

PART III

LAND TREATMENT OF SLUDGES AND SLUDGE PRODUCTS

Amended October 15, 1999

SECTION 100. AUTHORITY AND SCOPE

Subsection 101. Authority

- (1) 7 Delaware Code, Chapter 60; and Sections 405(d) and (e) of the Clean Water Act, as amended by Pub. L. 95-217, Sec. 54 (d), 91 Stat. 1591 (33 U.S.C. 1345 9 d) and (e); and Pub. L. 100-4, Title IV, Sec. 406 (a), (b), 101 Stat., 71, 72 (33 U.S.C. 1251 et seq.) code of Federal Regulations, Part 503 - Standards for the Use of Disposal of Sewage Sludge.

Subsection 102. Scope

- (1) This regulation establishes standards which consist of general requirements, pollution limits, management practices and operational standards for the final use or disposal of sludge generated in the treatment of wastewater at a wastewater treatment or wastewater pretreatment facility. Standards are included in this part for sewage sludge applied to land, sold or given away in bag or bulk or used for research purposes.
- (2) The regulation also provides standards for all persons engaged in the collection, handling, generation, preparation, storage, and transportation of sludge, treated sludge or any product containing these materials in the State of Delaware.
- (3) These regulations supersede the Delaware Solid Waste Disposal Regulations of the Department of Natural Resources and Environmental Control, dated December 1994 regarding sludge or any material containing sludge.
- (4) This regulation in its entirety is effective immediately upon promulgation.

SECTION 200. DEFINITIONS. The following terms have the meanings indicated.

- (1) "Aerobic digestion" is the biochemical decomposition of organic matter in sewage sludge into primarily carbon dioxide and water by microorganisms in the presence of air.

- (2) "Anaerobic digestion" is the biochemical decomposition of organic matter in sewage sludge into methane gas and carbon dioxide by microorganisms in the absence of air.
- (3) "Agricultural land" is land on which a food crop, a feed crop, or a fiber crop is grown. This includes range land and land used as pasture.
- (4) "Agricultural utilization" means the application rate of wastes or sludge or sludge products which shall not exceed the nutrient needs of the crop grown on the particular soil plus the other assimilative pathways in soils (e.g. immobilization with organic material, volatilization, and leachate in compliance with drinking water standards).
- (5) "Agricultural wastes" means wastes normally associated with the production and processing of food and fiber on farms, feedlots, ranches, ranges, and forests which may include animal manure, crop residues, and dead animals; also agricultural chemicals, fertilizers and pesticides which may find their way into surface and subsurface water.
- (6) Agronomic rate" is the whole sludge application rate (dry weight basis) designed:
 - (1) To provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and
 - (2) To minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.
- (7) "Annual pollutant loading rate" is the maximum amount of a pollutant that can be applied to a unit area of land during a 365 day period.
- (8) "Annual whole sludge application rate" is the maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365 day period.
- (9) "Applier" is a person who is responsible for applying stabilized sewage sludge to a parcel of land.
- (10) "Aquifer" is a geologic formation, grouping of geologic formations, or a portion of a geologic formation capable of yielding ground water to wells or springs.
- (11) "Base flood" is a flood that has a one percent chance of occurring in any given year.
- (12) "Bulk sewage sludge" is *Exceptional Quality* sludge that is not sold or given away in a bag or other container for application to the land.
- (13) "Collection" means any action involved in the gathering or subsequent placement or sludge, treated sludge, or any other product containing these materials, into a vehicle, container or any other vessel for transportation to some other location.
- (14) "Cover" is soil or other material used to cover sewage sludge placed on an active sewage sludge unit.
- (15) "Cover crop" is a small grain crop, such as oats, wheat, or barley, *grown to prevent nitrogen leaching during the winter months.*
- (16) "Crops for direct human consumption" means crops that are consumed by humans without processing.

- (17) "Cumulative pollutant loading rate" is the maximum amount of an inorganic pollutant that can be applied to an area of land.
- (18) "Density of microorganisms" is the number of microorganisms per unit mass of total solids (dry weight) in the sewage sludge.
- (19) "Department" means the Department of Natural Resources and Environmental Control.
- (20) "Disposal" means the discharge, deposit, injection, dumping, spilling, leaking, or placing of sludge, any material containing sludge, or any constituent of it on or in the land, the air or any waters, including ground water, and includes any method of sludge utilization that involves reuse of nutrients in the sludge at greater than agronomic rates (this excludes land reclamation).
- (21) "Distribute" means to barter, sell, offer for sale, consign, furnish, provide, or otherwise supply a material as part of a commercial enterprise or a giveaway program.
- (22) "Domestic septage" is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, holding tank, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.
- (23) "Domestic sewage" is water and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works.
- (24) "Dry weight basis" means calculated on the basis of having been dried at 105 degrees Celsius until reaching a constant mass (i.e., essentially 100 percent solids content).
- (25) "Exceptional Quality Sludge ("EQ Sludge") sludge that has been stabilized *(as per Subsection 603 by a Further Reduction Pathogens, meets one of the Vector Attraction Reduction Requirements specified in Subsection 604(a-h) and contains lower metal concentrations than the allowable Pollutant Concentration specified Table 402-3.*
- (26) "Feed crops" are crops produced primarily for consumption by animals.
- (27) "Fiber crops" are crops such as flax, cotton, and hemp.
- (28) "Food chain crops" means tobacco, crops grown for human consumption, and crops grown to feed animals whose products are consumed by humans.
- (29) "Food crops" are crops consumed by humans. These include, but are not limited to, fruits, vegetables, and tobacco.
- (30) "Forest" is a tract of land thick with trees and underbrush.
- (31) "Forestry" means the science of the ecosystems, management and production of a forest or forest system.
- (32) "Free liquids" means liquids which readily separate from the solid portion of a waste under the EPA Gravity Test. The test protocol calls for a 100 ml representative sample of the waste from a container to be placed in a 400 micron conical paint filter for 5 minutes. The filter specified is a standard paint filter which is commonly available at hardware and

paint stores. The filter is to be supported by a funnel on a ring stand with a beaker or cylinder below the funnel to capture any free liquid that passes through the filter. If any amount of free liquid passes through the filter, the waste is considered to hold free liquids.

- (33) "Grease trap waste" means the combined liquid and solid fractions of material accumulated in a tank or other device designed for the removal of grease, fat and oil from wastewater (for the purpose of these regulations petroleum products are excluded).
- (34) "Grit (and screenings)" are the heavy materials such as sand, gravel, cinders and egg shells collected in the preliminary treatment of sewage. Screenings are the materials separated from wastewater during preliminary treatment made up of floatable debris such as wood, plastic and cloth.
- (35) "Ground water" is water below the land surface in the saturated zone.
- (36) "Handling" means any way in which sludge, treated sludge, or any other product containing these materials is dealt with, other than collection, burning, storage, treatment, land application, disposal, or transportation. It includes distribution of treated sludge.
- (37) "Holding tank waste" means wastewater from any home or business that is held temporarily in a container where no on-site treatment is performed. The wastewater is hauled off site for treatment.
- (38) "Impermeable" means having a hydraulic conductivity equal to or less than 1×10^{-7} cm/sec as determined by field and laboratory permeability tests made according to standard test methods which may be correlated with soil densification as determined by compaction tests.
- (39) "Industrial wastewater" is wastewater generated in a commercial or industrial process.
- (40) "Label" means the display of all written, printed, or graphic material on the immediate container, or information accompanying the material.
- (41) "Land application" means the placement of sludge, treated sludge, or any other product containing these materials on or within 2 feet below the surface of land used to support vegetative growth.
- (42) "Land disposal of sludge" means application of sludge at rates higher than acceptable for agricultural utilization.
- (43) "Land with a high potential for public exposure" is land that the public uses frequently. This includes, but is not limited to, a public contact site and a reclamation site located in a populated area (e.g., a construction site located in a city).
- (44) "Land with a low potential for public exposure" is land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest, and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area).
- (45) "Land reclamation" means the application of sludge at a rate not greater than necessary to support and maintain immediate revegetation. Application may be in multiple cycles prior to establishment of vegetation, but must be accomplished within a single short-term operational period.

- (46) "Land treatment" means a technology for the intimate mixing or dispersion of wastes into the upper zone of the plant-soil system with the objective of microbial stabilization, immobilization, selective dispersion, or crop recovery leading to an environmentally acceptable assimilation of the waste.
- (47) "Landfill" means a natural topographic depression, man-made excavation or diked area formed primarily of earthen materials, which has been lined with man-made materials or remains unlined and which is designed to hold an accumulation of solid wastes.
- (48) "Liquid waste" means any waste which is not a solid waste as defined for the purposes of these regulations.
- (49) "Other container" is either an open or closed receptacle. This includes, but is not limited to, a bucket, box, carton, truck or trailer.
- (50) "Pasture" is land on which animals feed directly on forage crops such as legumes, grasses, grain stubble, or stover.
- (51) "Pathogenic organisms" are disease-causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova.
- (52) "Permitting authority" is either EPA or a State with an EPA-approved sludge management program.
- (53) "Person" means an individual, trust, firm, joint stock company, federal agency, corporation (including a government corporation), partnership, association, state, municipality, commission, political subdivision of a state, or any interstate body.
- (54) "PFRP" means process to further reduce pathogens.
- (55) "pH" means the logarithm of the reciprocal of the hydrogen ion concentration.
- (56) "Pollutant" is an organic substance, an inorganic substance, a combination of organic and inorganic substances, or a pathogenic organisms that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism, either directly from the environment or indirectly by ingestion through the food chain, could, on the basis of information available to the Administration of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations in either organisms or offspring of the organisms.
- (57) "Pollutant limit" is a numerical value that describes the amount of a pollutant allowed per unit amount of sewage sludge (e.g., milligrams per kilogram of total solids); the amount of a pollutant that can be applied to a unit area of land (e.g., kilograms per hectare); or the volume of a material that can be applied to a unit area of land (e.g., gallons per acre).
- (58) "Preparer" is a person who prepares sewage sludge or is either the person who generates sewage sludge during the treatment of domestic sewage in a treatment works or the person who derives a material from sewage sludge.
- (59) "PSRP" means process to significantly reduce pathogens.
- (60) "Public contact site" is land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.

- (61) "Range land" is open land with indigenous vegetation.
- (62) "Reclamation site" is drastically disturbed land that is reclaimed using sewage sludge. This includes, but is not limited to, strip mines and construction sites.
- (63) "Runoff" is rainwater, leachate, or other liquid that drains overland on any part of a land surface and runs off of the land surface.
- (64) "Sewage" means water-carried human or animal wastes from septic tanks, water closets, residences, buildings, industrial establishments, or other places, together with such groundwater infiltration, subsurface water, admixture of industrial wastes or other wastes as may be present.
- (65) "Sewage sludge" means sludges which derives in whole or in part from sewage.
- (66) "Silviculture" means any forest management activity, including but not to, the harvest of timber, construction of roads and trails for the purpose of forest management, and preparation of property for reforestation.
- (67) "Sludge compost" means a treated sludge produced by subjecting a mixture of sludge and a bulking agent, such as wood chips, to aerobic decomposition in a manner that destroys primary pathogenic and malodorous components.
- (68) "Sludge" means the accumulated semi-liquid suspension, settled solids, or dried residue of these solids that is deposited from (a) liquid waste in a municipal or industrial wastewater treatment plant, (b) domestic septage is included herein as sludge (see section 200, (22)).
- (69) "Sludge generator":
- (a) Means a person who owns or operates a facility that receives or processes wastewater and produces or otherwise generates sludge.
 - (b) Does not include the owner or operator of a septic tank, chemical toilet, privy, or holding tank used for the collection of sewage.
- (70) "Sludge utilization" means the preparation , transportation, storage, land application, or marketing and distribution of sludge.
- (71) "Sludge utilizer" means: any person who collects, stores, applies to land, or markets or distributes sludge.
- (72) "Solid waste" means any garbage, refuse, rubbish, and other discarded materials resulting from industrial, commercial, mining, agricultural operations and from community activities which does not contain free liquids. Containers holding free liquids shall be considered solid waste when the container is designed to hold free liquids for use other than storage (e.g. radiators, batteries, transformers) or the waste is household waste.
- (73) "Specific oxygen uptake rate (SOUR)" is the mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in the sewage sludge.
- (74) "Spray irrigation" means the loading rate for land treatment of wastewater which shall not exceed either the needs of the crop grown on the particular soil plus the other assimilative mechanisms (immobilization with organic material, volatilization, and leachate in compliance with drinking water standards), or the hydraulic capacity of the soil. The Department may require a lower loading rate if the design criteria for

pathogens, metals or organics contained in these Regulations and generally accepted technical standards for land treatment technology (e.g. U.S. EPA Process Design Manual or Overcash, M.R. and P. Pal 1979 Design of Land Treatment Systems for Industrial Wastes - Theory and Practice cannot be achieved at a rate consistent with agricultural utilization.

- (75) "Storage" means the interim containment (*for a period not to exceed two years*) of sludge, treated sludge, or any other product containing these materials after removal from a wastewater *treatment plant* and before disposal or utilization.
- (76) "Surface impoundment" means a natural topographic depression, or diked area formed primarily of earthen materials may be lined with man-made materials or remains unlined, and which is designed to hold an accumulation of liquid wastes or wastes containing free liquids.
- (77) "Total solids" are the materials in sewage sludge that remain as residue when the sewage sludge is dried at 103 to 105 degrees Celsius.
- (78) "Transportation" means the off-site movement of sludge, treated sludge, or any other product containing these materials by air, rail, highway, pipeline, or water.
- (79) "Treat or treatment of sewage sludge" is the preparation of sewage sludge for final use or disposal. This includes, but is not limited to, thickening, stabilization, and dewatering of sewage sludge.
- (80) "Treatment" means a process which alters, modifies, or changes the biological, physical, or chemical characteristics of sludge or liquid waste.
- (81) "Treatment works" means any device and system used in the storage, treatment, recycling and reclamation of municipal sewage, or industrial wastes of a liquid nature, or necessary to recycle or reuse water at the most economical cost over the estimated life of the works, including intercepting sewers, outfall sewers, sewage collection systems, pumping, power and other equipment, and their appurtenances, extensions, improvements, remodeling, additions and alterations thereof; elements essential to provide a reliable recycled supply such as standby treatment units and clear well facilities and improvements to exclude or minimize inflow and infiltration.
- (82) "TWDS" means Treatment Works Treating Domestic Sewage.
- (83) "Unstabilized solids" are organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process.
- (84) "Vector attraction" is the characteristic of sewage sludge that attracts rodents, flies, mosquitos, or other organisms capable of transporting infectious agents.
- (85) "Volatile solids" is the amount of the total solids in sewage sludge lost when the sewage sludge is combusted at 550 degrees Celsius in the presence of excess air.
- (86) "Wastewater treatment plant" means a facility designed and constructed to receive, treat, or store waterborne wastes.
- (87) "Wetlands" means those areas that are inundated or saturated by surface water or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in

saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

SECTION 300. PERMITS.

