
Rules of

Department of Natural Resources

Division 80—Solid Waste Management

Chapter 2—General Provisions

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**Title 10—DEPARTMENT OF
NATURAL RESOURCES
Division 80—Solid Waste Management
Chapter 2—General Provisions**

10 CSR 80-2.010 Definitions

PURPOSE: This rule defines terms used in 10 CSR 80.

- (1) Alkaline-manganese battery or alkaline battery means a battery having a manganese dioxide positive electrode, a zinc negative electrode, an alkaline electrolyte, including alkaline-manganese button cell batteries intended for use in watches, calculators, and other electronic products, and larger-sized alkaline-manganese batteries in general household use.
- (2) Button cell battery or button cell means any small alkaline-manganese or mercuric-oxide battery having the size and shape of a button.
- (3) Airport means a public-use airport open to the public without prior permission and without restrictions within the physical capacities of available facilities.
- (4) Applicant means a person who applies for a solid waste permit from the department.
- (5) Aquifer means a hydrostratigraphic unit capable of consistently yielding a sufficient amount of water to a monitoring well within twenty-four (24) hours of purging for sampling and analysis.
- (6) Areas susceptible to mass movement means those areas of influence (for example, areas characterized as having an active or substantial possibility of mass movement) where the movement of earth material at, beneath or adjacent to the sanitary landfill, because of natural or man-induced events, results in the downslope transport of soil and rock material by means of gravitational influence. Areas of mass movement include, but are not limited to, landslides, avalanches, debris slides and flows, solifluction, block sliding and rock fall.
- (7) Bedrock means the solid rock strata underlying solid and unconsolidated surface materials.
- (8) Bird hazard means an increase in the likelihood of bird/aircraft collisions that may cause damage to the aircraft or injury to its occupants.
- (9) Cell means compacted solid wastes that are enclosed on all sides by natural soil or cover in a solid waste disposal area.
- (10) City means any incorporated city, town or village.
- (11) Clean fill means uncontaminated soil, rock, sand, gravel, concrete, asphaltic concrete, cinderblocks, brick, minimal amounts of wood and metal, and inert solids as approved by rule or policy of the department for fill, reclamation or other beneficial use.
- (12) Closure means the permanent cessation of active disposal operations, abandonment of the disposal area, revocation of the permit or filling with waste of all areas and volumes specified in the permit and preparing the area for long-term care.
- (13) Closure plan means plans, designs and relevant data which specify the methods and schedule by which the operator will complete or cease disposal operations, prepare the area for long-term care and make the area suitable for other uses, to achieve the purposes of the Solid Waste Management Law and the corresponding rules.
- (14) Commercial waste means all types of solid waste generated by stores, offices, restaurants, warehouses and other nonmanufacturing activities, excluding residential and industrial wastes.
- (15) Commingled recyclables means more than one(1) source separated recyclable material that has been placed in a single container for collection.
- (16) Competent bedrock means solid rock that underlies unconsolidated deposits (including residuum) which displays limited evidence of weathering throughout the rock mass.
- (17) Compost facility means a solid waste processing facility using a controlled process of microbial degradation of organic material which was not source-separated into a stable, nuisance-free humus-like product.
- (18) Confining unit means a hydrostratigraphic unit of low permeability material above or below one (1) or more aquifers.
- (19) Cover means soil or other suitable material that is used to cover compacted solid waste in a solid waste disposal area.
- (20) Demolition landfill means a solid waste disposal area used for the controlled disposal of demolition wastes, construction materials, brush, wood wastes, soil, rock, concrete and inert solids insoluble in water.
- (21) Department means the Department of Natural Resources.
- (22) Detailed site investigation means the process of conducting a detail surface and subsurface geologic and hydrologic investigation for a proposed solid waste disposal area.
- (23) Detail site investigation report means a written report that is submitted to the Missouri Department of Natural Resources concerning the results of a detailed surface and subsurface geologic and hydrologic investigation for a proposed solid waste disposal area.
- (24) Detailed site investigation workplan means a plan for conducting a detailed surface and subsurface geologic and hydrologic investigation for a proposed solid waste disposal area.
- (25) Director means the director of the Department of Natural Resources.
- (26) Displacement means the relative movement of any two (2) sides of a fault measured in any direction.
- (27) Existing sanitary landfill means any sanitary landfill that continues to receive solid waste in contiguous areas after October 9, 1993.
- (28) Fault means a fracture or a zone of fractures in any material along which strata on one side have been displaced with respect to that on the other side.
- (29) Final closure means that a solid waste disposal area has ceased taking waste, has completed all closure activities applicable to the Solid Waste Management Program's law and rules and has obtained closure approval from the program.
- (30) Financial assurance instrument means an instrument or instruments including, but not limited to, cash or surety bond, letters of credit, corporate guarantee or secured trust fund, submitted by the applicant to ensure proper closure, post-closure care, or corrective action of a solid waste disposal area in the event that the operator fails to correctly perform closure, post-closure care, or corrective action except that the financial test for the corporate guarantee shall not exceed one and one-half (1 1/2) times the estimated cost of closure and post-closure. The form and content of the financial assurance instrument



shall meet or exceed the requirements of the department. The instrument shall be reviewed and approved or disapproved by the attorney general.

(31) Flood area means any area inundated by one hundred (100)-year flood event, or the flood event with a one percent (1%) chance of occurring in any given year.

(32) Floodplain means the lowland and relatively flat areas adjoining inland waters, that are inundated by the one hundred (100)-year flood.

(33) Gas condensate means the liquid generated as a result of gas recovery process(es) at the solid waste disposal area.

(34) Geologic structure means the post-depositional deformation of bedrock and surficial materials resulting from physical stresses, (e.g. faults, folds).

(35) Groundwater means water in the saturated zone beneath the land surface.

(36) Groundwater monitoring plan means a description of the strategy for effectively monitoring groundwater at a proposed or existing solid waste disposal area.

(37) Hazardous wastes means any waste or combination of wastes, as determined by the Hazardous Waste Commission by rules and regulations, which, because of quantity, concentration, or physical, chemical or infectious characteristics, may cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illnesses, or pose a present or potential threat to the health of humans or the environment.

(38) Holocene means the most recent epoch of the Quaternary Period, extending from the end of the Pleistocene Epoch to the present.

(39) Horizontal expansion means an expansion of a disposal area beyond current permitted disposal area limits through issuance of a new permit by the department.

(40) Household consumer means an individual who generates used motor oil through the maintenance of the individual's personal motor vehicle, vessel, airplane, or other machinery powered by an internal combustion engine.

(41) Household consumer used motor oil collection center means any site or facility that accepts or aggregates and stores used motor

oil collected only from household consumers or farmers who generate an average of twenty-five (25) gallons per month or less of used motor oil in a calendar year. This section shall not preclude a commercial generator from operating a household consumer used motor oil collection center.

(42) Household consumer used motor oil collection system means any used motor oil collection center at publicly owned facilities of private locations, any curbside collection of household consumer used motor oil, or any other household consumer used motor oil collection program determined by the department to further the purposes of the Solid Waste Management Law.

(43) Household waste means any solid waste (including garbage, trash and sanitary waste in septic tanks) derived from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds and day-use recreation areas).

(44) Hydrostratigraphic unit means a geologic stratum or group of strata that exhibit similar characteristics with respect to transmission of fluids or gases.

(45) Incinerator means a solid waste processing facility consisting of any device or structure resulting in weight or volume reduction of solid waste by combustion.

(46) Incinerator residue means all wastes that remain after combustion, including bottom ash, fly ash, slag and grate siftings.

(47) Infectious waste means waste in quantities and characteristics as determined by the department by rule that is capable of producing an infectious disease because it contains pathogens of sufficient virulence and quantity so that exposure to the waste by a susceptible human host could result in an infectious disease. These wastes include isolation wastes, cultures and stocks of etiologic agents, blood and blood products, pathological wastes, other contaminated wastes from surgery and autopsy; contaminated laboratory wastes, sharps, dialysis unit wastes, discarded biological materials known or suspected to be infectious; provided, however, that infectious waste does not mean waste treated to department specifications.

(48) Infectious waste processing facility means a solid waste processing facility permitted specifically for the treatment or other processing of infectious waste.

(49) Karst terranes means areas where karst, with its characteristic surface and subsurface features, is developed as the result of dissolution of limestone, dolomite or other soluble rock. Characteristic physiographic features present in karst terranes include, but are not limited to, sinkholes, losing streams, caves, solution channels or conduits, springs and solution valleys.

(50) Land surveyor means a land surveyor licensed to practice by the Missouri Board for Architects, Professional Engineers, Professional Land Surveyors, and Landscape Architects.

(51) Leachate means liquid that has percolated through solid waste or has come in contact with solid waste and has extracted, dissolved or suspended materials from it.

(52) Leachate collection system means any combination of landfill base slopes, liners, permeable zones, pipes, sumps, pumps or retention structures that is designed, constructed and maintained to monitor leachate generation in a solid waste disposal area and collect and remove leachate as necessary to reduce leachate depth over a landfill base.

(53) Lead acid battery means a battery designed to contain lead and sulfuric acid with a nominal voltage of at least six (6) volts and of the type intended for use in motor vehicles and watercraft.

(54) Liner means a continuous layer(s) of soil, man-made materials, or both, beneath and on the sides of a solid waste disposal area which controls and minimizes the downward or lateral escape of solid waste, solid waste constituents or leachate.

(55) Liquid waste means any waste material that is determined to contain free liquids as defined by Method 9095 (Paint Filter Liquids Test), as described in *Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods* (EPA Pub. No. SW-846).

(56) Lithified earth material means all rock, including all naturally occurring and naturally formed aggregates or masses of minerals or small particles of older rock that formed by crystallization of magma or by induration of loose sediments. This term does not include man-made materials, such as fill, concrete and asphalt or unconsolidated earth materials, soil or regolith lying at or near the earth surface.

(57) Major appliance means clothes washers and dryers, water heaters, trash compactors,



dishwashers, microwave ovens, conventional ovens, ranges, stoves, woodstoves, air conditioners, refrigerators, and freezers.

(58) Maximum horizontal acceleration in lithified earth material means the maximum expected horizontal acceleration depicted on a seismic hazard map, with a ninety percent (90%) or greater probability that the acceleration will not be exceeded in two hundred fifty (250) years, or the maximum expected horizontal acceleration based on a site-specific seismic risk assessment.

(59) Mercuric-oxide battery or mercury battery means a battery having a mercuric-oxide positive electrode, a zinc negative electrode, and an alkaline electrolyte, including mercuric-oxide button cell batteries generally intended for use in hearing aides and larger size mercuric-oxide batteries used primarily in medical equipment.

(60) Motor oil means any oil intended for use in a motor vehicle, as defined in section 301.010, RSMo, train, vessel, airplane, heavy equipment, or other machinery powered by an internal combustion engine.

(61) Municipal wastes means household waste, commercial, agricultural, governmental, industrial and institutional waste which have chemical and physical characteristics similar to those of household waste.

(62) New sanitary landfill means any sanitary landfill that has not received waste prior to October 9, 1993.

(63) On-site means the same or geographically contiguous property which may be divided by public or private right-of-way, provided the entrance and exit between the properties is at a crossroads intersection and access is by crossing, as opposed to going along, the right-of-way. Noncontiguous properties owned by the same person but connected by a right-of-way which s/he controls and to which the public does not have access is also considered on-site property.

(64) One hundred (100)-year flood means a flood that has a one percent (1%) or greater chance of recurring in any given year or a flood of a magnitude equalled or exceeded once in one hundred (100) years on the average over a significantly long period.

(65) Open burning means the combustion of solid waste without: 1) control of combustion air to maintain adequate temperature for efficient combustion, 2) containment of the combustion reaction in an enclosed device to provide

sufficient residence time and mixing for complete combustion and 3) control of the emission of the combustion products.

