less than or equal to 10 micrometers (0.0004 inches).

**partitioning or distribution coefficient** – A quantity relating the amount or concentration of a substance in a unit of soil or sediment to the amount or concentration in the overlying or pore water in contact with the solid medium.

**past-practice unit** – The Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) defines past-practice unit as a waste management unit where wastes or substances have been disposed of (intentionally or unintentionally) that is not subject to regulation as a treatment, storage, or disposal unit. Due to the relatively large number of past-practice units at the Hanford Site, these units have been organized into groups called operable units for investigation and response action to prioritize the cleanup work to be done at the site.

**pathways (exposure)** – The means by which a substance moves from an environmental source to an organism.

**Peak ground acceleration** – A measure of the maximum horizontal acceleration (as a percentage of the acceleration due to Earth's gravity) experienced by a particle on the surface of Earth during the course of earthquake motion.

**perched aquifer/groundwater** – A body of groundwater of small lateral dimensions separated from an underlying body of groundwater by an unsaturated zone.

**performance assessment** – A systematic analysis of the potential risks posed by waste management systems to the public and the environment and a comparison of those risks to established performance objectives.

**periphyton** – Total assemblage of attached (sessile) organisms on any substrate that are

capable of fixing carbon by photosynthesis or chemosynthesis.

**permeability** – In geology, the ability of rock or soil to transmit a fluid.

**person-rem** – A unit of collective radiation dose applied to populations or groups of individuals; that is, a unit for expressing the dose when summed across all persons in a specified population or group. One person-rem equals 0.01 person-sieverts. (See *collective dose*, *dose*, *person-sievert*, and *ionizing radiation*.)

**person-sievert** – A unit of collective radiation dose applied to populations or groups of individuals; that is, a unit for expressing the dose when summed across all persons in specified population or group. One person-sievert equals 100 person-rem.

**pH** – A measure of the relative acidity or alkalinity of a solution, expressed on a scale from 0 to 14, with the neutral point at 7.0. Acid solutions have pH values lower than 7.0, and basic (alkaline) solutions have pH values higher than 7.0.

Because pH is the negative logarithm of the hydrogen ion (H<sup>+</sup>) concentration, each unit increase in pH value expresses a change of state of 10 times the preceding state. Thus, pH 5 is 10 times more acidic than pH 6, and pH 9 is 10 times more alkaline than pH 8.

**phenolic protective coating** – A coating material made from the chemical phenol.

**photon** – A unit of electromagnetic energy exhibiting behavior like that of a particle.

**physical extraction** – Separation or removal of materials or components based on size or material characteristic.

**phytoplankton** – Microscopic plants floating in a body of water that are incapable of countering water movements.

**picocurie** – One trillionth (10<sup>-12</sup>) of a curie. (See *curie*.)

**Pleistocene** – The geologic period of the earliest epoch of the Quaternary period, spanning between about 1.6 million years ago and the beginning of the Holocene epoch at 10,000 years ago. It is characterized by the succession of northern glaciations; also called the “Ice Age.”

**Pliocene** – The latest geologic epoch of the Tertiary period, beginning about 5.3 million years ago and ending 1.6 million years ago.

**plume** – The elongated volume of contaminated water or air originating at a pollutant source, such as an outlet pipe or a smokestack. A plume eventually diffuses into a larger volume of less-contaminated material as it is transported away from the source.

**plutonium** – A heavy, radioactive metallic element with the atomic number 94. It is produced artificially by neutron bombardment of uranium. Plutonium has 15 isotopes, with atomic masses ranging from 232 to 246 and half-lives ranging from 20 minutes to 76 million years. (See *half-life [radiological]*, *isotope*, and *neutron*.)

**plutonium-238** – An isotope with a half-life of 87.74 years, used as the heat source for radioisotope power systems. When plutonium-238 undergoes radioactive decay, it emits alpha particles and gamma rays. (See *alpha particle*, *beta particle*, *gamma radiation*, *half-life [radiological]*, *isotope*, and *radioactive decay*.)

**plutonium-239** – An isotope with a half-life of 24,110 years, it is the primary radionuclide in weapons-grade plutonium. When plutonium-239 decays, it emits alpha particles. (See *alpha particle*, *half-life [radiological]*, *isotope*, *radioactive decay*, and *radioisotope or radionuclide*.)

**PM<sub>2.5</sub>** and **PM<sub>10</sub>** – See *particulate matter*.

**pollution prevention** – The use of materials, processes, and practices that reduce or eliminate the generation and release of pollutants, contaminants, hazardous substances, and waste into land, water, and air. For the

U.S. Department of Energy, this includes recycling activities. (See *waste minimization and pollution prevention*.)

**polychlorinated biphenyl (PCB)** – Any compound or mixture of compounds of a family of chlorinated organic chemicals that were formerly manufactured for use as coolants and lubricants in transformers, capacitors, and other electrical equipment. The manufacture of PCBs stopped in the United States in 1977 because of evidence that they build up in the environment and cause harmful effects. PCBs in water, for example, build up in fish and marine mammals and can reach levels thousands of times higher than the levels in water. It is not known whether PCBs cause cancer in people, but the U.S. Department of Health and Human Services has determined that PCBs may reasonably be anticipated to be carcinogens. The U.S. Environmental Protection Agency has classified all PCBs as Group B2, possible human carcinogens.

**polymer** – A natural or synthetic chemical compound or mixture of compounds formed by a chemical reaction in which two or more small molecules combine to form larger molecules that contain repeating structural units of the original molecules.

**population dose** – See *collective dose*.

**pore water** – The water present between particles of soil or sediment.

**pounds per square inch** – A measure of pressure; atmospheric pressure is about 14.7 pounds per square inch.

**predator** – An animal that eats another animal.

**Prevention of Significant Deterioration (PSD) (of air quality)** – Regulations established to prevent significant deterioration of air quality in areas that already meet National Ambient Air Quality Standards. Specific details of PSD are found in Title 40 of the *Code of Federal Regulations (CFR)*, Section 51.166. Among other provisions, cumulative increases in sulfur dioxide, nitrogen dioxide, and PM<sub>10</sub> (particulate matter with an

aerodynamic diameter less than or equal to 10 micrometers) levels after specified baseline dates must not exceed specified maximum allowable amounts. These allowable increases, also known as increments, are especially stringent in areas designated as Class I areas (e.g., national parks, wilderness areas), where the preservation of clean air is particularly important. All areas not designated as Class I are currently designated as Class II. Maximum increments in pollutant levels are also given in 40 CFR, Section 51.166, for Class III areas, if any such areas should be so designated by the U.S. Environmental Protection Agency. Class III increments are less stringent than those for Class I or II areas. (See *National Ambient Air Quality Standards*.)

