

Chapter 8

Glossary

absorbed dose – For ionizing radiation, 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. (See rad and gray.)

accelerator – A device that accelerates charged particles (e.g., electrons or protons) to high velocities so they have high kinetic energy (i.e., the energy associated with motion); it focuses the charged particles into a beam and directs them against a target.

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

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

activation products – Nuclei, usually radioactive, formed by the bombardment and absorption in material with neutrons, protons, or other nuclear particles.

Advanced Test Reactor – A light-water cooled and moderated test reactor located within the Test Reactor Area of Idaho National Engineering and Environmental Laboratory. It is fueled with uranium enriched with uranium-235 and has a full power level of 250 megawatts, but typically operates at 140 megawatts or less.

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

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

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.)

ambient – Surrounding.

ambient air – The surrounding atmosphere as it exists around people, plants, and structures.

ambient air quality standards – The level of pollutants in the air prescribed by regulations 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.

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 geological 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 less-permeable geologic unit that inhibits the flow of water.

archaeological sites (resources) – Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

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

as low as is reasonably achievable (ALARA) – An approach to radiation protection to manage and control worker and public exposures (both 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 but a process for minimizing doses to as far below limits as is practicable.

attainment area – An area that the U.S. Environmental Protection Agency has designated as being 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.)

atmospheric dispersion – The process of air pollutants being dispersed in the atmosphere. This occurs by the wind that carries the pollutants away from their source, by turbulent air motion that results from solar heating of the Earth's surface, and air movement over rough terrain and surfaces.

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

Commission were replaced by the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy.

Atomic Energy Commission – 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, the Atomic Energy Commission was abolished, and all functions were transferred to the Nuclear Regulatory Commission and the Administrator of the Energy Research and Development Administration. The Energy Research and Development Administration 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.

background radiation – Radiation from (1) cosmic sources, (2) naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material), and (3) global fallout as it exists in the environment (e.g., from the testing of nuclear explosive devices).

badged worker – A worker who has the potential to be exposed to occupational radiation, and is equipped with a dosimeter to measure his/her dose.

barrier – Any material or structure that prevents or substantially delays movement of radionuclides toward the accessible environment.

baseline – The existing environmental conditions against which impacts of the proposed action and its alternatives can be compared. For this NI PEIS, the environmental baseline is the site environmental conditions as they exist or are estimated to exist in the absence of the proposed action.

beam expander – A device designed to expand the proton beam in an accelerator to a larger cross-sectional area.

beamstop – A device designed to absorb the full beam of an accelerator.

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

BEIR V – Biological Effects of Ionizing Radiation; referring to the fifth in a series of committee reports from the National Research Council.

benthic – 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 reactors as a neutron reflector.

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 small ability to penetrate other materials.

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 due to external events or multiple component or system failures that can potentially lead to beyond-design-basis accidents. (See design-basis events.)

biodiversity – The diversity of life in all its forms and all levels of organization. Also termed "biological diversity."

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

blanket – Blanket assembly in an accelerator is a material where the generated neutrons would be moderated to be absorbed (captured) in the target material to produce a new isotope.

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

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

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

burial ground – With regard to radioactive wastes, a place for burying unwanted (i.e., radioactive) materials in which the Earth acts as a receptacle to prevent the escape of radiation and the dispersion of wastes into the environment.

calcination – A process in which a material is heated to a high temperature to drive off volatile matter (to remove organic material) or to effect changes (as oxidation or pulverization, or to convert to nodular form). The temperature is kept below the fusion point.

cancer – The name given to a group of diseases characterized by uncontrolled cellular growth with cells having invasive characteristics such that the disease can transfer from one organ to another.

canister – A general term for a container, usually cylindrical, used in handling, storage, transportation, or disposal of 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) macro-seismicity instrumentally determined with records of sufficient precision to demonstrate a direct relationship with the fault; (3) a structural relationship to a capable fault according to characteristic (1) or (2) above, such that movement

on one could be reasonably expected to be accompanied by movement on the other.

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

carbon dioxide – A colorless, odorless gas that is a normal component of ambient air; it results from fossil fuel combustion, and is an expiration production.

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

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

cation – A positively charged ion.

cell – See hot cell.