Subsection 301. Permits Required.

- (1) Unless excepted under the provisions of Subsection 301(2), a person may not engage in the generation, collection, storage, preparation, land application, marketing and distribution, disposal or transportation of sludge, treated sludge, or any product containing these materials in the State without first obtaining a permit from the Department. No permit may be granted unless the county or municipality having jurisdiction has first approved the activity by zoning procedures provided by law. No person shall use sludge, treated sludge or any product containing these materials for the purpose of agricultural use, land reclamation, research, distribution or land disposal if the sludge was generated outside of the State of Delaware without obtaining a permit from the Department. No permit shall be issued for agricultural use, land reclamation, research, distribution or land disposal of sludge, treated sludge or any product containing sludge generated outside the State of Delaware that does not meet the standards for Exceptional Quality as outlined in these regulations. No sludge or sludge product generated in the State shall be transported, marketed, distributed, prepared or land applied in any other state or jurisdiction without notification of the permitting authority of that state or jurisdiction.
- (2) *Exception.* Permits issued under this regulation are not required for a wastewater treatment plant, if the pertinent activities involve the construction and operation of the plant in accordance with plans approved by the Department. This exception does not include removal of sludge from the plant.

Subsection 302. Exclusions.

- (1) A permit from the Department is not required under these regulations for the following activities. The exclusion under these regulations do not exclude requirements from other Federal, State, County or local regulations as they may apply:
 - (a) Cofiring of sewage sludge with other waste in an incinerator, unless the other waste is used as auxiliary fuel for the firing of the sludge.
 - (b) Hazardous wastewater sludge determined to be hazardous by this regulation or any other Federal, State, County or local regulation as they may apply.
 - (c) Sewage sludge with high PCB concentrations as determined by this regulation or any other Federal, State, County or local regulations as they may apply.
 - (d) Incinerator ash for use or disposal from the firing of sewage sludge in a sewage sludge incinerator.
 - (e) Grit and screenings generated or collected in a wastewater treatment process.
 - (f) Aquatic plants or managed wetlands plants used and harvested as part of a wastewater treatment process and that are not complexed with the sludge at the time of harvest.
 - (g) Drinking water treatment residuals from non-sewage sources.

- (h) Commercial septage, industrial septage, a mixture of domestic septage and commercial septage or a mixture of domestic septage and industrial septage.
- (i) Grease trap waste.

Subsection 303. Application for a Permit

- (1) Initial applications for permits, permit renewals or permit modifications under the provisions of these regulations shall be submitted to the department on an application form specified by the Department.
- (2) An application consists of the initial application form specified by the Department combined with a Project Development Report (PDR) containing any supplementary information and analysis necessary to enable the Department to review the proposed project to determine if it is consistent with Delaware law and regulation.
- (3) An application shall demonstrate how the applicant plans to comply with the applicable requirements of these regulations, as well as any additional operating requirements set forth in these regulations that are specifically applicable to the particular type of operation that is proposed.
- (4) A separate permit application shall be submitted for each sludge utilization site. Adjacent properties owned by separate individuals shall be considered as separate sites. Noncontiguous but proximate parcels owned by one person may, at the discretion of the Department, be considered as a single utilization site.
- (5) Depending on the sludge utilization method chosen, additional specific submission requirements may apply. These requirements are given in Section 700 of the regulation.

Subsection 304. Public Notice, Application for Sludge Utilization Permit.

Upon Department acceptance of the Project Development Report, the applicant must apply for a Department Sludge Utilization permit. Upon receipt of a completed application for this permit, the Department will advertise receipt of the application and conduct any hearings in accordance with 7 Del. C., Ch. 60. The cost of the advertisement is to be borne by the applicant.

The final permit will require submission by the applicant and approval by the Department of any revisions required by the Department for the Plan of Operation and Management or Plans and Specifications report for the facility prior to start-up and operation.

Subsection 305. Standard Permit Conditions. The following conditions shall apply to and be included in all permits.

- (1) Compliance Required. The permittee shall comply with all conditions of the permit.
- (2) Renewal Responsibilities. If the permittee intends to continue operation of the permitted facility after the expiration of an existing permit, the permittee shall apply for a new permit in accordance with these regulations.
- (3) Operation of Facilities. The permittee shall at all times properly maintain and operate all structures, systems, and equipment for treatment, control and monitoring, which are installed or used by the permittee to achieve compliance with the permit or these regulations.

- (4) Provide Information. The permittee shall furnish to the Department within a reasonable time, any information including copies of records, which may be requested by the Director to determine whether cause exists for modifying, revoking, reissuing, or terminating the permit, or to determine compliance with the permit or these regulations.
- (5) Entry and Access. The permittee shall allow the Department, consistent with 7 Del. C., Chapter 60, to:
- (a) Enter the permitted facility.
 - (b) Inspect any records that must be kept under these regulations or conditions of the permit.
 - (c) Inspect any facility, equipment, practice, or operation permitted or required by the permit.
 - (d) Sample or monitor for the purpose of assuring permit compliance, any substance or any parameter at the facility.
- (6) Reporting. The permittee shall report to the Department under the circumstances and in the manner specified in this section:
- (a) In writing thirty (30) days before any planned physical alteration or addition to the permitted facility or activity if that alteration or addition would result in any significant change in information that was submitted during the permit application process.
 - (b) In writing thirty (30) days before any anticipated change which would result in noncompliance with any permit condition or these regulations.
 - (c) Orally within twenty-four (24) hours from the time the permittee became aware of any noncompliance which may endanger the public health or the environment at telephone numbers provided in the permit by the Department.
 - (d) In writing as soon as possible but within five (5) days of the date the permittee knows or should know of any noncompliance unless extended by the Department. This report shall contain:
 - (i) A description of the noncompliance and its cause;
 - (ii) The period of noncompliance including to the extent possible, times and dates and, if the noncompliance has not been corrected, the anticipated time it is expected to continue; and
 - (iii) Steps taken or planned to reduce or eliminate reoccurrence of the noncompliance.
 - (e) In writing as soon as possible after the permittee becomes aware of relevant facts not submitted or incorrect information submitted, in a permit application or any report to the Director. Those facts or the correct information shall be included as a part of this report.

- (7) Minimize Impacts. The permittee shall take all necessary actions to eliminate and correct any adverse impact on the public health or the environment resulting from permit noncompliance.
- (8) Reopener. In the event that the regulations governing the land treatment of sludges and sludge products are revised by the Department, this permit may be reopened and modified accordingly after notice and opportunity for a public hearing.

Subsection 306. Specific Permit Conditions.

- (1) Basis for Specific Permit Conditions. Conditions necessary for the protection of the environment and the public health may differ from facility to facility because of varying environmental conditions and waste compositions. The Department may establish additional permit conditions. Specific conditions shall be established in consideration of characteristics specific to a facility and inherent hazards of those characteristics. Such characteristics include, but are not limited to:
 - (a) Chemical, biological, physical, and volumetric characteristics of the sludge;
 - (b) Geological and climatic nature of the facility site;
 - (c) Size of the site and its proximity to population centers and to ground and surface water;
 - (d) Legal considerations relative to land use and water rights;
 - (e) Techniques used in sludge distribution and the disposition of that vegetation exposed to sludge;
 - (f) Abilities of the soils and vegetative covers to treat the sludge without undue hazard to the environment or to the public health; and
 - (g) The need for monitoring and record keeping to determine if the facility is being operated in conformance with its design and if its design is adequate to protect the environment and the public health.
- (2) Duration of Permit. The permit shall be effective for a fixed term of not more than five (5) years.
- (3) Limitations to Operation. Conditions of the permit may specify or limit:
 - (a) Sludge composition;
 - (b) Method, manner, and frequency of sludge treatment;
 - (c) Sludge pretreatment requirements;
 - (d) Physical, chemical, and biological characteristics of a land application facility; and
 - (e) Any other condition the Department finds necessary to protect public health or environment.

- (4) Compliance Schedules. The Department may establish a compliance schedule for existing facilities as part of the permit conditions including:
 - (a) Specific steps or actions to be taken by the permittee to achieve compliance with applicable requirements or final permit conditions;
 - (b) Dates by which those steps or actions are to be taken; and
 - (c) In any case where the period of time for compliance exceeds one (1) year the schedule may also establish interim requirements and the dates for their achievement.
- (5) Monitoring Requirements. Any facility may be subject to monitoring requirements including, but not limited to:
 - (a) The installation, use, and maintenance of monitoring equipment;
 - (b) Monitoring or sampling methodology, frequency, and locations;
 - (c) Monitored substances or parameters;
 - (d) Testing and analytical procedures; and
 - (e) Reporting requirements including both frequency and form.

Subsection 307. Permit Modification.

- (1) Minor Modifications. Minor modifications are those which if granted would not result in any increased hazard to the environment or to the public health. Such modifications shall be made by the Director. Minor modifications are normally limited to:
 - (a) The correction of typographical errors.
 - (b) Transfer of ownership or operational control.
 - (c) A change in monitoring or reporting frequency.
- (2) Major Modifications. All modifications not considered minor shall be considered major modifications. The procedure for making major modifications shall be the same as that used for a new permit under these regulations.

Subsection 308. Permit Transferable. Permits shall be transferable to a new owner or operator provided that the permittee notifies the Department by requesting a minor modification of the permit before the date of transfer and provided that the transferee shows evidence of a legal right to use the site and is otherwise in compliance with all applicable provisions of these regulations.

Subsection 309. Appeal of Final Permits.

Appeals of final permit shall be governed by 7 Del. C., ¶6008 and 6009.

Subsection 310. Permit Revocation.

- (1) Conditions for Revocation. The Department may revoke a permit if the permittee violates any permit condition or these regulations or fails to pay applicable Department fees.

- (2) Notice of Revocation. Except in cases of emergency, the Department shall issue a written notice of intent to revoke to the permittee prior to final revocation. Revocation shall become final within twenty (20) days of receipt of the notice by the permittee, unless within that time the permittee requests an administrative hearing in writing.
- (3) Notice of Hearing. The Department shall notify the permittee in writing of any revocation hearing at least twenty (20) days prior to the date set for such hearing. The hearing shall be conducted in accordance with 7 Del. C., Chapter 60.
- (4) Emergency Action. If the Department finds the public health, safety or welfare requires emergency action, the Department shall incorporate findings in support of such action in a written notice of emergency revocation issued to the permittee. Emergency revocation shall be effective upon receipt by the permittee. Thereafter, if requested by the permittee in writing, the Department shall provide the permittee a revocation hearing and prior notice thereof. Such hearings shall be conducted in accordance with 7 Del. C., Chapter 60.

SECTION 400. PROCEDURES FOR STATE REVIEW AND APPROVAL.

Subsection 401. Proposal for a Sludge Utilization Permit.

Any person who intends to utilize sludge or sludge products must submit a letter of intent to the Department. The letter shall indicate the projected location, size, and anticipated utilization method. The steps in subsection 403 provide the prospective permit applicant with an overview of the entire Department process. Whenever the preparation of reports or other documents required by these regulations involves the practice of engineering, geology or other recognized profession under Delaware law, sufficient evidence of appropriate certification or registration in accordance with Title 24 of the Delaware Code must be submitted by the preparer. The guidance document included with these regulations should be used to tailor the design criteria for the specific waste, process, use, or site under consideration.

TABLE 402-1 RANGE OF ORGANIC PRIORITY POLLUTANTS TYPICAL OF MUNICIPAL SLUDGE IN THE U.S.

VOLATILE COMPOUNDS (PURGEABLE)	Parts Per Million Concentration (Dry Weight Basis)	
Benzene	0.29	- 7.3
Carbon tetrachloride	0.9	- 22
Chlorobenzene	0.23	- 5.8
Chloroform	0.17	- 4.2
1,2-Dichloroethane	5	- 125
Methylene Chloride	1.7	- 43
Tetrachloroethylene	0.69	- 17
Toluene	340	- 8,600
Trichloroethylene	1.8	- 46
Vinyl chloride	7.1	- 180
ACID COMPOUNDS (ACID EXTRACTABLE)		
Pentachlorophenol	2.1	- 52
Phenol	39	- 96
2,4,6-Trichlorophenol	0.46	- 12
BASE/NEUTRAL COMPOUNDS (BASE/NEUTRAL EXTRACTABLE)		
Benzo(a)anthracene	1.8	- 46
Benzo(a)pyrene	51	- 1300
bis(2-Ethylhexyl)phthalate	32	- 790
Chrysene	1.7	- 42

3,3-Dichlorobenzidine	0.33	- 8.2
Hexachlorobenzene	0.25	- 6.2
Hexachlorobutadiene	0.9	- 22
n-Nitrosodimethylamine	0.008	- 0.2
Phenanthrene	1.2	- 30
Pyrene	1.4	- 34
PESTICIDES AND PCB'S		
Aldrin	0.03	- 0.75
Gamma-BHC (Lindane)	0.004	- 0.01
Chlordane	0.6	- 15
2,4-D		- 23
4,4-DDT	0.056	- 1.4
4,4-DDE	0.0012	- 0.3
4,4-DDD	0.042	- 1
Dieldrin	0.004	- 0.1
Endrin	ND	
Heptachlor	0.004	- 0.1
Malathion	0.13	- 3.2
PCB's	6	- 50*
Toxaphene	1.6	- 39

Range encompasses 50% of data for organic compounds found in several U.S. analytical studies (adopted from Fricke, C., C. Clarkson, E. Lomnitz, and T. O'Farrell, 1985. Comparing priority pollutants in municipal sludges, Biocycle, Jan/Feb: 35-37).

Note: *Sludges containing more than 10 ppm of PCB's must be incorporated into the soil upon application, and sludges containing more than 50 ppm of PCBs are subject to TOSCA requirements.