**prey** – An animal that is eaten by another animal.

**primary system** – In regard to nuclear reactors, the system that circulates a coolant (e.g., water) through the reactor core to remove the heat of reaction. (See *nuclear reactor*.)

**prime farmland** – Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor and without intolerable soil erosion, as determined by the Secretary of Agriculture (Farmland Protection Policy Act of 1981; Title 7 of the *Code of Federal Regulations*, Part 658).

**Priority 1 species (Idaho State)** – A taxon in danger of becoming extinct in Idaho in the foreseeable future if identifiable factors contributing to its decline continue to operate; these are taxa whose populations are present only at a critically low level or whose habitats have been degraded or depleted to a significant degree.

**Priority 2 species (Idaho State)** – A taxon likely to be classified as Priority 1 within the foreseeable future in Idaho if factors contributing to its population decline or habitat degradation or loss continue.

**priority habitat** – A habitat type with unique or significant value to many species that may be described by a (1) unique vegetation type or dominant plant species of primary importance to fish and wildlife (e.g., oak woodlands, eelgrass meadows) or (2) successional stage (e.g., old growth and mature forests). Alternatively, a priority habitat may consist of a specific habitat element (e.g., consolidated marine/estuarine shorelines, talus slopes, caves, snags) of key value to fish and wildlife.

**probabilistic risk assessment** – A comprehensive, logical, and structured methodology that accounts for population dynamics and human activity patterns at various levels of sophistication, considering time-space distributions and sensitive subpopulations. The probabilistic method results in a more-complete characterization of the exposure information available, which is defined by probability distribution functions. This approach offers the possibility of an associated quantitative measure of the uncertainty around the value of interest.

**process** – Any method or technique designed to change the physical or chemical character of a product.

**processing** – As used in this environmental impact statement, any activity necessary to prepare waste for disposal. Processing waste may consist of repackaging, removal, or stabilization of nonconforming waste or treatment of physically or chemically hazardous constituents in compliance with state or Federal regulations.

**protactinium** – An element produced by the radioactive decay of neptunium-237. This pure metal has a bright metallic luster. The protactinium-233 isotope has a half-life of 27 days and emits beta particles and gamma rays during radioactive decay. (See *beta particle*, *gamma radiation*, *half-life [radiological]*, *isotope*, and *radioactive decay*.)

**proton** – An elementary nuclear particle with a positive charge equal in magnitude to the negative charge of the electron; it is a constituent of all atomic nuclei. The atomic

number of an element indicates the number of protons in the nucleus of each atom of that element. (See *electron* and *nucleus*.)

**PUREX** – An acronym for plutonium-uranium extraction, the name of the chemical process usually used to remove plutonium and uranium from spent nuclear fuel, irradiated targets, and other nuclear materials.

**purpose-built vessel** – A vessel specifically designed to carry nuclear fuel casks.

**pyrolysis** – Chemical decomposition or other chemical change brought about by the action of heat, regardless of the temperature involved.

**quality factor** – A multiplying factor applied to an absorbed dose to express the biological effectiveness of the radiation producing it. The numerical values of the quality factor are given as a function of the linear energy transfer in water for the radiation producing the absorbed dose. (See *absorbed dose*.)

**Quaternary** – The second geologic time period of the Cenozoic era, dating from about 1.6 million years ago to the present. It contains two epochs: the Pleistocene and the Holocene, and is characterized by the first appearance of human beings on Earth.

**rad** – See *radiation absorbed dose*.

**radiation absorbed dose (rad)** – The basic unit of absorbed dose equal to the absorption of 0.01 joules per kilogram (100 ergs per gram) of absorbing material (such as body tissue). One rad equals 0.01 grays. (See *erg*, *gray*, and *joule*.)

**radiation (ionizing)** – See *ionizing radiation*.

**radioactive decay** – The decrease in the amount of any radioactive material with the passage of time due to spontaneous nuclear disintegration (i.e., emission from atomic nuclei of charged particles, photons, or both). (See *nucleus*.)

**radioactive waste** – In general, waste that is managed for its radioactive content. Waste material that contains source, special nuclear,

or byproduct material is subject to regulation as radioactive waste under the Atomic Energy Act. Also, waste material that contains accelerator-produced radioactive material or a high concentration of naturally occurring radioactive material may be considered radioactive waste.

**radioactivity** – (*process definition*) The spontaneous transformation of unstable atomic nuclei, usually accompanied by the emission of ionizing radiation.

(*property definition*) The property of unstable nuclei in certain atoms to spontaneously emit ionizing radiation during nuclear transformations. (See *neutron* and *ionizing radiation*.)

**radioisotope or radionuclide** – An unstable isotope that undergoes spontaneous transformation, emitting radiation. (See *isotope*.)

**radiological risk** – In general, a measure of potential harm to populations or individuals due to the presence or occurrence of an environmental or manmade radiological hazard. In terms of human health, risk comprises three components: a sequence of events leading to an adverse impact, the probability of occurrence of that sequence of events, and the severity of the impact. For the release of radionuclides affecting a population, the impact is occurrence of a fatal cancer; risk is expressed as the expected number of latent cancer fatalities (i.e., the product of probability of occurrence and the magnitude of impact). For the release of radionuclides affecting individuals, the impact is incidence of cancer; risk is expressed as the probability over a lifetime of developing cancer.

**radon** – A gaseous, radioactive element with the atomic number 86 resulting from the radioactive decay of radium. Radon occurs naturally in the environment and can collect in unventilated enclosed areas, such as basements. Large concentrations of radon can cause lung cancer in humans.

**RADTRAN** – A computer code combining user-determined meteorological, demographic, transportation, packaging, and material factors with health physics data to calculate the expected radiological consequences and accident risk of transporting radioactive material.

**reactivity** – The rate of nuclear disintegration in a nuclear reactor. (See *nuclear reactor*.)

**reactor accident** – See *design-basis accident* and *severe accident*.

**reactor containment** – A steel-reinforced concrete dome built over a nuclear reactor to trap radioactive vapors that might otherwise be released into the environment during a nuclear accident. (See *nuclear reactor*.)

