WEST VIRGINIA
SECRETARY OF STATE
KEN HECHLER
ADMINISTRATIVE LAW DIVISION

Form #7

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MAR 20 4 27 PM '95

OFFICE OF WEST VIRGINIA
SECRETARY OF STATE

Effective Date

NOTICE OF AN EMERGENCY RULE

AGENCY: Div. Environmental Protection Water Resources & Solid Waste Management TITLE NUMBER: 47

CITE AUTHORITY: WV Code 22-1-3, 22-1-3a, 22-1A, and 22-15-20(b)

EMERGENCY AMENDMENT TO AN EXISTING RULE: YES ☒ NO ☐

IF YES, SERIES NUMBER OF RULE BEING AMENDED: 38D

TITLE OF RULE BEING AMENDED: Sewage Sludge Management Rule

IF NO, SERIES NUMBER OF RULE BEING FILED AS AN EMERGENCY: N/A

TITLE OF RULE BEING FILED AS AN EMERGENCY: N/A

THE ABOVE RULE IS BEING FILED AS AN EMERGENCY RULE TO BECOME EFFECTIVE AFTER APPROVAL BY SECRETARY OF STATE OR 42ND DAY AFTER FILING, WHICHEVER OCCURS FIRST.

THE FACTS AND CIRCUMSTANCES CONSTITUTING THE EMERGENCY ARE AS FOLLOWS:

SEE ATTACHMENT

1460

Use additional sheets if necessary

Roger T Hall
Signature
Roger T. Hall

EMERGENCY RULE

47 CSR 38D

DIVISION OF ENVIRONMENTAL PROTECTION

WATER RESOURCES AND SOLID WASTE MANAGEMENT

FACTORS CONSTITUTING AN EMERGENCY

Pursuant to West Virginia Code 22-15-20 (b), the Division of Environmental Protection promulgated an emergency rule which governed the land application of sewage sludge. Legislative rule 47 CSR 38D was subsequently filed on May 13, 1994 and became effective on June 1, 1994. Both rules contained maximum allowable soil concentration standards for various metals (arsenic, lead, zinc, etc.). These standards are contained in Table 3 of the existing rule.

Because of the emergency nature of the rule, as declared by the Legislature, there was virtually no time to develop a sound technical and scientific foundation for establishing the soil concentration standards. During the ensuing period of time since promulgating the rule, it has been determined through scientific sampling and analysis that many native soils throughout the state exhibit naturally-occurring levels of metals which exceed the standards established in Table 3.

The results of these determinations are that lands containing these naturally-occurring metals preclude the land application of sewage sludge. This poses a serious health and economic problem for Publicly Owned Treatment Works (POTW's) which are primarily municipal sewage treatment plants. These facilities are forced to either store the sewage sludge on site or dispose of it in permitted landfills. The stored sludge must be composted and carefully monitored by the POTW and poses an ever-present potential for health risks. This is an expansive process for which POTW"s are not well trained or prepared to implement. Landfilling is even more expensive because of the mandatory tipping fees. This additional cost will eventually be passed on to the public in the form of higher sewage and water bills.

In view of the inappropriateness of the soil concentration standards and the health and monetary considerations, the Division of Environmental Protection must amend Table 3 to reflect soil concentration levels which are based on sound technical and scientific data. Collection and analysis of such data will require several months. In the interim, the division is compelled to lift the requirements of Table 3 to avert any economic and health risk to the public.

GASTON CAPERTON
GOVERNOR

BUREAU OF ENVIRONMENT
10 McJUNKIN ROAD
NITRO, WV 25143-2506

DAVID C. CALLAGHAN
COMMISSIONER

March 20, 1995

The Honorable Ken Hechler
Secretary of State
Building 1, Suite 157K
Charleston, West Virginia 25305

FILED
MAR 20 4 30 PM '95
OFFICE OF WEST VIRGINIA SECRETARY OF STATE

ATTN: Judy Cooper

RE: Emergency Rule 47CSR 38D
Sewage Sludge Management Rules

Dear Mr. Secretary:

This is to advise you that I am giving approval for the filing of the above-captioned emergency rule as a modification to a proposed rule with your Office and Legislative Rule-Making.

Your cooperation in this regard is very much appreciated. If you have any questions or require additional information, please feel free to contact Roger T. Hall at 759-0515.

Sincerely yours,

David C. Callaghan
Commissioner

DCC:RTH:jrb

Attachment

EMERGENCY RULE

DIVISION OF ENVIRONMENTAL PROTECTION
WATER RESOURCES AND SOLID WASTE MANAGEMENT

SEWAGE SLUDGE MANAGEMENT RULE
47 CSR 38D

SUMMARY

The emergency rule amends existing 47 CSR 38D by making the definition of "Solid Waste" consistent with the definition in West Virginia Code 22-15. The existing rule is further amended by deleting Table 3 (Maximum Allowable Soil Concentrations) and any references to Table 3. The subject table sets standards which are more restrictive than natural concentrations in native soils, which in effect precludes the land application of sewage sludge for Publicly Owned Treatment Works (Sewage Treatment Plants). The standards were set without the benefit of adequate technical and scientific foundation, and were not intended by the Code and the existing rule to prohibit land application practices.

A number of "clean up" amendments are also made by the emergency rule.

APPENDIX B

FISCAL NOTE FOR PROPOSED RULES

Rule Title: Sewage Sludge Management Rule

Type of Rule: ____Legislative ____Interpretive ____Procedural

Agency X EMERGENCY Division of Environmental Protection

Address 10 McJunkin Road

Nitro, WV 25143

1. Effect of Proposed Rule

	ANNUAL		FISCAL YEAR		
	INCREASE	DECREASE	CURRENT	NEXT	THEREAFTER
ESTIMATED TOTAL COST	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-
PERSONAL SERVICES	-0-	-0-	-0-	-0-	-0-
CURRENT EXPENSE	-0-	-0-	-0-	-0-	-0-
REPAIRS & ALTERNATIONS	-0-	-0-	-0-	-0-	-0-
EQUIPMENT	-0-	-0-	-0-	-0-	-0-
OTHER	-0-	-0-	-0-	-0-	-0-

2. Explanation of above estimates:

The proposed emergency rule will not result in any increase or decrease in cost or revenue to the state.

3. Objectives of these rules:

The emergency rule will in effect amend existing 47CSR38D by making the definition of "Solid Waste" identical to the definition which appears at WV Code 22-15-2-(27) and deletes Table 3 (Maximum Allowable Soil Concentrations) and any reference to Table 3 from the existing rule.

Rule Title: Sewage Sludge Management Rule

4. Explanation of Overall Economic Impact of Proposed Rule.

A. Economic Impact on State Government.

None

B. Economic Impact on Political Subdivisions; Specific Industries; Specific groups of Citizens.

The emergency rule will remove an unachievable restriction on the land application of sewage sludge for Publicly Owned Treatment Works (Sewage Treatment Plants); thereby saving these facilities substantial costs of storage or landfilling which would eventually be passed on to the public.

C. Economic Impact on Citizens/Public at Large.

The emergency rule will reduce the cost of sewage sludge disposal to Publicly Owned Treatment Works (Sewage Treatment Plants) which would ultimately be passed on to the public.

Date: March 20, 1995

Signature of Agency Head or Authorized Reprensentative

Roger T. Hall

Roger T. Hall

DATE: March 20, 1995

FILED

TO: **LEGISLATIVE RULE-MAKING REVIEW COMMITTEE**

MAR 20 4 31 PM '95

FROM: Division of Environmental Protection

OFFICE OF WEST VIRGINIA SECRETARY OF STATE

EMERGENCY RULE TITLE: Sewage Sludge Management Rule

1. **Date of Filing** March 20, 1995

2. **Statutory authority for promulgating emergency rule:**

WV Code 22-1-3, 22-1-3a, 22-1A and 22-15-20(b)

3. **Date of filing of proposed legislative rule:** March 29, 1995

4. **Does the emergency rule adopt new language or does it amend or appeal a current legislative rule?**

The emergency rule amends a current legislative rule

5. **Has the same or similar emergency rule previously been filed and expired?**

No

6. **State, with particularity, those facts and circumstances which make the emergency rule necessary for the immediate preservation of public peace, health, safety or welfare.**

The existing rule (47 CSR 38D) imposes unachievable restrictions on Publicly Owned Treatment Works (sewage treatment plants) for disposal of sewage sludge. The cost to the sewage sludge treatment plant for storage or landfilling of sewage sludge is substantial and will ultimately be passed on to the public. The emergency rule will lift the restrictions on maximum allowable soil concentrations (Table 3) which were placed in the existing rule without sufficient technical or scientific foundation.

7. **If the emergency rule was promulgated in order to comply with a time limit established by the Code or federal statute or regulation, cite the Code provision, federal statute or regulation and time limit established therein.**

None

8. **State, with particularity, those facts and circumstances which make the emergency rule necessary to prevent substantial harm to the public interest.**

The emergency rule will in effect remove the unachievable restrictions on land application of sewage sludge found in Table 3 of the existing rule (47CSR38D). By removing the maximum allowable soil concentrations (Table 3) from the existing rule, sewage treatment plants can avoid the substantial cost of storing or landfilling sewage sludge. It is not in the best public interest to have this cost passed on the the public because of the overly-restrictive soil concentration limits which were placed in the existing rule without sound technical and scientific foundation.

TITLE 47
LEGISLATIVE RULES
DIVISION OF ENVIRONMENTAL PROTECTION
WATER RESOURCES AND SOLID WASTE MANAGEMENT

SERIES 38D
SEWAGE SLUDGE MANAGEMENT RULE

§47-38D-1. GENERAL.

1.1. Scope and Purpose. -- This legislative rule establishes requirements for the permitting siting, bonding, installation, establishment, construction, modification, and operation of any facility that generates, processes, recycles and/or disposes of sewage sludge by whatever means, including, but not limited to, land application, composting, incineration, mixed waste composting, or any other method of handling sewage sludge within the state. This rule applies to any person who owns or operates a sewage sludge facility or who is responsible for the processing or disposal of sewage sludge.

1.2. Authority. -- W. Va. Code ~~§20-5F-2b(b)~~ §22-1-3, §22-1-3a, 22-1A, and §22-15-20(b)

1.3. Filing Date. ---~~May 13, 1994~~.

1.4. Effective Date. -- ~~June 1, 1994.~~

1.5. Incorporation by Reference. -- Whenever federal or state statutes or regulations are incorporated into this rule by reference, the reference is to the statute or regulation in effect on the effective date of this rule.

§47-38D-2. DEFINITIONS.

The following definitions shall apply to this rule unless otherwise specified herein:

2.1. "Agronomic rate" means the whole sewage sludge application rate, by dry weight, designed: (1) To provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop or vegetation on the land; and (2) To minimize the amount of nitrogen in sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

2.2. "Applicant" means the person applying for a commercial solid waste facility permit or similar renewal permit and any person related to such person by virtue of common ownership, common management or family relationships as the Director of the Division may specify, including the following: spouses, parents, children and siblings.

2.3. "Approved solid waste facility" means a solid waste facility or practice which has a valid permit under W. Va. Code ~~§20-5F~~ §22-15.

2.4. "Backhauling" means the practice of using the same container to transport solid waste and to transport any substance or material used as food by humans, animals raised for human consumption or reusable item which may be refilled with any substance or material used as food by humans.

2.5. "Bulking Agent" means materials such as yard waste, wood chips, leaves and other living or dead plant tissues approved by the Chief as suitable to promote the passage of air through a static pile or windrow.

2.6. "Chief" means the Chief of the Office of Waste Management of the Division.

2.7. "Commercial recycler" means any person, corporation or business entity whose operation involves the mechanical separation of materials for the purpose of reselling or recycling at least seventy percent (70%) by weight of the materials coming into the commercial recycling facility.

2.8. "Commercial solid waste facility" means any solid waste facility which accepts solid waste generated by sources other than the owner or operator of the facility and shall not include an approved solid waste facility owned and operated by a person for the sole purpose of disposing of solid wastes created by that person or such person and other persons on a cost-sharing or nonprofit basis and shall not include land upon which reused or recycled materials are legitimately applied for structural fill, road base, mine reclamation and similar applications.

2.9. "Composting" means the aerobic, thermophilic decomposition of natural constituents of solid waste to produce a stable, humus-like material.

2.10. "Composting facility" means any solid waste facility processing solid waste by composting, including sludge composting, organic waste or yard waste composting, but does not include a facility for composting solid waste that is located at the site where the waste was generated.

2.11. "Curing area" means an area where organic material that has undergone the rapid initial stage of decomposition is further stabilized into a humus-like material.

2.12. "Director" means the Director of the Division.

2.13. "Distributor" is a person who prepares the product for distribution and marketing and is responsible for distributing and marketing the product.

2.14. "Division" means the Division of Environmental Protection.

2.15. "Domestic septage" means either liquid or solid material (septage) 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, 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.

2.16. "Energy recovery incinerator" means any solid waste facility at which solid waste is incinerated with the intention of using the resulting energy for the generation of steam, electricity or any other use not specified herein.

2.17. " Importer" means any person receiving sewage sludge from any source whatsoever for the purpose of processing .

2.18. "Incineration technologies" means any technology that uses controlled flame combustion to thermally break down solid waste, including refuse-derived fuel, to an ash residue that contains little or no combustible materials, regardless of whether the purpose is

processing, disposal, electric or steam generation or any other method by which solid waste is incinerated.

2.19. "Incinerator" means an enclosed device using controlled flame combustion to thermally break down solid waste, including refuse-derived fuel, to an ash residue that contains little or no combustible materials.

2.20. "Landfill" means any solid waste facility for the disposal of solid waste on land. Such facility is situated, for purposes of W. Va. Code ~~§20-5F~~ §22-15, in the county where the majority of the spatial area of such facility is located.

2.21. "Materials recovery facility" means any solid waste facility at which source-separated materials or materials recovered through a mixed waste processing facility are manually or mechanically shredded or separated for purposes of reuse and recycling, but does not include a composting facility.

2.22. "Mixed solid waste" means solid waste from which materials sought to be reused or recycled have not been source-separated from general solid waste.

2.23. "Mixed waste processing facility" means any solid waste facility at which materials are recovered from mixed solid waste through manual or mechanical means for purposes of reuse, recycling or composting.

2.24. "Municipal solid waste incineration" means the burning of any solid waste collected by any municipal or residential solid waste disposal company.

2.25. "Open dump" means any solid waste disposal which does not have a permit under W. Va. Code ~~§20-5F~~ §22-15, or is in violation of state law, or where solid waste is disposed in a manner that does not protect the environment.

2.26. "Person" or "persons" mean any industrial user, public or private corporation, institution, association, firm or company organized or existing under the laws of this or any other state or country; state of West Virginia; governmental agency, including federal facilities; political subdivision; county commission; municipal corporation; industry; sanitary district; public service district; drainage district; soil conservation district; watershed improvement district; partnership trust; estate; person or individual; group of persons or individuals acting individually or as a group; or any legal entity whatever.

2.27. "Producer" means any person producing sewage sludge at a publicly owned treatment works (POTW).

2.28. "Publicly owned treatment works" or "POTW" means any device or system used in the conveyance and/or treatment (including recycling and reclamation) of municipal sewage or industrial waste of a liquid nature which is owned by a state or municipality as defined by section 502 (4) of the Clean Water Act, any other treatment works treating domestic sewage (TWTDS), or wastewater treatment device or system, regardless of ownership (including federal facilities) used in the storage, treatment, recycling and reclamation of municipal or domestic sewage.

2.29. "Recycling facility" means any solid waste facility for the purpose of recycling at which neither land disposal nor biological, chemical or thermal transformation of solid waste occurs: Provided, That mixed waste recovery facilities, sludge processing facilities and composting facilities are not considered recycling facilities nor considered to be reusing or recycling solid waste within the meaning of W. Va. Code ~~§§20-9 and 11~~ §§22C-4 and 20-11.

2.30. "Representative sample" means a sample collected from a population or whole that exhibits the average or typical properties of the larger population or whole.

2.31. "Sewage sludge" means solid, semi-solid or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage, scum or solids removed in primary, secondary or advanced wastewater treatment processes and a material derived from sewage sludge. "Sewage sludge" does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator."

2.32. "Sewage sludge processing facility" is a solid waste facility that processes sewage sludge for land application, incineration or disposal at an approved landfill. Such processes include, but are not limited to, composting, lime stabilization, thermophilic digestion and anaerobic digestion.

2.33. "Sludge" means any solid, semisolid, residue or precipitate, separated from or created by a municipal, commercial or industrial waste treatment plant, water supply treatment plant or air pollution control facility or any other such waste having similar origin.