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.)

cladding – The outer metal jacket of a nuclear fuel element or target. It prevents fuel corrosion and retains fission products during 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.

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

Class II areas – Most of the country 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.

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 – Expands the U.S. Environmental Protection Agency's enforcement powers, and adds restrictions on air toxics, ozone depleting chemicals, stationary and mobile emissions sources, and emissions implicated in acid rain and global warming.

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.

Code of Federal Regulations – All Federal regulations in effect are published in codified form in the Code of Federal Regulations.

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-sievert.

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

committed dose equivalent – The dose equivalent to organs or tissues that will be received by an individual during the 50-year period following the intake of radioactive material. It does not include contributions from radiation sources external to the body. Committed dose equivalent is expressed in units of rems or sieverts.

committed effective dose equivalent – The dose value obtained by (1) multiplying the committed dose equivalents for the organs or tissues that are irradiated and the weighting factors applicable to those organs or tissues and (2) summing all the resulting products. Committed effective dose equivalent is expressed in units of rem or sievert.

(See committed dose equivalent and weighting factor.)

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

community (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 are exposed to industry that stimulates unwanted noise, smell, industrial traffic, particulate matter, or other nonaesthetic impacts.

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; and that such activities will not: (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or 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 greater than 200 millirem per hour). (See remote-handled waste.)

container – With regard to radioactive wastes, the metal envelope in the waste package that provides the primary containment function of the waste package, which is designed to meet the containment requirements of 10 CFR 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.

contamination – The deposition of undesirable radioactive material 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.

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 which 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.

credible accident – An accident that has a probability of occurrence greater than or equal to once in a one million year time period.

criteria pollutants – 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 10 micrometers (0.0004 inch) in diameter, and less than or equal to 2.5 micrometers (0.0001 inch) 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 and its implementing regulations (50 CFR Part 424). (See endangered species and threatened species.) 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).

criticality – The condition in which a system is capable of sustaining a nuclear chain reaction.

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.

cultural resources – Archaeological sites, historical sites, architectural features, traditional use areas, and Native American sacred sites.

cumulative impacts – The impacts on the environment that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of the agency or person who undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR 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.

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.

deactivation – The placement of a facility in a radiologically and industrially safe shutdown condition that is suitable for a long-term surveillance and maintenance phase prior to final decontamination and decommissioning.

decay (radioactive) – 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).

decay heat (radioactivity) – The heat produced by the decay of radionuclides.

decibel – 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. The A-weighted decibel scale corresponds approximately to the frequency response of the human ear and thus correlates well with loudness.

deciduous – Trees which shed leaves at a certain season.

decommissioning – Retirement of a facility, including any necessary decontamination and/or dismantlement.

decontamination – The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive or chemical contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

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").

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.

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.)

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

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

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

dose (or radiation dose) – 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 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 sievert.

dose rate – The radiation dose delivered per unit of time (e.g., rem per year).

dosimeter – A small device (instrument) carried by a radiation worker that measures cumulative radiation dose (e.g., a film badge or ionization chamber).

drinking water standards – The level of constituents or characteristics in a drinking water supply specified in regulations under the Safe Drinking Water Act as the maximum permissible.

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 interacting as an ecological unit.

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 rems or sieverts. (See committed dose equivalent and committed effective dose equivalent.)

effluent – A waste stream flowing into the atmosphere, surface water, ground water, or soil.

Most frequently the term applies to wastes discharged to surface waters.

electron – An elementary particle with a mass of 9.107×10^{-28} gram (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.

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

emission standards – Legally enforceable limits on the quantities and/or kinds of air contaminants that can be emitted into the atmosphere.

endangered species – Plants or animals that are in danger of extinction through 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 the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424). (See threatened species.) The lists of endangered species can be found in 50 CFR Section 17.11 for wildlife, 50 CFR Section 17.12 for plants, and 50 CFR Section 222.23(a) for marine organisms.

engineered safety features – For a nuclear facility, features that prevent, limit, or mitigate the release of radioactive material from its primary containment.

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

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 reactors. The organisms involved may include phyto- and zooplankton, fish eggs and larvae (ichthyoplankton), shellfish larvae, and other forms of aquatic life.