**reactor coolant system** – The system used to transfer energy from the reactor core either directly or indirectly to the heat rejection system. (See *nuclear reactor*.)

**reactor core** – The fuel assemblies, fuel and target rods, control rods, blanket assemblies, and coolant/moderator. Fissioning takes place in this part of the reactor.

**reactor facility** – Unless it is modified by words such as *containment*, *vessel*, or *core*, this term includes the housing, equipment, and associated areas devoted to the operation and maintenance of one or more reactor cores. Any apparatus that is designed or used to sustain nuclear chain reactions in a controlled manner, including critical and pulsed assemblies and research, tests, and power reactors, is defined as a reactor. All assemblies designed to perform subcritical experiments that could potentially reach criticality are also considered reactors.

**receptor** – An organism that is exposed to chemicals or radionuclides in the environment. (See *radioisotope* or *radionuclide*.)

**Record of Decision (ROD)** – (*National Environmental Policy Act [NEPA] definition*) A concise public document that records a Federal agency's decision(s) concerning proposed actions for which the agency has

prepared an environmental impact statement. The ROD is prepared in accordance with Council on Environmental Quality NEPA regulations (Title 40 of the *Code of Federal Regulations*, Section 1505.2). A ROD identifies the alternatives considered in reaching the decision, the environmentally preferred alternative(s), the factors balanced by the agency in making the decision, and whether all practicable means to avoid or minimize environmental harm were adopted, and if not, why they were not. (See *environmental impact statement*.)

(*Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] definition*) A document that records the selection of remedial actions, facts, analyses, public participation, and site-specific policy determinations considered in the course of carrying out CERCLA cleanup activities.

**redd** – The nest of gravel or small cobble that a fish makes in a river to lay its eggs.

**reductant** – A chemical used to reduce the oxidation state (ionic charge) of another chemical.

**reference concentration** – The chronic-exposure concentration (milligrams per cubic meter) for a given hazardous chemical at which or below which adverse human noncancer health effects are not expected to occur. (See *exposure limit* and *reference dose*.)

**reference dose** – The chronic-exposure dose (milligrams or kilograms per day) for a given hazardous chemical at which or below which adverse human noncancer health effects are not expected to occur. (See *exposure limit* and *reference concentration*.)

**refractory block** – A solid object composed of a nonmetallic material that maintains its strength and integrity when exposed to extreme heat. Refractory blocks are used in the construction of structures or system components that are exposed to extremely high temperatures.

**refueling outage** – The period of time that a reactor is shut down for refueling operations.

**region of influence** – A site-specific geographic area in which the principal direct and indirect effects of actions are likely to occur and are expected to be of consequence for local jurisdictions.

**regional economic area** – A geographic area consisting of an economic node, including surrounding counties that are economically related because they include the locations of the places of work and residences of the labor force. Each regional economic area is defined by the U.S. Bureau of Economic Analysis.

**regulated substances** – A general term used to refer to materials other than radionuclides that may be regulated by other applicable Federal, state, or local requirements.

**release** – Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of a material into the environment. Statutory or regulatory definitions of release may differ.

**rem** – See *roentgen equivalent man*.

**remedial action** – Activities conducted to reduce potential risks to people and/or harm to the environment from radioactive and/or hazardous substance contamination. (See *cleanup*.)

**remediation** – The process, or a phase in the process, of rendering radioactive, hazardous, or mixed waste environmentally safe, whether through processing, entombment, or other methods.

**remote-handled waste** – In general, refers to radioactive waste that must be handled at a distance (remotely) to protect workers from unnecessary exposure (e.g., waste with a dose rate of 200 millirem per hour or more at the surface of the waste package). (See *contact-handled waste*.)

**resin** – See *ion exchange resin*.

**resource** – Valued attribute of a system.

**Resource Conservation and Recovery Act (RCRA), as amended** – This law gives the U.S. Environmental Protection Agency the authority to control hazardous waste from “cradle to grave” (i.e., from the point of generation to the point of ultimate disposal), including its minimization, generation, transportation, treatment, storage, and disposal. RCRA also sets forth a framework for management of nonhazardous solid waste. (See *hazardous waste*.)

**respiration** – Processes by which a living organism takes in oxygen from the air or water, distributes and utilizes it in oxidation, and gives off products of oxidation.

**retrievably stored waste** – Waste stored in a manner intended to permit retrieval at a future time.

**Review Group 1 species (Washington State)** – A plant taxon of potential concern for which additional fieldwork is needed before a status can be assigned (Washington State Natural Heritage Program, established by the Natural Area Preserves Act [*Revised Code of Washington*, Chapter 79.70]).

**Review Group 2 species (Washington State)** – A plant taxon of potential concern for which taxonomic questions are unresolved (Washington State Natural Heritage Program, established by the Natural Area Preserves Act [*Revised Code of Washington*, Chapter 79.70]).

**Revised Code of Washington (RCW)** – The compilation of all permanent laws now in force in the State of Washington; a collection of session laws (enacted by the legislature and signed by the governor or enacted via the initiative process), arranged by topic, with amendments added and repealed laws removed. Temporary laws such as appropriation acts are not included.

**riparian** – Of or pertaining to the banks of a river or stream.

**risk** – In general, a measure of potential harm to populations or individuals due to the presence or occurrence of an environmental or manmade hazard. Risk is calculated as the product of the probability of an occurrence of an impact and the magnitude of the impact. The probability can be interpreted as a relative frequency of occurrence, a quantity with no assigned units.

In terms of human health, risk comprises three components: a sequence of events leading to an adverse impact, the probability of occurrence of that sequence of events, and the severity of the impact. For the release of radionuclides affecting a population, the impact is occurrence of a fatal cancer; risk is expressed as the expected number of latent cancer fatalities (i.e., the product of probability of occurrence and the magnitude of impact). For the release of radionuclides affecting individuals, the impact is incidence of cancer; risk is expressed as the probability over a lifetime of developing cancer.

**risk assessment (chemical or radiological)** – The qualitative and quantitative evaluation performed to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific chemical or radiological materials.

**River Protection Project (RPP)** – The Hanford Site’s U.S. Department of Energy RPP mission is to retrieve and treat the site’s tank waste and to close the tank farms to protect the Columbia River.