2.34. "Solid waste" means any garbage, paper, litter, refuse, cans, bottles, waste processed for the express purpose of incineration; sludge from a waste treatment plant, water supply treatment plant or air pollution control facility; and other discarded materials, including offensive or unsightly matter, solid, liquid, semisolid or contained liquid or gaseous material resulting from industrial, commercial, mining or community activities but does not include solid or dissolved material in sewage or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources and have permits under W. Va. Code ~~§20-5A~~ §22-11, or source, special nuclear or by-product material as defined by the Atomic Energy Act of 1949, as amended, including any nuclear or by-product material considered by federal standards to be below regulatory concern, or a hazardous waste either identified or listed under W. Va. Code ~~§20-5E~~ §22-18, or refuse, slurry, overburden or other wastes or material resulting from coal-fired electric power or steam generation, the exploration, development, production, storage and recovery of coal, oil, and gas and other mineral resources placed or disposed of at a facility which is regulated under W. Va. Code §§22-2, §22-3, §22-4, §22-6, §22-7, §22-8, §22-9, §22-10, §22A, §22C-2, §22C-7, §22C-8, and §22C-9 ~~22A, or 22B,~~ so long as such placement or disposal is in conformance with a permit issued pursuant to such provisions of this code. ~~chapters~~.

2.35 "Solid waste disposal" means the practice of disposing of solid waste including placing, depositing, dumping or throwing or causing to be placed, deposited, dumped or thrown any solid waste.

2.36. "Solid waste disposal shed" means the geographical area which the solid waste management board designates and files in the state register pursuant to W. Va. Code ~~§16-26-8~~ §22C-3-9.

2.37. "Solid waste facility" means any system, facility, land contiguous land, improvements on the land, structures or other appurtenances or methods used for processing, recycling or disposing of solid waste, including landfills, transfer stations, materials recovery facilities, mixed waste processing facilities, sewage sludge processing facilities, composting facilities and other such facilities not herein specified but not including land upon which sewage sludge is applied in accordance with W. Va. Code ~~§20-5F-2b~~ §22-15-20. Such facility shall be deemed to be situated, for purposes of this rule, in the county where the majority of the spatial area of such facility is located: Provided, That a salvage yard licensed and regulated pursuant to the terms of W. Va. Code §17-23, is not a solid waste facility.

2.38. "Source separated materials" means materials separated from general solid waste at the point of origin for the purpose of reuse and recycling but does not mean sewage sludge.

2.39. "Source separated organic waste" means readily degradable organic material such as food waste, yard waste and wood waste, except pressure-treated wood waste, which is collected separately from the mixed solid waste stream. It does not include sewage sludge or domestic septage.

2.40. "Stabilization" means the decomposition .of organic material to the point where it neither reheats when wetted nor gives off offensive odors and does not include pathogens, toxins or vectors in excess of Federal regulations 40 CFR 503.

§47-38D-3. STANDARDS FOR USE, DISPOSAL AND PROCESSING OF SEWAGE SLUDGE.

3.1. Incorporation of Federal Regulations. -- Federal regulations 40 CFR 503, excluding sections 503.10(b)(1) and 503.20 through 503.29 inclusive, in effect on the effective date this rule, are hereby fully incorporated and implemented as a part of these sewage sludge management regulations promulgated under the authority of W. Va. Code ~~§20-5F-2b~~ §22-15-20. Provided, That in instances where similar provisions exist, the more stringent requirements (state or federal) shall apply.

3.2. Sewage Sludge Land Application Siting Restrictions and Location Standards

3.2.1 Sludge will not be applied to land that meets any of the following conditions:

3.2.1.a. Land that is frozen, snow-covered, or known to be flooded on a regular basis unless the applicant can demonstrate to the Director that the land application will not cause runoff into streams or wetlands.

3.2.1.b. Land within 50 feet of surface water to include streams, springs, ponds, wetlands, or other collection points for surface water.

3.2.1.c. Land within 200 feet of drinking water supply wells or other personal water supply.

3.2.1.d. Land within 200 feet of an occupied dwelling.

3.2.1.e. Land within 50 feet of a federal or state highway.

3.2.1.f. Land within 100 feet of an adjacent property owner's property line.

3.2.1.g. Land from which drainage leads into a sinkhole.

3.2.1.h. Land that has been tested and determined to have a pH of less than 6.2, unless the pH is adjusted to 6.2 or greater.

3.2.1.i. Land that has a slope greater than 15%.

3.2.1.j. Land that has a seasonal high groundwater table less than 2 feet from the surface.

3.2.1.k. Land that has less than 6 inches of soil over bedrock or an impervious pan.

3.2.1.l. Land containing soil with surface permeability of less than 0.6 inches/hour or greater than 6 inches/hour.

3.2.2. No person or entity shall be allowed to apply sewage sludge to land in a manner that will result in exceeding the maximum soil concentration for arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc. ~~as listed in Table 3 of this rule and the soil testing requirements of this rule.~~

3.2.2.a. The director shall assign an individual and lifetime loading rate for each land application site by considering background soil concentrations, ~~and~~ maximum allowable pollutant concentrations as per Table 1 ~~and per Table 3~~ of this rule, and cumulative loading rates as per Federal Regulations 40 CFR Part 503, Sections 503.13.a2i and 503.13.b2 except as provided for in 3.2.2.b.

3.2.2.b. If circumstances at sewage sludge processing facilities result in short term excursions of Table 1 criteria, the Director may develop temporary loading rates, for a period not to exceed six months, based on the provisional limitations of Table 2 of this rule.

3.2.3. No land, except a solid waste facility, shall be allowed to accept or store so much sewage sludge as to exceed the agronomic rate or a rate of fifteen dry ton per acre per year, whichever is less: Provided, That up to twenty-five dry tons per acre per year may be applied in the reclamation of surface mine land.

3.2.4. No person shall be allowed to store sewage sludge at a land application site for a period longer than one week; except, storage shall be allowed for no longer than three months where provisions, approved by the Chief of the Office of Water Resources of the Division, have been made to prevent leachate runoff into surface or groundwater. Septage storage shall only be allowed in-tank and for no more than three days, or as otherwise authorized by the Chief of the Office of Water Resources of the Division.

3.2.5. No person shall be allowed to land apply sludge except during the hours of daylight.

3.3. Sewage Sludge Processing Facility Operational and Design Requirements.

3.3.1. Sewage sludge processing facilities must adhere to the following requirements:

3.3.1.a. Areas used for processing, curing and storage of raw materials, intermediate and final products, loading and unloading areas, impoundments, pipelines, ditches, pumps and drums, sumps and tanks, must be designed, constructed and operated to prevent release of contaminants to the groundwater and surface water. Storage of finished products from the facility shall be limited to one year.

3.3.1.b. The facility must be designed and operated to control vectors and odors.

3.3.1.c. The facility must not be operated or constructed within the one hundred year flood plain unless provisions have been made to prevent the encroachment of flood waters upon the facility.

3.3.1.d. All land areas within the boundaries of a sewage sludge processing facility upon which sewage sludge, intermediate or final products come in direct contact with the land surface must be protected in accordance with the Groundwater Protection Act, W. Va. Code ~~§20-5M~~ §22-12 and the rules promulgated thereunder.

3.4. Leachate Management Requirements.

3.4.1. Any liquid which comes in contact with sewage sludge at a sewage sludge processing facility must be handled as leachate and is subject to the requirements of W. Va. Code ~~§§20-5A and 5M~~ §§22-11 and 12, and the rules promulgated thereunder.

3.5. Storm Water Requirements.

3.5.1. Storm water drainage must be directed around and away from the operating area. All storm water must be collected and discharged in compliance with State Water Quality Standards and the permit issued by the Office of Water Resources of the Division.

3.6. Landfill Disposal of Sewage Sludge. -- Sewage sludge disposed at a landfill shall contain at least twenty percent (20%) solids by weight. This requirement may be met by adding or blending sand, sawdust, lime, or soil. Alternative sludge disposal methods can be utilized upon obtaining prior written approval from the Chief.

3.6.1. Sewage sludge may not represent more than twenty-five percent (25%) by weight of the total weight of waste disposed of at the landfill on any working day.

§47-38D-4. PERMITS REQUIRED.

4.1. Applicability.

4.1.1. No person may construct or operate a sewage sludge processing facility (including mixed waste composting facilities which utilize sewage sludge) or a commercial solid waste facility which processes or handles sewage sludge or materials derived from sewage sludge without first obtaining a solid waste facility permit; Provided, That land upon which sewage sludge is applied is not a solid waste facility.

4.1.2. On and after the effective date of this rule, all permitted facilities shall submit an application to modify such permit.

4.1.3. No person may land apply sewage sludge without first obtaining a land application permit; provided, That land application permit requirements may be incorporated into a modification of a facility's WV/NPDES permit required under W. Va. Code ~~§20-5A~~ §22-11.

4.1.4. For those publicly owned treatment works (POTW's) which produce sewage sludge and are regulated by the Division pursuant to an WV/NPDES permit required under W. Va. Code ~~§20-5A~~ §22-11 a sewage sludge processing facility modification will be obtained by the applicant as a part of the existing WV/NPDES permit and shall include a sewage sludge management plan approved by the Chief of the Office of Water Resources of the Division.

4.1.5. Facilities which are surface disposal sites as defined in 40 CFR 503, Subpart C, are hereby defined as "landfills" and must meet all requirements of 47 CSR 38 applicable to landfills.

4.1.6. Permits issued under paragraph 4.1.1 of this rule, shall be subject to the provisions of 47 CSR 38, section 3 (excluding the provisions for Liner Requirements) and the closure requirements of 47 CSR 38, section 6.

4.1.7. Permits issued under paragraph 4.1.4. of this rule, shall be subject to the permit issuance procedures, procedures for permit modifications, suspension and revocation, procedures for transfer of permits, and the procedures for permit appeals of ~~46 CSR 2~~ 47 CSR 10 and are not subject to the procedures outlined in 4.1.5, 4.1.6. and 4.1.8 of this rule.

4.1.8. Permits issued under paragraph 4.1.5, of this rule, shall be subject to the procedures of 47 CSR 38 section 3 and the closure requirements of 47 CSR 38 section 6.

4.1.9 Permits issued under paragraph 4.1.3 of this rule except for land application modifications made in WV/NPDES permits under paragraph 4.1.4 of this rule shall be subject to the permit issuance procedures (subsections 3.17 through 3.29 inclusive) of 47 CSR 38 and are not subject to the procedures outlined in paragraphs 4.1.5, 4.1.6 and 4.1.8 of this rule.

4.2. General, Processing Facility, and Land Application Permit Requirements -- Persons required to obtain a permit pursuant to this rule must provide the following information, in the form and manner prescribed by the Chief of the Office of Waste Management or the Office of Water Resources of the Division as appropriate. The form may require information in addition to that required by this subsection.

4.2.1. Permit Application General Requirements -- All applicants must provide the following information:

4.2.1.a. The name, address, and location of the facility;

4.2.1.b. A description of the activities conducted or to be conducted by the applicant;

4.2.1.c. The operator's and owner's name, address, telephone number, ownership status, and status as a federal, state, private, public or other entity;

4.2.1.d. Other environmental permits issued by any local,state or federal agency;

4.2.1.e. A description of the specific source(s) of sewage sludge;

4.2.1.f. The amount of sewage sludge actually generated or imported;

4.2.1.g. The content of heavy metals, pathogens, toxins or vectors and moisture (percent solids) present in the sewage sludge;

4.2.1.h. Each location that the sewage sludge is stored, land applied or otherwise disposed of; the amount so stored, land applied or otherwise disposed of; and the capacity of that location to accept sewage sludge;

4.2.1.i. Information relative to the quality of the sewage sludge(s) or product(s) derived from sewage sludge as required by 40 CFR 503, and

4.2.1.j. A detailed design and a description of the method to collect and control leachate and surface water runoff, including the method for treatment and disposal of leachate generated.

4.2.2. Sewage Sludge Processing Facility Permit Requirements.--All applicants for permits for sewage sludge processing facilities, except facilities located at the site where sewage sludge is generated, must submit the following additional information:

4.2.2.a. An engineering report to construct must contain, at a minimum, the following:

4.2.2.a.A. A regional map, or maps, (of appropriate scale) that delineate the entire service area of the proposed facility (both existing and proposed); existing and proposed collection, processing, and disposal operations; the location of the closest population centers; and the transportation systems including highways, airports, railways and waterways;

4.2.2.a.B. A vicinity map (minimum scale of 1"=2000') that delineates the area within one mile of the facility boundaries, zoning and land use, residences, surface waters, access roads, bridges, railroads, airports, historic sites, and other existing and proposed man-made or natural features relating to the project;

4.2.2.a.C. A site plan (minimum scale of 1"=200' with five foot contour intervals) that delineates property boundaries, the location of existing and proposed soil boring, monitoring wells, buildings and appurtenances, fences, gates, roads, parking areas, drainage, culverts, storage facilities or areas, loading areas; existing and proposed elevation contours and direction of prevailing winds; and the location of residences, potable wells, surface water bodies, and drainage swales located within the site and in the site plan area; and

4.2.2.a.D. A map indicating wetlands and flood plains within 1,000 feet of the site, if any.

4.2.2.b. A description of the operation of the facility, detailed engineering plans and specifications for the entire facility, must be submitted by the applicant including at a minimum:

4.2.2.b.A. A schedule of operation, including the days and hours that the facility will be open, preparations before opening, and procedures followed after closing for the day;

4.2.2.b.B. Anticipated daily traffic flow to and from the facility, including the number of trips by private or public collection vehicles, and the quantity of material contained in each vehicle;

4.2.2.b.C. The procedure for unloading trucks (including frequency, rate, and method);

4.2.2.b.D. Special precautions or procedures for operation during wind, heavy rain, snow, and freezing conditions;

4.2.2.b.E. A description of the ultimate use for the finished compost or other product, method for removal from the site, and a plan for use or disposal of those finished products that cannot be used in the expected manner due to poor quality or change in market conditions;

4.2.2.b.F. A (description) copy of the label or other information source, by the distributor, that outlines the type of waste the compost product was derived from, a list of any restrictions on use, and recommended safe uses and application rates;

4.2.2.b.G. Identification of the personnel required to operate and maintain the facility and their job descriptions/responsibilities;

4.2.2.b.H. A detailed description of the source, and anticipated quality, and quantity of any bulking agent to be used in the process; and

4.2.2.b.I. A detailed description of the quantity, quality and specific source of the sewage sludge received or anticipated to be received.

4.2.2.c. The permit application must contain an operating engineering report which must include, at a minimum, the following:

4.2.2.c.A. Detailed engineering plans and specifications for the entire sewage sludge processing facility, including manufacturer's performance data for the selected equipment;

4.2.2.c.B. Contingency plans detailing corrective (or remedial) action to be taken in the event of equipment breakdown; air pollution (odors); unacceptable waste delivered to the facility; groundwater contamination; spills; and undesirable conditions such as fires, dust, noise, vectors, lack of a market for the compost product and unusual traffic conditions; and

4.2.2.c.C. An Operation and Maintenance manual.--The manual must contain general design information, detailed operational information and instructions. In addition, the manual must list the specific procedures used or to be used in monitoring, sampling and analyzing sewage sludge and the finished product, and record keeping requirements.

4.2.2.d. A description of the design of the facility, including:

4.2.2.d.A. The type, size, and associated detention times of equipment used in the handling, processing, and storage of sewage sludge;

4.2.2.d.B. The method of measuring, shredding, mixing, and proportioning input materials;

4.2.2.d.C. A description and sizing of the storage facilities for amendment, bulking agent, and finished product;

4.2.2.d.D. The separation, processing, storage, and ultimate disposal of materials that cannot be composted, if applicable;

4.2.2.d.E. The location of all temperature and any other type of monitoring points, and the frequency of monitoring;

4.2.2.d.F. A process flow diagram of the entire process, including all major equipment and flow streams. The flow streams must indicate the quantity of material on a wet weight, dry weight, and volumetric basis;

4.2.2.d.G. The aeration capacity of the system;

4.2.2.d.H. The method of supplying and regulating airflow;

4.2.2.d.I. The expected mass balance through the composting system;

4.2.2.d.J. A description of how the (temperature) monitoring equipment will ensure that facility qualifies as a process to further reduce pathogens, toxins, heavy metals and/or vectors; and

4.2.2.d.K. If applicable, a description of the air emission collection and control technologies.