Environment, Safety, and Health Program – In the context of the U.S. Department of Energy,

encompasses those requirements, activities, and functions in the conduct of all Department and Department-controlled operations that are concerned with: impacts to 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 facilities safety, nuclear safety, emergency preparedness, quality assurance, and radioactive and hazardous waste management.

environmental impact statement – The detailed written statement that is required by section 102(2)(C) of the National Environmental Policy Act for a proposed major Federal action significantly affecting the quality of the human environment. A U.S. Department of Energy environmental impact statement is prepared in accordance with applicable requirements of the Council on Environmental Quality National Environmental Policy Act regulations in 40 CFR Parts 1500–1508 and the U.S. Department of Energy National Environmental Policy Act regulations in 10 CFR Part 1021. The statement includes, among other information, discussions of the environmental impacts of the proposed action and all reasonable alternatives, adverse environmental effects that can not be avoided should the proposal be implemented, the relationship between short-term uses of the human environment and enhancement of 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, or socioeconomic groups, should bear a disproportionate share of the negative

environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and 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 minority population and low-income population.)

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, in order to identify and alleviate health problems and promote better health.

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.

Reference dose is the chronic-exposure dose (milligram or kilogram per day) for a given hazardous chemical at which or below which adverse human non-cancer health effects are not expected to occur.

Reference concentration is the chronic exposure concentration (milligram per cubic meter) for a given hazardous chemical at which or below which adverse human non-cancer health effects are not expected to occur.

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 – A liquid-metal (sodium) cooled test reactor and moderated test reactor at the Hanford Site. It is fueled with a mixture of plutonium-uranium dioxide, and has a power level of 400 megawatts. It is presently in a standby status.

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.

fissile materials – 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.

fission products – Nuclei (fission fragments) formed by the fission of heavy elements, plus the nuclides formed by the fission fragments' radioactive decay.

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.

floodplain – The lowlands and relatively flat areas adjoining inland and coastal waters and the flood prone areas of offshore islands. Floodplains include, at a minimum, that area with at least a 1.0 percent chance of being inundated by a flood in any given year.

The *base floodplain* is defined as the area which has a 1.0 percent or greater chance of being flooded in any given year. Such a flood is known as a 100-year flood.

The *critical action floodplain* is defined as the area which has at least a 0.2 percent chance of being flooded in any given year. Such a flood is known as a 500-year flood. Any activity for which even a slight chance of flooding would be too great (e.g., the storage of highly volatile, toxic, or water reactive materials) should not occur in the critical action floodplain.

The *probable maximum flood* is the hypothetical flood that is considered to be the most severe reasonably possible flood, based on the 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.

Fluorinel Dissolution Process Facility – A processing facility at the Idaho Nuclear Technology and Engineering Center on the Idaho National Engineering and Environmental Laboratory that is designed to handle highly radioactive material using remote handling equipment. This facility was originally intended to process spent nuclear fuel.

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

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

fuel assembly – A cluster of fuel rods or plates. Also called a fuel element. Approximately 200 fuel assemblies make up a reactor core.

fuel rod – A nuclear reactor component that includes the fissile material.

Fuels and Materials Examination Facility – A processing facility at the Hanford Site that is designed to handle highly radioactive materials using remote handling equipment. This facility was originally intended to process spent nuclear fuel and irradiated targets from the Fast Flux Test Facility.

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, piles of stored material (e.g., coal); and road construction areas or other areas where earthwork is occurring.

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, but are usually more energetic than, x-rays.

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.

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

geology – The science that deals with the Earth: the materials, processes, environments, and history of the planet, including rocks and their formation and structure.

gigaelectron volts – 1,000 million electron volts (MeV). (See MeV.)

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

gray – The SI (International System of Units) unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (1 gray is equal to 100 rads). (The joule is the SI unit of energy.) (See absorbed dose.)

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

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

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

half-life – 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.

Hazard Index – A summation of the Hazard Quotients for all chemicals now being used at a site, and those proposed to be added, to yield cumulative levels for a site. A Hazard Index value of 1.0 or less means that no adverse human health effects (noncancer) are expected to occur.