**roentgen** – A unit of exposure to ionizing x or gamma radiation equal to or producing one electrostatic unit of charge per cubic centimeter of air. (See *gamma radiation* and *x-rays*.)

**roentgen equivalent man (rem)** – A unit of dose equivalent. The dose equivalent in rem equals the absorbed dose in rad in tissue multiplied by the appropriate quality factor and possibly other modifying factors. Rem refers to the dosage of ionizing radiation that will cause the same biological effect as 1 roentgen of x-ray or gamma-ray exposure. One rem equals 0.01 sieverts. (See *absorbed dose*, *dose*

*equivalent*, *radiation absorbed dose [rad]*, and *roentgen*.)

**runoff** – The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and eventually enters streams.

**Safe Drinking Water Act** – This act protects the quality of public water supplies, water supply and distribution systems, and all sources of drinking water.

**safe, secure trailer (also “safeguarded trailer”)** – A specially modified semitrailer pulled by an armored tractor truck and used by the U.S. Department of Energy to transport nuclear weapons, nuclear weapon components, or special nuclear material over public highways.

**safeguarded trailer** – See *safe, secure trailer*.

**safeguards** – An integrated system of physical protection, material accounting, and material control measures designed to deter, prevent, detect, and respond to unauthorized access, possession, use, or sabotage of nuclear materials.

**safety analysis report (SAR)** – A report that systematically identifies potential hazards within a nuclear facility, describes and analyzes the adequacy of measures to eliminate or control identified hazards, and analyzes potential accidents and their associated risks. SARs are used to ensure that a nuclear facility can be constructed, operated, maintained, shut down, and decommissioned safely and in compliance with applicable laws and regulations. SARs are required for U.S. Department of Energy (DOE) nuclear facilities and as a part of applications for U.S. Nuclear Regulatory Commission (NRC) licenses. NRC regulations or DOE orders and technical standards that apply to the facility type provide specific requirements for the content of SARs. (See *nuclear facility*.)

**safety evaluation report** – A document prepared by the U.S. Nuclear Regulatory Commission that evaluates documentation (technical specifications, safety analysis

reports, and special safety reviews and studies) submitted by a reactor licensee for approval. This ensures that all of the safety aspects of part or all of the activities conducted at a reactor are formally and thoroughly analyzed, evaluated, and recorded.

**saline** – Of or pertaining to salt.

**sand** – Loose grains of rock or mineral sediment formed by weathering that range in size from 0.0625 to 2.0 millimeters (0.0025 to 0.08 inches) in diameter and often consist of quartz particles.

**sanitary waste** – Liquid or solid waste generated by normal housekeeping activities (includes sludge) that is not hazardous or radioactive.

**scope** – The range of actions, alternatives, and impacts to be considered in a document prepared pursuant to the National Environmental Policy Act of 1969.

**scoping** – An early and open process for determining the scope of issues to be addressed in an environmental impact statement (EIS) and for identifying significant issues related to proposed actions. The scoping period begins upon publication in the *Federal Register* of a Notice of Intent to prepare an EIS. The public scoping process is that portion of the process where the public is invited to participate. The U.S. Department of Energy (DOE) also conducts an early internal scoping process for environmental assessments and EISs. For EISs, this internal scoping process precedes the public scoping process. DOE's scoping procedures are found in Title 10 of the *Code of Federal Regulations*, Section 1021.311.

**screening** – Type of assessment that allows some receptors, pathways, or stressors to be removed from further consideration with a high degree of confidence by using conservative assumptions.

**secondary waste** – Waste generated as a result of other activities, e.g., waste retrieval or waste treatment, that is not further treated by the Waste Treatment Plant or supplemental

treatment facilities, and includes liquid and solid wastes. Liquid waste sources could include process condensates, scrubber wastes, spent reagents from resins, offgas and vessel vent wastes, vessel washes, floor drain and sump wastes, and decontamination solutions. Solid waste sources could include worn filter membranes, spent ion exchange resins, failed or worn equipment, debris, analytical laboratory waste, high-efficiency particulate air filters, spent carbon adsorbent, and other process-related wastes. Secondary waste can be characterized as low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, or hazardous waste.

**security** – An integrated system of activities, systems, programs, facilities, and policies for the protection of restricted data and other classified information or matter; nuclear materials, weapons and components; and/or U.S. Department of Energy contractor facilities, property, and equipment.

**sediment** – Soil, sand, and minerals washed from land into water and deposited on the bottom of a water body.

**sediment-dwelling biota** – Animals and plants that live in or on the soft substrate in aquatic environments.

**seep** – A spot where water contained in the ground oozes slowly to the surface and often forms a pool; a small spring. On the Columbia River, seepage occurs below the river surface and exposed riverbank, and is particularly noticeable at the low-river stage. The seeps flow intermittently, apparently influenced primarily by changes in the river level.

**seismic** – Pertaining to any Earth vibration, especially an earthquake.

**seismicity** – The frequency and distribution of earthquakes.

**sensitive species** – *Idaho State*: A taxon with small populations or localized distributions within Idaho that presently do not meet the criteria for classification as Priority 1 or 2, but whose populations and habitats may be

jeopardized without active management or removal of threats.

*Washington State:* A taxon that is vulnerable or declining and could become endangered or threatened without active management or removal of threats (*Washington Administrative Code 232-12-297*; Washington State Natural Heritage Program, established by the Natural Area Preserves Act [*Revised Code of Washington*, Chapter 79.70]).

**severe accident** – An accident with a frequency rate of less than  $10^{-6}$  per year that would have more-severe consequences than a design-basis accident in terms of damage to the facility, offsite consequences, or both. Also called “beyond-design-basis reactor accidents” in this environmental impact statement.

**sewage** – The total organic waste and wastewater generated by an industrial establishment or a community’s municipal wastewater.

**shielding** – In regard to radiation, any material of obstruction (bulkheads, walls, or other construction) that absorbs radiation to protect personnel or equipment.

**short-lived activation product** – An element formed from neutron interaction that has a relatively short half-life and is not produced from a fission reaction (e.g., a cobalt isotope formed from impurities in the metal of the reactor piping). (See *fission*, *half-life [radiological]*, *neutron*, and *nuclear reactor*.)