(66) Open dump means an unpermitted solid waste disposal area at which solid wastes are disposed of in a manner that does not protect the environment, are susceptible to open-burning and are exposed to the elements, vectors and scavengers.

(67) Operator means a person who is responsible for the overall day-to-day operation and maintenance of a facility and along with the owner, obtains a solid waste permit from the department.

(68) Owner means any person holding a freehold interest in the land upon which the solid waste disposal area or solid waste processing facility is located.

(69) Owner/operator means owner and operator.

(70) Permeable geologic media means soil or lithified earth material that has a hydraulic conductivity of greater than 1.0×10^{-6} centimeters per second (cm/sec), as determined in situ aquifer tests, packer test or other methods approved by the department's geological survey program.

(71) Permit modification means any approval issued by the department which alters or modifies the provision of an existing permit previously issued by the department.

(72) Person means individual, partnership, corporation, association, institution, city, county, other political subdivision, authority, state agency or institution or federal agency or institution.

(73) Phase means a distinct area of a landfill, identifiable both in the plans and in the field by natural boundaries or permanent survey markers. A phase must include provisions for constructing and operating leachate collection systems, liners, gas collection systems and any other landfill structures independent of any other phase.

(74) Phased development means the division of the construction and operations of a solid waste disposal area permit into two (2) or more distinct phases in order to facilitate more orderly construction, operation, closure or post-closure care, or both, of the solid waste disposal area, with each phase being distinctly identifiable both in the plans and in the field by natural boundaries or permanent survey markers, or both.

(75) Piezometer means a well that is used to measure groundwater elevation or depth.

(76) Plans mean reports and drawings, including a narrative operating description, prepared to describe the solid waste disposal area or solid waste processing facility design, its proposed operation and closure and post-closure care.

(77) Poor foundation conditions means those areas where features exist which indicate that a natural or man-induced event may result in inadequate foundation support for the structural components of a landfill.

(78) Post-closure care means all maintenance and monitoring performed at a solid waste disposal area after closure is complete to prevent or minimize existing or potential health hazards, public nuisance or environmental pollution and in accordance with the terms of the permit, the Solid Waste Management Law and the corresponding rules.

(79) Post-closure plan means plans, designs and relevant data which specify the methods and schedules by which the operator shall perform necessary monitoring and care for the area after closure to achieve the purposes of the Solid Waste Management Law and the corresponding rules.

(80) Potable groundwater means groundwater that is safe for human consumption in that is free from impurities in amounts sufficient to cause disease or harmful physiological effects and has less than ten thousand (10,000) parts per million total dissolved solids.

(81) Preliminary site investigation means an investigation conducted by the Division of Geology and Land Survey to determine the geohydrologic suitability for further exploration at a proposed solid waste disposal area.

(82) Professional engineer means a professional engineer licensed to practice by the Missouri Board for Architects, Professional Engineers, Professional Land Surveyors, and Landscape Architects.

(83) Qualified groundwater scientist means a scientist or licensed professional engineer who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in groundwater hydrology and related fields as may be demonstrated by state registration, professional certifications or completion of accredited university programs



that enable that individual to make sound professional judgments regarding groundwater monitoring, contaminant fate and transport, and corrective action.

(84) Rapid migration means the movement of fluids at rates in excess of ten feet (10') per year as determined by: tracer tests, age dating, in situ aquifer testing, packer tests or other methods as approved by the Geological Survey Program.

(85) Recovered materials means those material which have been diverted or removed from the solid waste stream for sale, use, reuse or recycling, whether or not they require subsequent separation and processing.

(86) Recycled content means the proportion of fiber or content in a product which is derived from post-consumer waste.

(87) Recycling means the separation and reuse or remanufacture of materials which might otherwise be disposed of as solid waste.

(88) Recycling center means any collection (not manufacturing) facility or system that accepts source-separated recyclable or commingled recyclable materials for processing and resale to markets for resource recovery for example: aluminum cans and scraps, tin, copper, glass, paper products, plastics, bi-metal and steel containers, ferrous and non-ferrous metals.

(89) Resource recovery means a process by which recyclable and recoverable material is removed from the waste stream to the greatest extent possible, as determined by the department and pursuant to department standards, for reuse or remanufacture.

(90) Resource recovery facility means any facility including a material recovery facility in which recyclable and recoverable material is removed from the waste stream to the greatest extent possible, as determined by the department and pursuant to department standards, for reuse or remanufacture.

(91) Runoff means any liquid that drains over land from any part of a facility.

(92) Run-on means any liquid that drains over land onto any part of a facility.

(93) Salvaging means the controlled removal of solid waste materials for utilization.

(94) Sanitary landfill means a permitted solid waste disposal area employing an engi-

neered method of disposing of solid wastes on land in a manner that minimizes environmental hazards by spreading the solid wastes in thin layers, compacting the solid wastes to the smallest practical volume and applying cover at the end of each operating day. Sanitary landfills include all disposal area that accept all types of solid waste including, but not limited to, commercial and residential solid waste.

(95) Scavenging means uncontrolled or unauthorized removal of solid waste from a solid waste disposal area or solid waste processing facility.

(96) Seismic impact zone means an area with a ten percent (10%) or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10g in two hundred fifty (250) years.

(97) Site means any area proposed for construction of a solid waste disposal area.

(98) Sludge means the accumulated semi-solid suspension of settled solids deposited from wastewaters or other fluids in tanks or basins.

(99) Soil means sediments or other unconsolidated accumulations of solid particles produced by the physical and chemical disintegration of rocks and which may or may not contain organic matter.

(100) Solid waste means garbage, refuse and other discarded materials including, but not limited to, solid and semisolid waste materials resulting from industrial, commercial, agricultural, governmental and domestic activities, but does not include hazardous waste as defined in sections 260.360 to 260.434, RSMo recovered materials, overburden, rock, tailings, matte, slag or other waste material resulting from mining, milling or smelting.

(101) Solid waste disposal area means any area used for the disposal of solid waste from more than one (1) residential premises, or one (1) or more commercial, industrial, manufacturing, recreational or governmental operation.

(102) Solid waste management plan means a set of documents legally adopted by a state recognized governing body of a local or regional solid waste management program to administer the solid waste management system(s) for a minimum of ten (10) years.

(103) Solid waste management system means the entire process of managing solid waste in a manner which minimizes the generation and subsequent disposal of solid waste, including waste reduction, source separation, storage, collection, transportation, recycling, resource recovery, volume minimization, processing market development and disposal of solid wastes.

(104) Solid waste processing facility means any facility where solid wastes are salvaged and processed, including:

(A) A transfer station; or

(B) An incinerator which operates with or without energy recovery but excluding waste tire end-user facilities; or

(C) A material recovery facility which operates with or without composting.

(105) Solid waste technician means an individual who has successfully completed training in the practical aspects of the design, operation and maintenance of a permitted solid waste processing facility or solid waste disposal area in accordance with the Solid Waste Management Law and rules.

(106) Source reduction means practices which avoid, eliminate or minimize the generation of solid waste.

(107) Source-separated recyclable material means a waste material, for which a market exists, which has not been commingled with other solid waste but has been kept separate at the point of generation.

(108) Special waste means waste which is not regulated hazardous waste, which has physical or chemical characteristics, or both, that are different from municipal, demolition, construction and wood wastes, and which potentially require special handling.

(109) Special waste landfill means a solid waste disposal area permitted specifically for the disposal of one (1) or more special waste(s).

(110) Special waste processing facility means a solid waste processing facility permitted specifically for the processing of one (1) or more special waste(s).

(111) Structural components means liners, leachate collection systems, final covers, run-on/runoff systems and any other component used in the construction and operation of the solid waste disposal area that is necessary for protection of human health and the environment.

(112) Tire means a continuous solid or pneumatic rubber covering encircling the wheel of any self-propelled vehicle not operated exclusively upon tracks, or a trailer as defined in Chapter 301, RSMo, except farm tractors and farm implements owned and operated by a family farm or family farm corporation as defined in section 350.010, RSMo.

(113) Transfer station means a site or facility which accepts solid waste for temporary storage, or consolidation and further transfer to a waste disposal, processing or storage facility. Transfer station includes, but is not limited to, a site or facility where waste is transferred from: a rail carrier, motor vehicle or water carrier to another carrier, if the waste is removed from the container or vessel.

(114) Unstable area means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of the landfill structural components responsible for preventing releases from a landfill. Unstable areas can include poor foundation conditions, areas, susceptible to mass movements and karst terranes.

(115) Uppermost aquifer means the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the property boundary.

(116) Uppermost regional aquifer means the hydrostratigraphic unit closest to the ground surface that is capable of consistently yielding at least three hundred sixty (360) gallons per day of potable water to a well and is commonly used for private or public drinking water supply.

(117) Used motor oil means any motor oil which as a result of use, becomes unsuitable for its original purpose due to loss of original properties or the presence of impurities, but used motor oil shall not include ethylene glycol oils used for solvent purposes, oil fibers that have been drained of free-flowing used oil, oily waste, oil recovered from oil tank cleaning operation, oil spilled to land or water, or industrial nonlube oils such as hydraulic oils, transmission oils, quenching oils, and transformer oils.

(118) Utility waste means fly ash waste, bottom ash waste, slag waste and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels.

(119) Utility waste landfill means a solid waste disposal area used for fly ash waste,

bottom ash waste, slag waste and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels.

(120) Vector means a carrier including, but not limited to, arthropod, birds and rodents capable of transmitting a pathogen from one organism to another.

(121) Vegetation means plant materials that have been specified in the closure/post-closure plans and have been specifically cultivated for cover on the landfill and borrow area. Vegetation should provide at least eighty percent (80%) coverage in order to control erosion and limit water infiltration.

(122) Washout means the carrying away of solid waste by waters of the one hundred (100)-year flood.

(123) Waste tire means a tire that is no longer suitable for its original intended purpose because of wear, damage, or defect.

(124) Waste tire collection center means a site where waste tires are collected prior to being offered for recycling or processing and where fewer than five hundred (500) tires are kept on-site on any given day.

(125) Waste tire end-user facility means a site where waste tires are used as a fuel or fuel supplement or converted into a useable product. Baled or compressed tires used in structures, or used at recreational facilities, or used for flood or erosion control shall be considered an end use.

(126) Waste tire generator means a person who sells tires at retail or any other person, firm, corporation, or government entity that generates waste tires.

(127) Waste tire processing facility means a site where tires are reduced in volume by shredding, cutting, chipping or otherwise altered to facilitate recycling, resource recovery or disposal.

(128) Waste tire site means a site at which five hundred (500) or more waste tires are accumulated, but not including a site owned or operated by a waste tire end-user that burns waste tires for the generation of energy or converts waste tires to a useful product.

(129) Waters of the state mean all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely

upon lands owned, leased or otherwise controlled by a single person or by two (2) or more persons jointly or as tenants in common and includes waters of the United States lying within the state.

(130) Water table means the upper surface of a zone of saturation where the fluid pressure of the body of groundwater is equal to atmospheric pressure.

(131) Well means any hole drilled in the earth for or in connection with the discovery or recovery of water, minerals, oil, gas or for or in connection with the underground storage of gas in natural formations.

(132) Wetlands means those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include, but are not limited to, swamps, marshes, bogs and similar areas.

(133) Working face means that portion of the solid waste disposal area where solid wastes are discharged and are spread and compacted prior to the placement of cover.

(134) Yard waste means leaves, grass clippings, yard and garden vegetation and Christmas trees. This term does not include stumps, roots or shrubs with intact root balls.