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 exposure at which it would be expected that adverse health effects would begin to be produced. It is independent of a cancer risk, which is calculated only for those chemicals identified as carcinogens.

hazardous air pollutants – Air pollutants not covered by ambient air quality standards but which may present a threat of adverse human health effects or adverse environmental effects. Those specifically listed in 40 CFR Section 61.01 are asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. More broadly, hazardous air pollutants are any of the 189 pollutants listed in or pursuant to section 112(b) of the Clean Air Act. Very generally, hazardous air pollutants are any air pollutants that may realistically be expected to pose a threat to human health or welfare.

hazardous chemical – Under 29 CFR Part 1910, Subpart Z, hazardous chemicals are defined as “any chemical which 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 49 CFR Section 171.8, which poses a risk to health, safety, and 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. To be considered hazardous, a waste must be a solid waste under the Resource Conservation and Recovery Act and must exhibit at least one of four characteristics described in 40 CFR Section 261.20 through 40 CFR Section 261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the U.S. Environmental Protection Agency in 40 CFR Section 261.31 through 40 CFR Section 261.33.

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

High Flux Isotope Reactor – A light-water cooled and moderated test reactor in the Oak Ridge National Laboratory area of the Oak Ridge Reservation. It is fueled with uranium highly enriched with uranium-235 and has a full authorized power level of 85 million watts.

high-level radioactive waste – High-level waste is the 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.

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

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 natural uranium, enriched uranium, and depleted uranium.)

historic resources – Archaeological sites, architectural structures, and objects produced after the advent of written history, dating to the time of the first Euro-American contact in an area.

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

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

impingement – The process by which aquatic organisms too large to pass through the screens of a water intake structure become caught on the screens and are unable to escape.

incident-free risk – The radiological or chemical impacts resulting from emissions during normal operations and packages aboard vehicles in normal transport. This includes the radiation or hazardous chemical exposure of specific population groups and workers.

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

injection wells – 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 (protons) a positive charge. An electric voltage removes the protons from the injector.

ion – An atom that has too many or too few electrons, causing it to be electrically charged.

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.

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), and anion exchange resins are used to remove negatively charged particles (anions).

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.

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

isotopes – 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).

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

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.

latent cancer fatalities – Deaths from cancer occurring some time after, and postulated to be due to, exposure to ionizing radiation or other carcinogens.

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, H₂O), in which the hydrogen atom consists completely of the normal hydrogen isotope (one 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.

long-lived radionuclides – Radioactive isotopes with half-lives greater than 30 years.

loss-of-coolant accident – An accident that results from the loss of reactor coolant because of a break in the reactor coolant system.

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 population – Low-income populations, defined in terms of Bureau of the Census annual statistical poverty levels (Current Population Reports, Series P-60 on Income and Poverty), may consist of groups or individuals who live in geographic proximity to one another or who are geographically dispersed or transient (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect. (See environmental justice and minority population.)

low-level radioactive waste – Waste that contains radioactivity but is not classified as high-level waste, transuranic waste, spent nuclear fuel, or by-product material as defined by Section 11e (2) of the Atomic Energy Act of 1954, as amended. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic waste is less than 100 nanocuries per gram.

maximally exposed offsite individual – 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).

maximum contaminant level – The designation for U.S. Environmental Protection Agency standards for drinking water quality under the Safe Drinking Water Act. The maximum contaminant level for a given substance is the maximum permissible concentration of that substance in water delivered by a public water system. The primary maximum contaminant levels (40 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 maximum contaminant levels (40 CFR Part 143) are set by the U.S. Environmental Protection Agency to protect the public welfare. The secondary drinking water regulations control substances in drinking water that primarily affect aesthetic qualities (such as taste, odor, and color) relating to the public acceptance of water. These regulations are not federally enforceable, but are intended as guidelines for the states.

megawatt – A unit of power equal to 1 million watts. Megawatt thermal is commonly used to define heat produced, while megawatt electric defines electricity produced.

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

MeV (million electron volts) – A unit used to quantify energy. In this NI PEIS, it describes a particle's kinetic energy, which is an indicator of particle speed.

micron – One-millionth of one meter.

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 one rem.

minority population – Minority populations exist where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than in the general population or other appropriate unit of geographic analysis (such as a governing body's jurisdiction, a neighborhood, census tract, or other similar unit). "Minority" refers to individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. "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 Native Americans), where either type of group experiences common conditions of environmental exposure or effect. (See environmental justice and low-income population.)

mitigate – 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 oxide fuel – Reactor fuel made with a physical blend of different fissionable materials, such as uranium dioxide and plutonium dioxide.

mixed waste – Waste that contains both nonradioactive hazardous waste and radioactive waste, as defined in this glossary.

moderator – A material used to decelerate neutrons in a reactor from high energies to low energies.