Table 402.2 CEILING CONCENTRATIONS

Table 402.3 POLLUTANT CONCENTRATIONS

Pollutant	Ceiling concentration (milligrams per kilogram) ¹	Pollutant	average concentration (milligrams per kilogram)
Arsenic	75	Arsenic	41
Cadmium	85	Cadmium	39
Chromium	3000	Chromium	1200
Copper	4300	Copper	1500
Lead	840	Lead	300
Mercury	57	Mercury	17
Molybdenum	75	Molybdenum	18
Nickel	420	Nickel	420
Selenium	100	Selenium	36
Zinc	7500	Zinc	2800

¹Dry weight basis

¹Dry weight basis

Table 402.4 CUMULATIVE POLLUTANT
LOADING RATES

Table 402.5 ANNUAL POLLUTANT
LOADING RATE

Pollutant	Cumulative pollutant loading rate (kilograms per hectare)	Pollutant	Annual pollutant loading rate (kilograms per hectare per 365 day period)
Arsenic	41	Arsenic	2.0
Cadmium	39	Cadmium	1.9
Chromium	3000	Chromium	150
Copper	1500	Copper	75
Lead	300	Lead	15

Mercury	17	Mercury	0.85
Molybdenum	18	Molybdenum	0.95
Nickel	420	Nickel	21
Selenium	100	Selenium	5.0
Zinc	2800	Zinc	140

Subsection 402. Project Development Report: *General Requirements.*

- (1) A Project Development Report must be prepared. After this report is submitted for Department review, and accepted, it becomes the basis for the permit application. In any event, the applicant must demonstrate that the proposed facility, site or use will meet the regulatory objectives set forth in these regulations and will not cause violations of State or Federal drinking water standards on an average annual basis or State water quality standards for streams.

Upon receipt of a Project Development Report, the Department will schedule a public information meeting to inform interested citizens of the proposed utilization project. The Department may consider local zoning or other locally required meetings as sufficient for satisfying this requirement. After the Department has fixed the date, place and time for a public information meeting, the Department shall notify by certified mail owners and occupants of land contiguous to the site of the proposed facility or site and of the scheduled meeting. A copy of the Project Development Report will be available for review and discussion at the public meeting. The applicant for the permit shall also be present at the public meeting to present information on the proposed project.

The Department will accept and consider all comments, concerns and suggestions received during the public meeting. If the concerns raised at the public meeting cannot be reasonably addressed, a permit will not be issued for the proposed project.

- (2) Project Development Reports for all proposed facilities, land application sites and sludge uses must provide a chemical analysis of the sludge to be produced or utilized which includes the following:
- (a) Results of three chemical analyses of the sludge from each treatment facility or other source of sludge. The Department will waive this requirement for domestic septage that is land applied in accordance with the State's Septage Management Plan. Chemical analyses include:
- (i) Moisture content.
 - (ii) Percent total nitrogen (moist and dried).
 - (iii) Percent organic nitrogen (moist and dried).

- (iv) Ammonia and nitrate concentration (moist and dried).
 - (v) pH.
 - (vi) Percent volatile solids.
 - (vii) PCB's.
 - (viii) The following, as reported on a dry weight basis: cyanide, sodium, calcium, magnesium, phosphorous, potassium, cadmium, zinc, copper, nickel, lead, chromium, mercury, arsenic, molybdenum and selenium.
 - (ix) Such other components or constituents which may be required by the Department, including but not limited to TOC, COD, FOG, and boron.
- (b) Sludges are to be analyzed as a composite sample for the priority pollutants. If the organics are higher than the typical municipal sludge range in the U.S. (see Table 402-1) then the Department shall require the applicant to submit a detailed sludge analysis for those elevated organic constituents to assess their fate in a soil matrix.
 - (c) Sludges are to be analyzed as a composite sample using the Toxicity Characteristic Leaching Procedure (TCLP). Any sludge that fails the TCLP test shall be deemed to be hazardous and will then be subject to regulations under Subtitle C of the Resource Conservation and Recovery Act (RCRA).
 - (d) For septage, a specific plan for obtaining representative samples may be required.
 - (e) No sludge or sludge product which exceeds the Ceiling Concentrations in Table 402.2 will be permitted for land application in the State. Sludge or sludge products which exceed the Pollutant Concentrations in Table 402.3 will not be permitted for marketing and distribution in the State. Application rates for any sludge may not exceed the values in Tables 402.4 and Table 402.5.
 - (f) The analyses shall be conducted on composite samples of the waste to be applied, and shall be reported in a tabular form that lists the range of the three samples. Each of the composite samples shall be taken at intervals of more than 30 days unless otherwise approved by the Department in writing. Sampling and analytical procedures shall be approved by the Department and be consistent with Section 1000 of these Regulations.

Subsection 403. Project Development Reports: Specific Requirements for Facilities.

A permit is required for the construction and operation of any sludge handling, storage, processing or treatment operation. Such facilities include, but are not limited to: composting, alkaline stabilization or heat drying facilities, storage lagoons or tanks, and disposal sites. Information required for the Project Development Report includes:

- (1) Maps and related information.
 - (a) A topographic map or maps on a scale not less than a USGS 7.5 minute series or equivalent, including any necessary narrative descriptions, which show the following:
 - (i) All boundaries and names of present owners of record of land and including easements, rights of way, and other property interests, for the proposed permit area and contiguous area; and a description of all title, deed, or usage restrictions affecting the proposed permit area.
 - (ii) Latitude and longitude of site

- (iii) The boundaries of any land where sludge or sludge product will be stored at various times over the estimated total life of the proposed operation.
 - (iv) The location and name of any domestic wells within 1000 feet and irrigation, commercial, industrial and public wells within 2500 feet of the outer edge of the buffer zone as defined in 701(4). Information may be obtained (for a fee) through the Department from the Delaware Water User Data System (DWUDS).
 - (v) Other information that the Department deems relevant or necessary.
- (b) A soil map which shows the locations and types, and engineering properties of soils found within the proposed permit area and which includes a report on the field investigations conducted by a registered Engineer or Professional Soil Scientist depicting soils conditions on the site. This element should be prepared and submitted to the Department early in the process so that unsuitable sites/areas can be eliminated from further analysis.

- (2) Ground water information. The Project Development Report shall contain a description of the ground water hydrology of the proposed site and adjacent area.

The following information shall be prepared by a Geologist, Hydrologist or a Professional Engineer qualified in hydrology and licensed to practice in the State of Delaware.

- (a) A map of the site and surrounding area showing all potential contamination sources (such as large on-site systems, feedlots, bulk storage facilities, etc.). Surface water bodies within 1,000 feet of the site boundary of the proposed sludge application area shall also be located.
- (b) Description of the geology of the area, including the lithology and thickness of the outcropping and subcropping or underlying formations. Any unique or important geomorphological features which could influence ground water flow directions should also be indicated.
- (c) The following hydrogeological information should be provided to the Department:
 - (i) The thickness, saturated thickness, and depth to water (DTW) of the water table aquifer. The depth to water measurement should indicate the level of the local seasonal high water table.
 - (ii) The DTW of the seasonal high water table formed by a perched water table when these water table types exist.
 - (iii) The thickness, lithology, and name of the geological formation which forms the first aquitard or aquiclude beneath the water table aquifer.
 - (iv) The name of the first confined aquifer beneath the ground surface including the name(s) of the formation(s) composing this aquifer.
- (d) A description of the ground water flow patterns under the proposed site. A hydraulic head contour map with ground water flow lines should be included in the description. When the direction of the ground water flow cannot be determined with any degree of confidence, observation wells (piezometers) in numbers sufficient enough to determine ground water flow direction will be required.
- (e) Reference must be provided for all the geological and hydrogeological information which was researched.

- (3) Surface water information.
- (a) Each Project Development Report shall contain a description of the surface waters in the proposed site and adjacent area, including the name of the watershed which will receive any water discharges, the location of all surface water bodies such as streams, lakes, ponds, and descriptions of major surface drainage systems within the proposed permit area and adjacent areas.
 - (b) Each Project Development report shall also include a plan to manage runoff and control erosion during the lifetime of the facility. These plans will use best management practices for nonpoint source pollution control such as developed by the USDA Natural Resources Conservation Service (NRCS).
- (4) Detailed Construction Specifications - Each Project Development Report shall include drawings of proposed site layout, plan and elevation view of structures, equipment layout, facility access, and construction site erosion and sediment controls, stamped by an engineer registered in the state of Delaware.
- (5) Plan of Operation and Management - Each plan shall contain a narrative description of the following:
- (a) Explaining the type of operation to be conducted at the proposed facility.
 - (b) Detailing the operation and processing steps of the proposed facility; the expected life of the operation; and the origin, dry weight and volume of sludge that are proposed to be utilized during the operation.
 - (c) The equipment to be used at the facility for handling, storage, processing and treatment (including mixing, air control, bagging and monitoring the sludge or sludge products), or site preparation and land disposal of sludge.
 - (d) The closure plan and future use of the site if the facility ceases operation.
 - (e) A control plan to prevent health hazards or nuisances.
 - (f) For disposal sites, a crop nitrogen balance, the proposed application rate per acre and management scheme, crops to be grown; phosphorus and other constituent loading rates; determination of land limiting constituent; acreage needed and required storage volume, if any; and the dates (or climatic conditions) when the applicant proposes to apply sludge.
 - (g) Material Safety Data Sheets
- (6) Endangered Species Assessment - No facility may be constructed or operated in a manner likely to adversely affect a threatened or endangered species listed under section 4 of the Endangered Species Act or its designated critical habitat. An endangered or threatened species and impact report is required.
- (7) Additional requirements for land disposal sites
- (a) Each Project Development Report shall contain a description of:
 - (i) Soils within the proposed permit area, including a description of the depth, matrix, color, texture, structure, pH, consistency, degree of mottling and, if present mottled colors and coarse fragment content for each horizon of soil from the surface to a depth of at least five (5) feet or bedrock, whichever is shallower.
 - (ii) Any subsurface conditions adversely affecting lateral or vertical drainage of the land.

- (iii) A delineation of soil areas at the site which are not suitable for land application of sludge.

The applicant shall base the description on a sufficient number of pits, hand augerings, or excavations to allow an accurate characterization of the soils within the proposed permit area. As a minimum, however, the Department requires that at least one sample be taken for every 5 to 10 acres of each soil series to confirm NRCS.

- (b) All classifications and interpretations of soil materials required by this section shall be based on criteria specified in the United States Department of Agriculture Handbooks 436 (Soil Taxonomy) and 18 (Soil Survey Manual).
- (c) The Project Development Report shall include a minimum of three chemical analyses for each major soil series at the proposed facility. Soil chemistry testing must be in accordance with the Methods of Soil Analysis published by the American Society of Agronomy, or otherwise shall be consistent with Department guidance and the requirements of Section 1000. Results are to be expressed on a dry soil basis. The constituents to be tested are pH, cation exchange capacity, percent organic matter, plant nutrient status, total cadmium, total copper, total lead, total nickel, total zinc, total arsenic, total selenium and total molybdenum.
- (d) For sites where sludge was previously applied within 5 years to the proposed permit area, the application shall also describe background concentrations for all constituents identified above for similar soils where sludge has not been applied.
- (e) The information required by this section shall be prepared by qualified persons in soil science or land treatment.

(8) Additional requirements for sludge storage facilities are identified in section 900.

Subsection 404. Project Development Reports: Specific Requirements for Land Application Sites.

Sludge or sludge products which meet the minimum quality criteria of Subsection 402 and Section 600, but do not meet Exceptional Quality criteria for marketing and distribution, may only be applied to sites permitted for land application. Land application to permitted sites may be for agricultural, silvicultural, reclamation or research purposes. The following information is required in the Project Development Report for each land application site:

(1) Maps and related information.

- (a) Each Project Development Report shall contain a topographic map or maps on a scale not less than a USGS 7.5 minute series or equivalent, including any necessary narrative descriptions, which show the following:
 - (i) Latitude and longitude of the site.
 - (ii) All boundaries and names of present owners of record of land and including easements, rights of way, and other property interests, for the proposed permit area and contiguous area; and a description of all title, deed, or usage restrictions affecting the proposed permit area.
 - (iii) The boundaries of the land where sludge will be utilized over the estimated total life of the proposed operation, including the boundaries of the land that will be affected in each sequence of sludge utilization activity.

- (iv) The boundaries of any land where sludge or sludge product will be stored at various times over the estimated total life of the proposed operation.
 - (v) The location and name of any domestic wells within 1000 feet and irrigation, commercial, industrial and public wells within 2500 feet of the outer edge of the buffer zone as defined in 701(4). Information may be obtained (for a fee) through the Department from the Delaware Water User Data System (DWUDS).
 - (vi) The location and type of existing or proposed erosion control practices following NRCS guidelines.
 - (vii) Other information that the Department deems relevant or necessary.
- (b) Each Project Development Report shall contain a *NRCS* soil map which shows the locations and types of soils, depth to ground water, and depth to impermeable strata within the proposed permit area. The Department may require additional detailed mapping and soils investigations conducted by a Professional Soil Scientist registered with the American Registry of Certified Professionals in Agronomy, Crops and Soils (ARCPACS). This element should be prepared and submitted to the Department early in the process so that unsuitable sites/areas can be eliminated from further analysis.

(2) Soils description.

- (a) Each Project Development Report shall contain a description of:
- (i) Soils within the proposed permit area, including a description of the depth, matrix, color, texture, structure, pH, consistency, degree of mottling and, if present mottled colors and coarse fragment content for each horizon of soil from the surface to a depth of at least five (5) feet or bedrock, whichever is shallower.
 - (ii) Any subsurface conditions adversely affecting lateral or vertical drainage of the land.
 - (iii) A delineation of soil areas at the site which are not suitable for land application of sludge.

The applicant shall base the description on a sufficient number of pits, hand augerings, or excavations to allow an accurate characterization of the soils within the proposed permit area. As a minimum, however, the Department requires that at least one sample be taken for every 5 to 10 acres of each soil series to confirm NRCS.

- (b) All classifications and interpretations of soil materials required by this section shall be based on criteria specified in the United States Department of Agriculture Handbooks 436 (Soil Taxonomy) and 18 (Soil Survey Manual).
- (c) The Project Development Report shall include a chemical analyses for each major soil series per field at the proposed site. Soil chemistry testing must be in accordance with the Methods of Soil Analysis published by the American Society of Agronomy, or otherwise shall be consistent with Department guidance. Results are to be expressed on a dry soil basis. The constituents to be tested are pH, cation exchange capacity, percent organic matter, plant nutrient status, total cadmium, total copper, total lead, total nickel, total zinc.
- (d) For sites where sludge was previously applied within 5 years to the proposed permit area, the application shall also describe background concentrations for all constituents identified above for similar soils where sludge has not been applied.