4.2.3. Land Application Permit Requirement.--Persons performing land application of sewage sludge or materials derived from sewage sludge must submit the following information to the Chief of the Office of Water Resources of the Division in addition to that required under section 4.2.1. of this rule

4.2.3.a. Soil analysis for all land application sites including but not limited to pH, potassium, phosphorus, nitrogen, all metals listed in Table 1 of this rule and any additional chemical analysis required by the Director;

4.2.3.b. Information relative to the nitrogen content of the sludge(s) or product(s) derived from sewage sludge to be land applied;

4.2.3.c. A soils map with application sites clearly defined;

4.2.3.d. An agreement between the preparer of sewage sludge(s) or material(s) derived from sewage sludge, the applier, and the owner of the land application site indicating each party's concurrence with the application, and certifying that each will comply with applicable requirements of 40 CFR 503 and this rule;

4.2.3.e. A description of existing and future uses of the land application site;

4.2.3.f. Information relative to past application(s) of sewage sludge or material(s) derived from sewage sludge as necessary to comply with 40 CFR 503.12 and this rule;

4.2.3.g. Information relative to past fertilizer applications to the site;

4.2.3.h. In addition to the chemical analyses required in paragraph 4.2.1 of this rule, any additional chemical analyses of sewage sludge(s) or material(s) derived from sewage sludge, requested by the Chief of the Office of Water Resources of the Division, including, but not limited to sodium, chloride, fluoride, calcium and sulfates;

4.2.3.i. A description of the methods to be used for land application;

4.2.3.j. A description of the methods for transportation of sludge to the site;

4.2.3.k. For sewage sludge or material derived from sewage sludge, which has been imported, a copy of the POTW's NPDES permit;

4.2.3.l. For sewage sludge or material derived from sewage sludge, which has been imported, information relative to the significant industrial users of the POTW from which the sludge or material originated;

4.2.3.m. For sewage sludge or material derived from sewage sludge, which has been imported, a description of the methods by which pathogen control and vector attraction reduction are being achieved; and

4.2.3.n. A description of the methods to be utilized to adjust and maintain the soil to a minimum pH of 6.2 for at least 5 years from the date of application.

§47-38D-5. GENERAL, PROCESSING FACILITY, AND LAND APPLICATION PERMIT REQUIREMENTS.

5.1. Permit General Requirements.-- All permits issued pursuant to this rule shall contain the following:

5.1.1. Any requirement of 40 CFR 503, including but not limited to:

5.1.1.a. Limitations on the concentrations of pollutants (heavy metals), toxins, vectors and pathogens in the sewage sludge or sewage sludge products;

5.1.1.b. Requirements relative to monitoring sewage sludge and sewage sludge product quality and reporting the results of those analyses for pH, percent solids, organic nitrogen, potassium, phosphorus, calcium, magnesium, total nitrogen, ammonia nitrogen, pathogen test results, vector attraction verification; and all heavy metals listed in Table 1 of this rule except that the frequency of monitoring shall be as described in Appendix A of this rule ;

5.1.1.c. Requirements relative to reporting and certification;

5.1.1.d. Requirement to pay fees as identified in section 6 of this rule;

5.1.1.e. Requirements for the proper collection, control and disposal of leachate and stormwater runoff for the protection of ground and surface waters;

5.1.1.f. Requirements to retain records for the facility for a minimum of five years;

5.1.1.g. Requirements to monitor and report monthly to the Division the quantity of sewage sludge produced or imported and the specific source of the sewage sludge produced or imported;

5.1.1.h. Requirements not to exceed a commercial solid waste facility's tonnage limits, where applicable;

5.1.1.i. Requirements to provide copies of monthly reports to the county or regional solid waste authority in which the facility or land application site(s) is located;

5.1.1.j. Any other requirements, including additional monitoring, determined to be necessary by the Director to insure compliance with state and federal regulations;

5.2. Processing Facility Permit Requirements.-- In addition to the requirements of subsection 5.1. of this rule, any solid waste facility permit issued to a sewage sludge processing facility, pursuant to the sewage sludge regulations, must contain the following:

5.2.1. Operational requirements relative to pathogen control in accordance with 40 CFR 503.32 and its Appendix B;

5.2.2. Operational requirements relative to vector attraction reduction in accordance with 40 CFR 503.33;

5.2.3. Requirements to routinely monitor and report information relative to the quality of raw materials used in the sewage sludge processing facility including but not limited to: sewage sludge, bulking agents, and kiln dust; except that the frequency of monitoring shall be as described in Appendix A of this rule;

5.2.4. Limitations for the pollutant concentrations of the end product of the sewage sludge processing facility;

5.2.5. Labeling requirements as per 40 CFR 503.14.e., if applicable;

5.2.6. Requirements for the implementation of practices to prevent the contamination of ground and surface waters, including liners if necessary; and

5.2.7. For commercial sewage sludge processing facilities, requirements for reporting in accordance with subsection 4.12 of the Solid Waste Management Regulations (47 CSR.38);

5.3. Land Application Permit Requirements.-- In addition to the requirements of subsection 5.1 of this rule, any land application permit issued pursuant to the sewage sludge regulations shall contain the following:

5.3.1. Requirements delineating the sites for which land application is approved;

5.3.2. Limitations on the maximum amount of sewage sludge allowed to be land applied;

5.3.3. Requirements implementing the siting restrictions and location standards of subsection 3.2 of this rule;

5.3.4. Requirements limiting the types of crops that may be grown on land used for application of sewage sludge and the time between application of sewage sludge and the harvesting of crops, in accordance with 40 CFR 503.32(b);

5.3.5. Restrictions on animal grazing and public access, in accordance with 40 CFR 503.32(b); ~~and~~

5.3.6. Applicable vector attraction reduction requirements of 40 CFR 503.33; and

5.3.7. Applicable pathogen reduction requirements of 40 CFR 503.32 and its Appendex B.

§47-38D-6. FEE AND BONDING REQUIREMENTS

6.1. Applicability.-- Any producer or importer of sewage sludge for land application shall be subject to non-refundable fees, as described herein, which shall be used to cover the costs of the sewage sludge management program. The fees established herein in paragraphs 6.4.1 and 6.4.2 of this rule shall be assessed on forms prescribed by the Chief of the Office of Water Resources of the Division and shall be paid to said chief quarterly.

6.2. Water Quality Management Fund.-- Fees collected for land application shall be deposited in the special revenue fund designated the "Water Quality Management Fund" established under the provisions of W.Va. Code ~~§ 20-5A-6a~~ §22-11-10 except as otherwise specified herein.

6.3. Bonding.-- The Director may require a surety bond, deposit or similar instrument in an amount sufficient to cover the cost of future environmental remediation from producers and importers of sewage.

6.4. Fee Assessments.

6.4.1. Producers and importers of sewage sludge or material derived from sewage sludge for land application shall be assessed a sewage sludge management program fee calculated as $5.00 per actual ton of sludge times the proportion of solids in the sludge for sludge with maximum metals concentrations not exceeding those listed in Table 1 of this rule.

6.4.2. All sewage sludge placed in, or upon, or used by a solid waste facility or processed or handled, pursuant to a permit issued by the Division, shall be subject to the same tipping and other fees as levied on the disposal of solid waste under W. Va. code ~~§ 20~~ §22; Provided, That no such fees, excepting assessment fees required by this section, shall be levied upon the application of sewage sludge to land outside a solid waste facility in accordance with the statute and this rule.

6.4.3. Fees generated pursuant to paragraph 6.4.1 shall be reviewed periodically by the Director and shall be adjusted as necessary to assure that total collections shall not exceed $200,000 per year.

APPENDIX A

FREQUENCY OF MONITORING

AMOUNT OF SEWAGE SLUDGE RECEIVED (actual dry tons per 365 day period)	FREQUENCY OF MONITORING
Greater than zero but less than 290	once every 6 months
Equal to or greater than 290 but less than 1,500	once per quarter (4 times per year)
Equal to or greater than 1,500 but less 15,000	once per month (12 times per year)
Equal to or greater than 15,000	once per week

TABLE 1

MAXIMUM CONCENTRATION OF METALS IN SEWAGE SLUDGE FOR LAND APPLICATION

Metal	Concentration (mg/kg)
Arsenic	41
Cadmium	10
Chromium	1000
Copper	1000
Lead	250
Mercury	10
Molybdenum	18
Nickel	200
Selenium	36
Zinc	2500

TABLE 2

PROVISIONAL MAXIMUM CONCENTRATION OF METALS IN SEWAGE SLUDGE FOR PRODUCERS NOT MEETING TABLE 1 CRITERIA

Metal	Concentration (mg/kg)
Arsenic	75
Cadmium	85
Chromium	3000
Copper	4300
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7500

~~TABLE 3~~

~~MAXIMUM ALLOWABLE SOIL CONCENTRATIONS~~

~~Metal~~	~~Concentration (mg/kg)~~
~~Arsenic~~	~~5.7~~
~~Cadmium~~	~~1.4~~
~~Chromium~~	~~140.0~~
~~Copper~~	~~140.0~~
~~Lead~~	~~35.0~~
~~Mercury~~	~~2.0~~
~~Molybdenum~~	~~2.5~~
~~Nickel~~	~~28.0~~
~~Selenium~~	~~5.0~~
~~Zinc~~	~~350.0~~

EMERGENFCY RULE
47 CSR-38D

RULEMAKING FINDINGS REQUIRED OF THE DIVISION OF ENVIRONMENTAL PROTECTION

1. INCORPORATION BY REFERENCE - FEDERAL REGULATION

Subsection 3.1 of the existing rule and the emergency rule incorporates federal regulations 40 CFR 503, excluding sections 503.10(b)(1) and 503.20 through 503.29 inclusive. These federal regulations give general guidance to states which have been delegated authority under the Federal Clean Water Act.

2. STATEMENT OF STRINGENCY - FEDERAL COUNTERPART REGULATION

In addition to the federal counterpart regulations, described in Item No. 1 above, this emergency rule incorporates by reference 40 CFR 503.13(a)(2) and 503.13(b)(2) [attached]. Although the emergency rules does not incorporate the federal counterpart regulation verbatim, it does capture the essence of the federal regulation including the values in the referenced tables. Therefore, the emergency rule is no more stringent nor less stringent than the federal counterpart regulation as it relates to Table 3.

3. AFFECT ON PRIVATE PROPERTY RIGHTS

The emergency rule has no affect on the rights of private property owners, except to authorize the use of sewage sludge on land for soil enrichment purposes.

ative pollutant loading rates
b)(2) has been reached.
person shall apply domestic
agricultural land, forest, or
tion site during a 365 day pe-
annual application rate in
as been reached during that

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nd, forest, a public contact
clamation site shall provide
who applies the bulk sewage
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of total nitrogen (as N on a
basis) in the bulk sewage

person who applies sewage
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in this subpart.
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sewage sludge subject to
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sewage sludge subject to
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20, 1993, and the cumu-
of each pollutant ap-
ite in the bulk sewage

sludge since that date is not known, an additional amount of each pollutant shall not be applied to the site in accordance with §503.13(a)(2)(i).

(f) When a person who prepares bulk sewage sludge provides the bulk sewage sludge to a person who applies the bulk sewage sludge to the land, the person who prepares the bulk sewage sludge shall provide the person who applies the sewage sludge notice and necessary information to comply with the requirements in this subpart.

(g) When a person who prepares sewage sludge provides the sewage sludge to another person who prepares the sewage sludge, the person who provides the sewage sludge shall provide the person who receives the sewage sludge notice and necessary information to comply with the requirements in this subpart.

(h) The person who applies bulk sewage sludge to the land shall provide the owner or lease holder of the land on which the bulk sewage sludge is applied notice and necessary information to comply with the requirements in this subpart.

(i) Any person who prepares bulk sewage sludge that is applied to land in a State other than the State in which the bulk sewage sludge is prepared shall provide written notice, prior to the initial application of bulk sewage sludge to the land application site by the applier, to the permitting authority for the State in which the bulk sewage sludge is proposed to be applied. The notice shall include:

(1) The location, by either street address or latitude and longitude, of each land application site.

(2) The approximate time period bulk sewage sludge will be applied to the site.

(3) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) for the person who prepares the bulk sewage sludge.

(4) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) for the person who will apply the bulk sewage sludge.

(j) Any person who applies bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) to the land shall provide written notice, prior to the initial application of bulk sewage sludge to a land application site by the applier, to the permitting authority for the State in which the bulk sewage sludge will be applied and the permitting authority shall retain and provide access to the notice. The notice shall include:

(1) The location, by either street address or latitude and longitude, of the land application site.

(2) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) of the person who will apply the bulk sewage sludge.

§503.13 Pollutant limits.

(a) Sewage sludge. (1) Bulk sewage sludge or sewage sludge sold or given away in a bag or other container shall not be applied to the land if the concentration of any pollutant in the sewage sludge exceeds the ceiling concentration for the pollutant in Table 1 of §503.13.

(2) If bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site, either:

(i) The cumulative loading rate for each pollutant shall not exceed the cumulative pollutant loading rate for the pollutant in Table 2 of §503.13; or

(ii) The concentration of each pollutant in the sewage sludge shall not exceed the concentration for the pollutant in Table 3 of §503.13.

(3) If bulk sewage sludge is applied to a lawn or a home garden, the concentration of each pollutant in the sewage sludge shall not exceed the concentration for the pollutant in Table 3 of §503.13.

(4) If sewage sludge is sold or given away in a bag or other container for application to the land, either:

(i) The concentration of each pollutant in the sewage sludge shall not exceed the concentration for the pollutant in Table 3 of §503.13; or

(ii) The product of the concentration of each pollutant in the sewage sludge and the annual whole sludge application rate for the sewage sludge shall not cause the annual pollutant loading rate for the pollutant in Table 4 of §503.13 to be exceeded. The procedure used to determine the annual whole

sludge application rate is presented in appendix A of this part.

(b) Pollutant concentrations and loading rates—sewage sludge.

(1) Ceiling concentrations.

TABLE 1 OF § 503.13.—CEILING CONCENTRATIONS

Pollutant	Ceiling concentration (milligrams per kilogram)[1]
Arsenic	75
Cadmium	85
Chromium	3000
Copper	4300
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7500

[1] Dry weight basis.

(2) Cumulative pollutant loading rates.

TABLE 2 OF § 503.13.—CUMULATIVE POLLUTANT LOADING RATES

Pollutant	Cumulative pollutant loading rate (kilograms per hectare)
Arsenic	41
Cadmium	39
Chromium	3000
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	100
Zinc	2800

(3) Pollutant concentrations.

TABLE 3 OF § 503.13.—POLLUTANT CONCENTRATIONS

Pollutant	Monthly average concentrations (milligrams per kilogram)[1]
Arsenic	41
Cadmium	39
Chromium	1200
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	36
Zinc	2800

[1] Dry weight basis.

(4) Annual pollutant loading rates.

TABLE 4 OF § 503.13.—ANNUAL POLLUTANT LOADING RATES

Pollutant	Annual pollutant loading rate (kilograms per hectare per 365 day period)
Arsenic	2.0
Cadmium	1.9
Chromium	150
Copper	75
Lead	15
Mercury	0.85
Nickel	21
Selenium	5.0
Zinc	140

(c) 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 (1).

$$AAR = \frac{N}{0.0026} \quad \text{Eq. (1)}$$

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.

[58 FR 9387, Feb. 19, 1993, as amended at 58 FR 9099, Feb. 25, 1994]

§ 503.14 Management practices.

(a) Bulk sewage sludge shall not be applied to the land if it is likely to adversely affect a threatened or endangered species listed under section 4 of the Endangered Species Act or its designated critical habitat.

(b) Bulk sewage sludge shall not be applied to agricultural land, forest, a public contact site, or a reclamation site that is flooded, frozen, or snow-covered so that the bulk sewage sludge enters a wetland or other waters of the United States, as defined in 40 CFR 122.2, except as provided in a permit issued pursuant to section 402 or 404 of the CWA.

(c) Bulk sewage sludge shall not be applied to agricultural land, forest, or a reclamation site that is 10 meters or less from waters of the United States, as defined in 40 CFR 122.2, unless other-

§503.1 Purpose and applicability.

(a) Purpose.

(1) This part establishes standards, which consist of general requirements, pollutant limits, management practices, and operational standards, for the final use or disposal of sewage sludge generated during the treatment of domestic sewage in a treatment works. Standards are included in this part for sewage sludge applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator. Also included in this part are pathogen and alternative vector attraction reduction requirements for sewage sludge applied to the land or placed on a surface disposal site.

(2) In addition, the standards in this part include the frequency of monitoring and recordkeeping requirements when sewage sludge is applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator. Also included in this part are reporting requirements for Class I sludge management facilities, publicly owned treatment works (POTWs) with a design flow rate equal to or greater than one million gallons per day, and POTWs that serve 10,000 people or more.

(b) Applicability.

(1) This part applies to any person who prepares sewage sludge, applies sewage sludge to the land, or fires sewage sludge in a sewage sludge incinerator and to the owner/operator of a surface disposal site.

(2) This part applies to sewage sludge applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator.

(3) This part applies to the exit gas from a sewage sludge incinerator stack.

(4) This part applies to land where sewage sludge is applied, to a surface disposal site, and to a sewage sludge incinerator.

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§503.2 Compliance period.

(a) Compliance with the standards in this part shall be achieved as expeditiously as practicable, but in no case later than February 19, 1994. When compliance with the standards requires construction of new pollution control facilities, compliance with the standards shall be achieved as expeditiously as practicable, but in no case later than February 19, 1995.

(b) The requirements for frequency of monitoring, recordkeeping, and reporting in this part for total hydrocarbons in the exit gas from a sewage sludge incinerator are effective February 19, 1994 or, if compliance with the operational standard for total hydrocarbons in this part requires the construction of new pollution control facilities, February 19, 1995.