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.

National Ambient Air Quality Standards – Standards defining the highest allowable levels of certain pollutants in the ambient air (i.e., the 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 10 micrometers [0.0004 inch] in diameter and less than or equal to 2.5 micrometers [0.0001 inch] 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 – Emissions standards set by the U.S. Environmental Protection Agency for air pollutants which are not covered by National Ambient Air Quality Standards and which may, at sufficiently high levels, cause increased fatalities, irreversible health effects, or incapacitating illness.

These standards are given in 40 CFR Parts 61 and 63. National Emission Standards for Hazardous Air Pollutants are given for many specific categories of sources (e.g., equipment leaks, industrial process cooling towers, dry cleaning facilities, petroleum refineries). (See hazardous air pollutants.)

National Environmental Policy Act of 1969 –

This act is the basic national charter for protection of the environment. It establishes policy, sets goals (Section 101), and provides means (Section 102) for carrying out policy. 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 the National Environmental Policy Act requires Federal agencies to prepare a detailed statement that includes the environmental impacts of the proposed action and other specified information.

National Historic Preservation Act – This act provides that property resources with significant national historic value be placed on the National Register of Historic Places. It does not require any permits, but 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 –

A provision of the Clean Water Act which 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 Indian reservation. The National Pollutant Discharge Elimination System permit lists either permissible discharges, the level of cleanup technology required for wastewater, or both.

National Register of Historic Places –

The official list of the Nation’s cultural 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, archeology, culture, or engineering. Properties included on the National Register range from large-scale, monumentally proportioned buildings to smaller scale, regionally distinctive buildings. The listed properties are not just of nationwide importance; most are significant primarily at the state or local level. Procedures for listing properties on the National Register are found in 36 CFR Part 60.

natural phenomena accidents – Accidents that are initiated by phenomena such as earthquakes, tornadoes, floods, etc.

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

neptunium – An element, mostly manmade, 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.

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.

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.

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

nitrogen oxides – Refers to the oxides of nitrogen, primarily nitrogen oxide and nitrogen dioxide.

These are produced in the combustion of fossil fuels and can constitute an air pollution problem. Nitrogen dioxide emissions contribute to acid deposition and formation of atmospheric ozone.

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

nonattainment area – An area that the U.S. Environmental Protection Agency has designated as not meeting (i.e., not being in attainment of) 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 attainment area, National Ambient Air Quality Standards, and particulate matter.)

normal operation – All normal (incident-free) conditions and those abnormal conditions that frequency estimation techniques indicate occur with a frequency greater than 0.1 events per year.

Notice of Intent – Announces the scoping process. The Notice of Intent is usually published in 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 DOE 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 the nuclear fuel in its various states from mining the 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 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) by-product 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.

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

Nuclear Regulatory Commission – The Federal agency that regulates the civilian nuclear power industry in the United States.

nuclide – A species of atom characterized by the constitution of its nucleus and hence by the number of protons, the number of neutrons, and the energy content.

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

offsite – The term denotes a location, facility, or activity occurring outside of the site boundary.

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

ozone – The triatomic form of oxygen; in the stratosphere, ozone protects the 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, together with its radioactive contents, as presented for transport (the packaging plus the radioactive contents equals the package).

packaging – With regard to hazardous or radionuclide materials, the assembly of components necessary to ensure compliance with Federal regulations. 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 as part of the packaging.

particulate matter – Any finely divided solid or liquid material, other than uncombined (i.e., pure) water. A subscript denotes the upper limit of the diameter of particles included. Thus, PM₁₀ includes only those particles equal to or less than 10 micrometers (0.0004 inch) in diameter; PM_{2.5} includes only those particles equal to or less than 2.5 micrometers (0.0001 inch) in diameter.

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 (see collective dose); 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.

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

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 from 20 minutes to 76 million years.

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.

plutonium-239 – An isotope with a half-life of 24,110 years and is the primary radionuclide in weapons-grade plutonium. When plutonium-239 decays, it emits alpha particles.

population dose – See collective dose.