- (e) The information required by this section shall be prepared by qualified persons in soil science or land treatment.
- (3) Ground water information. The Project Development Report shall contain a description of the ground water hydrology of the proposed site and adjacent area. The following information shall be prepared by a Geologist or a Professional Engineer qualified in hydrology and licensed to practice in the State of Delaware.
- (a) A map of the site and surrounding area showing all potential contamination sources (such as large on-site systems, feedlots, bulk storage facilities, etc.). Surface water bodies within 1,000 feet of the site boundary of the proposed sludge application area shall also be located.
 - (b) Description of the geology of the area, including the lithology and thickness of the outcropping and subcropping or underlying formations. Any unique or important geomorphological features which could influence ground water flow directions should also be indicated.
 - (c) The following hydrogeological information should be provided to the Department:
 - (i) The thickness, saturated thickness, and depth to water (DTW) of the water table aquifer. The depth to water measurement should indicate the level of the local seasonal high water table.
 - (ii) The DTW of the seasonal high water table formed by a perched water table when these water table types exist.
 - (iii) The thickness, lithology, and name of the geological formation which forms the first aquitard or aquiclude beneath the water table aquifer.
 - (iv) The name of the first confined aquifer beneath the ground surface including the name(s) of the formation(s) composing this aquifer.
 - (d) A description of the ground water flow patterns under the proposed site. A hydraulic head contour map with ground water flow lines should be included in the description. When the direction of the ground water flow cannot be determined with any degree of confidence, observation wells (piezometers) in numbers sufficient enough to determine ground water flow direction may be required.
 - (e) Reference must be provided for all the geological and hydrogeological information which was researched.
- (4) Surface water information.
- (a) Each Project Development Report shall contain a description of the surface waters in the proposed site and adjacent area, including the name of the watershed which will receive any water discharges, the location of all surface water bodies such as streams, lakes, ponds, and descriptions of major surface drainage systems within the proposed permit area and adjacent areas.
 - (b) Each Project Development report shall also include a plan to manage runoff and control erosion during the lifetime of the facility. These plans will use best management practices for nonpoint source pollution control such as developed by the *NRCS*.
- (5) Plan of Operation and Management - each Project Development Plan shall contain a narrative description of the following:

- (a) The origin, annual production (dry weight and volume) and pathogen reduction method for the proposed sludge source.
 - (b) The type of operation (e.g. agricultural, silvicultural, reclamation or research) to be conducted at the proposed site, and the expected life of the operation.
 - (c) The equipment to be used for site preparation, sludge handling, and land application.
 - (d) A projected three year crop rotation plan, including type of farming operation, type of crop, planting sequence, crop management, and use of the crops.
 - (e) Crop fertility worksheets for each field including: a nitrogen balance and the proposed sludge or septage application rate per acre (calculated according to the requirements of Subsection 702.1); phosphorus loading rate; lime loading rate; and a determination of the most limiting constituent, for land application for each sludge source.
 - (f) The expected dates and climatic conditions when sludge will be land applied.
 - (g) A control plan to prevent health hazards or nuisances and odors.
 - (h) A sludge sampling plan documenting how the applicant will comply with the monitoring and record keeping and reporting requirements of Section 700.
 - (i) A map showing the location of any ground water monitoring devices if they exist or are proposed for the facility.
 - (j) Evidence of landowner and operator consent for the proposed operation.
- (6) Endangered Species Assessment - no sludge or products derived from sludge shall be applied to land in a manner likely to adversely affect a threatened or endangered species or its designated habitat. An endangered or threatened species impact report may be required.
- (7) Additional requirements for land reclamation sites:
- (a) A complete revegetation plan for the site, including methods of site preparation, seeding mixtures, and seeding rates.
 - (b) Calculations or modeling demonstrating that the Cumulative Pollutant Loading Rates established by these regulations (see Table 402.4) shall not be exceeded.
- (8) Additional requirements for Research Projects:
- (a) Applications for permits shall include five copies of a complete description of the project. After a preliminary review, the Department may request such additional information as is necessary to evaluate and document the project.
 - (b) As a condition of any permit under this section the titleholder must execute and record in the appropriate County Office of Recorder of Deeds an affidavit in a form approved by the Department which notifies prospective purchasers that the property has been used to conduct sludge utilization research.

Subsection 405. Project Development Reports: Specific Requirements for Marketing and Distribution of Exceptional Quality Sludge or Sludge Products

Sewage sludge or sludge products that contain sewage sludge which has been stabilized as per Subsection 603 by a Process to Further Reduce Pathogens, meets one of the Vector Attraction Reduction Requirements specified in Subsection 604(2)(a-h) and contains lower metal concentrations than the allowable Pollutant Concentration specified Table 402.3 may be

marketed and distributed in the State. Specific information required for the Project Development Report includes:

- (1) Identification of the site(s) where the Exceptional Quality sludge or sludge product is generated. A description of the source and quantity of sludge or sludge products generated.
- (2) A detailed description of the treatment process and facility equipment, which clearly explains how the end-product is treated to meet the Exceptional Quality criteria.
- (3) A description of the quality control and monitoring program(s) utilized at the facility.
- (4) A description of the record keeping and reporting system used at the facility producing the exceptional quality material.
- (5) A copy of the proposed label which includes the following information:
 - (a) It shall identify the product as containing sludge and provide the name and address of the preparer.
 - (b) Provide information on essential plant nutrient content and instructions for proper use on different plant types, soils and slopes, maximum loading rates (such as number of square feet per bag, ratio of sludge to soil in sludge-soil mixture, etc.).
 - (c) For sludge or sludge products for general distribution to the public which contain more than 4 percent iron on a dry weight basis, it shall warn against using the sludge or sludge product on pasture land.
 - (d) Describe proper procedures for storage and stockpiling of the material.
 - (e) A statement indicating that the product should not be applied to any site that is flooded, frozen or snow covered, and identify any unacceptable uses of the material.
 - (f) Shall include a statement that land application of sewage sludge is prohibited except in accordance with the instructions on the label or information sheet.
- (6) Information confirming that all requirements of the Delaware Department of Agriculture Regulations (Chapter 21, Title 3, Delaware Code) governing the sale of commercial fertilizers and soil conditioners have been met.

Subsection 406. Site Inspection and Concurrence.

The Project Development Report is submitted for Department review along with a request for general site concurrence. Upon receipt of the report, a Department representative will inspect the selected site(s) and a written site concurrence or denial letter will be sent to the applicant. Upon receipt of a site concurrence the applicant may submit a permit application. Site concurrences for land treatment of sludges are valid for one year.

Subsection 407. Facility Plans and Specifications.

- (1) After Department acceptance of the permit application and completed Project Development Report (prepared under Subsection 403), the applicant must submit final detailed plans and specifications. The plans and specifications will be reviewed for consistency with the Project Development Report and accepted engineering standards.

Subsection 408. Approval to Commence Operations.

Upon final Departmental review and approval of any required revisions to the Project Development Plan, a permit and a letter of authorization to commence operation will be issued on

a timely basis. The Department shall give notice of such approval to any person who has submitted a written request for such notice.

SECTION 500. BONDING.

Subsection 501. Bond Required. Unless excepted under the provisions of Subsection 502, as a requirement for keeping a Permit issued under these regulations, a person shall file with the Department a bond or other security in a form approved by the Department. The bond shall be payable to the Department and the obligation of the bond shall be conditioned upon the fulfillment of all requirements related to the permit.

Subsection 502. Exceptions. Bond is not required for the following persons or entities:

- (1) A landfill, which is owned and operated by the Delaware Solid Waste Authority pursuant to state laws and regulations;
- (2) Persons using treated sludge that complies with all the requirements for distribution of these regulations and that is distributed in accordance with a valid permit issued by the Department;
- (3) Any local, municipal, county, state, or federal governmental agency, or political subdivision; or
- (4) Septage land treatment systems utilizing a limited application rate of 7,100 gallons per acre per year or less.

Subsection 503. Amount of Bond. The amount of the bond shall be:

- (1) \$5,000 for transportation permits and research projects;
- (2) \$25,000 for permits to apply sludge to land at agricultural rates;
- (3) \$50,000 for permits to land apply sludge for land reclamation;
- (4) \$125,000 for land disposal facilities;
- (5) \$75,000 for projects other than those in Subsection 503 (1)-(4).
- (6) \$10,000 for distribution and marketing.

Subsection 504. Consolidation of Bonds. For permits to apply sludge to land at agricultural rates or at land reclamation rates the Department may allow a sludge utilizer to file one bond to cover more than one utilization site. The amount of the bond shall be the amount shown in Subsection 503 for the first site plus 40 percent of the amount shown in Subsection 503 for each additional site up to a minimum total of \$200,000.

Subsection 505. Liability. Liability under the bond shall remain in effect until the expiration date of the permit. The Department shall release the bond after the Department determines that all of the conditions of the permit or permits covered by the bond have been fulfilled.

Subsection 506. Execution and Payment of Bond.

- (1) The bond shall be executed by the applicant and by a corporate surety licensed to do business in this State. Instead of having a bond executed by a corporate surety, the applicant may elect to deposit, with the Department, cash or negotiable bonds of the federal government or of this State or any other securities acceptable to the Department. The amount of the cash deposit or the market value of any securities shall be at least equal to the required sum of the bond. The Department shall receive and hold the cash or securities in trust, for the purposes for which the deposit is posted.

- (2) The obligation of the applicant and of any corporate surety under the bond shall become due and payable, and all or any part of any cash or securities shall be applied to payment of the costs of properly fulfilling any requirement of the Permit if the Department has:
 - (a) Notified the applicant and any corporate surety that the conditions of the Permit have not been fulfilled, and specified in the notice the particular deficiencies in the fulfillment of the permit conditions;
 - (b) Given the applicant and any corporate surety a reasonable opportunity to correct the deficiencies and to fulfill all of the conditions of the permit; and
 - (c) Determined that, at the end of a reasonable length of time, some or all of the deficiencies specified under Subsection 506(2)(a), above, remain uncorrected.

SECTION 600. PATHOGENS AND VECTOR ATTRACTION REDUCTION REQUIREMENTS.

Subsection 601. Requirements for Pathogen Control.

- (1) All sewage sludges and domestic septage prepared for land application in Delaware must at a minimum be treated by one of the processes described in this section to significantly reduce pathogens (PSRP). Sludges treated to meet PSRP requirements will be defined as Class B sludges for the purpose of these regulations.
- (2) All sewage sludges prepared for Distribution and Marketing in Delaware must be treated by one of the processes to further reduce pathogens as described in the section (PFRP). Sludges treated to meet the PFRP requirements will be defined as Class A sludges for the purpose of these regulations.
- (3) Any sewage sludge or domestic septage prepared in a manner to meet the Class A or Class B requirements of this section must also meet the additional requirements found in these regulations prior to being applied to land, given away or sold in bulk or bag.

Subsection 602. Class B Sludge - Sewage sludges processed to Significantly Reduce Pathogens (PSRP). (Septage included herein as sewage sludge)

- (1) Sludges prepared to meet the Class B requirements of this section must be processed by means of one of the following alternatives:
 - (a) Class B Alternative 1.
 - (i) Seven samples of the sewage sludge shall be collected at the time the sewage sludge is used or disposed.
 - (ii) The geometric mean of the density of fecal coliform in the samples shall be less than either 2,000,000 Most Probable Number per gram of total solids (dry weight basis) or 2,000,000 Colony Forming Units per gram of total solids (dry weight basis).
 - (b) Class B Alternative 2.
 - (i) Aerobic digestion - Sewage sludge is agitated with air or oxygen to maintain aerobic conditions for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 40 days at 20 degrees Celsius and 60 days at 15 degrees Celsius.
 - (ii) Air drying - Sewage sludge is dried on sand beds or on paved or unpaved basins. The sewage sludge dries for a minimum of three months. During two of the three months, the ambient average daily temperature is above zero degrees Celsius.

- (iii) Anaerobic digestion - Sewage sludge is treated in the absence of air for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 15 days at 35 to 55 degrees Celsius and 60 days at 20 degrees Celsius.
 - (iv) Composting - Using either the within-vessel, static aerated pile or windrow composting methods, the temperature of the sewage sludge is raised to 40 degrees Celsius or higher and remains at 40 degrees Celsius or higher for five days. For four hours during the five days, the temperature in the compost pile exceeds 55 degrees Celsius.
 - (v) Lime stabilization - Sufficient lime is added to the sewage sludge to raise the pH of the sewage sludge to 12 after 2 hours of contact.
- (c) Class B - Alternative 3. Sewage sludge that is used or disposed shall be treated in a process that is equivalent to a Process to Significantly Reduce Pathogens, as determined by the Department.
- (2) Monitoring and Reporting.
- (a) Sludge processed to significantly reduce pathogens must be monitored in accordance with the requirements described in the alternative used. Additional monitoring may be required by the Department as a condition of the preparer's permit.
 - (b) The preparer must submit a report of process monitoring on a form provided by the Department. The frequency of reporting shall conform with the reporting frequency specified in Section 701 of the regulations or as specified in any permit issued for preparation.

Subsection 603. Class A Sludge - Sludges processed to further reduce pathogens (PFRP).

- (1) Sludges prepared to meet Class A requirements must be processed by means of one of the following alternatives. The Class A pathogen requirements in Subsection 603(1)(a-f) shall be met either prior to meeting or at the same time the vector attraction reduction requirements in Subsection 604 (except for 604(f), (g) and (h)) are met.
- (a) Class A - Alternative 1.
 - (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of *SALMonella* sp. bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is prepared for sale or give away in as bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in Section 700.
 - (ii) The temperature of the sewage sludge that is used or disposed shall be maintained at a specific value for a period of time.
 - (A) When the percent solids of the sewage sludge is seven percent or higher, the temperature of the sewage sludge shall be 50 degrees Celsius or higher; the time period shall be 20 minutes or longer; and the temperature and time period shall be determined using equation (2), except when small particles of sewage sludge are heated by either warm gases or an immiscible liquid.

Install Equation Editor and double-click here to view equation.

Where,

D = time in days.

t = temperature in degrees Celsius.

- (B) When the percent solids of the sewage sludge is seven percent or higher and small particles of sewage sludge are heated by either warmed gases or an immiscible liquid, the temperature of the sewage sludge shall be 50 degrees Celsius or higher; the time period shall be 15 seconds or longer; and the temperature and time period shall be determined using equation 2.
- (C) When the percent solids of the sewage sludge is less than seven percent and the time period is at least 15 seconds but less than 30 minutes, the temperature and time period shall be determined using equation (2).
- (D) When the percent solids of the sewage sludge is less than seven percent; the temperature of the sewage sludge is 50 degrees Celsius or higher; and the time period is 30 minutes or longer,

Install Equation Editor and double-click here to view equation.

the temperature and time period shall be determined using equation (3).

Where,

D = time in days.

t = temperature in degrees Celsius.