(c) All other requirements for frequency of monitoring, recordkeeping, and reporting in this part are effective on July 20, 1993.

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§503.3 Permits and direct enforceability.

(a) Permits. The requirements in this part may be implemented through a permit:

(1) Issued to a "treatment works treating domestic sewage", as defined in 40 CFR 122.2, in accordance with 40 CFR parts 122 and 124 by EPA or by a State that has a State sludge management program approved by EPA in accordance with 40 CFR part 123 or 40 CFR part 501 or

(2) Issued under subtitle C of the Solid Waste Disposal Act; part C of the Safe Drinking Water Act; the Marine Protection, Research, and Sanctuaries Act of 1972; or the Clean Air Act. "Treatment works treating domestic sewage" shall submit a permit application in accordance with either 40 CFR 122.21 or an approved State program.

(b) Direct enforceability. No person shall use or dispose of sewage sludge through any practice for which requirements are established in this part except in accordance with such requirements.

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§503.4 Relationship to other regulations.

Disposal of sewage sludge in a municipal solid waste landfill unit, as defined in 40 CFR 258.2, that complies with the requirements in 40 CFR part 258 constitutes compliance with section 405(d) of the CWA. Any person who prepares sewage sludge that is disposed in a municipal solid waste landfill unit shall ensure that the sewage sludge meets the requirements in 40 CFR part 258 concerning the quality of materials disposed in a municipal solid waste landfill unit.

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§503.5 Additional or more stringent requirements.

(a) On a case-by-case basis, the permitting authority may impose requirements for the use or disposal of sewage sludge in

addition to or more stringent than the requirements in this part when necessary to protect public health and the environment from any adverse effect of a pollutant in the sewage sludge.

(b) Nothing in this part precludes a State or political subdivision thereof or interstate agency from imposing requirements for the use or disposal of sewage sludge more stringent than the requirements in this part or from imposing additional requirements for the use or disposal of sewage sludge.

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§503.6 Exclusions.

(a) Treatment processes. This part does not establish requirements for processes used to treat domestic sewage or for processes used to treat sewage sludge prior to final use or disposal, except as provided in §503.32 and §503.33.

(b) Selection of a use or disposal practice. This part does not require the selection of a sewage sludge use or disposal practice. The determination of the manner in which sewage sludge is used or disposed is a local determination.

(c) Co-firing of sewage sludge. This part does not establish requirements for sewage sludge co-fired in an incinerator with other wastes or for the incinerator in which sewage sludge and other wastes are co-fired. Other wastes do not include auxiliary fuel, as defined in 40 CFR 503.41(b), fired in a sewage sludge incinerator.

(d) Sludge generated at an industrial facility. This part does not establish requirements for the use or disposal of sludge generated at an industrial facility during the treatment of industrial wastewater, including sewage sludge generated during the treatment of industrial wastewater combined with domestic sewage.

(e) Hazardous sewage sludge. This part does not establish requirements for the use or disposal of sewage sludge determined to be hazardous in accordance with 40 CFR part 261.

(f) Sewage sludge with high PCB concentration. This part does not establish requirements for the use or disposal of sewage sludge with a concentration of polychlorinated biphenyls (PCBs) equal to or greater than 50 milligrams per kilogram of total solids (dry weight basis).

(g) Incinerator ash. This part does not establish requirements for the use or disposal of ash generated during the firing of sewage sludge in a sewage sludge incinerator.

(h) Grit and screenings. This part does not establish

requirements for the use or disposal of grit (e.g., sand, gravel, cinders, or other materials with a high specific gravity) or screenings (e.g., relatively large materials such as rags) generated during preliminary treatment of domestic sewage in a treatment works.

(i) Drinking water treatment sludge. This part does not establish requirements for the use or disposal of sludge generated during the treatment of either surface water or ground water used for drinking water.

(j) Commercial and industrial septage. This part does not establish requirements for the use or disposal of commercial septage, industrial septage, a mixture of domestic septage and commercial septage, or a mixture of domestic septage and industrial septage.

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§503.7 Requirement for a person who prepares sewage sludge.

Any person who prepares sewage sludge shall ensure that the applicable requirements in this part are met when the sewage sludge is applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator.

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§503.8 Sampling and analysis

(a) Sampling. Representative samples of sewage sludge that is applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator shall be collected and analyzed.

(b) Methods. The materials listed below are incorporated by reference in this part. These incorporations by reference were approved by the Director of the Federal Register in accordance with 5 USC 552(a) and 1 CFR part 51. The materials are incorporated as they exist on the date of approval, and notice of any change in these materials will be published in the Federal Register. They are available for inspection at the Office of the Federal Register, 7th Floor, suite 700, 800 North Capitol Street, NW., Washington, DC, and at the Office of Water Docket, room L-102, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC. Copies may be obtained from the standard producer or publisher listed in the regulation. Methods in the materials listed below shall be used to analyze samples of sewage sludge.

(1) 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, ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

(2) Fecal coliform. Part 9221 E. or Part 9222 D., "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992, American Public Health Association, 1015 15th Street, NW., Washington, DC 20005.

(3) Helminth ova. Yanko, W.A., "Occurrence of Pathogens in Distribution and Marketing Municipal Sludges", EPA 600/1-87-014, 1987. National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161 (PB 88-154273/AS).

(4) 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). Second Edition and Updates I and II are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161 (PB-87-120-291). Third Edition and Revision I are available from Superintendent of Documents, Government Printing Office, 941 North Capitol Street, NE., Washington, DC 20002 (Document Number 955-001-00000-1).

(5) Salmonella sp. bacteria. Part 9260 D., "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992, American Public Health Association, 1015 15th Street, NW., Washington, DC 20005; or

Kenner, B.A. and H.P. Clark, "Detection and enumeration of Salmonella and Pseudomonas aeruginosa", Journal of the Water Pollution Control Federation, Vol. 46, no. 9, September 1974, pp. 2163-2171. Water Environment Federation, 601 Wythe Street, Alexandria, Virginia 22314.

(6) Specific oxygen uptake rate. Part 2710 B., "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992, American Public Health Association, 1015 15th Street, NW., Washington, DC 20005.

(7) Total, fixed, and volatile solids. Part 2540 G., "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992, American Public Health Association, 1015 15th Street, NW., Washington, DC 20005.

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§503.9 General definitions

(a) Apply sewage sludge or sewage sludge applied to the land means land application of sewage sludge.

(b) Base flood is a flood that has a one percent chance of occurring in any given year (i.e., a flood with a magnitude equalled once in 100 years).

(c) Class I sludge management facility is any publicly owned treatment works (POTW), as defined in 40 CFR 501.2, required to have an approved pretreatment program under 40 CFR 403.8(a) (including any POTW located in a State that has elected to assume local program responsibilities pursuant to 40 CFR 403.10(e)) and any treatment works treating domestic sewage, as defined in 40 CFR 122.2, classified as a Class I sludge management facility by the EPA Regional Administrator, or, in the case of approved State programs, the Regional Administrator in conjunction with the State Director, because of the potential for its sewage sludge use or disposal practice to affect public health and the environment adversely.

(d) Cover crop is a small grain crop, such as oats, wheat, or barley, not grown for harvest.

(e) CWA means the Clean Water Act (formerly referred to as either the Federal Water Pollution Act or the Federal Water Pollution Control Act Amendments of 1972), Public Law 92-500, as amended by Public Law 95-217, Public Law 95-576, Public Law 96-483, Public Law 97-117, and Public Law 100-4.

(f) 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, 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.

(g) Domestic sewage is waste and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works.

(h) 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).

(i) EPA means the United States Environmental Protection Agency.

(j) Feed crops are crops produced primarily for consumption by animals.

(k) Fiber crops are crops such as flax and cotton.

(l) Food crops are crops consumed by humans. These include, but are not limited to, fruits, vegetables, and tobacco.

(m) Ground water is water below the land surface in the saturated zone.

(n) Industrial wastewater is wastewater generated in a commercial or industrial process.

(o) Municipality means a city, town, borough, county, parish, district, association, or other public body (including an intermunicipal Agency of two or more of the foregoing entities) created by or under State law; an Indian tribe or an authorized Indian tribal organization having jurisdiction over sewage sludge management; or a designated and approved management Agency under section 208 of the CWA, as amended. The definition includes a special district created under State law, such as a water district, sewer district, sanitary district, utility district, drainage district, or similar entity, or an integrated waste management facility as defined in section 201(e) of the CWA, as amended, that has as one of its principal responsibilities the treatment, transport, use, or disposal of sewage sludge.

(p) Permitting authority is either EPA or a State with an EPA-approved sludge management program.

(q) Person is an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

(r) Person who prepares sewage sludge 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.

(s) Place sewage sludge or sewage sludge placed means disposal of sewage sludge on a surface disposal site.

(t) Pollutant is an organic substance, an inorganic substance, a combination of organic and inorganic substances, or a pathogenic organism 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 Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction), or physical deformations in either organisms or offspring of the organisms.

(u) 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).

(v) Runoff is rainwater, leachate, or other liquid that drains

overland on any part of a land surface and runs off of the land surface.

(w) Sewage sludge is solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works.

(x) State is one of the United States of America, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Trust Territory of the Pacific Islands, the Commonwealth of the Northern Mariana Islands, and an Indian Tribe eligible for treatment as a State pursuant to regulations promulgated under the authority of section 518(e) of the CWA.

(y) Store or storage of sewage sludge is the placement of sewage sludge on land on which the sewage sludge remains for two years or less. This does not include the placement of sewage sludge on land for treatment.

(z) 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. This does not include storage of sewage sludge.

(aa) Treatment works is either a federally owned, publicly owned, or privately owned device or system used to treat (including recycle and reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature.

(bb) Wetlands m

eans 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.

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Subpart B--Land Application

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503.10 Applicability.

(a) This subpart applies to any person who prepares sewage sludge that is applied to the land, to any person who applies

sewage sludge to the land, to sewage sludge applied to the land, and to the land on which sewage sludge is applied.

(b)(1) Bulk sewage sludge. The general requirements in 503.12 and the management practices in 503.14 do not apply when bulk sewage sludge is applied to the land if the bulk sewage sludge meets the pollutant concentrations in 503.13(b)(3), the Class A pathogen requirements in 503.32(a), and one of the vector attraction reduction requirements in 503.33 (b)(1) through (b)(8).

(2) The Regional Administrator of EPA or, in the case of a State with an approved sludge management program, the State Director, may apply any or all of the general requirements in 503.12 and the management practices in 503.14 to the bulk sewage sludge in 503.10(b)(1) on a case-by-case basis after determining that the general requirements or management practices are needed to protect public health and the environment from any reasonably anticipated adverse effect that may occur from any pollutant in the bulk sewage sludge.

(c)(1) The general requirements in 503.12 and the management practices in 503.14 do not apply when a bulk material derived from sewage sludge is applied to the land if the derived bulk material meets the pollutant concentrations in 503.13(b)(3), the Class A pathogen requirements in 503.32(a), and one of the vector attraction reduction requirements in 503.33 (b)(1) through (b)(8).

(2) The Regional Administrator of EPA or, in the case of a State with an approved sludge management program, the State Director, may apply any or all of the general requirements in §503.12 and the management practices in §503.14 to the bulk sewage sludge in §503.10(b)(1) on a case-by-case basis after determining that the general requirements or management practices are needed to protect public health and the environment from any reasonably anticipated adverse effect that may occur from any pollutant in the bulk sewage sludge.

(c)(1) The general requirements in §503.12 and the management practices in §503.14 do not apply when a bulk material derived from sewage sludge is applied to the land if the derived bulk material meets the pollutant concentrations in §503.13(b)(3), the Class A pathogen requirements in §503.32(a), and one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8).

(2) The Regional Administrator of EPA or, in the case of a State with an approved sludge management program, the State Director, may apply any or all of the general requirements in §503.12 or the management practices in §503.14 to the bulk material in §503.10(c)(1) on a case-by-case basis after determining that the general requirements or management practices are needed to protect public health and the environment from any reasonably anticipated adverse effect that may occur from any pollutant in the bulk sewage sludge.

(d) The requirements in this subpart do not apply when a bulk material derived from sewage sludge is applied to the land if the sewage sludge from which the bulk material is derived meets the pollutant concentrations in §503.13(b)(3), the Class A pathogen requirements in §503.32(a), and one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8).

(e) Sewage sludge sold or given away in a bag or other container for application to the land. The general requirements in §503.12 and the management practices in §503.14 do not apply when sewage sludge is sold or given away in a bag or other container for application to the land if the sewage sludge sold or given away in a bag or other container for application to the land meets the pollutant concentrations in §503.13(b)(3), the Class A pathogen requirements in § 503.32(a), and one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8).

(f) The general requirements in §503.12 and the management practices in §503.14 do not apply when a material derived from sewage sludge is sold or given away in a bag or other container for application to the land if the derived material meets the pollutant concentrations in §503.13(b)(3), the Class A pathogen requirements in §503.32(a), and one of the vector attraction

reduction requirements in §503.33 (b)(1) through (b)(8).

(g) The requirements in this subpart do not apply when a material derived from sewage sludge is sold or given away in a bag or other container for application to the land if the sewage sludge from which the material is derived meets the pollutant concentrations in §503.13(b)(3), the Class A pathogen requirements in §503.32(a), and one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8).

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§503.11 Special definitions

(a) 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.

(b) 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.

(c) 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.

(d) 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.

(e) Bulk sewage sludge is sewage sludge that is not sold or given away in a bag or other container for application to the land.

(f) Cumulative pollutant loading rate is the maximum amount of an inorganic pollutant that can be applied to an area of land.

(g) Forest is a tract of land thick with trees and underbrush.

(h) Land application is the spraying or spreading of sewage sludge onto the land surface; the injection of sewage sludge below the land surface; or the incorporation of sewage sludge into the soil so that the sewage sludge can either condition the soil or fertilize crops or vegetation grown in the soil.

(i) Monthly average is the arithmetic mean of all measurements

taken during the month.

(j) Other container is either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of one metric ton or less.

(k) Pasture is land on which animals feed directly on feed crops such as legumes, grasses, grain stubble, or stover.

(l) 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.

(m) Range land is open land with indigenous vegetation.

(n) Reclamation site is drastically disturbed land that is reclaimed using sewage sludge. This includes, but is not limited to, strip mines and construction sites.

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§503.12 General requirements.

(a) No person shall apply sewage sludge to the land except in accordance with the requirements in this subpart.

(b) No person shall apply bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) to agricultural land, forest, a public contact site, or a reclamation site if any of the cumulative pollutant loading rates in §503.13(b)(2) has been reached.

(c) No person shall apply domestic septage to agricultural land, forest, or a reclamation site during a 365 day period if the annual application rate in §503.13(c) has been reached during that period.

(d) The person who prepares bulk sewage sludge that is applied to agricultural land, forest, a public contact site, or a reclamation site shall provide the person who applies the bulk sewage sludge written notification of the concentration of total nitrogen (as N on a dry weight basis) in the bulk sewage sludge.

(e)(1) The person who applies sewage sludge to the land shall obtain information needed to comply with the requirements in this subpart.

(2)(i) Before bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) is applied to the land, the person who proposes to apply the bulk sewage sludge shall contact the permitting authority for the State in which the bulk

sewage sludge will be applied to determine whether bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) has been applied to the site since July 20, 1993.

(ii) If bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) has not been applied to the site since July 20, 1993, the cumulative amount for each pollutant listed in Table 2 of §503.13 may be applied to the site in accordance with §503.13(a)(2)(i).

(iii) If bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) has been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site in the bulk 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 to the site in accordance with §503.13(a)(2)(i).

(iv) If bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) has been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site in the bulk sewage sludge since that date is not known, an additional amount of each pollutant shall not be applied to the site in accordance with §503.13(a)(2)(i).

(f) When a person who prepares bulk sewage sludge provides the bulk sewage sludge to a person who applies the bulk sewage sludge to the land, the person who prepares the bulk sewage sludge shall provide the person who applies the sewage sludge notice and necessary information to comply with the requirements in this subpart.

(g) When a person who prepares sewage sludge provides the sewage sludge to another person who prepares the sewage sludge, the person who provides the sewage sludge shall provide the person who receives the sewage sludge notice and necessary information to comply with the requirements in this subpart.

(h) The person who applies bulk sewage sludge to the land shall provide the owner or lease holder of the land on which the bulk sewage sludge is applied notice and necessary information to comply with the requirements in this subpart.

(i) Any person who prepares bulk sewage sludge that is applied to land in a State other than the State in which the bulk sewage sludge is prepared shall provide written notice, prior to the initial application of bulk sewage sludge to the land application site by the applier, to the permitting authority for the State in which the bulk sewage sludge is proposed to be applied. The notice shall include:

(1) The location, by either street address or latitude and longitude, of each land application site.

(2) The approximate time period bulk sewage sludge will be applied to the site.