**shrub steppe** – Plant community consisting of short-statured, widely spaced, small-leaved shrubs, sometimes aromatic, with brittle stems and an understory dominated by perennial bunch grasses.

**shutdown** – Facility condition where operations and/or construction activities have ceased.

**sievert** – The International System of Units (SI) unit of radiation dose equivalent. The dose equivalent in sieverts equals the absorbed dose in grays multiplied by the appropriate quality

factor (1 sievert equals 100 rem). (See *dose equivalent*, *gray*, and *roentgen equivalent man [rem]*.)

**silica gel** – An amorphous, highly adsorbent form of silicon dioxide.

**silt** – Loose particles of rock or mineral sediment ranging in size from about 0.002 to 0.0625 millimeters (0.00008 to 0.0025 inches) in diameter. Silt is finer than sand, but coarser than clay.

**single-shell tank (SST)** – Underground reinforced concrete containers with one carbon steel liner that are covered with 2 to 3 meters (6.6 to 9.8 feet) of earth. Capacity ranges from 208,175 to 3.79 million liters (55,000 to 1 million gallons). SSTs have been used to store radioactive and mixed waste.

**single-shell tank (SST) system** – An area of the Hanford Site high-level radioactive waste tank farm system that includes 149 SSTs, ancillary equipment, and soils (from surface soils to the interface with groundwater) within SST farms and/or waste management area boundaries used to support Hanford Site waste retrieval and storage activities. (See *high-level radioactive waste*.)

**sinter** – A process in which particles are bonded together by pressure and heating them below the melting point.

**site** – A geographic entity comprising leased or owned land, buildings, and other structures required to perform program activities.

**soil profile** – A two-dimensional cross section extending vertically from Earth’s surface and exposing all the soil horizons and a part of the relatively unaltered underlying material.

**soils** – All unconsolidated materials above bedrock; natural earthy materials on Earth’s surface, in places modified or even made by human activity, that contain living matter and either support or are capable of supporting plants out of doors.

**solid waste** – In general, nonliquid, nonsoluble discarded materials, ranging from municipal garbage to industrial waste, that contains complex and sometimes hazardous substances, including sewage sludge, agricultural refuse, demolition waste, and mining residues. For purposes of regulation under the Resource Conservation and Recovery Act, solid waste is “any garbage; refuse; sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; and other discarded material.” Solid waste includes solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities. Solid waste does not include solid or dissolved material in domestic sewage or irrigation return flows or industrial discharges, which are point sources subject to permits under Section 402 of the Clean Water Act. Finally, solid waste does not include source, special nuclear, or byproduct material as defined by the Atomic Energy Act. A more-detailed regulatory definition of solid waste can be found in Title 40 of the *Code of Federal Regulations*, Section 261.2. (See *hazardous waste* and *Resource Conservation and Recovery Act*.)

**source material** – In general, material from which special nuclear material can be derived. Under the Atomic Energy Act and U.S. Nuclear Regulatory Commission regulations, “source material” is uranium and thorium in any physical or chemical form, including ores, containing one-twentieth of 1 percent (0.05 percent) or more by weight of uranium or thorium. (See *special nuclear material*.)

**source term** – The amount of a specific pollutant (e.g., chemical, radionuclide) emitted or discharged to a particular environmental medium (e.g., air, water) from a source or group of sources. It is usually expressed as a rate (i.e., amount per unit time).

**spallation** – A nuclear reaction in which light particles are ejected as the result of bombardment (as by high-energy protons). (See *proton*.)

**special nuclear material** – As defined in Section 11 of the Atomic Energy Act of 1954, special nuclear material includes (1) plutonium, uranium enriched in the isotope 233 or 235, and any other material that the U.S. Nuclear Regulatory Commission determines to be special nuclear material; or (2) any material artificially enriched by any of the above. Hydrogen-3 (tritium) is not a special nuclear material. (See *isotope*.)

**species of concern (Federal)** – Species whose conservation standing is of concern to the U.S. Fish and Wildlife Service, but for which status information is still needed.

**spectral (response) acceleration** – An approximate measure of the acceleration (as a percentage of the acceleration due to Earth’s gravity) experienced by a building, as modeled by a particle on a massless vertical rod that has the same natural period of vibration as the building.

**spent nuclear fuel** – Fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated.

**stability class** – A category characterizing the degree of stability (absence of turbulence) in the atmosphere. The classification used for regulatory models and methods for estimating the appropriate stability category from other meteorological data are given by the U.S. Environmental Protection Agency.

**stabilization** – Mixing an agent such as Portland cement with waste to increase the mechanical strength of the resulting waste form and decrease its leachability.

**stable isotope** – Variation of an element that has the same atomic number but a different weight (because of the number of neutrons in its nucleus) and that does not undergo radioactive decay. (See *neutron*, *nucleus*, and *radioactive decay*.)

**standard (waste packaging)** – The common forms of waste packages (such as drums and boxes) used for low-level radioactive waste

(LLW) and mixed LLW. (See *nonstandard [waste packaging]*.)

**State Environmental Policy Act (SEPA)** – The State of Washington’s environmental law enacted in 1971 as Chapter 43.12C of the *Revised Code of Washington*. The purposes of this law are to (1) declare a state policy that will encourage productive and enjoyable harmony between man and his environment, (2) promote efforts that will prevent or eliminate damage to the environment and biosphere, (3) stimulate the health and welfare of man, and (4) enrich the understanding of the ecological systems and natural resources important to the state and Nation.

**steady state model** – A representation of a system with state variables that do not change in value over time; the parameters and inputs are constant.

**steam reforming** – A thermal process that immobilizes waste by converting (1) low-activity waste solutions (tank waste) to granular minerals and volatilizing water and (2) the decomposing organic compounds, nitrate, and nitrite present in the tank waste to carbon dioxide, water, and nitrogen. (See *low-activity waste*.)

**stochastic analysis** – A set of calculations performed using values randomly selected from a range of reasonable values for one or more parameters. In this environmental impact statement, the median value is reported (in contrast, see *deterministic analysis*).

**stochastic variability** – Natural variation of a measured quantity. For example, in a room full of people, there is an average height, with some being taller and some shorter; the stochastic variability of that group is described by the differences between the individuals’ heights and the average.

**storage** – Holding waste for a temporary period, at the end of which the waste is treated, disposed of, or stored elsewhere.