- (b) Class A - Alternative 2.
 - (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of Salmonella sp. bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in Section 700.
 - (ii)
 - (A) The pH of the sewage sludge that is used or disposed shall be raised to above 12 and shall remain above 12 for 72 hours.
 - (B) The temperature of the sewage sludge shall be above 52 degrees Celsius for 12 hours or longer during the period that the pH of the sewage sludge is above 12.
 - (C) At the end of the 72 hour period during which the pH of the sewage sludge is above 12, the sewage sludge shall be air dried to achieve a percent solids in the sewage sludge greater than 50 percent.

(c) Class A - Alternative 3.

- (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of *Salmonella sp.* bacteria in sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge is prepared to meet the requirements of Section 700.
- (ii)
 - (A) The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains enteric viruses.
 - (B) When the density of enteric viruses in the sewage sludge prior to pathogen treatment is less than one Plaque-forming Unit per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to enteric viruses until the next monitoring episode for the sewage sludge.
 - (C) When the density of enteric viruses in the sewage sludge prior to pathogen treatment is equal to or greater than one Plaque-forming Unit per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to enteric viruses when the density of enteric viruses in the sewage sludge after pathogen treatment is less than one Plaque-forming Unit per four grams of total solids (dry weight basis) and when the values or ranges of values for the operating parameters for the pathogen treatment process that produces the sewage sludge that meets the enteric virus density requirement are documented.
 - (D) After the enteric virus reduction in paragraph (iii)(C) of this section is demonstrated for the pathogen treatment process, the sewage sludge continues to be Class A with respect to enteric viruses when the values for the pathogen treatment process operating parameters are consistent with the values or ranges of values documented in paragraph (ii)(C) of this section.
- (iii)
 - (A) The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains viable helminth ova.
 - (B) When the density of viable helminth ova in the sewage sludge prior to pathogen treatment is less than one per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to viable helminth ova until the next monitoring episode for the sewage sludge.
 - (C) When the density of viable helminth ova in the sewage sludge prior to pathogen treatment is equal to or greater than one per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to viable helminth ova when the density of viable helminth ova in the sewage sludge after pathogen treatment is less than one per four grams of total solids (dry weight basis) and when the values or ranges of values for the operating parameters for the pathogen treatment process that produces the sewage sludge that meets the viable helminth ova density requirement are documented.

- (D) After the viable helminth ova reduction in (iii)(C) of this subsection is demonstrated for the pathogen treatment process, the sewage sludge continues to be Class A with respect to viable helminth ova when the values for the pathogen treatment process operating parameters are consistent with the values or ranges of values documented in (iii)(C) of this subsection.

(d) Class A - Alternative 4.

- (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of Salmonella sp. bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in Section 700.
- (ii) The density of enteric viruses in the sewage sludge shall be less than one Plaque-forming Unit per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in Section 700 unless otherwise specified by the permitting authority.
- (iii) The density of viable helminth ova in the sewage sludge shall be less than one per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in Section 700, unless otherwise specified by the permitting authority.

(e) Class A - Alternative 5.

- (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of Salmonella sp. bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or given away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in Section 700.
- (ii) Sewage sludge that is used or disposed shall be treated in one of the Processes to Further Reduce Pathogens described below:
 - (A) *Composting* - Using either the within-vessel composting method or the static aerated pile composting method, the temperature of the sewage sludge is maintained at 55 degrees Celsius or higher for three days.

Using the windrow composting method, the temperature of the sewage sludge is maintained at 55 degrees or higher for 15 days or longer. During the period when the compost is maintained at 55 degrees or higher, there shall be a minimum of five turnings of the windrow.

- (B) *Heat drying* - Sewage sludge is dried by direct or indirect contact with hot gases to reduce the moisture content of the sewage sludge to 10 percent or lower. Either the temperature of the sewage sludge particles exceeds 80 degrees Celsius or the wet bulb temperature of the gas in contact with the sewage sludge as the sewage sludge leaves the dryer exceeds 80 degrees Celsius.
 - (C) *Heat treatment* - Liquid sewage sludge is heated to a temperature of 180 degrees Celsius or higher for 30 minutes.
 - (D) *Thermophilic aerobic digestion* - Liquid sewage sludge is agitated with air or oxygen to maintain aerobic conditions and the mean cell residence time of the sewage sludge is 10 days at 55 to 60 degrees Celsius.
 - (E) *Beta ray irradiation* - Sewage sludge is irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at room temperature (ca. 20 degrees Celsius).
 - (F) *Gamma ray irradiation* - Sewage sludge is irradiated with gamma rays from certain isotopes, such as Cobalt 60 and Cesium 137, at room temperature (ca. 20 degrees Celsius).
 - (G) *Pasteurization* - The temperature of the sewage sludge is maintained at 70 degrees Celsius or higher for 30 minutes or longer.
- (f) Class A - Alternative 6.
- (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of Salmonella, sp. bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or given away in a bag or other container for application to the land; or at the time the sewage sludge is prepared to meet the requirements in Section 700.
 - (ii) Sewage sludge that is used or disposed shall be treated in a process that is equivalent to a Process to Further Reduce Pathogens, as determined by the permitting authority.

(2) Monitoring and Reporting.

- (a) Any sludge processed to further reduce pathogens must be monitored in accordance with the requirements described in the alternative used. Additional monitoring may be required by the Department as a permit condition.
- (b) Anyone who prepares a Class A sludge must report the results of all monitoring for the processing alternative used on a form provided by the Department. The frequency of reporting shall comply with the reporting frequency described in Section 701 or as specified in the permit.

Subsection 604. Vector Attraction Reduction Requirements.

- (1) All sludge prepared for land application and for sale or give away in bulk or bag must meet the requirements of this subsection for Vector Attraction Reduction in addition to the requirements in Section 700 and in Subsections 402, 602 and 603.

- (2) Vector Attraction Reduction requirements may be achieved by application of one of the following processes:
- (a) The mass of volatile solids in the sewage sludge shall be reduced by a minimum of 38 percent (see calculation procedures in "Environmental Regulations and Technology - Control of Pathogens and Vector Attraction in Sewage Sludge", EPA-625/R-92/013, 1992, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268).
 - (b) When the 38 percent volatile solids reduction requirement in (2)(a) cannot be met for an anaerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge anaerobically in the laboratory in a bench-scale unit for 40 additional days at a temperature between 30 and 37 degrees Celsius. When at the end of the 40 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 17 percent, vector attraction reduction is achieved.
 - (c) When the 38 percent volatile solids reduction requirement in (2)(a) cannot be met for an aerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge that has a percent solids of two percent or less aerobically in the laboratory in a bench-scale unit for 30 additional days at 20 degrees Celsius. When at the end of the 30 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 15 percent, vector attraction reduction is achieved.
 - (d) The specific oxygen uptake rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 milligrams of oxygen per hour per gram of total solids (dry weight basis) at a temperature of 20 degrees Celsius.
 - (e) Sewage sludge shall be treated in an aerobic process for 14 days or longer. During that time, the temperature of the sewage sludge shall be higher than 40 degrees Celsius and the average temperature of the sewage sludge shall be higher than 45 degrees Celsius.
 - (f) The pH of sewage sludge shall be raised to 12 or higher by alkaline addition and, without the addition of more alkali shall remain at 12 or higher for two hours and then at 11.5 or higher for an additional 22 hours.
 - (g) The percent solids of sewage sludge that does not contain unstabilized solids generated in a primary wastewater treatment process shall be equal to or greater than 75 percent based on the moisture content and total solids prior to mixing with other materials.
 - (h) The percent solids of sewage sludge that contains unstabilized solids generated in a primary wastewater treatment process shall be equal to or greater than 90 percent based on the moisture content and total solids prior to mixing with other materials.
 - (i) Sewage sludge shall be injected below the surface of the land.
 - (i) No significant amount of the sewage sludge shall be present on the land surface within one hour after the sewage sludge is injected.
 - (ii) When the sewage sludge that is injected below the surface of the land is Class A with respect to pathogens, the sewage sludge shall be injected below the land surface within eight hours after being discharged from the pathogen treatment process.
 - (j) Sewage sludge applied to the land surface disposal site shall be incorporated into the soil within six hours after application to or placement on the land.

- (i) When sewage sludge that is incorporated into the soil is Class A with respect to pathogens, the sewage sludge shall be applied to or placed on the land within eight hours after being discharged from the pathogen treatment process.
 - (k) The pH of domestic septage shall be raised to 12 or higher by alkaline addition and, without the addition of more alkali, shall remain at 12 or higher for 30 minutes.
- (3) Vector Attraction Reduction requirements may also be met by employment of any one of the following practices in lieu of a specific Vector Reduction process found in 604 (2)(a-j).
 - (a) One of the vector attraction reduction requirements in Subsection 604 (2)(a) through (2)(j) shall be met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site.
 - (b) One of the vector attraction reduction requirements in Subsection 604 (2)(a) through (2)(h) shall be met when bulk sewage sludge is applied to a lawn or a home garden.
 - (c) One of the vector attraction reduction requirements in Subsection 604 (2)(a) through (2)(h) shall be met when sewage sludge is sold or given away in a bag or other container for application to the land.
 - (d) One of the vector attraction reduction requirements in Subsection 604 (2)(i), (2)(j), or (2)(k) shall be met when domestic septage is applied to agricultural land, forest, or a reclamation site.
- (4) Monitoring and Reporting.
 - (a) Any sludge prepared for land application or for sale or give away in bulk or bag must be monitored for vector attraction reduction according to the conditions specified in the processes outlined in Subsection 604 (2)(a-j) or practices outlined in Subsection 604 (3)(a-d).
 - (b) Any person that prepares a sludge for land application or for sale or give away in bulk or bag must report vector attraction reduction monitoring results to the Department on a form provided by the Department. The frequency of reporting must comply with the schedule outlined in Subsection 701 of these regulations or as specified in the permit.

SECTION 700. UTILIZATION METHODS.

Subsection 701. General Operating Requirements.

- (1) Each person that conducts sludge utilization shall comply with all of the following:
 - (a) The requirements of the Delaware Environmental Protection Act, 7 Del. C., Ch. 60, these regulations and the additional operating requirements for the specific type of operation that are set forth in these regulations.
 - (b) The plans and specifications in the permit, the terms and conditions of the permit, and any orders issued by the Department.
 - (c) The Departmental regulations for agricultural utilization, unless the person is operating pursuant to a permit that allows use of the loading rate guidelines for land reclamation, utilization or disposal at landfills, research projects, land disposal, or sludge distribution program, in which case the person shall comply with the applicable guidelines for such operation.

- (d) Prior to utilization all sewage sludge shall be stabilized according to a method specified in Section 600.
- (e) Before sewage sludge subject to the cumulative pollutant loading rates in Table 402.4 is applied, the Applier shall contact the Department to determine whether sewage sludge subject to the cumulative pollutant loading rates in Table 402.4 has been applied to the site since July 20, 1993.

If such sewage sludge has not been applied to the site since July 20, 1993, the cumulative amount for each pollutant listed in Table 402.4 may be applied to the site in accordance with these Regulations.

If such sewage sludge has been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site in the sewage sludge since that date is known, the cumulative amount of each pollutant applied to the site shall be used to determine the additional amount of each pollutant that can be applied in accordance with Table 402.4.

- (2) Monitoring requirements for all sludge utilization methods.
 - (1) The monitoring frequency for the parameters identified in Section 402 (tables 402.2-402.3, 402.4, 402.5), 602(1), 603(1) and 604(2) shall be based on the amount of sewage sludge generated, prepared, or applied (in metric tons on a dry weight basis) per 365-day period as follows:
 - Greater than 0 but less than 290 - once per year
 - Equal to or greater than 290 but less than 1,500 - once per quarter (four times a year)
 - Equal to or greater than 1,500 but less than 15,000 - once per 60 days (six times per year)
 - Equal to or greater than 15,000 - once per month (12 times per year)
 - (4) The Department may specify additional monitoring in any permit issued for the utilization of sludge.
 - (5) The Department may reduce the frequency of monitoring for the pollution concentrations in Section 400 and for the pathogen density requirements in Section 600 after two years of monitoring to a minimum of yearly monitoring unless otherwise specified in a sludge utilization permit.
 - (6) Sampling and analysis shall be conducted in accordance with the requirements of Section 1000.
 - (7) The sludge generator shall submit to the Department, land applier and landowner annual copies of a chemical analysis of the sludge unless the Department approves a different schedule in the permit.
 - (8) The sludge generator shall perform and submit to the Department and landowner additional analyses as used in the permit application and design if there has been a significant change (greater than 25%) in the quality of sludge.
 - (9) The Department may modify the approved sludge application rate based upon review of continuing or additional analyses.

Subsection 702. Agricultural Utilization of Sludge and Septage.

This section applies to the land application of sewage sludges, sludge products, and septage which meet the minimum quality criteria specified in Subsection 402 and pathogen reduction

requirements of Section 600, but do not meet the Exceptional Quality standards for general distribution and marketing.

(1) Agronomic Rate:

(a) Sewage sludge application rates must be calculated based on the following:

- (i) The nitrogen required by the crop to be grown according to University of Delaware Cooperative Extension Service crop fertility recommendations. Crop demand must be based on realistic yield goals determined either through the average of the three highest yields from the previous five years for each field for each specific crop, or Extension recommendations.
- (ii) The total crop nitrogen requirement less any nitrogen that will be available from mineralization of previous manure or sludge applications, legumes, or expected manure applications.

Table 702-1. Estimated Percentages and Amounts of Organic N Mineralized After Sludge of Various Types are Applied to Soils

Time After sludge Applic (years)	Unstabilized Primary and Waste Activated		Aerobically Digested		Anaerobically Digested		Composted	
	F % N _o *	K _m [□] kg/mt/%N _o	F % N _o	K _m kg/mt/%N _o	F % N _o	K _m kg/mt/%N _o	F % N _o	K _m kg/mt/%N _o
0-1	40	4.00	30	3.00	20	2.00	10	1.00
1-2	20	1.20	15	1.05	10	0.80	5	0.45
2-3	10	0.48	8	0.45	5	0.36	3	0.25
3-4	5	0.22	4	0.21	3	0.21	3	0.25
4-5	3	0.12	3	0.16	3	0.20	3	0.24
5-6	3	0.12	3	0.15	3	0.19	3	0.23
6-7	3	0.12	3	0.15	3	0.19	3	0.23
7-8	3	0.11	3	0.15	3	0.18	3	0.22
8-9	3	0.11	3	0.15	3	0.18	3	0.21
9-10	3	0.11	3	0.15	3	0.17	3	0.21
10-yr steady state	93		75		56		39	

* Percentage of organic N (N_o) present mineralized during time interval shown.