AUTHORITY: sections 260.200, RSMo Supp. 2005 and 260.225, RSMo 2000. Original rule filed Dec. 11, 1973, effective Dec. 21, 1973. Amended: Filed July 14, 1986, effective Jan. 1, 1987. Amended: Filed Jan. 5, 1987, effective June 1, 1987. Amended: Filed Jan. 29, 1988, effective Aug. 1, 1988. Amended: Filed Aug. 15, 1988, effective Dec. 29, 1988. Emergency amendment Sept. 29, 1993, effective Oct. 9, 1993, expired Feb. 5, 1994. Amended: Filed May 3, 1993, effective Jan. 13, 1994. Amended: Filed March 17, 1992.** Emergency rescission of the 1992 amendment filed March 19, 1997, effective April 1, 1997, expired Sept. 27, 1997. Amended: Filed Oct. 10, 1996, effective July 30, 1997. Rescission of the 1992 amendment filed April 3, 1997, effective Aug. 30, 1997. Amended: Filed June 30, 2006, effective Feb. 28, 2007.*

**Original authority: 260.200, RSMo 1972, amended 1975, 1986, 1988, 1990, 1993, 1995, 2002, 2005 and 260.225, RSMo 1972, amended 1975, 1986, 1988, 1990, 1993, 1995.*



***The Missouri Supreme Court in Missouri Coalition for the Environment, et al., v. Joint Committee on Administrative Rules, et al., Case No. 78628, dated February 25, 1997, ordered the secretary of state to publish this amendment. The Missouri Department of Natural Resources subsequently filed an emergency rescission of this amendment as well as a proposed rescission of this amendment which became effective August 30, 1997. See the above authority section for filing dates.*

10 CSR 80-2.011 Definitions

Emergency rule filed Sept. 29, 1993, effective Oct. 9, 1993, expired Feb 5, 1994. Emergency rule filed Jan. 28, 1994, effective Feb. 7, 1994, expired June 6, 1994.

10 CSR 80-2.015 Preliminary Site Investigation, Detailed Site Investigation Workplan, and Detailed Site Investigation and Characterization Report

PURPOSE: *This rule describes the steps required to characterize the geologic and hydrologic conditions at a proposed solid waste disposal area prior to submittal of a construction permit application in compliance with section 260.205, RSMo (Cum. Supp. 1996).*

(1) On and after January 1, 1996, no applicant may apply for, or obtain, a permit to construct a solid waste disposal area unless the person has obtained geologic and hydrologic site approval from the department. Geologic and hydrologic approval indicates that the site has been found to be suitable for development of a solid waste disposal area, provided the required plans and engineering reports detailing the construction and operation of the site are prepared and approved by the department. In order to obtain geologic and hydrologic site approval from the department, the following procedures must be followed:

(A) The potential disposal area construction permit applicant must obtain preliminary site approval from the department. The applicant shall provide the department a map that delineates the approximate horizontal boundaries of the proposed solid waste disposal area and provide the approximate elevation of the base of the proposed solid waste disposal area. The applicant may provide the department any other information pertinent to the site that may assist in the preliminary site investigation. The Division of Geology and

Land Survey (DGLS) Geologic Survey Program (GSP) will conduct a preliminary site investigation and approve or disapprove the site for further investigation within sixty (60) days of receipt of a request. Preliminary site approval is provisional, as required additional investigations may reveal conditions that may lead to site disapproval. Disapproval may be reviewed by the DGLS division director. Preliminary site investigation requests shall be submitted to the GSP on the form included in Appendix 1 which is included herein. After performing a preliminary site investigation, the GSP shall make one (1) of the following determinations:

1. The geologic and hydrologic conditions of the site are not suitable for the development of a solid waste disposal area.

A. Sites proposed for sanitary or demolition waste landfills known to have one (1) or more of the following geologic or hydrologic conditions within its boundaries are considered unsuitable for the development of a solid waste disposal area:

(I) Groundwater that must be pumped in order to keep the wastes within the proposed solid waste disposal area isolated above the water table;

(II) Permeable geologic media, including soil or bedrock with karst terrane features, faults, joints, fractures, or voids, that provide a pathway for the rapid migration of fluids from the site into the uppermost regional aquifer or the rapid migration of groundwater from the site to a surface water body outside of the site;

(III) Permeable geologic media, including soil or bedrock with karst terrane features, faults, joints, fractures, or voids, that provide a pathway for the migration of landfill-derived gases outside of the site;

(IV) A fault that has experienced movement during the Holocene epoch that is located within the boundaries of the proposed solid waste disposal area;

(V) Groundwater that cannot effectively be monitored on-site due to karst terrane conditions; or

(VI) The presence of subsurface voids or conditions that present a significant potential for catastrophic collapse.

B. Sites proposed for utility waste landfills known to have one (1) or more of the following geologic or hydrologic conditions within its boundaries are considered unsuitable for the development of a solid waste disposal area:

(I) A fault that has experienced movement during the Holocene epoch that is located within the boundaries of the proposed solid waste disposal area;

(II) Groundwater that cannot effec-

tively be monitored on-site due to karst terrane conditions; or

(III) The presence of subsurface voids or conditions that present a significant potential for catastrophic collapse;

2. There is insufficient data to allow a proper determination to be made about site suitability at the preliminary site investigation phase. Such sites shall receive preliminary site investigation approval but data must be collected during the subsequent detailed site investigation that fully characterizes the geologic and hydrologic conditions of the site and demonstrates that the site is suitable for the development of a solid waste disposal area. GSP will assist the applicant in identifying geologic and hydrologic conditions that must be fully characterized during the detailed site investigation. If geologic or hydrologic conditions pursuant to 10 CSR 80-2.015(1)(A)1. are identified during the detailed site investigation, the site shall be disapproved;

3. The geologic and hydrologic conditions of the site may be well suited for the development of a solid waste disposal area. Such sites shall receive preliminary site investigation approval and may be subject to reduced requirements during the detailed site investigation. Sites that do not have any conditions pursuant to 10 CSR 80-2.015(1)(A)1. and are underlain by one (1) or more of the following geologic and hydrologic conditions below the proposed sub-base grade may be well suited for the development of a solid waste disposal area:

A. A combined minimum thickness of fifty feet (50') of low-permeability geologic material that inhibits the movement of fluids into the uppermost regional aquifer that is currently used or is reasonably likely to be used as a future domestic drinking water source. The low-permeability geologic material must:

(I) Be comprised of shale, mudstone or glacial deposits comprised primarily of clay or silt size particles; and

(II) Lack karst terrane features, continuous sand or gravel layers, faults, fractures, cracks, voids, or other features that provide a pathway for the rapid migration of fluids or gases off the site;

B. Aquifers that are in geohydrologic connection with the proposed solid-waste disposal area that do not yield potable groundwater or are not capable of producing greater than three hundred sixty (360) gallons of water per day from a domestic water well;

(B) Prior to conducting further investigation of the proposed site, the potential disposal area construction permit applicant must retain a qualified groundwater scientist who



is a registered geologist per section 256.453, RSMo who shall request and attend a workplan development meeting with the GSP. This meeting shall include, at a minimum, discussion of the geology and hydrology of the proposed site and specific elements to be included in the workplan, time frames for completion of work and a discussion of the regulatory process;

(C) The qualified groundwater scientist who is a registered geologist per section 256.453, RSMo shall then prepare and submit to the department a workplan for conducting a detailed surface and subsurface geologic and hydrologic investigation. The elements and format of the workplan are listed in Appendix 1 which is included herein. The GSP will review and approve or disapprove the detailed site investigation workplan within thirty (30) days of receipt; and

(D) After the workplan is approved, a qualified groundwater scientist shall investigate and characterize the geology and hydrology of the site in accordance with the approved workplan, applicable rules and department guidance. All geologic and hydrologic data collection and interpretation shall be under the direction of a geologist registered in the state of Missouri. The applicant or a representative shall notify the GSP when drilling, testing, or field investigations are to take place so that department personnel may be present on-site during the investigations.

1. The approved workplan will provide site-specific guidance for the applicant to complete the detailed site investigation. The workplan may be amended and changed with the approval of the GSP, as the investigation proceeds.

2. The qualified groundwater scientist shall interpret and summarize the geologic and hydrologic characteristics of the site in a detailed site investigation and characterization report which is to be submitted to the GSP. Guidance for conducting and reporting a detailed site investigation is included herein as Appendix 1 of this rule. The report shall be signed and sealed by a geologist registered in the state of Missouri. The report shall be submitted to the GSP for review.

(2) The GSP will review the report within sixty (60) days of receipt and approve or disapprove the site.

(A) Approval will indicate that:

1. The site has been found to have suitable geologic and hydrologic characteristics for the development of an environmentally sound solid waste disposal area; or

2. That the detailed site investigation and characterization report adequately

addresses geologic or hydrologic conditions that can be overcome by engineering pursuant to 10 CSR 80-3.010(5)(B)3., 10 CSR 80-4.010(4)(B)8. and 10 CSR 80-11.010(5)(A)3. for the development of an environmentally sound solid waste disposal area. Approval shall not be granted to a site that has a condition specified as unsuitable pursuant to 10 CSR 80-2.015(1)(A)1.

(B) The potential disposal area construction permit applicant who has received approval may then apply for a permit by submitting the required documents, plans, and engineering reports to the department.

(C) Disapproval will indicate one (1) or more of the following:

1. The site has been found to have unsuitable geologic and hydrologic conditions for the development of an environmentally sound solid waste disposal area; or

2. The characterization of the site is not adequate to show that the site has suitable geologic and hydrologic conditions for the development of an environmentally sound solid waste disposal area; or

3. The characterization report is not adequate to show that the site has suitable geologic and hydrologic conditions for the development of an environmentally sound solid waste disposal area.

(D) The GSP will specify the inadequacies of the site, characterization of the site, or site characterization report in the written disapproval of the site. Disapprovals may be reviewed by the DGLS division director.

APPENDIX 1

GUIDANCE FOR CONDUCTING AND REPORTING DETAILED GEOLOGIC AND HYDROLOGIC INVESTIGATIONS AT A PROPOSED SOLID-WASTE DISPOSAL AREA



Missouri Department of Natural Resources
Division of Environmental Quality
Division of Geology and Land Survey

This appendix contains the following:

- Elements and format of a workplan for conducting the Detailed Site Investigation.
- Guidance for conducting an acceptable detailed geologic and hydrologic investigation of a proposed solid-waste disposal area.
- Guidance for the acceptable presentation of site characterization data.
- Form for requesting a preliminary investigation for a proposed solid-waste disposal area.

ELEMENTS AND FORMAT OF A DETAILED SITE INVESTIGATION WORKPLAN

The detailed site investigation workplan must contain the following elements plus any additional site-specific elements which may be requested by the Geological Survey Program (GSP).

1. Topographic map at a scale of 1:24,000 showing the pertinent property boundaries, as well as the location of the proposed solid-waste disposal area, and potential borrow areas
2. Site map at a suitable scale to display proposed locations for pits, borings, and piezometers
3. A general description of the proposed facility to include:
 - a. Maximum depth of excavation
 - b. Total acreage to be developed as a solid-waste disposal area
4. Description of proposed methods for site exploration to include:
 - a. Drilling methods
 - b. Sampling methods
 - c. Piezometer and monitoring well construction methods (must comply with 10CSR23-4):
 - (1) Approximate depth intervals to be screened
 - (2) Specific grout mixtures and emplacement methods to be used
 - d. Aquifer test methods
 - e. Alternative exploration methods (such as geophysical methods)
5. Record keeping procedures for:
 - a. Well logs, boring logs, drilling logs, pit logs
 - b. On-site precipitation data
 - c. Periodic water-level measurement data from piezometers
 - d. Aquifer test data

DETAILED SITE INVESTIGATION



General Procedures for Detailed Site Investigations

The potential disposal area construction permit applicant is responsible for retaining a qualified groundwater scientist to provide the GSP with a complete and accurate evaluation of the geologic and hydrologic conditions of the proposed solid-waste disposal area. All geologic and geohydrologic work must be completed under the direction of a geologist registered in the State of Missouri per RSMo 256.450 through 256.483 and the rules promulgated pursuant thereto. A consultant who subcontracts the drilling of piezometers or monitoring wells must hold a restricted or a nonrestricted monitoring well installation contractor's permit. Drilling must be done by a driller holding a nonrestricted monitoring well installation contractor's permit and appropriate permit numbers must be prominently displayed on all drill rigs used for site characterization, as required by 10 CSR 23 Chapters 1, 2 and 4. The detailed site investigation is intended to provide the GSP with sufficient geohydrologic data to determine if the site is suitable for the development of a solid waste disposal area.