**stratigraphy** – The science of the description, correlation, and classification of strata in

sedimentary rocks, including interpretation of the depositional environments of those strata.

**sulfate removal** – Sulfate, a significant component in the supernatant fractions of tank waste at the Hanford Site, poses serious economic impacts (creating more glass) and risks for the low-activity waste (LAW) vitrification process. Sulfate tends to phase-separate in the melter, forming a corrosive molten sulfate salt layer on top of the glass melt that will damage the melter if allowed to accumulate. Removal of the sulfate from the LAW before vitrifying can mitigate these problems. The sulfate removal approach comprises sulfate precipitation using strontium nitrate addition, filtration, and solidification with grout-forming additives for immobilized waste. (See *immobilization, low-activity waste, melter, and vitrification*.)

**sulfur oxides** – Common air pollutants, primarily sulfur dioxide, a heavy, pungent, colorless gas formed in the combustion of fossil fuels and considered a major air pollutant, and sulfur trioxide. Sulfur dioxide is involved in the formation of acid rain. It can also irritate the upper respiratory tract and cause lung damage.

**supernatant** – The liquid that stands over a precipitated material.

**supplemental treatment** – As used in this environmental impact statement, a waste treatment process used to solidify or immobilize the low-activity waste fraction of tank waste in addition to the Waste Treatment Plant vitrification process. (See *immobilization, low-activity waste, and vitrification*.)

**surface water** – All bodies of water on the surface of Earth that are open to the atmosphere, such as rivers, lakes, reservoirs, ponds, seas, and estuaries.

**surficial material (deposit)** – Any loose, unconsolidated sedimentary deposit lying on or above bedrock.

**suspect transuranic (TRU) waste** – Suspect TRU waste is radioactive waste that is thought to be TRU waste, but for which adequate characterization data are not yet available to confirm the classification.

**tank systems** – *Single-shell tank (SST) system:* All 149 SSTs, ancillary equipment (e.g., pipes and pits), and soils (from surface to interface with groundwater) within SST farms and/or waste management area boundaries. (See *single-shell tank*.)

*Double-shell tank (DST) system:* Existing and new DSTs, as well as the ancillary equipment and soils within the DST farms. (See *double-shell tank*.)

**target** – A tube, rod, or other form containing material that, on being irradiated in a nuclear reactor or an accelerator, would produce a desired end product. (See *nuclear reactor*.)

**taxa** – Plural of taxon. (See *taxon*.)

**taxon** – A group of organisms sharing common characteristics in varying degrees of distinction that constitute one of the categories of taxonomic classification, such as a phylum, class, order, family, genus, or species.

**technical specifications** – In regard to U.S. Nuclear Regulatory Commission (NRC) regulations, part of an NRC license authorizing the operation of a nuclear reactor facility. A technical specification establishes requirements for items such as safety limits and limits on safety system settings, control settings, and conditions for operation, as well as surveillance requirements, design features, and administrative controls.

**tectonic** – Of or relating to motion in Earth's crust and occurring along geologic faults.

**TEEL-0, -1, -2, and -3** – See *Temporary Emergency Exposure Limits*.

**teleost fish** – Of or belonging to the Teleostei or Teleostomi, a large group of fish with bony skeletons, including most common fish. The teleosts are distinct from cartilaginous fish such as sharks, rays, and skates.

**temporal use factor** – The ratio of the amount of time that an organism uses an area of contamination per unit time.

**Temporary Emergency Exposure Limits (TEELs)** – Values developed by the U.S. Department of Energy (DOE) for use in DOE facility hazard analyses and emergency planning and response for chemicals lacking Acute Exposure Guideline Levels or Emergency Response Planning Guidelines. TEEL values are applied to the peak 15-minute time-weighted average concentration at the point of interest and are defined for varying degrees of severity of toxic effects, as follows:

**TEEL-0:** The threshold concentration below which most people will experience no appreciable risk of health effects.

**TEEL-1:** The maximum concentration in air below which it is believed nearly all individuals could be exposed without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.

**TEEL-2:** The maximum concentration in air below which it is believed nearly all individuals could be exposed without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.

**TEEL-3:** The maximum concentration in air below which it is believed nearly all individuals could be exposed without experiencing or developing life-threatening health effects.

**terrestrial** – Of or pertaining to life on land.

**Tertiary** – The first geologic time period of the Cenozoic era (after the Mesozoic era and before the Quaternary period), spanning between about 66 million and 1.6 million years ago. During this period, mammals became the dominant life form on Earth.

**thermal treatment** – Treatment of waste in a device that uses elevated temperature to change

the chemical, physical, or biological character of the waste. Examples include, but are not limited to, vitrification, pyrolysis, steam reforming, and calcination.

**threatened species** – *Federal*: Species that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures set out in the Endangered Species Act (Title 16 of the *United States Code*, Parts 1551 through 1599) and its implementing regulations (Title 50 of the *Code of Federal Regulations* [CFR], Part 424).

The lists of threatened species can be found at 50 CFR, Sections 17.11 (wildlife), 17.12 (plants), and 227.4 (marine organisms).

*Idaho State*: Any wildlife species native to the state that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state if factors contributing to its decline continue. (See *candidate species* and *endangered species*.)

*Washington State*: Any wildlife species native to the state that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state if factors contributing to its decline continue (*Washington Administrative Code* 232-12-297; Washington State Natural Heritage Program, established by the Natural Area Preserves Act [*Revised Code of Washington*, Chapter 79.70]). (See *candidate species* and *endangered species*.)

**threshold limit values** – The recommended highest concentrations of contaminants to which workers may be exposed according to the American Conference of Governmental Industrial Hygienists.

**total effective dose equivalent (TEDE)** – The sum of the effective dose equivalent from external exposures and the committed effective dose equivalent from internal exposures.

TEDE is expressed in units of rem (or sieverts). (See *dose equivalent* and *roentgen equivalent man [rem]*.)

**total recordable cases** – The total number of cases recorded of work-related (1) deaths or (2) illnesses or injuries resulting in loss of consciousness, restriction of work or motion, transfer to another job, or required medical treatment beyond first aid.

**total uranium** – As used in this environmental impact statement, the total concentration of all of the 14 isotopes of uranium used for calculating *nonradiological* human health and ecological risk. (See *uranium* and *uranium-238*.)