□ kg N released per metric ton of sludge applied per % organic N in the sludge. For example, application of an anaerobically digested sludge containing 3% organic N at 10 mt/ha would result in the following amounts of N mineralization: year 0, 3% N_o x 10 mt/ha x 2.0 = 60 kg N/ha; year 1 3% N_o x 10 mt/ha x 0.80 = 24 kg N/ha; year 2, 3% N_o x 10 mt/ha x 0.36 = 10.8 kg N/ha.

□ Multiply kg/mt by 2 to obtain lbs./ton.

- (b) For domestic septage - the annual application rate for domestic septage applied to agricultural land, forest, or a reclamation site shall not exceed the annual application rate calculated using equation (b)(1).

(1) Equation:
$$AAR = \frac{N}{-----}$$

Where:

AAR = Annual application rate in gallons per acre per 365 day period.

N = Amount of nitrogen in pounds per acre per 365 day period needed by the crop or vegetation grown on the land.

- (i) The Plant Available Nitrogen (N_p) of the sewage sludge or sludge product shall be calculated at the summation of the ammonia, nitrate and % inorganic Nitrogen mineralized in the first year, bases on a recent rolling average analyses for the sludge source.

$$\text{Equation (1): } N_p = S [No_3^-] + K_v (NH_4^+) + F (N_o)](10)$$

Where:

N_p = Plant available N from the current year's sludge application only.

S = Sludge application rate (dry mt tons/ha).

No_3^- = Percent nitrate-N in sludge (as percent, e.g. 1% = 1.0).

K_v = Volatilization factor = 0.5 for surface applied liquid sludge, or 1.0 for incorporated liquid sludge and dewatered sludge applied in any manner.

NH_4^+ = Percent ammonia-N in the sludge, as percent (e.g. 3% = 3.0).

F = Organic Nitrogen mineralization factor (year 0-1) from Table 702.1 (percentage expressed as a fraction e.g. 20% = .20).

N_o = Percent organic nitrogen in the sludge (as percent e.g. 3% = 3.0).

- (iv) If sludge has been applied in previous years the nitrogen available in the current year from each previous application can be calculated as follows:

$$\text{Equation (2): } N_m = (K_m)(N_o)(s)$$

Where:

N_m = The quantity of N mineralized in the year under consideration, in kg/ha.

K_m = Mineralization factor for the year under consideration from Table 702.1 (in kg/mt/% N_o).

N_o = Percent organic N originally present in the sludge (as percent e.g. 3% = 3.0).

S = Sludge Application rate (mt/ha) in the year under consideration.

- (v) If the sludge is only applied one time, the N_o available in subsequent years is the amount calculated in eq (2). Sites which have received multiple sludge applications must include the summation of currently available N_p from N_o mineralization calculations for each previous sludge application.

(2) Buffer Zones.

- (a) Unless treated by PFRP, sewage sludge may not be land applied within the following buffer zones:

Surface

Subsurface

	Application	Injection
Occupied off-site dwelling	200 feet	100 feet
Occupied on-site dwelling	100 feet	50 feet
Potable wells	100 feet	100 feet
Non-potable wells	25 feet	25 feet
Public roads	25 feet	15 feet
Property lines	50 feet	25 feet
Bedrock outcrops	50 feet	25 feet
Streams, tidal waters, or other water bodies	50 feet	25 feet
Drainage ditches	25 feet	25 feet

- (b) The Department may require increased buffer distances or may reduce buffer distances, and may set buffer zones between sludge boundaries and other land uses such as wetlands. In making these determinations, the Department may consider adjacent land use, type of sludge, sludge application method, sludge application rate, sludge quality and level of treatment, land slopes, vegetative cover used, the nature of any surrounding bodies of water, and any other factors considered relevant by the Department.

(3) Pathogen Control.

- (a) Sewage sludge and septage treated by a PSRP process as described in Subsection 602, may be land applied in the State with the following restrictions:
- (i) Food crops with harvested parts that touch the sewage sludge/soil mixture and are totally above the land surface shall not be harvested for 14 months after application of sewage sludge.
 - (ii) Food crops with harvested parts below the surface of the land shall not be harvested for 20 months after application of sewage sludge when the sewage sludge remains on the land surface for four months or longer prior to incorporation into the soil.
 - (iii) Food crops with harvested parts below the surface of the land shall not be harvested for 38 months after application of sewage sludge when the sewage sludge remains on the land surface for less than four months prior to incorporation into the soil.
 - (iv) Food crops, feed crops, and fiber crops shall not be harvested for 30 days after application of sewage sludge.
 - (v) Animals shall not be allowed to graze on the land for 30 days after application of sewage sludge.
 - (vi) Turf grown on land where sewage sludge is applied shall not be harvested for one year after application of the sewage sludge when the harvested turf is placed on either land with a high potential for public exposure or a lawn, unless otherwise specified by the permitting authority.
 - (vii) Public access to land with a high potential for public exposure shall be restricted for one year after application of sewage sludge.
 - (viii) Public access to land with a low potential for public exposure shall be restricted for 30 days after application of sewage sludge.
 - (ix) Bulk sewage sludge shall not be applied to a public contact site unless the sludge meets exceptional quality standards.

- (x) Tobacco is grown or will be grown.
- (b) No person shall use spray irrigation equipment to apply sludge unless such person has demonstrated to the Department in his permit application the specific means by which pathogens will be controlled so as not to present a public health hazard. At a minimum, the report shall include the design effectiveness of the proposed bactericidal and viricidal equipment, the means by which aerosol-borne bacteria and viruses will be contained and the impact of wind velocity on the latter's transport offsite or that appropriate buffer zones have been included, and the Department has approved such equipment or areas as part of the permit.
- (4) In no case shall the pollutant loading rate to a field exceed the levels set forth in Section 400, Table 402.4 and Table 402.5.
- (5) The Department may deny an application to apply lime stabilized sludge or high lime content sludge on a specific site if the Department determines that the application will result in the average soil pH on the site exceeding the optimum pH range for the crop to be grown.
- (6) Site characteristics. No person shall apply sludge to a site unless the site complies with all of the following:
 - (a) The soils shall have a minimum depth from surface to impermeable strata of 20 inches.
 - (b) The site shall have a minimum depth from surface to seasonal high water table of 20 inches. The operator may establish this minimum depth through the use of a tile drain system. An NPDES permit will be required for the discharge from the tile drain. Sites where the minimum depth from surface to seasonal high water table is less than 20 inches but no less than 12 inches may be considered if application to the soil is restricted to:
 - (i) May, June, July or August and appropriate vegetation is established and harvested as practicable, and
 - (ii) Those periods when actual water table depth is at least 20 inches below the maximum depth of tillage to be used for the vegetation.
 - (c) Slopes to be utilized for sludge application may not exceed 15 percent, except that the Department may allow slopes of up to 30 percent for forest systems in the permit.
 - (d) Soil pH is to be adjusted to values of 6.2 or above unless the natural climatic conditions and soil chemistry preclude such values. In these cases, lime additions suitable to the vegetation used are to be applied in conjunction with annual metal monitoring of that vegetation.
 - (e) For silvicultural application the soil may remain at ambient pH provided sufficient litter exist on the forest tract floor as determined by the Department.
 - (f) If the site is planted with nursery crops that require a pH of less than 6.2, the Department may approve a soil pH of 5.8 or greater in the permit.
- (7) Application to soil.
 - (a) Sludge shall be spread evenly over the site using conventional agronomic equipment such as manure spreaders, spray equipment, or other applicators, or by commercial equipment specifically designed for sludge application on agricultural land.

- (b) Sludge or products derived from sewage sludge shall be applied to the soil surface or incorporated in a manner that prevents unreasonable nuisance or odor conditions.
 - (c) The sludge applied shall be incorporated into the soil as required in Section 600 or by the end of each working day except under the following circumstances when:
 - (i) Liquid sludge is surface sprayed, odors and nuisances are controlled, and the Department determines that there will be no adverse impact on the environment or public health; or
 - (ii) Site management plans such as no till farming or the presence of an established crop precludes sludge incorporation, adequate site features exist to preclude sludge migration from the site, odors and nuisances are controlled, and the Department determines that there will be no adverse impact on the environment or public health.
 - (d) For the surface application of sludge for top or side dressing on hayfields, for pastures, for cover crops, in forests or for no-till crops when the previous no-till crop was harvested for grain in a manner that left adequate crop residue, the Department may either:
 - (i) Approve a greater than 24 hour time period for incorporating sludge into the soil as part of the permit, or
 - (ii) Not require incorporation as part of the permit.
 - (e) The areas to receive sludge application shall be clearly marked with stakes or contain other markers before the sludge application.
 - (f) Trucks shall be reasonably cleaned on the site to prevent drag-out of soil or sludge onto public roads.
- (8) Weather.
- (a) No person may apply sludge when the ground surface is saturated or covered with snow, or during periods of rain or runoff.
 - (b) No person may apply sludge when the ground is frozen, unless the Department has approved such application in the permit and all of the following conditions exist:
 - (i) The slopes at the site do not exceed three percent.
 - (ii) The site contains sufficient vegetation or a well-established cover crop to prevent runoff of sludge.
 - (iii) No sludge storage capacity or other means of storage or disposal exists at the generating facility.
 - (iv) No run-off.
- (9) Daily Record Keeping and Reporting Requirements.
- (a) Permit applicants must provide the landowner and operator or the proposed site with a copy of the Project Development Report and permit application and information as specified in Section 1100.

- (b) Any person that land applies sludge shall make and maintain an operational record for each day that sludge is applied and when any other management activities are conducted at the land application site. The daily operational record shall be recorded on a form supplied by the Department and include the following:
 - (i) The date, type, and wet and dry weights of the sludge applied.
 - (ii) The facility from which the sludge originated.
 - (iii) The transporters of the sludge.
 - (iv) The particular map location of the area currently being used for land application of sludge, and the areas where sewage sludge was previously applied within 5 years.
 - (v) A record of any major deviations from the operating plan.
 - (vi) General daily weather conditions.
 - (vii) The application rate for sludge.
 - (viii) A record of all actions taken to correct violations of the Delaware Environmental Protection Act and the Department's regulations.
 - (ix) Management undertaken, such as planting and harvesting of crops, fertilizers and chemicals added, tillage practices, etc.
- (c) When sludge is being stored at the site, the operator shall maintain accurate operational records sufficient to determine whether the sludge is being stored in accordance with the Department's requirements for such operations.

(10) Annual Record Keeping and Reporting Requirements.

- (a) Any person that utilizes sludge by land application shall submit to the Department and landowner an annual operation report on or before February 1 of each year.
- (b) The annual operation report, which shall be submitted in a format specified by the Department, shall include the following:
 - (i) The weight or volume of each type of sludge received.
 - (ii) The type, weight, and volume of sludge received from each generator location where the sludge originated.
 - (iii) A copy of the applier's current public liability insurance policy.
 - (iv) Any changes in ownership of the land where the operation is conducted or any change in any lease agreement for the use of such land that may affect or alter the applier's rights upon such land.
 - (v) The annual ground water monitoring evaluation if ground water monitoring is required by the Department.
 - (vi) A chemical analysis of soil for each field at the facility for those constituents identified in the sludge, unless otherwise specified by the Department in the permit. The procedure for soil analysis shall be consistent with the Department guidance.
 - (vii) Any other information required by the Department.

- (c) The annual operation report shall also contain a topographic map of the same scale and contour interval as the map required for the initial permit application, showing the field boundaries where sludge has been applied.

Subsection 703. Land Reclamation.

- (1) Slopes to be utilized for sludge application may not exceed 20 percent, exception that the Department may approve slopes up to 35 percent in the permit if the applicant demonstrates to the Department's satisfaction that such slopes will not cause substantial erosion or off-site run-off.
- (2) The applier shall incorporate sludge into the soil within 24 hours unless otherwise specified in Section 600, following surface application.
- (3) Weather.
 - (a) The operator shall not apply sludge:
 - (i) When the ground is saturated, snow covered, frozen, or during periods of rain or runoff.
 - (ii) Between October 15 and April 15, unless a cover crop can be established.
 - (b) The Department may approve the storage of sludge between October 15 and May 30 in the permit if the operator makes a satisfactory demonstration that the requirements for storage in Section 900 are to be met. Storage may not exceed in amount the sludge necessary to reclaim the permitted area that was prepared for sludge application prior to October 15.

(4) Revegetation.

- (a) Vegetation shall be established on all land where sludge has been incorporated. The standard for successful revegetation shall be the percent ground cover of the vegetation which exists on undisturbed lands that are nearby or adjacent to the area where land reclamation is proposed. In no case shall the Department approve less than 70 percent ground cover of permanent plant species. No more than 1 percent of the area shall have less than 30 percent ground cover. No single or contiguous area exceeding 3,000 square feet shall have less than 30 percent ground cover.
- (b) Revegetation shall provide for an effective and permanent vegetative cover capable of self-regeneration and plant succession. Introduced species may be used in the revegetation process when approved by the Department in the revegetation plan. Vegetative cover shall be considered of the same seasonal variety when it consists of a mixture of species that is of equal or superior utility during each season of the year.
- (c) Revegetation shall provide a quick germinating, fast growing vegetative cover capable of stabilizing the soil surface from erosion.
- (d) Disturbed areas shall be seeded and planted when weather and planting conditions permit but such seeding and planting of disturbed areas shall be performed no later than the first normal period for favorable planting after final grading.
- (e) Mulch shall be applied to all regraded areas at rates adequate to control erosion, promote germination of seeds and increase the moisture retention of the soil.
- (f) The Department may require a chemical analysis of the vegetation.

- (g) Vegetation shall not be harvested for 2 years for food chain use following the application of sludge, unless otherwise approved by the Department.
- (6) Water Quality Monitoring. Since the use of sludge for land reclamation is often a one-time or short term application the Department may accordingly waive or reduce groundwater monitoring requirements.
- (7) Soils analysis. If the land to which sludge is applied will be used for agriculture, the operator shall conduct a soil analysis 2 years after the application of sludge to the land. The soil analysis shall be consistent with Department guidance.
- (8) The Department may impose other restrictions if considered necessary to protect public health and the environment.
- (9) All monitoring performed on the sludge utilized at the reclamation site shall be reported to the Department on approved reporting forms as specified in the permit.

Subsection 704. Research Projects.