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

Prevention of Significant Deterioration – Regulations established to prevent significant deterioration of air quality in areas that already meet National Ambient Air Quality Standards. Specific details of Prevention of Significant Deterioration are found in 40 CFR Section 51.166. Among other provisions, cumulative increases in sulfur dioxide, nitrogen dioxide, and PM₁₀ 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 EPA. Class III increments are less stringent than those for Class I or Class II areas. (See National Ambient Air Quality Standards.)

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

prime farmland – Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oil-seed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, without intolerable soil erosion, as determined by the Secretary of Agriculture

(Farmland Protection Act of 1981, 7 CFR Part 7, paragraph 658).

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 the product.

protactinium – An element that is produced by the radioactive decay of neptunium-237. The 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.

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, and the atomic number of an element indicates the number of protons in the nucleus of each atom of that element.

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.

rad – See radiation absorbed dose.

radiation (ionizing) – See ionizing radiation.

radiation absorbed dose (rad) – The basic unit of absorbed dose equal to the absorption of 0.01 joule

per kilogram (100 ergs per gram) of absorbing material.

radioactive waste – In general, waste that is managed for its radioactive content. Waste material that contains source, special nuclear, or by-product 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 – *Defined as a process:* The spontaneous transformation of unstable atomic nuclei, usually accompanied by the emission of ionizing radiation.

Defined as a property: The property of unstable nuclei in certain atoms to spontaneously emit ionizing radiation during nuclear transformations.

Radiochemical Engineering Development Center – A chemical processing facility at the Oak Ridge National Laboratory used for processing highly radioactive materials in hot cells using remote handling equipment. The REDC complex consists of Buildings 7920 and 7930.

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

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.

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

reactor coolant system – The system used to transfer energy from the reactor core either directly or indirectly to the heat rejection system.

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, the term reactor facility 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.

Record of Decision – A document prepared in accordance with the requirements of 40 CFR Section 1505.2 and 10 CFR Section 1021.315 that provides a concise public record of the U.S. Department of Energy's decision on a proposed action for which an environmental impact statement was prepared. A Record of Decision identifies the alternatives considered in reaching the decision, the environmentally preferable alternative, factors balanced by the U.S. Department of Energy in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and, if not, the reason why they were not.

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

reference concentration – It is an estimate of a toxic chemical daily inhalation of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Those effects are both to the respiratory system (portal-of-entry) and the peripheral to the respiratory system (extra-respiratory effects). It is expressed in units of microgram per cubic meter.

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 and the surrounding counties that are economically related, and include 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.

rem (roentgen equivalent man) – A unit of dose equivalent. The dose equivalent in rems equals the absorbed dose in rads in tissue multiplied by the appropriate quality factor and possibly other modifying factors. Derived from “roentgen equivalent man,” referring to the dosage of ionizing radiation that will cause the same biological effect as one roentgen of x-ray or gamma-ray exposure. One rem equals 0.01 sievert. (See absorbed dose and dose equivalent.)

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 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 Conservation and Recovery Act, as Amended – A law that 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. The Resource Conservation and Recovery Act also sets forth a framework for the management of nonhazardous solid wastes. (See hazardous waste.)

riparian – Of, on, or relating to the banks of a natural course of water.

risk – The probability of a detrimental effect from exposure to a hazard. Risk is often expressed quantitatively as the probability of an adverse event occurring multiplied by the consequence of that event (i.e., the product of these two factors). However, separate presentation of probability and consequence is often more informative.

risk assessment (chemical or radiological) – The qualitative and quantitative evaluation performed in an effort 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.

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.

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 – A specially modified semi-trailer, pulled by an armored tractor truck, which DOE uses to transport nuclear weapons, nuclear weapons components, or special nuclear material over public highways.

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 – 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. Safety analysis reports 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. Safety analysis reports are required for the U.S. Department of Energy nuclear facilities and as a part of applications for U.S. Nuclear Regulatory Commission licenses. The U.S. Nuclear Regulatory Commission regulations or DOE orders and technical standards that apply to the facility type provide specific requirements for the content of safety analysis reports. (See nuclear facility.)

safety evaluation report – A document prepared by the U.S. Nuclear Regulatory Commission that evaluates documentation (i.e., technical specifications, safety analysis reports, and special safety reviews and studies) submitted by a reactor licensee for its approval. This ensures all of the safety aspects of part or all of the activities conducted at a reactor are formally and thoroughly analyzed, evaluated, and recorded.

sanitary waste – Wastes generated by normal housekeeping activities, liquid or solid (includes sludge), which are not hazardous or radioactive.