(3) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) for the person who prepares the bulk sewage sludge.

(4) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) for the person who will apply the bulk sewage sludge.

(j) Any person who applies bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) to the land shall provide written notice, prior to the initial application of bulk sewage sludge to a land application site by the applier, to the permitting authority for the State in which the bulk sewage sludge will be applied and the permitting authority shall retain and provide access to the notice. The notice shall include:

(1) The location, by either street address or latitude and longitude, of the land application site.

(2) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) of the person who will apply the bulk sewage sludge.

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§503.13 Pollutant limits.

(a) Sewage sludge.

(1) Bulk sewage sludge or sewage sludge sold or given away in a bag or other container shall not be applied to the land if the concentration of any pollutant in the sewage sludge exceeds the ceiling concentration for the pollutant in Table 1 of §503.13.

(2) If bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site, either:

(i) The cumulative loading rate for each pollutant shall not exceed the cumulative pollutant loading rate for the pollutant in Table 2 of §503.13; or

(ii) The concentration of each pollutant in the sewage sludge shall not exceed the concentration for the pollutant in Table 3 of §503.13.

(3) If bulk sewage sludge is applied to a lawn or a home garden, the concentration of each pollutant in the sewage sludge shall not exceed the concentration for the pollutant in Table 3 of §503.13.

(4) If sewage sludge is sold or given away in a bag or other container for application to the land, either:

(i) The concentration of each pollutant in the sewage sludge shall not exceed the concentration for the pollutant in Table 3 of §503.13; or

(ii) The product of the concentration of each pollutant in the sewage sludge and the annual whole sludge application rate for the sewage sludge shall not cause the annual pollutant loading rate for the pollutant in Table 4 of §503.13 to be exceeded. The procedure used to determine the annual whole sludge application rate is presented in appendix A of this part.

(b) Pollutant concentrations and loading rates--sewage sludge.

(1) Ceiling concentrations.

Table 1 of § 503.13.--Ceiling Concentrations

Pollutant	Ceiling concentration (milligrams per kilogram) ↑1
Arsenic	
Cadmium	
Chromium	

Copper	43
Lead	8
Mercury	
Molybdenum	
Nickel	4
Selenium	1
Zinc	75

<FN1> Dry weight basis.

(2) Cumulative pollutant loading rates.

Table 2 of § 503.13.--Cumulative Pollutant Loading Rates

Pollutant	Cumulative pollutant loading rate (kilograms per hectare)
Arsenic	
Cadmium	
Chromium	30
Copper	15
Lead	3
Mercury	
Nickel	4
Selenium	1
Zinc	28

[§503.13(b)(2) Table 2 amended at 59 FR 9098, Feb. 25, 1994]

(3) Pollutant concentrations.

Table 3 of § 503.13.--Pollutant Concentrations

Pollutant	Monthly average concentrations (milligrams per kilogram)↑1
Arsenic	
Cadmium	
Chromium	12
Copper	15
Lead	3
Mercury	
Nickel	4
Selenium	

Zinc..... 28

<FN1> Dry weight basis.

[§503.13(b)(3) Table 3 amended at 59 FR 9098, Feb. 25, 1994]

(4) Annual pollutant loading rates.

Table 4 of § 503.13.--Annual Pollutant Loading Rates

Pollutant	Annual pollutant loading rate (kilograms per hectare per 365 da period)
Arsenic	2
Cadmium	1
Chromium	1
Copper	
Lead	
Mercury	0.
Nickel	
Selenium	5
Zinc	1

[§503.13(b)(4) Table 4 amended at 59 FR 9098, Feb. 25, 1994]

(c) 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 (1).

$$AAR = \frac{N}{0.0026} \quad \text{Eq. (1)}$$

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.

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§503.14 Management practices.

(a) Bulk sewage sludge shall not be applied to the land if it is likely to adversely affect a threatened or endangered species listed under section 4 of the Endangered Species Act or its designated critical habitat.

(b) Bulk sewage sludge shall not be applied to agricultural land, forest, a public contact site, or a reclamation site that is flooded, frozen, or snow-covered so that the bulk sewage sludge enters a wetland or other waters of the United States, as defined in 40 CFR 122.2, except as provided in a permit issued pursuant to section 402 or 404 of the CWA.

(c) Bulk sewage sludge shall not be applied to agricultural land, forest, or a reclamation site that is 10 meters or less from waters of the United States, as defined in 40 CFR 122.2, unless otherwise specified by the permitting authority.

(d) Bulk sewage sludge shall be applied to agricultural land, forest, a public contact site, or a reclamation site at a whole sludge application rate that is equal to or less than the agronomic rate for the bulk sewage sludge, unless, in the case of a reclamation site, otherwise specified by the permitting authority.

(e) Either a label shall be affixed to the bag or other container in which sewage sludge that is sold or given away for application to the land, or an information sheet shall be provided to the person who receives sewage sludge sold or given away in an other container for application to the land. The label or information sheet shall contain the following information:

(1) The name and address of the person who prepared the sewage sludge that is sold or given away in a bag or other container for application to the land.

(2) A statement that application of the sewage sludge to the land is prohibited except in accordance with the instructions on the label or information sheet.

(3) The annual whole sludge application rate for the sewage sludge that does not cause any of the annual pollutant loading rates in Table 4 of §503.13 to be exceeded.

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§503.15 Operational standards-- pathogens and vector attraction reduction.

(a) Pathogens--sewage sludge.

(1) The Class A pathogen requirements in §503.32(a) or the

Class B pathogen requirements and site restrictions in §503.32(b) shall be met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site.

(2) The Class A pathogen requirements in §503.32(a) shall be met when bulk sewage sludge is applied to a lawn or a home garden.

(3) The Class A pathogen requirements in §503.32(a) shall be met when sewage sludge is sold or given away in a bag or other container for application to the land.

(b) Pathogens--domestic septage.

The requirements in either §503.32 (c)(1) or (c)(2) shall be met when domestic septage is applied to agricultural land, forest, or a reclamation site.

(c) Vector attraction reduction--sewage sludge.

(1) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(10) shall be met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site.

(2) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) shall be met when bulk sewage sludge is applied to a lawn or a home garden.

(3) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) shall be met when sewage sludge is sold or given away in a bag or other container for application to the land.

(d) Vector attraction reduction--domestic septage. The vector attraction reduction requirements in §503.33(b)(9), (b)(10), or (b)(12) shall be met when domestic septage is applied to agricultural land, forest, or a reclamation site.

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§503.16 Frequency of monitoring.

(a) Sewage sludge.

(1) The frequency of monitoring for the pollutants listed in Table 1, Table 2, Table 3 and Table 4 of §503.13; the pathogen density requirements in §503.32(a) and in §503.32(b)(2) through (b)(4); and the vector attraction reduction requirements §503.33 (b)(1) through §503.33(b)(8) shall be the frequency in Table 1 of §503.16.

Table 1 of § 503.16.--Frequency of Monitoring--Land Application

Amount of sewage sludge ↑1 (metric tons per 365 day period)	Frequency
Greater than zero but less than 290	Once per yea
Equal to or greater than 290 but less than 1,500	Once per quarter (four times p year
Equal to or greater than 1,500 but less than 15,000	Once per 60 days (six times p year
Equal to or greater than 15,000	Once per month (12 times per year

<FN1>Either the amount of bulk sewage sludge applied to the land or the amount of sewage sludge received by a person who prepares sewage sludge that is sold or given away in a bag or other container for application to the land (dry weight basis).

(2) After the sewage sludge has been monitored for two years at the frequency in Table 1 of §503.16, the permitting authority may reduce the frequency of monitoring for pollutant concentrations and for the pathogen density requirements in §503.32(a)(5)(ii) and (a)(5)(iii), but in no case shall the frequency of monitoring be less than once per year when sewage sludge is applied to the land.

(b) Domestic septage. If either the pathogen requirements in §503.32(c)(2) or the vector attraction reduction requirements in §503.33(b)(12) are met when domestic septage is applied to agricultural land, forest, or a reclamation site, each container of domestic septage applied to the land shall be monitored for compliance with those requirements.

(Approved by the Office of Management and Budget under control number 2040-0157)

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§503.17 Recordkeeping.

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(a) Sewage sludge.

(1) The person who prepares the sewage sludge in §503.10(b)(1) or (e) shall develop the following information and shall retain the information for five years:

(i) The concentration of each pollutant listed in Table 3 of §503.13 in the sewage sludge.

(ii) The following certification statement:

"I certify, under penalty of law, that the Class A pathogen requirements in §503.32(a) and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in §503.33(b)(1) through §503.33(b)(8)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements and vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(iii) A description of how the Class A pathogen requirements in §503.32(a) are met.

(iv) A description of how one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) is met.

(2) The person who derives the material in §503.10 (c)(1) or (f) shall develop the following information and shall retain the information for five years:

(i) The concentration of each pollutant listed in Table 3 of §503.13 in the material.

(ii) The following certification statement:

"I certify, under penalty of law, that the Class A pathogen requirements in §503.32(a) and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements and the vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(iii) A description of how the Class A pathogen requirements in §503.32(a) are met.

(iv) A description of how one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) is met.

(3) If the pollutant concentrations in §503.13(b)(3), the Class A pathogen requirements in §503.32(a), and the vector

attraction reduction requirements in either §503.33 (b)(9) or (b)(10) are met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site:

(i) The person who prepares the bulk sewage sludge shall develop the following information and shall retain the information for five years.

(A) The concentration of each pollutant listed in Table 3 of §503.13 in the bulk sewage sludge.

(B) The following certification statement:

> "I certify, under penalty of law, that the pathogen requirements in §503.32(a) have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(C) A description of how the pathogen requirements in §503.32(a) are met.

(ii) The person who applies the bulk sewage sludge shall develop the following information and shall retain the information for five years.

(A) The following certification statement:

> "I certify, under penalty of law, that the management practices in §503.14 and the vector attraction reduction requirement in [insert either §503.33 (b)(9) or (b)(10)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices and vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including fine and imprisonment."

(B) A description of how the management practices in §503.14 are met for each site on which bulk sewage sludge is applied.

(C) A description of how the vector attraction reduction requirements in either §503.33(b)(9) or (b)(10) are met for each site on which bulk sewage sludge is applied.

(4) If the pollutant concentrations in §503.13(b)(3) and the Class B pathogen requirements in §503.32(b) are met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site:

(i) The person who prepares the bulk sewage sludge shall develop the following information and shall retain the information for five years:

(A) The concentration of each pollutant listed in Table 3 of §503.13 in the bulk sewage sludge.

(B) The following certification statement:

"I certify under, penalty of law, that the Class B pathogen requirements in §503.32(b) and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) if one of those requirements is met] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements [and vector attraction reduction requirements if applicable] have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(C) A description of how the Class B pathogen requirements in §503.32(b) are met.

(D) When one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8)-is met, a description of how the vector attraction reduction requirement is met.

(ii) The person who applies the bulk sewage sludge shall develop the following information and shall retain the information for five years.

(A) The following certification statement:

"I certify, under penalty of law, that the management practices in §503.14, the site restrictions in §503.32(b)(5), and the vector attraction reduction requirements in [insert either §503.33 (b)(9) or (b)(10), if one of those requirements is met] have been met for each site on which bulk sewage sludge is applied. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices and site restrictions [and the vector attraction reduction

requirements if applicable] have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(B) A description of how the management practices in §503.14 are met for each site on which bulk sewage sludge is applied.

(C) A description of how the site restrictions in §503.32(b)(5) are met for each site on which bulk sewage sludge is applied.

(D) When the vector attraction reduction requirement in either §503.33 (b)(9) or (b)(10) is met, a description of how the vector attraction reduction requirement is met.

(5) If the requirements in §503.13(a)(2)(i) are met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site:

(i) The person who prepares the bulk sewage sludge shall develop the following information and shall retain the information for five years.

(A) The concentration of each pollutant listed in Table 1 of §503.13 in the bulk sewage sludge.

(B) The following certification statement:

"I certify, under penalty of law, that the pathogen requirements in [insert either §503.32(a) or §503.32(b)] and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) if one of those requirements is met] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements [and vector attraction reduction requirements] have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(C) A description of how the pathogen requirements in either §503.32 (a) or (b) are met.

(D) When one of the vector attraction requirements in §503.33 (b)(1) through (b)(8) is met, a description of how the vector attraction requirement is met.

(ii) The person who applies the bulk sewage sludge shall develop the following information, retain the information in §503.17 (a)(5)(ii)(A) through (a)(5)(ii)(G) indefinitely, and

retain the information in §503.17 (a)(5)(ii)(H) through (a)(5)(ii)(M) for five years.

(A) The location, by either street address or latitude and longitude, of each site on which bulk sewage sludge is applied.

(B) The number of hectares in each site on which bulk sewage sludge is applied.

(C) The date and time bulk sewage sludge is applied to each site.

(D) The cumulative amount of each pollutant (i.e., kilograms) listed in Table 2 of §503.13 in the bulk sewage sludge applied to each site, including the amount in §503.12(e)(2)(iii).

(E) The amount of sewage sludge (i.e., metric tons) applied to each site.

(F) The following certification statement:

> "I certify, under penalty of law, that the requirements to obtain information in §503.12(e)(2) have been met for each site on which bulk sewage sludge is applied. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the requirements to obtain information have been met. I am aware that there are significant penalties for false certification including fine and imprisonment."

(G) A description of how the requirements to obtain information in §503.12(e)(2) are met.

(H) The following certification statement:

> "I certify, under penalty of law, that the management practices in §503.14 have been met for each site on which bulk sewage sludge is applied. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices have been met. I am aware that there are significant penalties for false certification including fine and imprisonment."

(I) A description of how the management practices in §503.14 are met for each site on which bulk sewage sludge is applied.

(J) The following certification statement when the bulk sewage sludge meets the Class B pathogen requirements in

§503.32(b):

> "I certify, under penalty of law, that the site restrictions in §503.32(b)(5) have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the site restrictions have been met. I am aware that there are significant penalties for false certification including fine and imprisonment."

(K) A description of how the site restrictions in §503.32(b)(5) are met for each site on which Class B bulk sewage sludge is applied.

(L) The following certification statement when the vector attraction reduction requirement in either §503.33 (b)(9) or (b)(10) is met:

> "I certify, under penalty of law, that the vector attraction reduction requirement in [insert either §503.33(b)(9) or §503.33(b)(10)] has been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the vector attraction reduction requirement has been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(M) If the vector attraction reduction requirements in either §503.33 (b)(9) or (b)(10) are met, a description of how the requirements are met.
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(6) If the requirements in §503.13(a)(4)(ii) are met when sewage sludge is sold or given away in a bag or other container for application to the land, the person who prepares the sewage sludge that is sold or given away in a bag or other container shall develop the following information and shall retain the information for five years:

(i) The annual whole sludge application rate for the sewage sludge that does not cause the annual pollutant loading rates in Table 4 of §503.13 to be exceeded.

(ii) The concentration of each pollutant listed in Table 4 of §503.13 in the sewage sludge.

(iii) The following certification statement:

"I certify, under penalty of law, that the management practice in §503.14(e), the Class A pathogen requirement in §503.32(a), and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practice, pathogen requirements, and vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(iv) A description of how the Class A pathogen requirements in §503.32(a) are met.

(v) A description of how one of the vector attraction requirements in §503.33 (b)(1) through (b)(8) is met.

(b) Domestic septage. When domestic septage is applied to agricultural land, forest, or a reclamation site, the person who applies the domestic septage shall develop the following information and shall retain the information for five years:

(1) The location, by either street address or latitude and longitude, of each site on which domestic septage is applied.

(2) The number of acres in each site on which domestic septage is applied.

(3) The date and time domestic septage is applied to each site.

(4) The nitrogen requirement for the crop or vegetation grown on each site during a 365 day period.

(5) The rate, in gallons per acre per 365 day period, at which domestic septage is applied to each site.

(6) The following certification statement:

"I certify, under penalty of law, that the pathogen requirements in [insert either §503.32(c)(1) or §503.32(c)(2)] and the vector attraction reduction requirements in [insert §503.33(b)(9), §503.33(b)(10), or §503.33(b)(12)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements and vector attraction reduction requirements have been met. I am aware

that there are significant penalties for false certification including the possibility of fine and imprisonment."

(7) A description of how the pathogen requirements in either §503.33 (c)(1) or (c)(2) are met.

(8) A description of how the vector attraction reduction requirements in §503.33 (b)(9), (b)(10), or (b)(12) are met. (Approved by the Office of Management and Budget under control number 2040-0157)

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§503.18 Reporting.

(a) Class I sludge management facilities, POTWs (as defined in 40 CFR 501.2) with a design flow rate equal to or greater than one million gallons per day, and POTWs that serve 10,000 people or more shall submit the following information to the permitting authority:

(1) The information in § 503.17(a), except the information in §503.17 (a)(3)(ii), (a)(4)(ii) and in (a)(5)(ii), for the appropriate requirements on February 19 of each year.