- (1) The Department may issue permits to utilize sludge as part of legitimate research projects to be carried out by qualified persons. Research projects may be designed to improve current sludge utilization methods, develop new methods, determine the environmental or health effects of sludge utilization, or all of these.
- (2) The Department may allow the application of sludge at high rates which exceed crop nitrogen requirements and/or the heavy metals limitations stated in the guidance and these regulations, on land specifically set aside for research purposes.
- (3) The Department may allow use of unstabilized sludge if appropriate precautions are taken to assure that viable pathogens do not enter ground water, surface water, or in any way adversely affect the public health.
- (4) The Department may allow the growth of crops such as vegetables and tobacco if the purpose of the research is to determine the effect of sludge on these crops, and the crops are not allowed to enter the human food chain.
- (5) Applications for permits shall include five copies of a complete description of the project. After a preliminary review, the Department may request such additional information as is necessary to evaluate and document the project.
- (6) As a condition of any permit under this section the titleholder must execute and record in the appropriate County Office of Recorder of Deeds an affidavit in a form approved by the Department which notifies prospective purchasers that the property has been used to conduct sludge utilization research.

Subsection 705. Sludge Distribution and Marketing.

- (1) Quality Criteria:
 - (a) Sludge and sludge products for Distribution and Marketing must meet one of the PFRP pathogen reduction standards specified in Subsection 603, vector attraction methods described in Subsection 604 (2) as alternative a through h, and the Pollutant Concentration Limits in Table 402.3 at the time of distribution.
 - (b) All sludge or sludge products shall be dried or otherwise amended to a minimum of twenty percent solids prior to distribution or marketing.
- (2) Monitoring Requirements for Distribution and Marketing:
 - (a) A quality control program approved by the Department shall be instituted to assure that all treated sludge and sludge products to be distributed meet the

Department's standards regarding the destruction of primary pathogen organisms (PFRP) and the limitations for heavy metals and other contaminants. During the stabilization process, temperature shall be monitored regularly until temperatures recorded in the material (or off-gas from a heat-drying process) exceed the level and duration required for adequate pathogen destruction. For aerobic stabilization processes, oxygen levels shall also be monitored frequently to assure that aerobic conditions are maintained. Additional monitoring of the treatment process may be required on a case-by-case basis.

- (b) The sludge or sludge products shall be tested according to the frequencies specified in Subsection 401, unless the Department requires a different monitoring as a permit condition.
 - (c) The sludge distribution facility shall perform and submit to the Department additional analyses if there has been a significant change in the quality of the sludge or sludge products.
- (3) Records and recordkeeping.
- (a) Any person that distributes and markets sludge or sludge products shall keep a log of all persons that receive more than ten (10) cubic yards of material per year.
 - (b) Before distributing sludge or sludge products to any person who will utilize more than 100 tons of the material in a twelve (12) month period, the permittee shall submit a plan to the Department which addresses the following:
 - (i) The end use(s) of the material
 - (ii) Maximum application rates
 - (iii) Total amount of material to be utilized
 - (iv) Storage practices
 - (v) Transportation methods
- (4) Application limitations.
- (a) No person who receives or applies sludge or sludge products pursuant to a distribution and marketing program may exceed the application rates for particular uses as listed in the instructional materials provided with the product, or otherwise use the product in any manner counter label directions.
 - (b) No sludge or sludge products may be stored or applied so as to cause surface or groundwater pollution, runoff/runoff, cause odor, adversely affect the food chain, attract vectors, or adversely affect private or public water supplies.

Subsection 706. Utilization or Disposal of Sludge at Sanitary Landfills.

- (1) Sludge utilized or disposed of in a sanitary landfill must not contain free liquids and must contain a minimum of 20% solids as determined by the EPA paint filter test.
- (2) Utilization or disposal of sludges governed by these regulations must comply with 40 CFR part 258, the "*Regulations Governing Solids Waste*" and Delaware Solid Waste Authority *Policy on Special Solid Wastes*.
- (3) Persons with a valid permit from the Delaware Solid Waste Authority or the Delaware Department of Natural Resources and Environmental Control, Division of Air and Waste Management to dispose or utilize sludge at an approved landfill are exempt from the permit requirements of these regulations.
- (4) Reporting and Record Keeping.

- (a) Unless specified in an NPDES or Ground Water Discharges Permit, all facilities must record the volume of sludge generated and disposed of on a dry weight basis under this subsection.
- (b) Unless specified in an NPDES or Ground Water Discharges Permit, all facilities must report on a yearly basis the volume of sludge generated and disposed of under this subsection.

SECTION 800. TRANSPORTATION OF SLUDGE OR SEPTAGE.

Subsection 801. General Requirements.

- (1) For the purpose of this section, sludge and septage are divided into three types as shown in the table below.

<u>Sludge Type</u>	<u>Percent Solids</u>
Liquid	Less than 15
Cake	15 - 35
Dried	Greater than 35

- (2) The Department may issue permits to transport sludge off-site if the Department approves of the equipment to be used, the operations plan, and the destination of the sludge.
- (3) Liquid sludge or septage can be pumped and transported by pipeline. If liquid sludge is transported by truck, rail, or barge, closed watertight vessels shall be used such as tank trucks and railroad tank cars or other vessels which can provide equivalent protection against spills and leakage.
- (4) Cake may be transported in watertight boxes, such as dump trucks properly sealed to prevent leaks, or cement type vehicles. Unless the applicant demonstrates equivalent protection against spills and leakage, when sludge cake is transported in dump trucks, the following standards shall be met:
 - (a) The trucks shall be equipped with splash guards firmly attached horizontally at the front and rear of the trailer;
 - (b) Each splash guard shall cover at least 25 percent of the trailer's open area; and
 - (c) A minimum 2 feet of freeboard shall be maintained between the sludge and the top of the trailer unless the top of the trailer is completely sealed.
- (5) The Department may require certain cake sludges to be transported as liquid sludge.
- (6) Dried sludge may be transported in open boxes, such as dump trucks, which are properly sealed to prevent leakage. The trucks shall be covered with tarps or the equivalent.
- (7) All vehicles used to transport sludge or septage shall be operated and maintained so as to be in compliance with all state and federal regulations and not present a hazard to human health or the environment through unsafe vehicle conditions. The permittee is responsible for the operation and maintenance of all vehicles operated under the permit.
- (8) All transporters of sludge or septage shall submit to the Department a plan for the prevention, control, and cleanup of accidental discharges. No transportation permit will be issued until such a plan has been submitted to and approved by the Department.
- (9) All transporters shall at all times maintain commercial automobile liability insurance with a combined single limit of at least \$100,000, and shall submit a Certificate of Insurance demonstrating compliance with this regulation. All persons subject to these regulations that were permitted to transport in Delaware before the adoption of this requirement shall

be subject to the requirement upon renewal of their permit, or 90 days after adoption of the part, whichever is first.

Subsection 802. Permit Application for Transportation.

An applicant for a Permit to transport sludge or septage in the State shall submit copies of the following information along with the initial application forms supplied by the Department:

- (1) A description of the sludge to include the source of the sludge, the quantity to be transported, and any treatment the sludge has undergone before transportation (for example anaerobic digestion, aerobic digestion, lime stabilization, composting, or dewatering).
- (2) Results of a laboratory analysis of a representative sample of the sludge which was obtained not more than 6 months before submission of the application unless these results would be submitted as a part of the land application program. The analysis shall include, as a minimum, percent solids, pH, and the dry weight concentration of total nitrogen, ammonium, nitrate, total phosphorous, total potassium, cadmium, copper, mercury, nickel, lead, zinc, arsenic, selenium, and molybdenum. The Department may require more frequent analyses and analyses for other sludge constituents if considered necessary to adequately assess the potential public health, environmental, and nuisance impacts of the project. The Department will waive the requirement for domestic septage.
- (3) A description of all equipment to include collection, short-term holding, handling, and wash down equipment, as well as a detailed description of the transport vehicles to include type, size, number, and all modifications made to prevent spills and leaks.
- (4) An operations plan to include transportation route, days and hours of operation, spill reporting and cleanup plans, plans to keeping transportation vehicles clean, and recordkeeping procedures.
- (5) The destination of the sludge and a description of what is to be done with the sludge at the destination.
- (6) Other relevant information requested by the Department.

SECTION 900. STORAGE.

Subsection 901. General Requirements. Adequate storage capacity for sludge is recognized as an integral and necessary element of an acceptable sludge management program. Storage facilities are to be used as proactive staging areas for sludge or sludge products and not to be used for final or permanent disposal. Storage facilities used in a manner that constitutes final or permanent disposal shall be classified a surface disposal unit and subject to the requirements of *The Regulations Governing the Disposal of Solid Waste in Delaware*.

- (1) The Department may issue permits for the construction and operation of temporary or permanent sludge storage facilities.
 - (a) A facility is a temporary facility if it exists for less than one (1) year or it is used for storage for less than six (6) months in any one year.
 - (b) A facility is a permanent facility if it is not a temporary facility.
- (2) Unless governed by another permitting authority, facilities for the temporary storage of sludge unless authorized only as an interim measure to provide sufficient time for the location, authorization, design and construction of permanent sludge storage facilities.

- (3) The Department may deny authorization to construct temporary storage facilities if it determines that the applicant or the generator is not actively pursuing efforts to secure adequate permanent storage facilities, or for other good cause.
- (4) When feasible, storage shall be limited to permanent facilities, specifically designed and constructed to safely contain sludge without resulting in public health or environmental problems, or creation of nuisance conditions.
- (5) Portable equipment used for the short-term holding of sludge (i.e., dumpsters and roll-offs) shall not be considered as storage facilities under this Section provided this equipment is included in the list of equipment provided in Subsection 802(3).

Subsection 902. Temporary Sludge Storage Facilities. Temporary sludge storage facilities shall be designed and constructed in accordance with the following specifications:

- (1) Storage facilities shall not be placed in flood prone areas.
- (2) Storage facilities within the 100-year floodplain shall be evaluated as to potential effects on adjoining landowners.
- (3) Storage facilities shall be located on soils of low to moderate permeability or on soils that seal through sedimentation and biological action. If a storage facility is proposed on other soils, the Department shall require permeability tests or use of an impermeable membrane liner or soil sealant, or all of these.
- (4) The minimum design volume of a storage facility which is not completely enclosed shall be the volume of sludge to be stored plus the expected volume of precipitation during the period of storage minus expected evaporation on the pond surface plus the volume of the maximum expected 25 years, 24 hours precipitation event.
- (5) Storage facilities shall be constructed of:
 - (a) Suitably compacted soils; or
 - (b) Manufactured materials such as asphalt, steel, reinforced concrete; or
 - (c) Fiberglass; or
 - (d) Other materials approved by the Department.
- (6) Storage facilities made by constructing an above ground embankment shall meet the following conditions:
 - (a) The minimum combined slopes of the embankment shall be five horizontal to one vertical with the wet side not steeper than 2:1 and the dry side not steeper than 3:1.
 - (b) Embankments having a height of 14 feet or less shall have a minimum top width of 8 feet. Embankments having a height of 15 feet to 19 feet shall have a minimum top width of 10 feet.
 - (c) The design height of the embankment shall be increased by the amount needed to insure that the design top elevation is maintained after all settlement has taken place. This increase may not be less than 5 percent when compaction rollers are used and not less than 10 percent when bulldozers or scrapers, or both, are used.
- (7) The minimum top elevation of the facility shall be 10 percent above the design depth after settlement. A minimum of one foot of freeboard must be provided in all cases. These provisions may be waived by the Department, or the freeboard requirements reduced if

the facility design includes secondary containment capability, and the accumulated liquids are routinely removed from the facility.

- (8) The side slopes of an excavated storage facility may not be steeper than 1:1.
- (9) Storage facilities constructed by both the embankment and excavation method shall meet all of the requirements for above ground embankments of these regulations if the design depth of the sludge impounded against the embankment is 3 feet or more.
- (10) Public access to the storage facility shall be controlled.
- (11) The storage facility shall be located in a relatively level area (usually less than 5 percent slope) and shall be located at least 150 feet from any drainage ditch, swale, or gully, and bermed to prevent run-on or surface water. Areas with slopes greater than 5 percent may be deemed suitable for storage provided that diversion ditches, additional buffer distances, or other provisions can be installed to further control storm water in the areas of the storage facilities.
- (12) The cell floor shall be located at least 2 feet above the maximum seasonal high ground water elevation.
- (13) Adequate specific conditions are included to control odors and potential nuisances.

Subsection 903. Permanent Storage Facilities. Permanent storage facilities shall be designed and constructed in accordance with all the requirements listed for temporary storage facilities in these regulations with the following additions:

- (1) The facility shall be lined to prevent loss of materials to ground waters. Acceptable liners shall include:
 - (a) 1-foot thick clay or other suitable material with an installed permeability of 1.0×10^{-7} cm/sec. or less;
 - (b) 2-foot thick clay or other suitable material with an installed permeability of 1.0×10^{-6} cm/sec or less;
 - (c) 2-foot thick compacted soil with an installed permeability of 1.0×10^{-5} cm/sec. or less in combination with an artificial liner at least 30 mil in thickness with a permeability of 1.0×10^{-7} cm/sec. or less; or
 - (d) Other manufactured facilities including but not limited to asphalt or reinforced concrete structures, steel tanks, fiberglass tanks, or their equivalent.
- (2) A ground water monitoring program shall be conducted in accordance with a plan approved by the Department. At a minimum, three wells, one upgradient and two downgradient of the facility, shall be installed. The Department may waive this provision for facilities which store sludge in above ground manufactured facilities such as tanks or similar structures.
- (3) The Department may approve the storing or stockpiling of dried sludge on a storage pad without groundwater monitoring if the pad meets the Department's standards for permanent storage facility liners and all runoff from the pad is collected and disposed of in a manner approved by the Department.
- (4) Other methods of storing or stockpiling dried sludge may be approved by the Department if the Department determines that they do not have significant potential to cause nuisances or adversely affect the public health or the environment.
- (5) If the facility is constructed after the date when these regulations are adopted by the Department a 1,000 foot buffer zone shall be maintained between the sludge processing

or storage area, or both, and the nearest inhabited off-site dwelling. This buffer distance may be reduced if the Department considers that the facility has adequate specific conditions to control odors and potential nuisances.