The minimum elements of a detailed site investigation are partially dependent on site-specific geologic conditions. As a result of data gathered during the preliminary or detailed site investigation, the GSP may require additional investigations to adequately define the geology and hydrology of the site. The GSP may require less detailed investigation based upon site geohydrologic conditions.

Geophysical methods may be used to help characterize the site; however borings or pits must be located and drilled to verify the results of the geophysical survey(s). Where geologic structures or solution features are present or suspected, additional borings or pits will be required to adequately define the extent and distribution of these features across the site, and to determine the relationships between these features and hydrostratigraphic units.

Sinkholes, solution-enlarged fractures and caves may have very small, near-surface expressions that a boring program would not be expected to detect. Sites will be rejected during preliminary or detailed site investigations where the site is characterized by karst terrane features which may affect the structural integrity or effective monitoring of the site.

Field Direction

A qualified groundwater scientist must direct the excavation of all pits, the drilling of all borings, the performance of any geophysical surveys, and the installation, development and abandonment of all exploratory wells or piezometers. Interpretations of geological data must be conducted under the direction of a geologist registered in the State of Missouri per RSMo 256.450 through 256.483.

A qualified groundwater scientist must supervise all field testing to determine the geologic and hydrologic characteristics of the material encountered or intended for use at the proposed site. A qualified groundwater scientist must maintain accurate and complete field notes of the investigation activities.

A land surveyor registered in the State of Missouri must determine the location and elevation of all wells and piezometers. Borings, excavation pits and all transects performed as part of a geophysical exploration will be located to the nearest one-tenth (0.1) foot by a land surveyor registered in the State of Missouri. All elevation measurements, grid patterns, and coordinates must be established and used consistently throughout the investigation and referenced to North American Datum (NAD) 1983 and National Geodetic Vertical Datum (NGVD) 1929 or North American Vertical Datum (NAVD) 1988. Monitoring well and piezometer measuring-point elevations must be accurate to the nearest one-hundredth (0.01) foot.

Field Investigations

The minimum requirements for conducting a detailed subsurface investigation are listed below. Alternative investigation techniques and procedures may be approved at the discretion of the GSP. Additional borings or pits may be required, subject to site-specific conditions, to fully characterize the geology of the area. The number of borings, pits, and piezometers required is dependent upon the anticipated size of the proposed disposal area and the site geohydrology. Borings that are not used as monitoring wells or piezometers must be permanently abandoned and reported as per 10 CSR 23-4. Exploration pits must be backfilled using native material, compacted to natural density condition, and their locations clearly marked on site maps.



1. Surficial Materials

A qualified groundwater scientist must determine the thickness, and geotechnical characteristics of significant hydrostratigraphic units, where they exist at the site, above competent bedrock. At least one boring must be drilled per two acres of the proposed disposal area. All borings must be extended to at least 25 feet below the anticipated disposal area sub-base grade or to competent bedrock, whichever is less. All borings must be continuously sampled. Exploration pits may be substituted for borings in areas where the surficial materials can be fully penetrated by the pits. For sites that meet the conditions pursuant to 10 CSR 80-2.015(1)(A)3 the GSP shall require only one boring per four acres of the site.

If geologic structures or solution features are suspected, at least one boring must be completed per acre of the proposed disposal area. All of these borings will be drilled to competent bedrock. Exploration pits may be substituted if approved by GSP.

The borings or pits must be distributed in a grid pattern across the site or located in a manner that will optimize characterization of the site. Deviations from a regular grid pattern must be approved by the GSP. The locations and elevations of borings or pits must be surveyed by a land surveyor.

2. Aquifers

A qualified groundwater scientist must determine the depth, thickness and lateral extent of the uppermost aquifer(s) beneath the proposed site and additional aquifers which are potentially at risk (as determined by the GSP).

Piezometers are required to adequately characterize the groundwater at the proposed site. There must be at least five piezometers, or one piezometer per four acres of the site, whichever is greater, installed in each aquifer to be characterized. For sites that meet the conditions pursuant to 10 CSR 80-2.015(1)(A)3 there must be at least five piezometers, or one piezometer per eight acres of the site, whichever is greater. Piezometer construction and development standards must be in accordance with 10 CSR 23-4.

All piezometers must be distributed in a grid pattern across the proposed site or located in a manner that will optimize characterization of the site. Deviations from a regular grid pattern must be approved by the GSP. An adequate number of piezometers must be located outside the anticipated fill area to sufficiently characterize each aquifer investigated. The measuring-point elevation of the piezometers must be determined by a land surveyor. Additional piezometers may be required to demonstrate the effectiveness of confining units and extent of aquifers. If geophysical methods are used, piezometers must be installed to verify the results of the geophysical survey(s).

A continuously recording precipitation gauge, capable of measuring precipitation events greater than one-tenth (0.1) inch, must be installed at the site concurrent with, or prior to, installation of piezometers. Data from the gauge will be used to interpret any fluctuations in potentiometric level(s) throughout the site characterization period and may be used for other purposes later, at the discretion of the department.

The hydraulic conductivity of the uppermost aquifer(s) beneath the proposed disposal area must be determined. The hydraulic conductivity must be determined in one out of every four piezometers installed for each aquifer tested. The hydraulic conductivity must be determined in the field. Accepted field tests are *in situ* slug and/or pump tests, as determined through the workplan process, which isolate the geologic unit of interest.

3. Other Hydrostratigraphic Units

At least one boring per four acres of the proposed disposal area or five borings, whichever is greater, must be drilled to characterize hydrostratigraphic units, including the uppermost confining unit, below the anticipated sub-base grade of the site. The depth of these borings will be determined based on geohydrologic conditions at the site. At least five of these borings must be continuously sampled, unless otherwise approved by the GSP. For sites that meet the conditions pursuant to 10 CSR 80-2.015(1)(A)3 there must be at least five of these borings or one boring per eight acres of the site, whichever is greater.

Rules of
Department of Natural Resources
Division 80—Solid Waste Management
Chapter 11—Utility Waste Landfill

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Title 10—DEPARTMENT OF NATURAL RESOURCES

Division 80—Solid Waste Management Chapter 11—Utility Waste Landfill

10 CSR 80-11.010 Design and Operation

PURPOSE: This rule pertains to the design and operation of a utility waste landfill.

(1) General Provisions. This rule is intended to provide for utility waste landfill operations that will have minimal impact on the environment. The rule sets forth requirements and the method of satisfactory compliance to ensure that the design, construction and operation of utility waste landfills will protect the public health, prevent nuisances and meet applicable environmental standards. The requirement subsections contained in this rule delineate minimum levels of performance required of any utility waste landfill operation. The satisfactory compliance subsections are presented as the authorized methods by which the objectives of the requirements can be realized. The satisfactory compliance subsections are based on the practice of landfilling utility waste. If techniques other than those listed as satisfactory compliance in design or operation are used, it is the obligation of the utility waste landfill owner/operator to demonstrate to the department in advance that the techniques to be employed will satisfy the requirements. Procedures for the techniques shall be submitted to the department in writing and approved by the department in writing prior to being employed. Notwithstanding any other provision of these rules, when it is found necessary to meet objectives of the requirement subsections, the department may require changes in design or operation as the condition warrants. This rule applies to new utility waste landfill construction and operating permits issued on or after the effective date of this rule.

(2) Solid Waste Accepted.

(A) Requirement. Fly ash, bottom ash, boiler slag or other slag waste and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels may be accepted at a utility waste landfill. Clean fill may also be accepted.

(B) Satisfactory Compliance—Design. The plans shall specify the types of waste to be accepted for disposal at a utility waste landfill.

(C) Satisfactory Compliance—Operations.

1. The first layer of waste placed above the liner shall be monitored to ensure that the liner's integrity has been maintained.

2. The disposal of waste approved in the construction permit shall be conducted in accordance with approved design and operating plans plus any additional procedures determined by the department as necessary to protect the water, air and land resources and to provide for safety of the operators and waste haulers.

(3) Solid Waste Excluded.

(A) Requirement. In consultation with the department, the applicant shall determine what wastes are to be accepted and shall identify them in the plan and the application for construction permit form.

(B) Satisfactory Compliance—Design.

1. The criteria used to determine whether the waste can be accepted shall include the design of the landfill, the physical and chemical characteristics of the wastes, the quantity of the wastes, the proposed operating procedures.

2. The plans shall specify the operating procedures for screening and removal of wastes which are excluded from disposal.

(C) Satisfactory Compliance—Operations.

1. The operating procedures for screening of wastes and for removal of wastes which are excluded from disposal shall be implemented.

2. Bulk liquid waste shall not be placed in a utility waste landfill unless the waste is leachate derived from the utility waste landfill, and the utility waste landfill is designed with a liner and leachate collection system as described in sections (9) and (10) of this rule.

3. Sluicing of waste for transport to proposed utility waste landfills shall be allowed only so long as the hydraulic head on top of the landfill liner can be maintained at less than one foot (1') of head, and the collected leachate and runoff meet all Water Pollution Control Program permit requirements.

(4) Site Selection.

(A) Requirement. Site selection and utilization shall include a study and evaluation of geologic and hydrologic conditions and soils at the proposed utility waste landfill and an evaluation of the environmental effect upon the projected use of the completed utility waste landfill. Applications for utility waste landfill construction permits received on or after the effective date of this rule shall document compliance with all applicable siting restriction requirements contained in paragraphs (4)(B)1. through 5. of this rule.

(B) Satisfactory Compliance—Design.

1. Owners/operators of proposed utility waste landfills, located in one hundred (100)-year floodplains shall demonstrate to the department that the utility waste landfill

will not restrict the flow of the one hundred (100)-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of waste so as to pose a hazard to public health or the environment.

2. Wetlands.

A. Proposed utility waste landfills shall not be located in wetlands, unless the owner/operator can make the following demonstrations to the department:

(I) The presumption that a practicable alternative to the proposed landfill is available which does not involve wetlands is clearly rebutted;

(II) The construction and operation of the utility waste landfill will not—

(a) Cause or contribute to violations of any applicable state water quality standard;

(b) Violate any applicable toxic effluent standard or prohibition under section 307 of the federal Clean Water Act;

(c) Jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Endangered Species Act of 1973; and

(d) Violate any requirement under the Marine Protection, Research, and Sanctuaries Act of 1972 for the protection of a marine sanctuary;

(III) The utility waste landfill will not cause or contribute to significant degradation of wetlands. The owner/operator shall demonstrate the integrity of the utility waste landfill and its ability to protect ecological resources by addressing the following factors:

(a) Erosion, stability and migration potential of native wetland soils, muds and deposits used to support the landfill;

(b) Erosion, stability and migration potential of dredged and fill materials used to support the landfill;

(c) The volume and chemical nature of the waste disposed of in the landfill;

(d) Impacts on fish, wildlife and other aquatic resources and their habitat from potential release of waste from the landfill;

(e) The potential effects of contamination of the wetland and the resulting impacts on the environment; and

(f) Any additional factors, as necessary, to demonstrate that ecological resources in the wetland are sufficiently protected;

(IV) Steps have been taken to attempt to achieve no net loss of wetlands (as defined by acreage and function) by first avoiding impacts to wetlands to the maximum extent practicable as required by subparagraph (4)(B)2.A. of this rule, then minimizing unavoidable impacts to the maximum

extent practicable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and practicable compensatory mitigation actions (for example, restoration of existing degraded wetlands or creation of man-made wetlands); and

(V) The requirements of paragraph (4)(B)3. may be satisfied by the owner/operator obtaining a United States Army Corps of Engineers permit for construction in a wetland or by demonstrating that the wetland is not regulated by the United States Army Corps of Engineers or other appropriate agency.