**Toxic Substances Control Act of 1976** – This law requires that the health and environmental effects of all new chemicals be reviewed by the U.S. Environmental Protection Agency before they are manufactured for commercial purposes. This act also imposes strict limitations on the use and disposal of polychlorinated biphenyls, chlorofluorocarbons, asbestos, dioxins, certain metal-working fluids, and hexavalent chromium.

**Toxic Substances Control Act (TSCA) waste** – Any waste, including polychlorinated biphenyl–commingled waste, regulated under TSCA requirements as codified in Title 40 of the *Code of Federal Regulations*, Part 761.

**toxicity reference value** – An exposure level from a valid scientific study that represents a threshold for some level of ecological effect.

**toxicity test** – An experiment to measure the adverse physiological effect in living organisms resulting from exposure to a chemical substance.

**toxicological** – Of or pertaining to a poison.

**toxicological impact** – Impact on human health, due to exposure to, or intake of, chemical materials. These impacts are typically described in terms of damage to affected organs.

**traditional cultural property** – A property or place that is eligible for inclusion on the National Register of Historic Places because of its association with cultural practices and beliefs that are (1) rooted in the history of a community and (2) important to maintaining the continuity of that community's traditional beliefs and practices.

**transients** – Events that could cause a change or disruption of plant thermal, hydraulic, or neutronic behavior.

**transportation index (of the package or packages)** – Defined as the highest package dose rate (millirem per hour) that would be received by an individual located at a distance of 1 meter (3.3 feet) from the external surface of the package. (See *dose*.)

**transuranic** – Refers to any element with an atomic number higher than uranium (atomic number 92), including neptunium, plutonium, americium, and curium. All transuranic elements are produced artificially and are radioactive.

**transuranic isotope** – Isotopes of any element having an atomic number greater than 92 (the atomic number of uranium). (See *isotope*.)

**transuranic (TRU) waste** – Radioactive waste containing more than 100 nanocuries (3,700 becquerels) of alpha-emitting TRU isotopes per gram of waste, with half-lives greater than 20 years, except for: (1) high-level radioactive waste; (2) waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the U.S. Environmental Protection Agency, does not need the degree of isolation required by Title 40 of the *Code of Federal Regulations* (CFR), Part 191, disposal regulations; or (3) waste that the U.S. Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR, Part 61. (See *alpha particle*, *half-life [radiological]*, and *high-level radioactive waste*.)

**treatment** – The physical, chemical, or biological processing of dangerous waste to make such waste nondangerous or less

dangerous, safer for transport, amenable for energy or material resource recovery, amenable for storage, or lesser in volume, with the exception of compacting, repackaging, and sorting, as allowed under *Washington Administrative Code* 173-303-400(b) and 173-303-600. For radioactive waste, treatment is any method, technique, or process designed to change the physical or chemical character of waste to render it less hazardous; safer to transport, store, or dispose of; or lesser in volume.

**treatment, storage, and disposal facility** – A facility engaged in the treatment, storage, and/or disposal of hazardous waste. These facilities are the last link in the cradle-to-grave hazardous waste management system.

**trench (ditch)** – A depression dug in the ground, open to the atmosphere, and designed for disposal of low-level or intermediate-level radioactive waste. It uses the moisture retention capability of the relatively dry soils above the groundwater.

**Tri-Party Agreement (TPA)** – See *Hanford Federal Facility Agreement and Consent Order*.

**tritiated** – Containing hydrogen-3 (tritium).

**trivalent** – Having a valence of three. (See *valence*.)

**trophic level** – The number of feeding relations between an organism and an abiotic energy source.

**Type A packaging** – A regulatory category of packaging for transportation of radioactive materials. Type A packaging must be designed and demonstrated to retain its containment and shielding integrity under normal conditions of transport. Examples of Type A packaging include 0.21-cubic-meter (55-gallon) drums and standard waste boxes. Type A packaging is used to transport materials with low radioactivity levels and usually does not require special handling, packaging, or transportation equipment. (See *Type B packaging*.)

**Type B packaging** – A regulatory category of packaging for transportation of radioactive material. The U.S. Department of Transportation and U.S. Nuclear Regulatory Commission (NRC) require Type B packaging for shipping highly radioactive material. Type B packages must be designed and demonstrated to retain their containment and shielding integrity under severe accident conditions, as well as under the normal conditions of transport. The current NRC testing criteria for Type B package designs (Title 10 of the *Code of Federal Regulations*, Part 71) are intended to simulate severe accident conditions, including impact, puncture, fire, and immersion in water. The most widely recognized Type B packages are the massive casks used for transporting spent nuclear fuel. Large-capacity cranes and mechanical lifting equipment are usually needed to handle Type B packages.

**Type B shipping cask** – A U.S. Nuclear Regulatory Commission–certified cask with a protective covering that contains and shields radioactive materials, dissipates heat, prevents damage to the contents, and prevents criticality during normal shipment and accident conditions. It is used for transport of highly radioactive materials and is tested under severe, hypothetical accident conditions that demonstrate resistance to impact, puncture, fire, and submersion in water.

**unit cancer risk** – A quantitative measure of the likelihood that a substance is a human carcinogen that estimates risk from oral or inhalation exposure. This estimate can be in terms of either risk per microgram per liter of drinking water or risk per microgram per cubic meter of inhaled air.

**untilled** – Not plowed for cultivation.

**uptake mechanisms (routes)** – Means by which a chemical enters an organism from the environment (e.g., ingestion, inhalation, dermal absorption).

**uranium** – A radioactive, metallic element with the atomic number 92; one of the heaviest naturally occurring elements. Uranium has 14

known isotopes, of which uranium-238 is the most abundant in nature. Uranium-235 is commonly used as a fuel for nuclear fission. (See *depleted uranium*, *enriched uranium*, *highly enriched uranium*, *isotope*, and *natural uranium*.)

**uranium-238** – As used in this environmental impact statement, the total concentration of all of the 14 isotopes of uranium used for calculating *radiological* human health and ecological risk. (See *uranium* and *total uranium*.)

**U.S. Nuclear Regulatory Commission (NRC)** – The Federal agency that regulates the civilian nuclear power industry in the United States.

**vadose zone** – The region of soil and rock between the ground surface and the top of the water table in which pore spaces are only partially filled with water. Over time, contaminants in the vadose zone often migrate downward to the underlying aquifer. (See *aquifer*.)