(2) The information in §503.17 (a)(5)(ii)(A) through (a)(5)(ii)(G) on [insert the month and day from the date of publication of this rule] of each year when 90 percent or more of any of the cumulative pollutant loading rates in Table 2 of §503.13 is reached at a site.
(Approved by the Office of Management and Budget under control number 2040-0157)

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§503.30 Scope.

(a) This subpart contains the requirements for a sewage sludge to be classified either Class A or Class B with respect to pathogens.

(b) This subpart contains the site restrictions for land on which a Class B sewage sludge is applied.

(c) This subpart contains the pathogen requirements for domestic septage applied to agricultural land, forest, or a reclamation site.

(d) This subpart contains alternative vector attraction reduction requirements for sewage sludge that is applied to the land or placed on a surface disposal site.

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§503.31 Special definitions.

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

(b) 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.

(c) Density of microorganisms is the number of microorganisms per unit mass of total solids (dry weight) in the sewage sludge.

(d) 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).

(e) 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).

(f) Pathogenic organisms are disease-causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova.

(g) pH means the logarithm of the reciprocal of the hydrogen ion concentration.

(h) 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.

(i) Total solids are the materials in sewage sludge that remain as residue when the sewage sludge is dried at 103 to 105 degrees Celsius.

(j) Unstabilized solids are organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process.

(k) Vector attraction is the characteristic of sewage sludge that attracts rodents, flies, mosquitos, or other organisms capable of transporting infectious agents.

(l) 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.

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§503.32 Pathogens.

(a) Sewage sludge--Class A.

(1) The requirement in §503.32(a)(2) and the requirements in either §503.32(a)(3), (a)(4), (a)(5), (a)(6), (a)(7), or (a)(8) shall be met for a sewage sludge to be classified Class A with respect to pathogens.

(2) The Class A pathogen requirements in §503.32 (a)(3) through (a)(8) shall be met either prior to meeting or at the same time the vector attraction reduction requirements in §503.33, except the vector attraction reduction requirements in §503.33 (b)(6) through (b)(8), are met.

(3) 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 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 §503.10 (b), (c), (e), or (f).

(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 warmed gases or an immiscible liquid.
To view Figure, TAB to this link, then press ENTER. There will be a pause while the figure-viewing software loads.

(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, the temperature and time period shall be determined using equation (3).
To view Figure, TAB to this link, then press ENTER. There will be a pause while the figure-viewing software loads.

(4) 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 §503.10 (b), (c), (e), or (f).

(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.

(5) 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 or material derived from sewage sludge is prepared to meet the requirements in §503.10 (b), (c), (e), or (f).

(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 (a)(5)(ii)(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 (a)(5)(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 paragraph (a)(5)(iii)(C) of this section 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 paragraph (a)(5)(iii)(C) of this section.

(6) 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 §503.10 (b), (c), (e), or (f).

(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 §503.10 (b), (c), (e), or (f), 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 §503.10 (b), (c), (e), or

(f), unless otherwise specified by the permitting authority.

(7) 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 §503.10(b), (c), (e), or (f).

(ii) Sewage sludge that is used or disposed shall be treated in one of the Processes to Further Reduce Pathogens described in appendix B of this part.

(8) 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 or material derived from sewage sludge is prepared to meet the requirements in §503.10(b), (c), (e), or (f).

(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.

(b) Sewage sludge--Class B.

(1)(i) The requirements in either §503.32(b)(2), (b)(3), or (b)(4) shall be met for a sewage sludge to be classified Class B with respect to pathogens.

(ii) The site restrictions in §503.32(b)(5) shall be met when sewage sludge that meets the Class B pathogen requirements in §503.32(b)(2), (b)(3), or (b)(4) is applied to the land.

(2) 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 collected in paragraph (b)(2)(i) of this section 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).

(3) Class B--Alternative 2. Sewage sludge that is used or disposed shall be treated in one of the Processes to Significantly Reduce Pathogens described in appendix B of this part.

(4) 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 permitting authority.

(5) Site 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.
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(c) Domestic septage.

(1) The site restrictions in §503.32(b)(5) shall be met when domestic septage is applied to agricultural land, forest, or a reclamation site; or

(2) The pH of domestic septage applied to agricultural land, forest, or a reclamation site shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 30 minutes and the site restrictions in §503.32 (b)(5)(i) through (b)(5)(iv) shall be met.

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§503.33 Vector attraction reduction.

(a)(1) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(10) shall be met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site.

(2) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) shall be met when bulk sewage sludge is applied to a lawn or a home garden.

(3) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) shall be met when sewage sludge is sold or given away in a bag or other container for application to the land.

(4) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(11) shall be met when sewage sludge (other than domestic septage) is placed on an active sewage sludge unit.

(5) One of the vector attraction reduction requirements in §503.33 (b)(9), (b)(10), or (b)(12) shall be met when domestic septage is applied to agricultural land, forest, or a reclamation site and one of the vector attraction reduction requirements in §503.33 (b)(9) through (b)(12) shall be met when domestic septage is placed on an active sewage sludge unit.

(b)(1) 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).

(2) When the 38 percent volatile solids reduction requirement in §503.33(b)(1) 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.

(3) When the 38 percent volatile solids reduction requirement in §503.33(b)(1) 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.

(4) 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.

(5) 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.

(6) The pH of sewage sludge shall be raised to 12 or higher by alkali 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.

(7) 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.

(8) 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.

(9)(i) Sewage sludge shall be injected below the surface of the land.

(ii) No significant amount of the sewage sludge shall be present on the land surface within one hour after the sewage

sludge is injected.

(iii) 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.

(10)(i) Sewage sludge applied to the land surface or placed on a surface disposal site shall be incorporated into the soil within six hours after application to or placement on the land.

(ii) 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.

(11) Sewage sludge placed on an active sewage sludge unit shall be covered with soil or other material at the end of each operating day.

(12) The pH of domestic septage shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 30 minutes.

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Subpart E--Incineration

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§503.40 Applicability.

(a) This subpart applies to a person who fires sewage sludge in a sewage sludge incinerator, to a sewage sludge incinerator, and to sewage sludge fired in a sewage sludge incinerator.

(b) This subpart applies to the exit gas from a sewage sludge incinerator stack.

(c) The management practice in §503.45(a), the frequency of monitoring requirement for total hydrocarbon concentration in § 503.46(b) and the recordkeeping requirements for total hydrocarbon concentration in §503.47(c) and (n) do not apply if the following conditions are met:

(1) The exit gas from a sewage sludge incinerator stack is monitored continuously for carbon monoxide.

(2) The monthly average concentration of carbon monoxide in the exit gas from a sewage sludge incinerator stack, corrected for zero percent moisture and to seven percent oxygen, does not exceed 100 parts per million on a volumetric basis.

(3) The person who fires sewage sludge in a sewage sludge incinerator retains the following information for five years:

(i) The carbon monoxide concentrations in the exit gas; and

(ii) A calibration and maintenance log for the instrument used to measure the carbon monoxide concentration.

(4) Class I sludge management facilities, POTWs (as defined in 40 CFR 501.2) with a design flow rate equal to or greater than one million gallons per day, and POTWs that serve a population of 10,000 people or greater submit the monthly average carbon monoxide concentrations in the exit gas to the permitting authority on February 19 of each year.
[§503.40(c) added at 59 FR 9098, Feb. 25, 1994]

>

§503.41 Special definitions.

(a) Air pollution control device is one or more processes used to treat the exit gas from a sewage sludge incinerator stack.

(b) Auxiliary fuel is fuel used to augment the fuel value of sewage sludge. This includes, but is not limited to, natural gas, fuel oil, coal, gas generated during anaerobic digestion of sewage sludge, and municipal solid waste (not to exceed 30 percent of the dry weight of sewage sludge and auxiliary fuel together). Hazardous wastes are not auxiliary fuel.

(c) Control efficiency is the mass of a pollutant in the sewage sludge fed to an incinerator minus the mass of that pollutant in the exit gas from the incinerator stack divided by the mass of the pollutant in the sewage sludge fed to the incinerator.

(d) Dispersion factor is the ratio of the increase in the ground level ambient air concentration for a pollutant at or beyond the property line of the site where the sewage sludge incinerator is located to the mass emission rate for the pollutant from the incinerator stack.

(e) Fluidized bed incinerator is an enclosed device in which organic matter and inorganic matter in sewage sludge are combusted in a bed of particles suspended in the combustion chamber gas.

(f) Hourly average is the arithmetic mean of all measurements, taken during an hour. At least two measurements must be taken during the hour.

(g) Incineration is the combustion of organic matter and

inorganic matter in sewage sludge by high temperatures in an enclosed device.

(h) Monthly average is the arithmetic mean of the hourly averages for the hours a sewage sludge incinerator operates during the month.

(i) Risk specific concentration is the allowable increase in the average daily ground level ambient air concentration for a pollutant from the incineration of sewage sludge at or beyond the property line of the site where the sewage sludge incinerator is located.

(j) Sewage sludge feed rate is either the average daily amount of sewage sludge fired in all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located for the number of days in a 365 day period that each sewage sludge incinerator operates, or the average daily design capacity for all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located.

(k) Sewage sludge incinerator is an enclosed device in which only sewage sludge and auxiliary fuel are fired.

(l) Stack height is the difference between the elevation of the top of a sewage sludge incinerator stack and the elevation of the ground at the base of the stack when the difference is equal to or less than 65 meters. When the difference is greater than 65 meters, stack height is the creditable stack height determined in accordance with 40 CFR 51.100 (ii).

(m) Total hydrocarbons means the organic compounds in the exit gas from a sewage sludge incinerator stack measured using a flame ionization detection instrument referenced to propane.

(n) Wet electrostatic precipitator is an air pollution control device that uses both electrical forces and water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

(o) Wet scrubber is an air pollution control device that uses water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

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§503.42 General requirements.

No person shall fire sewage sludge in a sewage sludge incinerator except in compliance with the requirements in this subpart.

>

§503.43 Pollutant limits.

(a) Firing of sewage sludge in a sewage sludge incinerator shall not violate the requirements in the National Emission Standard for Beryllium in subpart C of 40 CFR part 61.

(b) Firing of sewage sludge in a sewage sludge incinerator shall not violate the requirements in the National Emission Standard for Mercury in subpart E of 40 CFR part 61.

(c) Pollutant limit--lead.

(1) The daily concentration of lead in sewage sludge fed to a sewage sludge incinerator shall not exceed the concentration calculated using Equation (4).
To view Figure, TAB to this link, then press ENTER. There will be a pause while the figure-viewing software loads.

(2)(i) When the sewage sludge stack height is 65 meters or less, the actual sewage sludge incinerator stack height shall be used in an air dispersion model specified by the permitting authority to determine the dispersion factor (DF) in equation (4).

(ii) When the sewage sludge incinerator stack height exceeds 65 meters, the creditable stack height shall be determined in accordance with 40 CFR 51.100(ii) and the creditable stack height shall be used in an air dispersion model specified by the permitting authority to determine the dispersion factor (DF) in equation (4).

(3) The control efficiency (CE) in equation (5) shall be determined from a performance test of the sewage sludge incinerator, as specified by the permitting authority.

(d) Pollutant limit--arsenic, cadmium, chromium, and nickel.

(1) The daily concentration for arsenic, cadmium, chromium, and nickel in sewage sludge fed to a sewage sludge incinerator each shall not exceed the concentration calculated using equation (5).
To view Figure, TAB to this link, then press ENTER. There will be a pause while the figure-viewing software loads.

(2) The risk specific concentrations for arsenic, cadmium, and nickel used in equation (6) shall be obtained from Table 1 of §503.43.

Table 1 of § 503.43.--Risk Specific Concentration Arsenic, Cadmium, and Nickel

Pollutant	Risk specific concentration (micrograms per cubic meter)
Arsenic	0.0
Cadmium	0.0
Nickel	2

(3) The risk specific concentration for chromium used in equation (5) shall be obtained from Table 2 of §503.43 or shall be calculated using equation (6), as specified by the permitting authority.

Table 2 of § 503.43.--Risk Specific Concentration--Chromium

Type of incinerator	Risk specific concentration (micrograms per cubic meter)
Fluidized bed with wet scrubber	0.
Fluidized bed with wet scrubber and wet electrostatic precipitator	0.
Other types with wet scrubber	0.0
Other types with wet scrubber and wet electrostatic precipitator	0.0

To view Figure, TAB to this link, then press ENTER. There will be a pause while the figure-viewing software loads.

(4)(i) When the sewage sludge incinerator stack height is equal to or less than 65 meters, the actual sewage sludge incinerator stack height shall be used in an air dispersion model, as specified by the permitting authority, to determine the dispersion factor (DF) in equation (5).

(ii) When the sewage sludge incinerator stack height is

greater than 65 meters, the creditable stack height shall be determined in accordance with 40 CFR 51.100(ii) and the creditable stack height shall be used in an air dispersion model, as specified by the permitting authority, to determine the dispersion factor (DF) in equation (5).

(5) The control efficiency (CE) in equation (5) shall be determined from a performance test of the sewage sludge incinerator, as specified by the permitting authority.

>

§503.44 Operational standard--total hydrocarbons.

(a) The total hydrocarbons concentration in the exit gas from a sewage sludge incinerator shall be corrected for zero percent moisture by multiplying the measured total hydrocarbons concentration by the correction factor calculated using equation (7).
To view Figure, TAB to this link, then press ENTER. There will be a pause while the figure-viewing software loads.

(b) The total hydrocarbons concentration in the exit gas from a sewage sludge incinerator shall be corrected to seven percent oxygen by multiplying the measured total hydrocarbons concentration by the correction factor calculated using equation (8).
To view Figure, TAB to this link, then press ENTER. There will be a pause while the figure-viewing software loads.

(c) The monthly average concentration for total hydrocarbons in the exit gas from a sewage sludge incinerator stack, corrected for zero percent moisture using the correction factor from equation (7) and to seven percent oxygen using the correction factor from equation (8), shall not exceed 100 parts per million on a volumetric basis when measured using the instrument required by §503.45(a).

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§503.45 Management practices.

(a)(1) An instrument that measures and records the total hydrocarbons concentration in the sewage sludge incinerator stack exit gas continuously shall be installed, calibrated, operated, and maintained for each sewage sludge incinerator, as specified by the permitting authority.

(2) The total hydrocarbons instrument shall employ a flame ionization detector; shall have a heated sampling line maintained at a temperature of 150 degrees Celsius or higher at all times; and shall be calibrated at least once every 24-hour operating

period using propane.

(b) An instrument that measures and records the oxygen concentration in the sewage sludge incinerator stack exit gas continuously shall be installed, calibrated, operated, and maintained for each sewage sludge incinerator, as specified by the permitting authority.

(c) An instrument that measures and records information used to determine the moisture content in the sewage sludge incinerator stack exit gas continuously shall be installed, calibrated, operated, and maintained for each sewage sludge incinerator, as specified by the permitting authority.

(d) An instrument that measures and records combustion temperatures continuously shall be installed, calibrated, operated, and maintained for each sewage sludge incinerator, as specified by the permitting authority.

(e) The maximum combustion temperature for a sewage sludge incinerator shall be specified by the permitting authority and shall be based on information obtained during the performance test of the sewage sludge incinerator to determine pollutant control efficiencies.

(f) The values for the operating parameters for the sewage sludge incinerator air pollution control device shall be specified by the permitting authority and shall be based on information obtained during the performance test of the sewage sludge incinerator to determine pollutant control efficiencies.

(g) Sewage sludge shall not be fired in a sewage sludge incinerator if it is likely to adversely affect a threatened or endangered species listed under section 4 of the Endangered Species Act or its designated critical habitat.

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§503.46 Frequency of monitoring.

(a) Sewage sludge.

(1) The frequency of monitoring for beryllium and mercury shall be specified by the permitting authority.

(2) The frequency of monitoring for arsenic, cadmium, chromium, lead, and nickel in sewage sludge fed to a sewage sludge incinerator shall be the frequency in Table 1 of §503.46.

Table 1 of § 503.46.--Frequency of Monitoring--Incineration

Amount of sewage sludge ↑1 (metric tons per 365 day period)	Frequency
Greater than zero but less than 290	Once per yea
Equal to or greater than 290 but less than 1,500	Once per quarter (fo times per year
Equal to or greater than 1,500 but less than 15,000	Once per 60 days (s times per year
Equal to or greater than 15,000	Once per month (12 tim per year

<FN1> Amount of sewage sludge fired in a sewage sludge incinerator (dry weight basis).

(3) After the sewage sludge has been monitored for two years at the frequency in Table 1 of §503.46, the permitting authority may reduce the frequency of monitoring for arsenic, cadmium, chromium, lead, and nickel, but in no case shall the frequency of monitoring be less than once per year when sewage sludge is fired in a sewage sludge incinerator.

(b) Total hydrocarbons, oxygen concentration, information to determine moisture content, and combustion temperatures.