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

scoping – An early and open process for determining the scope of issues to be addressed in an environmental impact statement and for identifying the significant issues related to a proposed action. The scoping period begins after publication in the Federal Register of a Notice of Intent to prepare an environmental impact statement. The public scoping process is that portion of the process where the public is invited to

participate. The U.S. Department of Energy also conducts an early internal scoping process for environmental assessments or environmental impact statements. For environmental impact statements, this internal scoping process precedes the public scoping process. The U.S. Department of Energy's scoping procedures are found in 10 CFR Section 1021.311.

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, nuclear weapons and nuclear weapons components, and/or DOE contractor facilities, property, and equipment.

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

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 NIPeIS.

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

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

short-lived activation products – An element formed from neutron interaction that has a relatively short half-life, which is not produced from the fission reaction (e.g., a cobalt isotope formed from impurities in the metal of the reactor piping).

short-lived nuclides – Radioactive isotopes with half-lives no greater than about 30 years (e.g., cesium-137 and strontium-90).

shutdown – For a U.S. Department of Energy reactor, the condition in which a reactor has ceased operation, and DOE has officially declared that it does not intend to operate it further.

sievert – The SI (International System of Units) unit of radiation dose equivalent. The dose equivalent in sieverts equals the absorbed dose in grays multiplied by the appropriate quality factor (1 sievert is equal to 100 rem). (See gray.)

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

silt – A sedimentary material consisting of fine mineral particles, intermediate in size between sand and clay.

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

solvent extraction – A process that uses two solvents that do not mix (usually water and an organic solvent) to separate chemicals. An organic soluble chemical is usually added to the organic solvent to selectively extract a chemical from the aqueous solution into the organic solution when they are mixed. After the settling, the two solvents are separated from one another, and the desired chemical is removed from the organic solvent.

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).

special nuclear materials – As defined in Section 11 of the Atomic Energy Act of 1954, special nuclear material means: (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the U.S. Nuclear Regulatory Commission determines to be special nuclear material; or (2) any material artificially enriched by any of the above. Tritium is not a special nuclear material.

sulfur oxides – Common air pollutants, primarily sulfur dioxide, a heavy, pungent, colorless gas

(formed in the combustion of fossil fuels, 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.

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

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.

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

threatened species – Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which 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 and its implementing regulations (50 CFR Part 424). (See endangered species.)

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

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 – The sum of the effective dose equivalent from external exposures and the committed effective dose equivalent from internal exposures.

Toxic Substances Control Act of 1976 – This act authorizes the U.S. Environmental Protection Agency to secure information on all new and existing chemical substances and to control any substances determined to cause an unreasonable risk to public health or the environment. 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.

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

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

transuranic waste – Radioactive waste that is not classified as high-level radioactive waste and that contains more than 100 nanocuries (3700 becquerels) per gram of alpha-emitting transuranic isotopes with half-lives greater than 20 years.

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 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 U.S. Nuclear Regulatory Commission testing criteria for Type B package designs (10 CFR 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 – The likelihood that the substance is a human carcinogen and quantitatively gives an estimate of risk from oral exposure or from 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 air breathed.

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 natural uranium, enriched uranium, highly enriched uranium, and depleted uranium.)

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

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

waste acceptance criteria – The requirements specifying the characteristics of waste and waste packaging acceptable to a disposal facility, and the documents and processes the generator needs to certify that the waste meets applicable requirements.

waste classification – Wastes are classified according to DOE Order 435.1, *Radioactive Waste Management*, and include high-level, transuranic, and low-level wastes.

Waste Isolation Pilot Plant – 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. It is located in southeastern New Mexico, 42 kilometers (26 miles) east of the city of Carlsbad.

waste management – The planning, coordination, and direction of those functions related to 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.

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 for calculating the effective dose equivalent.

whole-body dose – With regard to radiation, dose 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 the 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 wind speeds for each compass direction.

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