**valence** – The combining capacity of an atom or radical determined by the number of electrons that it will lose, add, or share when it reacts with other atoms. (See *hexavalent*, *hexavalent chromium*, and *trivalent*.)

**viewshed** – The extent of an area that may be viewed from a particular location. Viewsheds are generally bounded by topographic features such as hills or mountains.

**Visual Resource Management class** – Any of the classifications of visual resources established through application of the Visual Resources Management process of the U.S. Bureau of Land Management. Four classifications are employed to describe different degrees of modification to landscape elements: Class I, areas where the natural landscape is preserved, including national wilderness areas and the wild sections of national wild and scenic rivers; Class II, areas with very limited land development activity, resulting in visual contrasts that are seen, but do not attract attention; Class III, areas in which development may attract attention, but

the natural landscape still dominates; and Class IV, areas in which development activities may dominate the view and may be the major focus in the landscape.

**vitrification** – A method used to immobilize waste (radioactive, hazardous, and mixed). This involves adding glass formers and waste to a vessel and melting the mixture into a glass. The purpose of this process is to permanently immobilize the waste and isolate it from the environment. (See *immobilization*.)

**volatile organic compound** – Any of a broad range of organic compounds, often halogenated, that vaporize at ambient or relatively low temperatures, such as benzene, chloroform, and methyl alcohol. In regard to air pollution, any organic compound that participates in atmospheric photochemical reaction, except for those determined by the U.S. Environmental Protection Agency Administrator to have negligible photochemical reactivity.

**Washington Administrative Code (WAC)** – Regulations of the executive branch agencies in the State of Washington as issued by the authority of statutes. The WAC codifies the regulations of the State of Washington and arranges them by subject or responsible agency. The WAC, which is a source of primary law, also states how agencies shall organize and adopt rules and regulations.

**waste acceptance criteria** – The technical and administrative requirements that a waste must meet for it to be accepted at a treatment, storage, or disposal facility.

**waste certification** – A process by which a waste generator certifies that a given waste or waste stream meets the waste acceptance criteria of the facility to which the generator intends to transfer waste for treatment, storage, or disposal.

**waste characterization** – Identification of waste composition and properties to determine appropriate storage, treatment, handling, transportation, and disposal requirements by (1) reviewing process

knowledge, (2) nondestructive examination, (3) nondestructive assay, or (4) sampling and analysis.

**waste classification** – Wastes are classified according to U.S. Department of Energy Manual 435.1-1, *Radioactive Waste Management Manual*, and include high-level radioactive, transuranic, and low-level radioactive wastes.

**waste container** – Any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled (*Washington Administrative Code* 173-303-400). A waste container may include any liner or shielding material that is intended to accompany the waste in disposal. At the Hanford Site, waste containers typically consist of 208- or 320-liter (55- or 85-gallon) drums and standard waste boxes. Other sizes and styles of containers may also be employed, depending on the physical, radiological, and chemical characteristics of the waste.

**waste disposal** – See *disposal*.

**Waste Isolation Pilot Plant (WIPP)** – A U.S. Department of Energy facility designed and authorized to permanently dispose of transuranic radioactive waste in a mined underground facility in deep geologic salt beds. WIPP is located in southeastern New Mexico, 42 kilometers (26 miles) east of the city of Carlsbad.

**waste life cycle** – The life of a waste from generation through storage, treatment, transportation, and disposal.

**waste management** – The planning, coordination, and direction of those functions related to the generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance and maintenance activities.

**waste minimization and pollution prevention** – An action that economically avoids or reduces the generation of waste and pollution by source reduction, reducing the toxicity of hazardous waste and pollution, improving

energy use, or recycling. These actions will be consistent with the general goal of minimizing present and future threats to human health, safety, and the environment.

**waste stream** – A waste or group of wastes from a process or a facility with similar physical, chemical, or radiological properties. In the context of this environmental impact statement, a waste stream is defined as a collection of wastes with physical and chemical characteristics that will generally require the same management approach (use of the same treatment, storage, and disposal capabilities).

**waste treatment facilities** – Includes existing and new facilities required to complete waste treatment.

**Waste Treatment Plant (WTP)** – Facility designed and built to thermally treat and immobilize tank waste at the U.S. Department of Energy's Hanford Site.

**watch list species (Washington State)** – A category of plant species, as identified by the Washington State Natural Heritage Program, established by the Natural Area Preserves Act (*Revised Code of Washington*, Chapter 79.70). Watch list species consist of those plant taxa of concern that are more abundant and/or less threatened than previously assumed.

**water table** – The boundary between the unsaturated zone and the deeper, saturated zone. The upper surface of an unconfined aquifer.

**weighting factor** – Generally, a method of attaching different importance values to different items or characteristics. In the context of radiation protection, the proportion of the risk of effects resulting from irradiation of a particular organ or tissue to the total risk of effects when the whole body is irradiated uniformly (e.g., the organ dose weighting factor for the lung is 0.12, compared to 1.0 for the whole body). Weighting factors are used to calculate the effective dose equivalent. (See *dose equivalent*.)

**wetlands** – Those areas that are inundated by surface water or groundwater with a frequency that is sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas (e.g., sloughs, potholes, wet meadows, river overflow areas, mudflats, natural ponds).

*Jurisdictional wetlands* are those wetlands protected by the Clean Water Act. They must have a minimum of one positive wetland indicator from each parameter (i.e., vegetation, soil, and hydrology). The U.S. Army Corps of Engineers requires a permit to fill or dredge jurisdictional wetlands.

**whole-body dose** – In regard to radiation, a dose of radiation resulting from the uniform exposure of all organs and tissues in a human body. (See *effective dose equivalent*.)

**wind rose** – A circular diagram showing, for a specific location, the percentage of time the wind is from each compass direction. A wind rose for use in assessing consequences of airborne releases also shows the frequency of different windspeeds for each compass direction.

**x-rays** – Penetrating electromagnetic radiation with a wavelength much shorter than that of visible light. X-rays are identical to gamma rays, but originate outside the nucleus, either when the inner orbital electrons of an excited atom return to their normal state or when a metal target is bombarded with high-speed electrons. (See *electron*, *gamma radiation*, and *nucleus*.)

**zircaloy** – An alloy of zirconium containing tin, iron, chromium, and nickel.

**zooplankton** – Microscopic animals floating in a body of water that are incapable of countering water movements.