The total hydrocarbons concentration and oxygen concentration in the exit gas from a sewage sludge incinerator stack, the information used to measure moisture content in the exit gas, and the combustion temperatures for the sewage sludge incinerator shall be monitored continuously.

(c) Air pollution control device operating parameters.

The frequency of monitoring for the sewage sludge incinerator air pollution control device operating parameters shall be specified by the permitting authority.
(Approved by the Office of Management and Budget under control number 2040-0157)

>

§503.47 Recordkeeping.

(a) The person who fires sewage sludge in a sewage sludge incinerator shall develop the information in §503.47(b) through §503.47(n) and shall retain that information for five years.

(b) The concentration of lead, arsenic, cadmium, chromium, and nickel in the sewage sludge fed to the sewage sludge incinerator.

(c) The total hydrocarbons concentrations in the exit gas from the sewage sludge incinerator stack.

(d) Information that indicates the requirements in the National Emission Standard for beryllium in subpart C of 40 CFR part 61 are met.

(e) Information that indicates the requirements in the National Emission Standard for mercury in subpart E of 40 CFR part 61 are met.

(f) The combustion temperatures, including the maximum combustion temperature, for the sewage sludge incinerator.

(g) Values for the air pollution control device operating parameters.

(h) The oxygen concentration and information used to measure moisture content in the exit gas from the sewage sludge incinerator stack.

(i) The sewage sludge feed rate.

(j) The stack height for the sewage sludge incinerator.

(k) The dispersion factor for the site where the sewage sludge incinerator is located.

(l) The control efficiency for lead, arsenic, cadmium, chromium, and nickel for each sewage sludge incinerator.

(m) The risk specific concentration for chromium calculated using equation (6), if applicable.

(n) A calibration and maintenance log for the instruments used to measure the total hydrocarbons concentration and oxygen concentration in the exit gas from the sewage sludge incinerator stack, the information needed to determine moisture content in the exit gas, and the combustion temperatures.
(Approved by the Office of Management and Budget under control number 2040-0157)

>

§503.48 Reporting.

Class I sludge management facilities, POTWs (as defined in 40 CFR 501.2) with a design flow rate equal to or greater than one million gallons per day, and POTWs that serve a population of

10,000 people or greater shall submit the information in §503.47(b) through §503.47(h) to the permitting authority on February 19 of each year.
(Approved by the Office of Management and Budget under control number 2040-0157)

>

Appendix A to Part 503--Procedure to Determine the Annual Whole Sludge Application Rate for a Sewage Sludge

Section 503.13(a)(4)(ii) requires that the product of the concentration for each pollutant listed in Table 4 of §503.13 in sewage sludge sold or given away in a bag or other container for application to the land and the annual whole sludge application rate (AWSAR) for the sewage sludge not cause the annual pollutant loading rate for the pollutant in Table 4 of §503.13 to be exceeded. This appendix contains the procedure used to determine the AWSAR for a sewage sludge that does not cause the annual pollutant loading rates in Table 4 of §503.13 to be exceeded.

The relationship between the annual pollutant loading rate (APLR) for a pollutant and the annual whole sludge application rate (AWSAR) for 1a sewage sludge is shown in equation (1).

APLR=CXAWSARX0.001 (1)

Where:

APLR=Annual pollutant loading rate in kilograms per hectare per 365 day period.

C=Pollutant concentration in milligrams, per kilogram of total solids (dry weight basis).

AWSAR=Annual whole sludge application rate in metric tons per hectare per 365 day period (dry weight basis).

0.001=A conversion factor.

To determine the AWSAR, equation (1) is rearranged into equation (2):
To view Figure, TAB to this link, then press ENTER. There will be a pause while the figure-viewing software loads.

The procedure used to determine the AWSAR for a sewage sludge is presented below.

Procedure:

1. Analyze a sample of the sewage sludge to determine the concentration for each of the pollutants listed in Table 4 of §503.13 in the sewage sludge.

2. Using the pollutant concentrations from Step 1 and the APLRs from Table 4 of §503.13, calculate an AWSAR for each pollutant using equation (2) above.

3. The AWSAR for the sewage sludge is the lowest AWSAR calculated in Step 2.

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Appendix B to Part 503--Pathogen Treatment Processes

A. Processes to Significantly Reduce Pathogens (PSRP)

1. 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.

2. 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.

3. 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.

4. 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.

5. Lime stabilization--Sufficient lime is added to the sewage sludge to raise the pH of the sewage sludge to 12 after two hours of contact.

B. Processes to Further Reduce Pathogens (PFRP)

1. 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.

2. 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.

3. Heat treatment--Liquid sewage sludge is heated to a temperature of 180 degrees Celsius or higher for 30 minutes.

4. 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.

5. 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).

6. 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).

7. Pasteurization--The temperature of the sewage sludge is maintained at 70 degrees Celsius or higher for 30 minutes or longer.

KEN HECHLER
Secretary of State

MARY P. RATLIFF
Deputy Secretary of State

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Deputy Secretary of State

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April 18, 1995

NOTICE OF EMERGENCY RULE DECISION BY THE SECRETARY OF STATE

AGENCY: DEP - Water Resources / Waste Management

RULE: Amendment, Series 38D Sewage Sludge Management Rule

DATE FILED AS AN EMERGENCY RULE: March 20, 1995

DECISION NO. 4-95

Following review under WV Code 29A-3-15a, it is the decision of the Secretary of State that the above emergency rule be **disapproved**. A copy of the complete decision with required findings is available from this office.

Ken Hechler

KEN HECHLER
Secretary of State

KEN HECHLER
Secretary of State

MARY P. RATLIFF
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EMERGENCY RULE DECISION
(ERD 4-95)

AGENCY: DEP - Water Resources / Waste Management
RULE: Amendments, Series 38D, Sewage Sludge Management Rule
FILED AS AN EMERGENCY RULE: March 20, 1995

par. 1 The DEP - Water Resources/Waste Management (DEP) has filed the above amendments to an existing rule as an emergency rule.

par. 2 West Virginia Code 29A-3-15a requires the Secretary of State to review all emergency rules filed after March 8, 1986. This review requires the Secretary of State to determine if the agency filing such emergency rule: 1) has complied with the procedures for adopting an emergency rule; 2) exceeded the scope of its statutory authority in promulgating the emergency rule; or 3) can show that an emergency exists justifying the promulgation of an emergency rule.

par. 3 Following review, the Secretary of State shall issue a decision as to whether or not such an emergency rule should be disapproved [(29A-3-15a(b)].

par. 4 (A) Procedural Compliance: WV Code 29A-3-15 permits an agency to adopt, amend or repeal, without hearing, any legislative rule by filing such rule, along with a statement of the circumstances constituting the emergency, with the Secretary of State and forthwith with the Legislative Rule-Making Review Committee (LRMRC).

par. 5 If an agency has accomplished the above two required filings with the appropriate supporting documents by the time the emergency rule decision is issued or the expiration of the thirty-five day review period, whichever is sooner, the Secretary of State shall rule in favor of procedural compliance.

par. 6 The DEP filed this emergency rule with supporting documents with the Secretary of State March 20, 1995 and with the LRMRC March 30, 1995.

par. 7 It is the determination of the Secretary of State that the DEP has complied with the procedural requirements of WV Code §29A-3-15 for adoption of an emergency rule.

par. 8 (B) Statutory Authority -- WV Code §22-1-3 reads in part:

(a) The director has the power and authority to propose legislative rules for promulgation in accordance with §29A-3-1 et seq to carry out and implement the provisions of this chapter and to carry out and implement any other provision of law relating to offices or functions of the division.

par. 9 WV Code §22-15-20(b) also states in part:

(b) The director shall promulgate rules necessary for the efficient and orderly regulation of sewage sludge . . .All rules, whether emergency or not, promulgated pursuant to this section shall assure, at a minimum, the following:
(a) That entities either producing sewage sludge within the state or importing sewage sludge into the state are required to report to the division the following:
(i) The specific source of the sewage sludge;
(ii) The amount of sewage sludge actually generated or imported;
(iii) The content of heavy metals, pathogens, toxins or vectors present in the sewage sludge; and
(iv) Each location that sewage sludge is stored, land applied or otherwise disposed of; the amount so stored, land applied or otherwise disposed of; and the capacity of that location to accept sewage sludge;
(2) That the division engage in reasonable and periodic monitoring of all sewage sludge related activities and to monitor data supplied by sewage sludge producers or importers to ensure compliance with state and federal regulations;
(3) That representatives of the division have the ability to enter onto any land application site for the purposes of inspecting and analyzing the effects of sewage sludge application on that site;
(4) That no permit for the processing or disposal of sewage sludge will be issued until there is an accurate finding that it has been adequately tested and shown not to contain heavy metals, pathogens, toxins or vectors in excess of regulatory standards;
(5) That the director may require a surety bond, deposit or similar instrument in an amount sufficient to cover the costs of future environmental remediation from producers and importers of sewage sludge;
(6) That no person or entity be allowed to apply sewage sludge to land in a manner that will result in exceeding the maximum soil concentration for all pollutants, including, but not limited to, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium and zinc;

(7) That no land, except a solid waste facility, be allowed to accept or store so much sewage sludge as to exceed the agronomic rate or a rate of fifteen dry tons per acre per year, whichever is less: Provided, That up to 75 dry tons per acre per year, whichever is less; Provided, That up to 25 dry tons per acre per year may be applied in the reclamation of surface mine land;
(8) That information relating to the disposal of sewage sludge is available to affected communities;
(9) That all sewage sludge processing facilities contain sufficient design specifications to protect ground and surface waters;
(10) That regulation of composting facilities varies according to types and quantities of materials handled;
(11) That only living or dead plant tissues are used as bulking agents in sewage sludge processing facilities; and
(12) That a fee, to be paid by the producer or importer, be levied and imposed on the land application of sewage sludge, to be collected at a per ton rate, sufficient to cover the costs of the sewage sludge management program. Fees collected pursuant to the terms of this subsection shall be deposited in the special revenue fund designated the "water quality management fund" established under §22-11-10 of this chapter. The fee schedule shall vary according to the volume of materials handled and the contaminant level of the sewage sludge and shall be subject to the provisions of §29A-3-1 et seq. of this code.

par. 10. The rule, Title 47, Series 38D went through several meetings of the Legislative Rule Making Review Committee and Table 3 was included in the rule only after the rule had been through LRMRC meetings, and then it was filed with the Agency's Modified rule. The rule then continued through the full body of the 1994 Legislature and Table 3 was passed and kept in the rule.

par. 11 Three separate bills (SB 528, SB 533 and SB 583) were introduced in the 1995 Legislative session to enable DEP to remove Table 3 from this rule and adopt the Federal standards instead. Each of the three bills were killed in committee.

par. 12 Unfortunately, it appears that DEP is attempting to improperly use the emergency rule procedure to avoid the legislative process.

par. 13 It is the determination of the Secretary of State that the DEP **has** exceeded its statutory authority in promulgating this emergency rule as the Legislature addressed "Table 3" in both of the last two sessions and determined to leave the standards more strict than Federal standards.

par. 14 (C) Emergency -- WV Code 29A-3-15(f) defines "emergency" as follows:

(f) For the purposes of this section, an emergency exists when the promulgation of a rule is necessary for the immediate preservation of the public peace, health, safety or welfare or is necessary to comply with a time limitation established by this code or by a federal statute or regulation or to prevent substantial harm to the public interest.

par. 15 There are essentially three classes of emergency broadly presented with the above provision: 1) immediate preservation; 2) time limitation; and 3) substantial harm. An agency need only document to the satisfaction of the Secretary of State that there exists a nexus between the proposal and the circumstances creating at least one of the above three emergency categories.

par. 16 The facts and circumstances as presented by the DEP are as follows:

Pursuant to West Virginia Code 22-15-20(b), the Division of Environmental Protection promulgated an emergency rule which governed the land application of sewage sludge. Legislative rule 47 CSR 38D was subsequently filed on May 13, 1994 and became effective on June 1, 1994. Both rules contained maximum allowable soil concentration standards for various metals (arsenic, lead, zinc, etc.). These standards are contained in Table 3 of the existing rule.
Because of the emergency nature of the rule, as declared by the Legislature, there was virtually no time to develop a sound technical and scientific foundation for establishing the soil concentration standards. During the ensuing period of time since promulgating the rule, it has been determined through scientific sampling and analysis that many native soils throughout the state exhibit naturally-occurring levels of metals which exceed the standards established in Table 3.
The results of these determinations are that lands containing these naturally-occurring metals preclude the land application of sewage sludge. This poses a serious health and economic problem for publicly Owned Treatment Works (POTW's) which are primarily municipally sewage treatment plants. These facilities are forced to either store the sewage sludge on site or dispose of it in permitted landfills. The stored sludge must be composted and carefully monitored by the POTW and poses an ever-present potential for health risks. This is an expansive process for which POTW's are not well trained or prepared to implement. Landfilling is even more expensive because of the mandatory tipping fees. This additional cost will eventually be passed on to the public in the form of higher sewage and water bills.
In view of the inappropriateness of the soil concentration standards and the health and monetary considerations, the Division of Environmental Protection must amend Table 3 to reflect concentration levels which are based on sound

technical and scientific data. Collection and analysis of such data will require several months. In the interim, the division is compelled to lift the requirements of Table 3 to avert any economic and health risk to the public.

par. 17 Averting economic risk to the public is one reason that DEP has given for proposing this rule as an emergency, but no fiscal impact statements were included.

par. 18 DEP declares that the levels of metals found in some soils exceed the standards established in Table 3, but fail to show evidence of whether these excesses are "naturally-occurring" or if they were human-induced.

par. 19 DEP also failed to show the environmental impact of lowering the standards contained in Table 3. The resultant higher levels of arsenic, lead, mercury and other toxic metals proposed to be applied upon land must some measurable, detrimental impact upon our environment.

par. 20 It is the determination of the Secretary of State that this proposal is contrary to the definition of an emergency as defined in §29A-3-15(f)..."for the immediate preservation of the public peace, health, safety or welfare" or "to prevent substantial harm to the public interest" and must be **disapproved**.

par. 21 This decision shall be cited as Emergency Rule Decision 4-95 or ERD 4-95 and may be cited as precedent. This decision is available from the Secretary of State and has been filed with the DEP - Water Resources/Waste Management, the Attorney General and the Legislative Rule Making Review Commission.

KEN HECHLER
Secretary of State

Entered_____

FILED
APR 10 | 06 PM '95
OFFICE OF WEST VIRGINIA
SECRETARY OF STATE

GASTON CAPERTON
GOVERNOR

DIVISION OF ENVIRONMENTAL PROTECTION
10 McJunkin Road
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DAVID C. CALLAGHAN
DIRECTOR

May 31, 1995

Ms. Judy Cooper
Director, Administrative Law
Division
Secretary of State's Office
Capitol Complex
Charleston, West Virginia 25305

RE: Emergency Rule 47CSR38D
Sewage Sludge Management Rule

Dear Judy,

I have reviewed the Secretary of State's recent decision regarding the above-captioned emergency rule filed with your office on March 20, 1995, and am hereby withdrawing the subject rule. As you know, the agency simultaneously filed a proposed legislative rule which is more or less similar to the emergency rule. It is the agency's intent to seek authorization of the Legislative rule. I will be filing the response to comments and other public notice information and the agency adopted rule with your office within the next few days.

As a point of information, I am also enclosing a copy of a draft legal review of the decision on the emergency rule which you may find informative.

If you have any questions regarding this matter, please feel free to contact me.

Sincerely yours,

Roger T. Hall

Roger T. Hall
Special Assistant to Director

RTH:cc

Attachment

MEMORANDUM

TO: Roger T. Hall
Division of Environmental Protection

FROM: David L. Lahr DLL
Assistant Attorney General
Environment & Energy Division

DATE: May 5, 1995

RE: Emergency Rule Amendments, Series 38D, Sewage Sludge Management Rule, Secretary of State Decision No. 4-95

==========

This memorandum is sent in response to your inquiry concerning the above-captioned Sewage Sludge Emergency Rule and the resulting Secretary of State Decision.

I have reviewed the documents and information contained in the packet received April 24, 1995. Documents contained in the packet include the Notice of Emergency Rule Decision by the Secretary of State, the salient provisions of the State Administrative Procedure Act, namely West Virginia Code §§ 29A-3-15(a)-(b), the information submitted by letter dated April 6, 1995, to Ms. Judy Cooper of the Secretary of State's Office, a copy of the Notice of the Emergency Rule filed, and the amended Rule filed March 20, 1995, the letter April 4, 1995, to you from Judy Cooper, and a copy of 40 C.F.R. 503. Your inquiry raises several obvious issues:

I.

WHETHER THE FILING OF A PETITION FOR A WRIT OF CERTIORARI WITH THE SUPREME COURT OF APPEALS IS THE APPROPRIATE METHOD TO INSTITUTE JUDICIAL REVIEW OF THE SECRETARY OF STATE'S DISAPPROVAL OF THE EMERGENCY RULE?