3. Proposed utility waste landfills located in the seismic impact zone shall not be located within two hundred feet (200') of a fault that has had displacement in Holocene time unless that owner/operator demonstrates to the department that an alternative setback distance of less than two hundred feet (200') will prevent damage to the structural integrity of the landfill and will be protective of public health and the environment.

4. Owners/operators of proposed utility waste landfills located in an unstable area shall demonstrate to the department that the utility waste landfill's design ensures that the integrity of the structural components of the utility waste landfill will not be disrupted. The owner/operator shall consider the following factors, at a minimum, when determining whether an area is unstable:

A. On-site or local rock or soil conditions that may result in failure or significant differential settling;

B. On-site or local geologic or geomorphologic features; and

C. On-site or local human-made features or events (both surface and subsurface).

5. Plans shall include:

A. A map showing initial and proposed topographies at contour intervals of five feet (5') or less. This map shall have a scale of not less than one inch (1") equal to one hundred feet (100'). If the entire site cannot be illustrated on one (1) plan sheet, an additional map with appropriate horizontal and vertical scales that allows the site to be shown on one (1) plan sheet is required;

B. A map showing the land use and zoning within one-fourth (1/4) mile of the utility waste landfill including location of all residences, buildings, wells, water courses, springs, lakes, rock outcroppings, caves, sinkholes and soil or rock borings. All electric, gas, water, sewer and other utility easements or lines that are located on, under or over the utility waste landfill shall be shown on the map. This map shall have a scale of not less than one inch (1") equals four hundred feet (400');

C. A description of the projected use of the closed utility waste landfill if the landfill is not located on the power plant site. In addition to maintenance programs and provisions, where necessary for monitoring and controlling leachate, the plans shall specify appropriate design, construction and operating provisions for the utility waste landfill to complement the projected future use;

D. An evaluation of the characteristics and quantity of available on-site soil with respect to its suitability for utility waste landfilling operations. The engineering properties and quantity estimates of the on-site soil shall be discussed and shall include:

(I) Texture. Sieve and hydrometer analyses shall be performed to determine grain size distribution of representative soil samples. Texture may be determined by using the procedures described in ASTM method D422-63 or the procedures described in Appendix D of *Engineer Manual 1110-2-1906* prepared by the United States Army Corps of Engineers;

(II) Plasticity. The liquid limit, plastic limit and plasticity index of representative soil samples shall be determined. Plasticity may be determined by using the procedures described in ASTM method D4318-84 or the procedures described in Appendix III of *Engineer Manual 1110-2-1906*, prepared by the United States Army Corps of Engineers;

(III) Hydraulic conductivity. Laboratory hydraulic conductivity tests shall be performed upon undisturbed representative soil samples using a flexible wall permeameter (ASTM D-5084). If an aquifer is found to be laterally continuous across the anticipated limit of the proposed landfill, the hydraulic conductivity of each significant continuous geologic unit must be determined. Examples of accepted field tests are *in situ* slug or pump tests which isolate the geologic unit of interest.

(IV) Areal extent and depth. The areal extent and depth of soil suitable for landfill construction shall be determined. Variations in soil depth shall be clearly described.

6. If the base of the landfill liner will be in contact with groundwater, the applicant shall demonstrate to the department's satisfaction that the groundwater will not adversely impact the liner.

7. Owners/operators of proposed utility waste landfills shall demonstrate how adverse geologic and hydrologic conditions may be altered or compensated for via surface water drainage diversion, underdrains, sumps, and other structural components. All alterations of the site shall be detailed in the plans. Precipitation, evapotranspiration and climatolog-

ical conditions shall be considered in site selection and design.

8. The results of the detailed site investigation report will be the basis to determine if a secondary liner, such as a geomembrane, or a leachate collection system is mandatory to ensure that there is no environmental impact from the landfill. Owner/operators of proposed utility waste landfills shall make a demonstration based on the following:

A. An evaluation of the physical and/or chemical characteristics of the waste; and

B. Documentation through modeling, testing, or other research data proving that the quality of groundwater underlying the proposed site will not be affected and that there is no potential for migration of fluids from the utility waste landfill.

(C) Satisfactory Compliance—Operations.

1. The utility waste landfill shall be accessible to vehicles which the utility waste landfill is designed to serve.

2. Temporary storage of waste for more than sixty (60) days is not permitted. Temporarily stored wastes shall be managed so as to prevent uncontrolled surface water runoff and erosion. All Water Pollution Control Program permits and approvals necessary to comply with the Missouri Clean Water Law and corresponding rules shall be obtained from the department.

(5) Design.

(A) Requirement. Plans, addendums, as-built drawings, or other documents which describe the design, construction, operation, or closure of a utility waste landfill or which request an operating permit modification for the utility waste landfill shall be prepared or approved by a professional engineer. These documents shall be stamped or sealed by the professional engineer and submitted to the department for review and approval.

1. Plans submitted as part of an application for a construction permit after the effective date of this rule shall provide for the maintenance of a one hundred foot (100')-buffer zone between utility waste landfill operations and any property line(s) or any right of way(s) of adjoining road(s) when the property line(s) is inside the right of way(s) to provide for assessment and/or remedial actions.

2. The plan shall include an operating manual describing the various tasks that shall be performed during a typical shift.

3. Owners/operators of utility waste landfills shall demonstrate how adverse geologic and hydrologic conditions may be altered or compensated for via surface water drainage diversion, underdrains, sumps, and

other structural components. All alterations of the site shall be detailed in the plans.

A. Precipitation, evapotranspiration and climatological conditions shall be considered in site selection and design.

B. Engineering plans and specifications that have computer model attached to them shall list the limitations and assumptions of each model used in the application.

4. Plans for stability analyses for all stages of construction shall include:

A. Settlement and bearing capacity analyses shall be performed on the in-place foundation material beneath the disposal area. The effect of foundation material settlement on the liner and leachate collection shall be evaluated;

B. Stability analyses shall be performed on all liner and leachate system components;

C. Leachate collection pipe material and drainage media shall be analyzed to demonstrate that these components possess structural strength to support maximum loads imposed by overlying waste materials and equipment;

D. Waste mass stability analyses shall be performed on the disposal area at final waste grade conditions and at intermediate slope conditions; and

E. Stability analyses shall be performed on all final cover system components, including an evaluation of the effect of waste settlement on the final cover system components, side slope liner system components, surface water management system components and gas migration system components.

(B) Satisfactory Compliance—Operations.

1. Construction and operation of the utility waste landfill shall be conducted in accordance with the engineering plans and specifications approved by the department.

2. The operating manual describing the various tasks that shall be performed during a typical shift shall be available to employees for reference and to the department upon request.

3. Phase development drawings shall be included with the application.

(6) Quality Assurance/Quality Control (qa/qc).

(A) Requirement. The construction, operation and closure of the utility waste landfill shall include quality assurance and quality control measures to ensure compliance with approved plans and all applicable federal, state and local requirements. The permittee shall be responsible for ensuring that the qa/qc supervision is conducted by a qualified professional.

(B) Satisfactory Compliance—Design.

1. Plans shall include:

A. A detailed description of the qa/qc testing procedures that will be used for every major phase of construction. The description must include at a minimum, the frequency of inspections, field testing, laboratory testing, equipment to be utilized, the limits for test failure, and a description of the procedures to be used upon test failure; and

B. A detailed procedure for the reporting and recording of qa/qc activities and testing results.

2. All qa/qc reports shall be reviewed and approved by a professional engineer.

(C) Satisfactory Compliance—Operations.

1. At a minimum qa/qc testing shall include:

A. Testing of each lift of the soil component of the final cover and landfill liner for field density and field moisture once per every ten thousand (10,000) square feet and providing relatively uniform coverage over the landfill surface;

B. Laboratory hydraulic conductivity testing of the soil used for liner construction once for every five thousand (5,000) cubic yards of liner constructed;

C. Continuous visual classification of borrow soil during landfill construction by qualified qa/qc inspector(s) or certifying professional engineer;

D. Measuring the elevations of the final cover and the landfill liner on a maximum spacing of one hundred-foot (100') centers and at one hundred-foot (100') intervals along each line where a break in slope occurs.

(I) Landfill liner. Measuring the elevations of the top and bottom of the landfill liner;

(II) Final cover. Measuring the elevations of the top and bottom of—

(a) The compacted clay layer; and

(b) The soil layer supporting vegetative growth; and

E. Verification of the thickness of the leachate collection media shall be made by the qualified qa/qc inspector(s) or certifying professional engineer on one hundred-foot (100') centers.

2. If a geomembrane is proposed—

A. Nondestructive testing of all seams of the geomembrane in the landfill liner; and

B. Random destructive testing of the seams of the geomembrane liner in the landfill liner on an average frequency of at least one (1) every five hundred (500) linear feet of seams.

3. All testing shall be performed under the direction of qualified qa/qc inspectors for every major phase of construction.

4. The qa/qc plan shall include the following components:

A. Leachate collection system. Reports prepared or approved by the professional engineer transmitting the results of the qa/qc procedures and stating that the leachate collection system was constructed according to the approved design or describing any deviations from the approved design; and

B. Liner. The liner specified by section (10) of this rule shall be constructed in accordance with the approved design specifications. The qa/qc procedures shall include:

(I) Evidence that the liner material(s) utilized meet the minimum design specifications;

(II) Evidence that field construction techniques are resulting in the minimum design specifications (for example, soil density tests);

(III) Evidence that the liner construction is proceeding as designed through regular verification using a predetermined system of horizontal and vertical survey controls; and

(IV) Oversight of the liner construction and qa/qc procedures by a professional engineer. This shall include reports prepared, or approved, by the professional engineer transmitting the results of the qa/qc procedures and stating that the liner was constructed according to design or describing any deviations from the design.

(7) Survey Control.

(A) Requirement. Benchmarks, horizontal controls and boundary markers shall be established by a land surveyor to check and mark the location and elevations of the utility waste landfill. Construction stakes marking an individual section(s) or phase(s) shall be established as necessary to ensure the construction and operation(s) proceed in accordance with approved plans.

(B) Satisfactory Compliance—Design.

1. Boundary survey. A survey of the entire permitted acreage shall be conducted in accordance with the current Minimum Standards for Property Boundary Surveys, 10 CSR 30-2.010.

2. Vertical control. The land surveyor shall establish a permanent monument as a benchmark or confirm the prior establishment of a benchmark on or adjacent to the property. The elevation shall be on the North American Vertical Datum, 1929 or similar well-documented datum. If no such established datum exists within one (1) mile of the property, a project datum may be assigned to the benchmark. The benchmark shall be clearly shown on the survey plat.

3. Horizontal control. The land surveyor shall establish three (3) permanent monuments as horizontal control stations. These stations shall form a triangle whose sides shall not be less than one thousand feet (1,000'). The location of the horizontal control will be shown on the survey plat.

4. The land surveyor shall establish boundary markers designating the entire permitted acreage which shall be composed of material which will last throughout the life of the utility waste landfill.

5. Construction stakes. Stakes marking the individual section(s) or phase(s) specifically designated for the placement of waste are to be placed in locations and composed of material that is consistent with the operating life of the section or phase.