Subsection 904. Application for a Storage Permit. Applications for permits to store sludge shall include the following information:

- (1) Written permission from the landowner or landowners and evidence of zoning approval as required by 7 Del. Code 6003(c) and Section 1100 of these regulations.
- (2) Results of a laboratory analysis of a representative sample of the sludge which was obtained not more than 6 months before submission of the application. The analysis shall include, as a minimum, the metals and nutrients parameters found in Section 400 of these regulations. The Department may require more frequent analyses and analyses for other sludge constituents if considered necessary to adequately assess the potential public health and environmental impacts of the project.
- (3) A site specific topographic map of sufficient scale to include:
 - (a) The areal extent of the site;
 - (b) The property boundaries;
 - (c) The size and location of the storage facility;
 - (d) The location of any streams, springs, or seeps in the area;
 - (e) The residences or buildings on the site or bordering on the site;
 - (f) Any roads on the site;
 - (g) The location of any wells on the site or within 1/2 mile of the site; and
 - (h) The location of all soil tests, soil borings, or test pits (attach test results).
- (4) A tax map of the site showing the owner's name, site acreage, and property identification number.
- (5) Evidence showing the frequency of flooding at the site based on available flood maps and other information along with an evaluation of stormwater management for the facility.
- (6) The source and volume of sludge to be stored.
- (7) Design volume calculation.
- (8) For facilities constructed of earthen material, and for facilities constructed or installed below grade, the following information shall be submitted:
 - (a) Soil permeability test results both on the soil used to construct side slopes and at the proposed depth of the facility.
 - (b) Representative test borings or test pits on the site, to include a description of the texture, color, and evidence of mottling of the soils encountered, and the depth to the ground water. The interpretation of test pit or boring information shall be made by a qualified person.
- (9) Evidence showing the maximum seasonal high ground water elevation.
- (10) The specifications of any liners or soil sealants, if required.
- (11) Detailed construction specifications.

- (12) Method of restricting public access to the site.
- (13) An operations plan to include a description of all sludge handling equipment, daily operating procedures, days and hours of operation, an odor and nuisance control plan, emergency plans, and recordkeeping procedures.
- (14) A description of the truck cleaning facility.
- (15) For permanent facilities constructed of earthen materials, or for facilities constructed or installed below grade, the following information shall be submitted:
 - (a) Adequate test boring logs, at a minimum of three per 10 acres. These shall be specific as to the soil, sediment, and rock types encountered, depth of groundwater at completion and at 24, 48, and 72 hours after completion, and depth of auger refusal, if applicable. The location of each boring shall be accurately mapped.
 - (b) Description of the geology at the site, including a discussion of the geologic formations directly involved, the present and future use of these formations as a ground water source and their relationship to underlying formations, providing cross sections based on the information compiled from borehole data.
 - (c) Hydraulic characteristics of the site, including a ground water contour map, superimposed on a topographic map, showing the location of the water table and the direction and rate of ground water flow, a discussion of the infiltration capacity of surface soils, and the percolation capacity of subsurface soils.
 - (d) A proposed ground water monitoring program consisting of at least three wells, one upgradient and two downgradient of the facility.
 - (e) A sediment and erosion control plan for the site.
- (16) For manufactured facilities, the following information shall be submitted:
 - (a) Information on the structural materials to be used;
 - (b) Design specifications, such as structural capacity, maximum load, restrictions on use, and dimensions;
 - (c) Installation or construction techniques and procedures;
 - (d) A plan for cleaning and periodic inspection of the facility for leaks or other structural defects;
 - (e) A contingency plan for repairs of the facility, if necessary.
- (17) For above ground enclosed facilities, a plan for controlling emission gases.
- (18) Other relevant information requested by the Department.

Subsection 905. Temporary Stockpiling. The Department may authorize the temporary stockpiling of sludge on a permitted utilization site provided that the following conditions are satisfied:

- (a) The sludge shall be utilized on the site within 7 days of delivery to the site;
- (b) The sludge has been dewatered to a minimum solids content which will allow it to pass the free liquids test under Subsection 705.

- (c) The Department determines that the stockpile area is situated in an area where runoff is adequately controlled and odor or other nuisance conditions do not occur.
- (d) The Department may approve stockpiling beyond 14 days if adequate covering or shelter is provided for the material.

SECTION 1000. SAMPLING AND LABORATORY ANALYSES.

The Department recognizes that sludge analysis is difficult due to the inherent complexity of sludge matrices. Sludge is rich in organic matter and highly variable in physical and chemical properties. However, sampling accuracy can be greatly enhanced if the correct protocol is established for the collection, storage, transportation, and analysis of the sludge sample. The Department may reject the method of analysis if it determines that the method of analysis is inaccurate, or for any other good cause.

Subsection 1001. Sample collection and Analysis

- (1) Sample Collection. All sludge generators and preparers shall develop a sludge sampling program which addresses random and cyclic variations within the sludge stream. The generator or preparer must receive Department approval prior to execution of this program. The EPA publication *POTW Sludge Sampling and Analysis Guidance Document* may be helpful in establishing a sampling and analysis program. Specifically, the program shall address, with respect to both stabilized and unstabilized sludges, the following:
 - (a) Sampling equipment, personnel, and containers, including set-up, tear-down and cleaning procedures
 - (b) Representative sampling (collection points, compositing method, frequency and timing of sampling)
 - (c) Sample preservation
 - (d) Recordkeeping/logbook
 - (e) Transfer and Chain-of-Custody Samples
- (2) Methods in the publications listed below shall be used to analyze samples of sewage sludge. The publications are listed as they existed on the effective date of this Regulation. Notice of and change in the listed methods will be published in the *Federal Register*. The Department will make a sincere effort to notify permittees of any testing method changes; however, it is the responsibility of all parties governed by these regulations to perform analysis using current EPA approved testing methods.
 - (a) Enteric viruses. ASTM Designation: D 4994-89, "Standard Practice for Recovery of Viruses From Wastewater Sludges", 1992 Annual Book of ASTM Standards: Section 11 - Water and Environmental Technology.
 - (b) Fecal coliform. Part 9221 E. or Part 9222 D., "Standard Methods for the Examination of Water and Wastewater", 19th Edition, 1992.
 - (c) Helminth ova. Yanko, W.A., "Occurrence of Pathogens in Distribution and Marketing Municipal Sludges", EPA 600/1-87-014, 1987.
 - (d) Inorganic pollutants. "Test Methods for Evaluating Solid Waste, Physical; Chemical Methods", EPA Publication SW-846, Second Edition (1982) with Updates I (April 1984) and II (April 1985) and Third Edition (November 1986) with Revision I (December 1987).

- (e) Salmonella sp. bacteria. Part 9260 D., "Standards Methods for the Examination of Water and Wastewater" 18th Edition, 1992. Kenner, B.A. and H.P. Clark, or "Detection and Enumeration of Salmonella and Pseudomonas aeruginosa", Journal of the Water Pollution Control Federation, Vol. 46, No. 9, September 1974, pp. 2163-2171.
 - (f) Specific oxygen uptake rate. Part 2710 B., "Standard Methods for the Examination of Water and Wastewater" 18th Edition, 1992.
 - (g) Total, fixed, and volatile solids. Part 2540 G., "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992.
- (3) All laboratory results submitted to the Department must list the method used for analysis. The laboratory may be required to submit a documented Quality Assurance (QA) program for Department approval; the QA program must identify sampling and test procedures in sufficient detail so as to allow a technical evaluation. All sludge generating facilities shall submit a description of the proposed sludge analysis program, which shall address:
- (a) Laboratories used, addresses, qualifications
 - (b) Parameters analyzed at each laboratory for each medium (water, soil, sludge)
 - (c) QA/QC procedures utilized, results of procedures
 - (d) Methodologies employed, citation for methodologies

The applicant must receive Department approval prior to execution of this program.

- (4) Where the regulations require a soils analysis to be performed in order to determine cumulative metals loading, a complete digestion process is required, and the specific testing method shall be referenced in the report; leachate tests would only be appropriate when testing to determine exchangeable cations uptake of metals by the plant-root system.

Subsection 1002. Other Treatment Methods. The Department may issue permits for the treatment of sludge by other processes if it can be demonstrated by the applicant that the following conditions will be met:

- (a) The treatment process does not contaminate the sludge to an extent that subsequent utilization of the treated sludge presents a public health hazard or danger to the environment.
- (b) Health hazards, environmental degradation, or nuisances do not result from the operation of the treatment process.
- (c) If the facility is constructed after the date when these regulations are adopted by the Department, a 1,000 foot buffer zone shall be maintained between the sludge processing or storage area and nearest inhabited off-site dwelling. This buffer distance may be reduced if the Department considers that the facility had adequate specific conditions to control odors and nuisances.

Subsection 1003. Information Required for Permits. Applications for permits for the treatment of sludge shall include a description of the treatment method, the source of the sludge, the quantity of sludge involved, and a map showing the location of the treatment facility. After a preliminary review the Department will specify the additional information necessary to evaluate the project and complete the application. Copies of this information shall be submitted and may include the following:

- (a) A site specific topographic map with a minimum scale of 1 inch = 200 feet and a contour interval of not more than 5 feet, showing the areal extent of the site, the

property boundaries, the exact acreage of the facility, location of all buffer zones, and surrounding land uses within 2500 feet including residences, streams, roads and wells.

- (b) Site specific geologic and hydrogeologic information as required by the Department to ensure that the treatment facility does not constitute a threat to ground or surface waters of the State.
- (c) Detailed discussion of the methods to be used for the protection of the ground water, such as leachate control or natural attenuation.
- (d) A laboratory analysis of each sludge in conformance with Subsection 402(2) of these regulations. The analysis shall include, as a minimum, percent solids, pH, and the dry weight concentration of total nitrogen, ammonium, nitrate, total phosphorous, total potassium, cadmium, copper, mercury, nickel, lead, and zinc. The Department may require the analysis of other parameters if considered necessary to protect public health or the environment.
- (e) A proposed program for monitoring the chemical quality of the ground water and surface waters on the site, including the depth and location of monitoring wells if applicable.
- (f) Written permission of the landowner or landowners for the operation to be carried out, and evidence of zoning approval as required by 7 Del. Code 6003(c).
- (g) Procedures to be employed to control odors, nuisances, and public access.
- (h) Location of the 100-year flood plain, if applicable.
- (i) Tax maps and property identification numbers.
- (j) Detailed design calculations.
- (k) Detailed engineering plans and specifications.
- (l) A detailed description of the treatment process.
- (m) Plans for storage and ultimate utilization of the treated sludge.
- (n) Plan to monitor efficiency of treatment device or process.
- (o) Contingency or emergency plans.
- (p) Other relevant information requested by the Department.

SECTION 1100. GENERATOR, PREPARER, APPLIER, OWNER, AND LEASEHOLDER RESPONSIBILITIES.

Subsection 1101. Generator's Responsibility.

- (1) Each sludge generator who generates or otherwise produces sludge in Delaware shall maintain the following information for a minimum of five (5) years:
 - (a) Volume of sludge generated monthly, or a dry weight basis.
 - (b) The name, address, telephone number and NPDES permit number and the sludge utilization permit number of the person(s) who prepare and apply the sludge, if different from the generator.

- (c) The location, by either street address or longitude and latitude of all sludge storage, utilization, disposal, or reclamation sites where the generator's sludge has been placed.
- (d) The concentration of pollutants identified in Section 400 of these regulations as required by the Department.
- (e) A description of how pathogen and vector reduction requirements are met, including a signed certification statement approved by the Department.
- (f) Any additional information required by the Department.

Subsection 1102. Preparer's Responsibility.

- (1) Each sludge preparer who prepares or otherwise treats sludge for final utilization or disposal in Delaware shall submit to the Department the following information, at a frequency identified in Section 400 of these Regulations:
 - (a) The concentration of total nitrogen of the prepared sludge.
 - (b) The concentration of pollutants identified in Section 700 of these Regulations.
 - (c) Other constituent concentrations identified in the sludge utilization or disposal permit.
 - (d) A description of how pathogen and vector reduction requirements are met, including a signed certification statement approved by the Department.
- (2) The information required in 1 above, shall also be provided to the sludge applier, if the applier is different from the sludge preparers, and shall be maintained for a minimum of five (5) years.

Subsection 1103. Applier's Responsibility.

- (1) Each sludge applier who land applies or disposes of sludge in the state shall submit to the Department the following information at a frequency identified in Section 700 of these Regulations. This part does not apply to sludge appliers who transport sludge to a sanitary landfill in accordance with Subsection 706 of these Regulations or to sludge appliers who apply sludge or sludge products in accordance with a valid Distribution and Marketing permit issued by the Department. *Required information includes:*
 - (a) The location, either by street address and longitude and latitude of all sludge utilization, disposal or reclamation sites where the applier has placed sludge.
 - (b) The total volume of sludge (in dry metric tons per hectare) applied to each site annually; the number of hectares the sludge was applied to; and the total site acreage.
 - (c) The cumulative pollutant loading rate (CPLR) of each pollutant listed in Table 402-4 applied to the site to date.
 - (d) The applier shall provide a description of how the management requirements in Sections 702, 703, and 404(7) were met and shall certify that the management requirements were met.
- (2) For all Class B sludges that are land applied, the appliers shall provide a description of how all site restrictions were met and shall certify that all site requirements identified in Section 600 and 700 of these Regulations have been met.

- (3) When vector attraction reduction requirements are achieved using either method (i) or (j) as described in Section 604 (2) of these Regulations, the applier shall maintain records documenting the methods employed to comply with these requirements. The applier shall also certify that the above vector attraction reduction requirements were met.
- (4) The applier shall provide to the landowner or lease holder notice and information necessary to comply with these regulations and the permit. The information shall include:
 - (a) The date(s) sludge was applied to the site.
 - (b) The areas on which sludge was applied, including acreage.
 - (c) The loading rate of sludge in dry tons per acre.
 - (d) The total amount of nitrogen available for crop uptake from the sludge application in pounds per acre.
 - (e) A copy of a recent laboratory analyses of the sludge.
 - (f) Any other information required by the Department.

Subsection 1104. Landowner or Leaseholder Responsibilities.

- (1) Prior to sludge application the landowner or leaseholder shall provide the sludge applier the following information:
 - (a) Identification of crops to be grown.
 - (b) Approximate dates for seeding or planting of crops.
 - (c) A statement agreeing to comply with site and crop restrictions when Class B sludges are applied to the field(s).
 - (d) Any other information required by the Department.

Subsection 1105. Fee Schedule.

The Department may establish a schedule of annual and/or one-time fees with respect to sludge treatment, storage, transportation, land application/treatment, and distribution. This fee schedule may be revised from time-to-time after notice and opportunity for hearing.

Fee Payment.

One time fees shall be submitted to the Department at the time of application. Fees shall be submitted to the Department upon receipt of notice from the Department, or in accordance with the following fee payment schedule:

<u>Fee Amount</u>	<u>Payment Schedule</u>
Less than \$1,000	Upon receipt of notice from the Department
Between \$1,000 and \$10,000	Quarterly payments
Over \$10,000	Monthly payments

The Department shall impose late charges at the rate of 1 percent per month, compounded, for any fee not received within 30 days of the due date.

Failure to pay fees shall constitute grounds for denial of subsequent applications for Permits, and revocation of previously issued permits involving sludge from the applicant.