(C) Satisfactory Compliance—Operations.

1. All boundary markers, benchmarks, horizontal control stations and construction stakes shall be clearly marked and identified.

2. Missing or displaced benchmarks or horizontal control stations shall be replaced or reestablished by or under the supervision of a land surveyor. The registered surveyor shall prepare a plat showing the replacement or reestablishment and furnish a copy to the department.

3. Missing or displaced construction stakes shall be replaced or reestablished as necessary to ensure the operations proceed in accordance with approved plans.

4. The permanent monuments designating vertical and horizontal control stations and boundary markers designating the entire permitted acreage shall be placed prior to receiving an operating permit as required by 10 CSR 80-2.020(2)(B).

5. Construction stakes marking the active area shall be placed prior to deposition of waste in individual areas, sections or phases of the utility waste landfill as designated by the approved engineering plans.

(8) Water Quality.

(A) Requirement. The location, design, construction and operation of the utility waste landfill shall minimize environmental hazards and shall conform to applicable ground and surface water quality standards and requirements. Applicable standards are federal, state or local standards and requirements that are legally enforceable.

(B) Satisfactory Compliance—Design.

1. Plans shall include:

A. A report on the detailed geologic and hydrologic investigation of the site as required by 10 CSR 80-2.015;

B. Current and projected use of water resources in the potential zone of influence of the utility waste landfill;

C. Groundwater elevation and proposed separation between the lowest point of the lowest cell and the predicted maximum water table elevation;

D. Potential interrelationship of the utility waste landfill, local aquifers and surface waters based on historical records or other sources of information;

E. Proposed location and design of observation wells, sampling stations and testing program planned; and

F. Provisions for surface water runoff control to minimize infiltration and erosion of cover. All Water Pollution Control Program permits and approvals necessary to comply with requirements of the Missouri Clean Water Law and corresponding rules shall be obtained from the department.

(I) The area of the watershed which will be affected by the utility waste landfill shall be specified.

(II) On-site drainage structures and channels shall be designed to prevent flow onto the active portion of the utility waste landfill during peak discharge from at least a twenty-five (25)-year storm. The engineering calculations and assumptions shall be included and explained in the engineering report.

(III) On-site drainage structures and channels shall be designed to collect and control at least the water volume resulting from a twenty-four (24)-hour, twenty-five (25)-year storm.

(IV) On-site drainage and channels shall be designed to empty expeditiously after storms to maintain the design capacity of the system.

(V) Contingency plans for on-site management of surface water which comes in contact with solid waste shall be specified.

(C) Satisfactory Compliance—Operations.

1. Surface water courses and runoff shall be diverted from the utility waste landfill (especially from the working face) by devices such as ditches, berms, and proper grading. The utility waste landfill shall be constructed and graded so as to promote rapid surface water runoff without excessive erosion. Regrading shall be done as required during construction and after completion to avoid ponding of precipitation and to maintain cover integrity.

2. The quantity of water coming in contact with solid waste shall be minimized by the daily operational practices. Water which comes in contact with the waste shall be managed as leachate in accordance with the approved plans.

(9) Leachate Collection Systems.

(A) Requirement. A leachate collection system shall be designed, constructed, main-

tained and operated to collect, and remove leachate from the utility waste landfill, unless the applicant provides adequate demonstrations specified in paragraph (4)(B)8. of this rule, and as determined by the department on a site-by-site basis.

(B) Satisfactory Compliance—Design. The potential for leachate generation shall be evaluated in determining the design of the system. Leachate flow quantities shall be estimated and the method(s) of leachate management shall be outlined. Leachate storage facilities shall comply with all currently applicable requirements of the Missouri Clean Water Law and corresponding rules. Construction qa/qc procedures shall be included. Where a leachate treatment system is designed to have a discharge to the waters of the state, any required discharge permit(s) shall be obtained from the department in accordance with requirements of the Missouri Clean Water Law and corresponding rules.

1. Minimum design criteria for leachate collection systems shall include the following:

A. Ponds and/or tanks of sufficient capacity to store, equalize flow to disposal systems, and allow system/operating flexibility;

B. Construction material chemically resistant to the waste managed in the utility waste landfill and the leachate expected to be generated;

C. Construction materials of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying utility wastes, cover, leachate, and by any equipment used at the utility waste landfill;

D. Design and operate systems to function without clogging through the scheduled operating life, closure and post-closure of the utility waste landfill;

E. Design and operate to maintain less than one foot (1') depth of leachate over the disposal area liner; and

F. Design and operate collection systems so that any leachate formed will flow by gravity into collection areas from which the leachate can be removed, treated, and disposed.

2. Leachate management by recirculation within the permitted fill area shall be conducted in accordance with an approved engineering method.

3. Any leachate collection system open to the atmosphere must be designed to prevent discharge during a twenty-five (25)-year, twenty-four (24)-hour storm event. Plans shall include the calculations detailing the design.

4. The applicant shall provide a method of leachate management in the application. A

secondary or “backup” method of leachate disposal will be required unless the applicant can demonstrate that a secondary method will not be necessary.

(C) Satisfactory Compliance—Operations.

1. The leachate collection system specified by subsection (9)(B) shall be properly installed and operated in accordance with the permit and the approved design and plans and maintained for the twenty (20)-year post-closure care period, or as long as the department determines necessary.

2. Leachate generated by the utility waste landfill shall be controlled on-site and not be allowed to discharge off the utility waste landfill property or discharge into the waters of the state, except in accordance with the approved plans and the Missouri Clean Water Law and corresponding rules.

(10) Liner System.

(A) Requirement. A liner shall be placed on all surfaces to minimize the migration of leachate from the utility waste landfill.

(B) Satisfactory Compliance—Design. A composite or a clay liner shall be required at all utility waste landfills applying for a construction permit after the effective date of this rule that includes—

1. For a composite liner a lower component that consists of at least a two-foot (2') layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-5} cm/sec. A compacted soil liner at a minimum shall be constructed of six to eight-inch (6–8") lifts, compacted to ninety-five percent (95%) of standard Proctor density with the moisture content between optimum moisture content and four percent (4%) above the optimum moisture content, or within other ranges of density and moisture such that are shown to provide for the liner to have a hydraulic conductivity no more than 1×10^{-5} cm/sec. For a single compacted clay liner a component that consists of at least a two-foot (2') layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. A compacted soil liner at a minimum shall be constructed of six to eight-inch (6–8") lifts, compacted to ninety-five percent (95%) of standard Proctor density with the moisture content between optimum moisture content and four percent (4%) above the optimum moisture content, or within other ranges of density and moisture such that are shown to provide for the liner to have a hydraulic conductivity no more than 1×10^{-7} cm/sec. The design shall include a detailed explanation of the construction techniques and equipment necessary to achieve ninety-five percent (95%) of the standard Proctor density under field conditions. The design also shall include

qa/qc procedures to be followed during construction of the liner. The composite liner and the compacted clay liner shall be protected from the adverse effects of desiccation or freeze/thaw cycles after construction, but prior to placement of waste. Traffic shall be routed so as to minimize the detrimental impact on the constructed liner prior to placement of waste. The soils used for this purpose shall meet the following minimum specifications:

A. Be classified under the Unified Soil Classification Systems as CL, CH, or SC (ASTM Test D2487-85);

B. Allow more than thirty percent (30%) passage through a No. 200 sieve (ASTM Test D1140);

C. Have a liquid limit equal to or greater than twenty (20) (ASTM Test D4318-84);

D. Have a plasticity index equal to or greater than ten (10) (ASTM Test D4318-84); and

E. Have a coefficient of permeability equal to or less than 1×10^{-7} cm/sec for the compacted clay liner and 1×10^{-5} cm/sec for the composite liner when compacted to ninety-five percent (95%) of standard Proctor density with the moisture content between optimum moisture content and four percent (4%) above the optimum moisture content, when tested by using a flexible wall permeameter (ASTM D-5084) or other procedures approved by the department;

2. For the composite liner an upper component consisting of a minimum thirty (30) mil thick geomembrane shall be installed if the applicant for a proposed utility waste landfill does not provide adequate demonstrations specified in paragraph (4)(B)8. of this rule, and as determined by the department on a site-by-site basis. Geomembrane components consisting of high density polyethylene (HDPE) shall be at least sixty (60) mil thick;

3. The geomembrane component shall be installed in direct and uniform contact with the compacted soil component so as to minimize the migration of leachate through the geomembrane should a break occur; and

4. All utility waste landfills shall have a minimum bottom slope in any direction of flow of at least one percent (1%).

(C) Satisfactory Compliance—Operations.

1. A test pad shall be constructed at the site and tested to verify that the proposed construction and quality control (qc) procedures are adequate to ensure that the soil component of the composite liner system will meet the requirements of paragraph (10)(B)1. of this rule.

A. Construction and qc procedures to be used during test pad construction shall be

described in detail in the approved engineering report, and shall be identical to those proposed for liner construction with the following additions:

(I) At least two (2) laboratory hydraulic conductivity tests shall be performed on undisturbed samples of the completed test pad;

(II) At least one (1) *in situ* hydraulic conductivity test shall be performed on the completed test pad; and

(III) At least two (2) test pits shall be excavated into the completed test pad to observe interlift bonding.

B. If test pad construction and testing shows that the proposed methods are not sufficient to meet the requirements of paragraph (10)(B)1. of this rule, a new test pad shall be constructed using revised procedures approved by the department.

2. For phased construction, only one (1) test pad will be required.

3. A final report shall be submitted to the department which describes in detail the construction and qc procedures which were used to achieve satisfactory test pad performance.

A. The report must be approved by the department prior to beginning construction of any portion of the composite liner system in the disposal area.

B. The report shall serve as guidance for construction of the soil component of the composite liner system.

4. The requirement for a test pad may be waived provided—

A. The applicant can demonstrate to the department's satisfaction the construction and qc procedures are identical to those described in the approved engineering report and will result in construction of a liner which meets the requirements of paragraph (10)(B)1. of this rule; and

B. The soils proposed for liner construction meet the following minimum specifications:

(I) Have a plasticity index greater than fifteen (15) and less than thirty (30) (ASTM test D4318-84);

(II) Allow more than fifty percent (50%) passage through a number 200 sieve (ASTM D11400); and

(III) Have less than ten percent (10%) by weight particle sizes greater than two (2) mm.

5. The liner specified in subsection (10)(B) of this rule shall be constructed in accordance with the approved design specifications.

(11) Groundwater Monitoring.

(A) Requirements. The owner/operator of a utility waste landfill shall implement a

groundwater monitoring program capable of determining the utility waste landfill's impact on the quality of groundwater underlying the utility waste landfill.

(B) Satisfactory Compliance—Design.

1. All utility waste landfills permitted after the effective date of this rule, must be in compliance with all groundwater monitoring requirements of section (11).

2. The department may require utility waste landfills permitted prior to the effective date of this rule, to comply with part or all of section (11) if it is determined necessary by the department.

3. The owner/operator of a utility waste landfill shall establish the potential for migration of fluid generated by the utility waste landfill into the groundwater by an evaluation of—

A. A water balance of precipitation, evapotranspiration, runoff and infiltration;

B. At a minimum, the following characteristics:

(I) Geologic materials;

(II) Description of soil and bedrock to a depth adequate to allow evaluation of water quality protection provided by the soil and bedrock;

(III) Groundwater elevation;

(IV) Proposed separation between the lowest point of the lowest cell and the maximum water table elevation;

(V) Proximity of the utility waste landfill to water supply wells or surface water;

(VI) Rate and direction of groundwater flow; and

(VII) Current and projected use of water resources in the potential zone of influence of the utility waste landfill.

4. A groundwater monitoring system shall be capable of yielding groundwater samples for analysis and shall consist of—

A. Monitoring wells (at least one (1)) installed hydraulically upgradient; that is, in the direction of increasing static head from the utility waste landfill. The numbers, locations and depths shall be sufficient to yield groundwater samples that are—

(I) Representative of background water quality in the groundwater near the utility waste landfill; and

(II) Not affected by the utility waste landfill; and

B. Monitoring wells (at least three (3)) installed hydraulically downgradient; that is, in the direction of decreasing hydraulic head from the utility waste landfill. The number, locations and depths shall ensure that they detect any significant amounts of fluids generated by the utility waste landfill that migrate from the utility waste landfill to

the groundwater. Monitoring wells, or clusters of monitoring wells, shall be capable at a minimum, of monitoring all saturated zones down to and including the uppermost aquifer.

5. All monitoring wells shall be constructed as per 10 CSR 23-4.

(C) Satisfactory Compliance—Operations.

1. Groundwater monitoring wells.

A. Groundwater monitoring wells shall be installed so that the number, spacing and depths of monitoring systems shall be determined based upon site-specific technical information that shall include thorough characterization of:

(I) Aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and

(II) Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer; including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities and porosities.

B. The design and installation of groundwater monitoring well systems shall be observed, supervised, and certified by a qualified groundwater scientist and approved by the department.

C. All groundwater monitoring wells shall be operational prior to the acceptance of wastes, unless other arrangements are approved by the department.

D. The design, installation, development, and decommissioning of monitoring wells and piezometers must be performed in accordance with 10 CSR 23-4.

2. Sampling and reporting.

A. Each groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide an accurate representation of groundwater quality at the background and downgradient wells installed in compliance with subsection (11)(B). The owner/operator must submit the sampling and analysis program to the department for approval. The program must include procedures and techniques for—

(I) Monitoring well maintenance;

(II) Monitoring well redevelopment;

(III) Monitoring well depth measurement and hydraulic levels;

(IV) Monitoring well purging and sampling utilizing dedicated equipment;

(V) Equipment calibration;

(VI) Decontamination and field blanks;

(VII) Sample and duplicate sample collection;

(VIII) Sample preservation;

(IX) Sample labeling;

(X) Sample handling;

(XI) Field measurements;

(XII) Field documentation;

(XIII) Chain of custody control;

(XIV) Sample shipment;

(XV) Analytical procedures;

(XVI) Qa/qc control—field and laboratory; and

(XVII) Statistical testing strategy per paragraph (11)(C)5. for each parameter's concentrations.

B. Each groundwater monitoring program shall include sampling and analytical methods that are appropriate for groundwater sampling and that accurately measure hazardous constituents and other monitoring parameters in groundwater samples. Analysis shall be performed on unfiltered samples.

C. The sampling procedures and frequency shall be protective of human health and the environment.

D. Groundwater elevations shall be measured in each well immediately prior to purging, each time groundwater is sampled. The owner/operator shall determine the rate and direction of groundwater flow each time groundwater is sampled. Groundwater elevations in wells which monitor the same utility waste landfill shall be measured within a period of time short enough to avoid temporal variations in groundwater flow which could preclude accurate determination of groundwater flow rate and direction.

3. Baseline/background monitoring.

A. The owner/operator shall establish background groundwater quality for each of the monitoring parameters or constituents required under paragraph (11)(C)4. To establish background, a minimum of four (4) quarterly samples of statistically independent sample data shall be obtained and analyzed from all monitoring wells during a minimum of one (1) year following well installation.

B. The number of samples collected to establish background values for groundwater quality data shall satisfy the requirements of subsection (11)(C) and shall be consistent with the appropriate statistical procedures determined pursuant to paragraph (11)(C)5. The sampling procedures shall be those specified under paragraph (11)(C)4. for detection monitoring and paragraph (11)(C)6. for assessment monitoring.

4. Detection monitoring.

A. The owner/operator shall obtain and analyze water samples from the groundwater monitoring wells during the months of May and November of each calendar year.

B. The following parameters shall be analyzed each time a sample is obtained:

Chemical Oxygen Demand (COD in milligrams per liter (mg/l));

Chlorides (Cl, mg/l);

Iron (Fe, (mg/l));

pH (units);

Specific Conductance (Conductivity at twenty-five degrees Celsius (25°C) ($\mu\text{mho/cm}$));

Total Dissolved Solids (TDS, in mg/l);

All parameters listed in Appendix I of this rule; and

Additionally, the water level in each well shall be measured at the time the sample is taken.

C. The sample results, and any results of statistical analysis determining statistically significant increases for any parameter per paragraph (11)(C)5., shall be submitted to the department in one (1) report within ninety (90) days of when samples are collected.

D. In the case of all detection monitoring requirements previously listed, the department may specify an appropriate alternative frequency for repeated sampling and analysis during the active life of the utility waste landfill (including closure) and the post-closure period. The department may add additional parameters or delete parameters on a site-by-site basis through an evaluation of waste and leachate characteristics of the utility waste landfill.

E. The electronic submission of groundwater data is required. This submission shall be in the format and method as prescribed by the department.

5. The owner/operator shall specify in the operating record one (1) or more of the following statistical methods to be used in evaluating groundwater monitoring data for each monitoring constituent. The statistical test chosen shall be conducted separately for each constituent—

A. A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The procedure shall include estimation and testing of the contrasts between each downgradient well's mean and the upgradient means for each parameter;

B. An ANOVA based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The procedure shall include estimation and testing of the contrasts between each downgradient well's median and the background medians for each parameter;

C. A confidence interval procedure in which an interval for each parameter in each

downgradient well is constructed around the mean/median of the particular well's data or data residuals and compared to the mean/median of pooled background well data;

D. A prediction interval procedure in which an upper prediction limit for an interval for each parameter in each well is compared to subsequently obtained values from the same well;

E. A prediction interval procedure in which an upper prediction limit for an interval for each parameter constructed on the pooled background well data or data residuals is compared to subsequently obtained values from each downgradient well;

F. A tolerance interval procedure in which an upper tolerance limit for an interval for each parameter's pooled background well data is compared to each downgradient well's concentration values;

G. A multicomparison procedure utilizing any recommended U.S. Environmental Protection Agency combinations of intra-well and inter-well procedures for each parameter;

H. A control chart approach meeting the performance standards of part (11)(C)5.J.(III), that gives control limits for each parameter;

I. A different statistical test method that meets the performance standards of subparagraph (11)(C)5.J. of the rule. The owner/operator must submit the statistical test method to the department for approval before the use of the alternative test; and

J. Any statistical method chosen under paragraph (11)(C)5. of this rule shall comply with the following performance standards, as appropriate:

(I) The statistical method used to evaluate groundwater monitoring data shall be appropriate for the distribution of the concentration data for the chemical parameters or hazardous constituents. If the distribution of the concentration data for the chemical parameters or hazardous constituents is shown by the owner/operator to be inappropriate for a normal data distribution theory test, then the data should be transformed or a distribution-free (nonparametric) theory test should be used. If the concentration data distributions for the constituents of each well differ, more than one (1) statistical method will be needed;

(II) If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentration or a groundwater protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type

I experiment-wide error rate for each testing period shall be no less than 0.05, however, the Type I error of no less than 0.01 for individual well comparisons shall be maintained. This performance standard does not apply to tolerance intervals, prediction intervals or control charts;

(III) If a control chart approach is used to evaluate groundwater monitoring data, the specific type of control chart and its associated parameter values shall be protective of human health and the environment. The selection of this method shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern;

(IV) If a confidence interval, tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, then the level of confidence for each interval, and the percentage of the population that each interval contains, shall be protective of human health and the environment. Selection of one (1) or more of these methods shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern;

(V) The statistical method shall account for data below the limit of detection with one (1) or more statistical procedures that are protective of human health and the environment. Any practical quantization limit that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility; and

(VI) If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

6. Response to statistical analysis.

A. If the comparison for the upgradient wells shows a statistically significant increase (or pH change) over background, the owner/operator shall submit this information to the department.

B. If the comparisons for downgradient wells show a statistically significant increase (or pH change), resulting from the landfill, over background, the owner/operator shall within ninety (90) days of the last sampling event obtain additional groundwater samples from those downgradient wells where a statistically significant difference was detected, split the samples in two (2), and obtain analyses of all additional samples to determine whether the significant statistical difference was a result of laboratory error.

C. If the additional samples show a statistically significant increase (or pH change) over background, the owner/operator must demonstrate to the department within ninety (90) days that a source other than the utility waste landfill caused the contamination or that the statistically significant increase resulted from an error in sampling, analysis, statistical evaluation or natural variation. If the owner/operator cannot make this demonstration to the department, the owner/operator shall submit a plan to the department for a groundwater assessment monitoring program and implement the program as described in subparagraphs (11)(C)6.D. through H. of this rule. The plan shall specify the following:

(I) The number, location and depth of wells;

(II) Sampling and analytical methods for the monitoring parameters listed in Appendix I of this rule on a quarterly basis;

(III) Evaluation procedures, including any use of previously gathered groundwater quality information;

(IV) The rate and extent of migration of the contaminant plume in the groundwater; and

(V) The concentrations of the contaminant plume in the groundwater.

D. After obtaining the results from the initial or subsequent sampling events required in subparagraph (9)(C)6.D. the owner/operator shall—

(I) Within fourteen (14) days, notify the department and place a notice in the operating record identifying the constituents that have been detected;

(II) Within ninety (90) days, and on a quarterly basis after that, resample all wells and conduct analysis for all constituents listed in Appendix I to this rule and notify the department of the constituent concentrations. A minimum of one (1) sample from each well sampled (background and downgradient) shall be collected and analyzed during these sampling events;

(III) Establish background concentrations for any new constituents detected during subsequent monitoring events; and

(IV) Establish groundwater protection standards for all new constituents detected during subsequent monitoring events.

E. If the concentrations of all constituents listed in Appendix I to this rule are shown to be at or below background levels as established in paragraph (11)(C)3. of this rule for two (2) consecutive sampling periods, the owner/operator may reinstate detection monitoring at the utility waste landfill as specified under subparagraph (11)(C)3.C. of this rule.

F. If the concentrations of any constituents listed in Appendix I of this rule are above background values, but all concentrations are below the groundwater protection standard established under subparagraph (11)(C)6.D. of this rule using the statistical procedures in paragraph (11)(C)5. of this rule, the owner/operator shall notify the department and the department may require the owner/operator to—

(I) Continue assessment monitoring; or

(II) Develop a corrective measures assessment, or both.

G. If one (1) or more constituents listed in Appendix I of this rule are detected at levels above the groundwater protection standard as established under subparagraph (11)(C)6.D., the owner/operator shall—

(I) Provide the department with a report assessing potential corrective measures;

(II) Characterize the nature and extent of the release by installing additional monitoring wells as necessary; install at least one (1) additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well in accordance with paragraph (11)(C)6. of this rule and, if required by the department, notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site if indicated by sampling of wells; and

(III) Continue assessment monitoring as per the groundwater quality assessment plan, and implement the approved corrective action program specified in part (11)(C)6.G.(I) of this rule.

H. The results of implementation of the assessment monitoring program shall be submitted to the department at the end of each year or an alternate time period approved by the department.

(12) Air Quality.

(A) Requirement. The design, construction and operation of the utility waste landfill shall minimize environmental hazards and shall conform to applicable ambient air quality and source control regulations.

(B) Satisfactory Compliance—Design. Plans shall include an effective dust control program.

(C) Satisfactory Compliance—Operations. A burning permit or exemption may be obtained from the department permitting the burning of tree trunks, tree limbs, and vegetation during clearing and grubbing. In areas operating under exemption certificates authorized by Chapter 643, RSMo approval shall

be obtained from the local pollution control agency. The operating procedures and location for burning practices shall be submitted to the department for review and written approval. Burning at the utility waste landfill shall be conducted in accordance with Chapter 643, RSMo, the corresponding rules, the terms, conditions, or both, of the plans, permit, or both, and all local requirements.

(13) Aesthetics.

(A) Requirement. The utility waste landfill shall be designed and operated at all times in an aesthetically acceptable manner.

(B) Satisfactory Compliance—Design. Plans shall include an effective vegetative growth program.

(C) Satisfactory Compliance—Operations.

1. Wastes that are easily moved by wind shall be covered, as necessary, to prevent becoming airborne and scattered.

2. On-site vegetation should be cleared only as necessary. Natural windbreaks, such as green belts, should be maintained where they will improve the appearance and operation of the utility waste landfill.

3. Mining operations for the purpose of removing waste for beneficial reuse shall be conducted in such a manner as to not detract from the appearance of the utility waste landfill. Materials removed from the utility waste landfill shall be stored for not more than sixty (60) days prior to beneficial reuse. Materials removed from the utility waste landfill shall be stored so as to prevent infiltration, surface water runoff and erosion from these removed materials. All Water Pollution Control Program permits and approvals necessary to comply with the Missouri Clean Water Law and corresponding rules shall be obtained from the department.

(14) Cover.

(A) Requirement. Cover shall be applied to minimize infiltration of precipitation, airborne waste; and provide a pleasing appearance.

(B) Satisfactory Compliance—Design. The owner/operator shall prepare a written closure plan that describes the steps necessary to close all utility waste landfill phases at any point during the active life of the utility waste landfill in accordance with the requirements of 10 CSR 80-2.030(4)(A). In addition, the final cover requirements specified in the closure and post-closure plans shall specify—

1. Cover sources, quantities and soil classification (Unified Soil Classification System or United States Department of Agriculture classification system);

2. The capability of the cover to perform the functions listed in subsection (14)(A) of this rule;

3. Surface grades and side slopes needed to promote maximum runoff, without excessive erosion, and to minimize infiltration. Final side slopes shall not exceed twenty-five percent (25%) unless it has been demonstrated in a detailed slope stability analysis approved by the department that the slopes can be constructed and maintained throughout the entire operational life and post-closure period of the landfill;

4. Procedures to establish and maintain vegetative growth to combat erosion and improve appearance of idle and completed areas. Procedures shall include seeding rate, fertilizer rate, soil conditioning rate and provisions for mulching;

5. Procedures to maintain a cover integrity, for example, regrading and recovering;

6. Methods for borrow areas to be reclaimed so as to restore aesthetic qualities and prevent excessive erosion;

7. The final slope of the top of the utility waste landfill shall have a minimum slope of one percent (1%); and

8. Shear failure analyses shall be included where intermediate or final slopes exceed twenty-five percent (25%). However, the department will waive the analyses for the slopes of twenty-five percent (25%) or less except in seismic impact zones.

(C) Satisfactory Compliance—Operations.

1. Cover shall be applied at a total thickness of at least one foot (1') of compacted soil on filled areas of the utility waste landfill which are idle for more than sixty (60) days, and on all final side slopes at the end of each filling sequence.

2. No active, intermediate or final slope shall exceed thirty-three and one-third percent (33 1/3%).

3. As each phase of the utility waste landfill is completed, a final cover system shall be installed consisting of one foot (1') of compacted clay with a coefficient of permeability of 1×10^{-5} cm/sec or less and overlaid with one foot (1') of soil capable of sustaining vegetative growth.

4. The installation of the final cover systems shall include provisions for slope stability.

5. The department may approve the use of an alternative final cover system provided that the owner/operator can demonstrate to the department that the alternative design will be at least equivalent to the final cover system described in paragraph (14)(C)3. of this rule.

6. Surface grades and side slopes shall be maintained to promote runoff without excessive erosion.

7. Vegetation shall be established within one hundred eighty (180) days of application of the cover required by paragraphs (14)(C)3. and 4. of this rule. Vegetation shall be established and maintained to minimize erosion and surface water infiltration.

8. Regrading and recovering shall be performed as necessary to maintain cover slope and integrity.

9. Borrow areas shall be reclaimed in accordance with the approved plans.

10. The compacted clay portion of the final cover shall consist of soils classified under the Unified Soil Classification System as CH, CL, ML, SC or MH.

(15) Compaction.

(A) Requirement. In order to conserve utility waste landfill site capacity, thereby preserving land resources and to minimize moisture infiltration and settlement, waste and cover shall be compacted to the smallest practicable volume.

(B) Satisfactory Compliance—Design.

1. Arrangements shall be made and indicated in the plans where substitute equipment will be available to provide uninterrupted service during routine maintenance periods or equipment breakdowns.

2. The plans shall specify the equipment that should be available to conduct the utility waste landfill operation.

(C) Satisfactory Compliance—Operations.

1. Waste handling equipment, during filling operations, shall be capable of performing and shall perform the following functions:

A. Spread the wastes to be compacted in layers no more than two feet (2') thick, while confining it to the smallest practicable area;

B. Compact the spread wastes to the smallest practicable volume; and

C. Place, spread and compact the final cover as much as practicable.

2. A preventive maintenance program should be employed to maintain equipment in operating order.

3. No waste shall be disposed of in water where the presence of the water will prohibit the proper spreading and compaction of the waste or where a mosquito breeding problem would be created.

(16) Safety.

(A) Requirement. The utility waste landfill shall be designed, constructed and operated in a manner so as to protect the health and

safety of personnel and others associated with and affected by the operation.

(B) Satisfactory Compliance—Design.

1. Provisions shall be included in the plans to control and limit access to the utility waste landfill in a manner that is compatible with the surrounding land use.

2. Provisions shall be included in the plans to control dust for safety purposes and to prevent a nuisance to the surrounding area.

(C) Satisfactory Compliance—Operation.

1. Adequate communications equipment shall be available at the utility waste landfill for emergency situations.

2. Access to the utility waste landfill shall be controlled and shall be by established roadways only. The utility waste landfill shall be accessible only when operating personnel are on duty.

3. Traffic signs or markers should be provided to promote an orderly traffic pattern to and from the discharge area and, if necessary, to maintain efficient operating conditions.

4. Dust control provisions shall be utilized as necessary for safety purposes and to prevent a nuisance to the surrounding area.

(17) Records.

(A) Requirement. The owner/operator of a utility waste landfill shall maintain records and monitoring data as specified by the department and file appropriate documents with the county recorder(s) of deeds.

(B) Satisfactory Compliance—Design. Plans shall prescribe methods to be used in maintaining records and monitoring the environmental impact of the utility waste landfill. Information on recording and monitoring requirements may be obtained from the department.

(C) Satisfactory Compliance—Operations.

1. Records shall be maintained at the facility site. Records five (5) years old or older may be stored at an alternate site if approved by the department; such stored records must be made available at the landfill upon request of department personnel. Records must cover at least the following:

A. Major operational problems, complaints or difficulties;

B. Any demonstration, certification, finding, monitoring, testing or analytical data required under sections (4) and (9) of this rule;

C. Dust and litter control efforts;

D. Quantitative measurements of the waste handled and an estimate of the air space left at the facility. Every two (2) years after the date of the permit issuance and within sixty (60) days of the anniversary date of the permit issuance, the owner/operator shall

submit to the department two (2) copies of a topographic map, prepared under the direction of a land surveyor or by aerial photography, showing the current horizontal and vertical boundaries of waste in the utility waste landfill and the boundaries of the utility waste landfill. Maps prepared by aerial photography shall meet the current National Map Accuracy Standards for Photogrammetry as indicated in United States Bureau of the Budget "Circular A-16 Exhibit C," dated October 10, 1958;

E. Closure and post-closure care plans and any monitoring, testing or analytical data as required under 10 CSR 80-2.030(4)(A);

F. Any cost estimates and financial assurance documentation required under 10 CSR 80-2.030(4);

G. Inspection records and training procedures as required under subsection (3)(B) of this rule;

H. Records associated with corrective measures as required under section (10) of this rule; and

I. The landfill operator shall keep a detailed report of the origin of all waste received. Effective January 1, 1998, on or before January 31 of each calendar year and annually thereafter each utility waste landfill shall submit a report to the department specifying the amount of utility waste received for disposal from states other than Missouri.

2. Upon closing of the utility waste landfill, the existence of the utility waste landfill shall be recorded with the recorder(s) of deeds in the county(ies) where the utility waste landfill is located. The owner/operator may request permission from the department to remove the notation from the deed if all wastes are removed from the facility.

A. A survey and plat meeting the requirements of the current Minimum Standards of Property Boundary Survey 10 CSR 30-2.010 and detailed description of the utility waste landfill shall be prepared by a land surveyor. The survey plat and detailed description, at a minimum, shall contain the following information:

(I) The name of the property owner as it appears on the property deed;

(II) The detailed description of the property;

(III) The general types and location of the wastes and the depth(s) of fill within the property; and

(IV) The location of any leachate control or water monitoring systems which shall be maintained after closure and the length of time that these systems are to be maintained.

B. The owner/operator shall obtain approval from the department of the survey plat and detailed description prior to filing with the county recorder of deeds. Filing the plat and detailed description shall be accomplished within thirty (30) days of departmental approval. Two (2) copies of the properly recorded plat and detailed description showing the recorder of deeds' seal or stamp, the book and page numbers and the date of filing shall be submitted to the department within thirty (30) days of filing.

C. Owners of all proposed utility waste landfills as a part of closure of the solid waste disposal area shall—

(I) Execute an easement with the department, which allows the department, its agents or its contractors to enter the premises to complete work specified in the closure plan; and

(II) Submit evidence to the department that a notice and covenant running with the land has been recorded with the recorder of deeds in the county where the utility waste landfill is located. The notice and covenant shall specify the following:

(a) That the property has been permitted as a utility waste landfill; and

(b) That use of the land in any manner which interferes with closure plans, and post-closure plans filed with the department, is prohibited.

*AUTHORITY: section 260.225, RSMo (Cum. Supp. 1996). * Original rule filed Oct. 10, 1996, effective July 30, 1997.*

**Original authority 1972, amended 1975, 1986, 1988, 1990, 1993, 1995.*

Appendix I—Constituents for Detection Monitoring

Arsenic (As, $\mu\text{g/l}$)
Aluminum (Al, $\mu\text{g/l}$)
Antimony (Sb, $\mu\text{g/l}$)
Barium (Ba, $\mu\text{g/l}$)
Beryllium (Be, mg/l)
Boron (B, $\mu\text{g/l}$)
Cadmium (Cd, $\mu\text{g/l}$)
Calcium (Ca, mg/l)
Chemical Oxygen Demand (COD, mg/l)
Chloride (Cl, mg/l)
Chromium (Cr, $\mu\text{g/l}$)
Cobalt (Co, $\mu\text{g/l}$)
Copper (Cu, $\mu\text{g/l}$)
Fluoride (F, mg/l)
Hardness (calculated, mg/l)
Iron (Fe, $\mu\text{g/l}$)
Lead (Pb, $\mu\text{g/l}$)
Magnesium (Mg, mg/l)
Manganese (Mn, $\mu\text{g/l}$)

Mercury (Hg, $\mu\text{g/l}$)
Nickel (Ni, mg/l)
pH (units)
Selenium (Se, $\mu\text{g/l}$)
Silver (Ag, $\mu\text{g/l}$)
Sodium (Na, mg/l)
Specific Conductance (Conductivity at 25°C, mho/cm)
Sulfate (SO, mg/l)
Thallium (Tl, $\mu\text{g/l}$)
Total Dissolved Solids (TDS, mg/l)
Total Organic Carbon (TOC, mg/l)
Total Organic Halogens (TOX, mg/l)
Zinc (Zn, $\mu\text{g/l}$).