Suggested answer: Yes.

West Virginia Code § 29A-3-15a(e) clearly provides for Supreme Court review of the Secretary of State's determination. It states, in pertinent part:

> The determination of the secretary of state shall be reviewable by the supreme court of appeals under its original jurisdiction, based upon a petition for a writ of

mandamus, prohibition or certiorari, as appropriate. Such proceeding may be instituted by:

(1) The agency which promulgated the emergency rule; (2) A member of the Legislature; or (3) Any person whose personal property interests will be significantly affected by the disapproval of the emergency rule by the secretary of state.

Based on the facts of this case, filing a petition for writ of certiorari is the appropriate remedy. The filing of a petition for a writ of prohibition is quickly eliminated as an appropriate method to institute review. This writ commonly used to restrain or prevent performance of an act by a judicial or quasi-judicial body. Here there is no act to be enjoined or restrained. However, the filing of a petition for a Writ of Prohibition would be the appropriate method of instituting Supreme Court review of the improper issuance of an Emergency Rule.

The filing of a petition for a writ of mandamus also seems inappropriate under this set of facts. Following the Court's reasoning in Halsted v. Dials, 391 S.E.2d 385 (1990), a writ of mandamus will not issue unless these elements co-exist:

1. A clear legal right in the Petitioner to the relief sought.

2. A legal duty on the part of the Respondent to do the thing which the Petitioner seeks to compel.

3. The absence of another adequate remedy.

Upon filing of an Emergency Rule or an amendment to an Emergency Rule by an agency, the Secretary of State is vested with discretion to approve or disapprove the rule. In light of the discretionary nature of the Secretary of State's statutory powers, it may be difficult to establish a legal duty on the Secretary's part to approve the Emergency Rule. Mandamus would be the appropriate remedy where, for example, the Secretary of State refused to approve or disapprove a rule or where the Legislature found that there was an emergency and the Secretary of State disapproved the Emergency Rule based on a finding of "No Emergency".

West Virginia Code § 29A-3-15a(e) also provides for review based upon a Petition for a writ of certiorari. Although my research has failed to locate a case where the Secretary of State's disapproval of a Emergency Rule was challenged by the filing of a petition for writ of certiorari, certiorari appears to be the appropriate remedy. In the case Bd. of Educ., Lincoln v. McQueen, 325 S.E.2d 355 (W. Va. 1984) the Court summarized the scope of a writ of certiorari as follows:

A Writ of Certiorari will lie from an inferior tribunal, acting in a judicial or quasi-judicial capacity, where substantial rights are alleged to have been

> violated and where there is no other statutory right of review given; [u]pon the hearing of such Writ of Certiorari, the circuit court is authorized to take evidence, independent of that contained in the record of the lower tribunal, to determine if such violations have occurred. (Emphasis added).

It is not enough to merely allege error by the lower tribunal; one additionally must allege and prove that a substantial right has been violated. Other certiorari cases cite to the denial of due process i.e. the failure to give a school teacher a employment termination hearing, and violations of equal protection as substantial rights. However, the substantial right alleged to have been violated need not be a right of constitutional dimension. In order to be entitled to a writ of certiorari, a petitioner must have an interest in the proceeding to be reviewed and must have sustained injury from the prior ruling therein. See Walker v. City of Charleston, 61 S.E.2d 743 (W. Va. 1950).

The persons whose personal property interest may be significally affected from the failure of the Secretary of State to approve the Rule are the POTWs and other sludge handlers. It also may be shown that the Director of DEP's statutory rights and obligations have been thwarted by the Secretary's disapproval.

II. LIKELIHOOD OF SUCCESS ON THE MERITS

The Secretary of State's Emergency Rule Decision cites two bases to deny approval of the Emergency Rule:

1. The Secretary of State found that DEP exceeded its statutory authority in promulgating the rule;

2. The proposal was contrary to the definition of an Emergency as defined in W. Va. Code § 29A-3-15(f). . ."for the immediate preservation of the public peace, health, safety, or welfare" or "to prevent substantial harm to public interest" and must be disapproved.

A. WHETHER THE CONCLUSION THAT DEP EXCEEDED ITS STATUTORY AUTHORITY IS SUPPORTED BY THE SECRETARY'S FINDINGS?

Suggested answer: No.

Although not cited, the statutory basis for the Secretary's conclusion that DEP attempted to improperly use the emergency rule procedure is presumably W. Va. code § 29A-3-15(d):

> The provision of this section shall not be used to avoid or evade any provision of this article or any other provisions of this code, including any provisions for legislative review and approval of proposed rules. . . .

The Legislature's failure or refusal to effectively respond to the emergency does not imply that an emergency does not exist.[1]

Only paragraphs 10, 11, and 12 of the Secretary's Decision appear to relate to the above conclusion. The fact that one or more bills were introduced into the 1995 Legislative Session appears to be irrelevant. One cannot infer from the failure of the Legislature to pass an amendment to the Sludge Rules, that in fact an amendment is not necessary and appropriate. The inference that DEP was trying to circumvent the process by filing this Emergency Rule is not supported by the evidence.

B. WHETHER THE DETERMINATION THAT THE PROPOSED RULE IS CONTRARY TO THE DEFINITION OF AN EMERGENCY IS SUPPORTED BY THE SECRETARY'S FINDINGS?

West Virginia Code § 29A-3-15 states in part, that the Secretary of State shall disapprove an emergency rule (b)(2). . ." if he determines. . . (t)hat an emergency does not exist justifying the promulgation of the emergency rule. . .". The Secretary's decision correctly cites the definition of emergency contained in W. Va. Code § 29A-3-15(f). It states:

> For the purposes of this section, an emergency exists when the promulgation of an emergency rule is necessary (1) for the immediate preservation of the public peace, health, safety or welfare, (2) to comply with a time limitation established by this code or by a federal statute or regulation, or (3) to prevent substantial harm to the public interest.

Although paragraph 15 of the Decision states that "(a)n agency need only document to the satisfaction of the Secretary of State that there exists a nexus between the proposal and the circumstances creating at least one of the above three emergency categories", the Secretary found that the proposed rule is contrary to the definition of an emergency defined as (1)"for the immediate preservation of the public peace, health, safety, or welfare", and (2) "to prevent substantial harm to the public interest."

The following comments address the Decision, paragraph by paragraph.

Paragraph 16- Facts and Circumstances

[1]Paragraph 11 of the Decision states that each of the three bills "were killed" in committee. It does not state who committed this legicide or, more importantly, why. One can only presume the bills did not die as a result of natural causes.

Although DEP presented the facts and circumstances contained in paragraph 16, additional information was supplied to the Secretary of State's office at the request of Judy Cooper, Director of the Administrative Law Division. The decision fails to recognize or incorporate any of the facts contained in DEP's April 6, 1995 supplemental submittal.

Paragraph 17- Economic Risk to the Public

The Decision cites that "no fiscal impact statements were included". The submittal does not include a fiscal impact statement however DEP's Factors Constituting An Emergency and supplemental response cite the increased cost to the POTWs which ultimately will be passed on to the citizens of the State.

Paragraph 18- Elevated Metal Levels-Naturally- Occurring or Human Induced

This finding completely ignores the supplemental submittal. Mike Zeto's Memorandum dated December 9, 1994, and Summers' report clearly indicate that naturally-occurring levels of Arsenic and nickel and to as lesser extent levels of chromium, lead and cadmium exceed the present regulatory limit. See Wood County Survey and State Wide.

Paragraph 19-Environmental Impact For Lowering Standards

Your observation that the Emergency Rule will not permit higher levels of the COC's to be applied is correct. This finding by the Secretary misses one reason for the Emergency Rule, namely that if approved it will allow the DEP time to evaluate the standards in regard to the potential environmental impact. The director has a nondiscretionary duty to consider and establish requirements based, in part, on the environmental impact of solid waste disposal. See W. Va. Code § 22-15-5(a) (1994). This finding fails to acknowledge that the Emergency Rule complies with the "stringency" requirements in W. Va. Code § 22-1-3a, entitled Rules-new or amended environmental provisions.

In making his findings, the Secretary failed to recognize or defer to DEP's expertise in environmental matters in determining whether an emergency exists within the definitional ambit of W. Va. Code § 29A-3-15(f). The Decision also fails to acknowledge that the rule incorporates by reference 40 C.F.R. 503.13(a)(2) and 503.13(b)(2). See DEP Rulemaking Findings, Statement of Stringency-Federal Counterpart Regulation. A strong case can be made that the Secretary's findings are not supported by the record submitted and he abused his discretion in disapproving the rule. However it is very likely that the Supreme Court will accord the Secretary's Decision great deference on this highly publicized issue.

KEN HECHLER
Secretary of State

MARY P. RATLIFF
Deputy Secretary of State

A. RENEE COE
Deputy Secretary of State

CATHERINE FREROTTE
Executive Assistant

Telephone: (304) 558-6000
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SECRETARY OF STATE

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WILLIAM H. HARRINGTON
Chief of Staff

JUDY COOPER
Director, Administrative Law

DONALD R. WILKES
Director, Corporations

(Plus all the volunteer help we can get)

FAX: (304) 558-0900

April 4, 1995

Mr. Roger Hall
10 McJunkin Road
Nitro, WV 25143-2506

Dear Roger:

I have been reviewing Title 47-38D, "Sewage Sludge Management" rules that you submitted as an emergency rule on March 20, 1995, and I need some additional documentation.

In your "Factors Constituting an Emergency" you say "it has been determined through scientific sampling and analysis that many native soils throughout the state exhibit naturally-occurring levels of metals which exceed the standards established in Table 3." May we have a copy of this report and a copy of the actual analysis.

In the same notice, you said that because POTW's were not well trained or prepared to implement the additional sewage sludge that extra cost would be passed along to the public in the form of higher sewage and water bills. On what basis do you establish this? What was the cost prior to 47-38D becoming effective? Will this extra cost have to go before the PSC before being passed along to the consumer?

When the Legislative Rule Making Committee approved as modified this rule on January 12, 1994, Table 3 was added to the original filing along with other changes. Would you please submit the explanation which was used at that time to approve/disapprove this table?

What rationalization did you use when you presented this issue to the 1995 Legislature in SB 528, which died in committee, to try to get this Table removed? Please send us a copy of your history for this also.

Are you aware of any out of state companies that are waiting for a chance to bring their sewage sludge and dispose of it in West Virginia? If so, who are they? When? What kind of sludge? etc.

I need this as soon as possible, no later that April 10, 1995. Thank you for your help in this matter.

Sincerely,

Judy Cooper

Judy Cooper, Director
Administrative Law Division

SENATE BILL NO. 528

95R1096

(By Senators Scott, Wiedebusch, Bailey, Yoder, Miller and Dittmar)

[Introduced February 20, 1995; referred to the Committee on Natural Resources.]

In part

A BILL to amend and reenact section twenty, article fifteen, chapter twenty-two of the code of West Virginia, one thousand nine hundred thirty-one, as amended, mandating the adoption of the federal sewage sludge regulations as the standard for the concentration of pollutants in the soil resulting from land application of sewage sludge.

Be it enacted by the Legislature of West Virginia:

That section twenty, article fifteen, chapter twenty-two of the code of West Virginia, one thousand nine hundred thirty-one, as amended, be amended and reenacted to read as follows:

ARTICLE 15. SOLID WASTE MANAGEMENT ACT.

§22-15-20. Sewage sludge management.

(a) The division shall develop and implement a comprehensive program for the regulation and management of sewage sludge. The division is authorized to require permits for all facilities and activities which generate, process or dispose of sewage sludge by whatever means, including, but not limited to, land application, composting, mixed waste composting, incineration or any other

(3) That representatives of the division have the ability to enter onto any land application site for the purposes of inspecting and analyzing the effects of sewage sludge application on that site;

(4) That no permit for the processing or disposal of sewage sludge will be issued until there is an accurate finding that it has been adequately tested and shown not to contain heavy metals, pathogens, toxins or vectors in excess of regulatory standards;

(5) That the director may require a surety bond, deposit or similar instrument in an amount sufficient to cover the costs of future environmental remediation from producers and importers of sewage sludge;

(6) That ~~no person or entity be allowed to apply sewage sludge to land in a manner that will result in exceeding the maximum soil concentration for all pollutants, including, but not limited to, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium and zinc~~ the standards and criteria for the land application of sewage sludge in West Virginia shall be as provided for in Part 503 of Title 40 of the code of federal regulations, 40 CFR 503, Subparts (B) and (D) in effect on the first day of January, one thousand nine hundred ninety-five, and no rule promulgated under subsection (b) of this section shall be in conflict therewith;

(7) That no land, except a solid waste facility, be allowed to accept or store so much sewage sludge as to exceed the agronomic rate or a rate of fifteen dry tons per acre per year,

SENATE BILL NO. 528

95R1096

(By Senators Scott, Wiedebusch, Bailey, Yoder, Miller and Dittmar)

[Introduced February 20, 1995; referred to the Committee on Natural Resources.]

A BILL to amend and reenact section twenty, article fifteen, chapter twenty-two of the code of West Virginia, one thousand nine hundred thirty-one, as amended, mandating the adoption of the federal sewage sludge regulations as the standard for the concentration of pollutants in the soil resulting from land application of sewage sludge.

Be it enacted by the Legislature of West Virginia:

That section twenty, article fifteen, chapter twenty-two of the code of West Virginia, one thousand nine hundred thirty-one, as amended, be amended and reenacted to read as follows:

ARTICLE 15. SOLID WASTE MANAGEMENT ACT.

§22-15-20. Sewage sludge management.

(a) The division shall develop and implement a comprehensive program for the regulation and management of sewage sludge. The division is authorized to require permits for all facilities and activities which generate, process or dispose of sewage sludge by whatever means, including, but not limited to, land application, composting, mixed waste composting, incineration or any other

method of handling sewage sludge within the state.

(b) The director shall promulgate rules necessary for the efficient and orderly regulation of sewage sludge no later than ninety days after the effective date of this article. The Legislature finds and declares that conditions warranting a rule to be promulgated as an emergency rule do exist and that the promulgation of the initial rule required by this section should be accorded emergency status. All rules, whether emergency or not, promulgated pursuant to this section shall assure, at a minimum, the following:

(1) That entities either producing sewage sludge within the state or importing sewage sludge into the state are required to report to the division the following:

(i) The specific source of the sewage sludge;

(ii) The amount of sewage sludge actually generated or imported;

(iii) The content of heavy metals, pathogens, toxins or vectors present in the sewage sludge; and

(iv) Each location that the sewage sludge is stored, land applied or otherwise disposed of; the amount so stored, land applied or otherwise disposed of; and the capacity of that location to accept sewage sludge;

(2) That the division engage in reasonable and periodic monitoring of all sewage sludge related activities and to monitor data supplied by sewage sludge producers or importers to ensure compliance with state and federal regulations;

(3) That representatives of the division have the ability to enter onto any land application site for the purposes of inspecting and analyzing the effects of sewage sludge application on that site;

(4) That no permit for the processing or disposal of sewage sludge will be issued until there is an accurate finding that it has been adequately tested and shown not to contain heavy metals, pathogens, toxins or vectors in excess of regulatory standards;

(5) That the director may require a surety bond, deposit or similar instrument in an amount sufficient to cover the costs of future environmental remediation from producers and importers of sewage sludge;

(6) That ~~no person or entity be allowed to apply sewage sludge to land in a manner that will result in exceeding the maximum soil concentration for all pollutants, including, but not limited to, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium and zinc~~ the standards and criteria for the land application of sewage sludge in West Virginia shall be as provided for in Part 503 of Title 40 of the code of federal regulations, 40 CFR 503, Subparts (B) and (D) in effect on the first day of January, one thousand nine hundred ninety-five, and no rule promulgated under subsection (b) of this section shall be in conflict therewith;

(7) That no land, except a solid waste facility, be allowed to accept or store so much sewage sludge as to exceed the agronomic rate or a rate of fifteen dry tons per acre per year,

whichever is less: *Provided,* That up to twenty-five dry tons per acre per year may be applied in the reclamation of surface mine land;

(8) That information relating to the disposal of sewage sludge is available to affected communities;

(9) That all sewage sludge processing facilities contain sufficient design specifications to protect ground and surface waters;

(10) That regulation of composting facilities varies according to types and quantities of materials handled;

(11) That only living or dead plant tissues are used as bulking agents in sewage sludge processing facilities; and

(12) That a fee, to be paid by the producer or importer, be levied and imposed on the land application of sewage sludge, to be collected at a per ton rate, sufficient to cover the costs of the sewage sludge management program. Fees collected pursuant to the terms of this subsection shall be deposited in the special revenue fund designated the "water quality management fund" established under the provisions of section ten, article eleven of this chapter. The fee schedule shall vary according to the volume of materials handled and the contaminant level of the sewage sludge and shall be subject to the provisions of article three, chapter twenty-nine-a of this code.

(c) For those publicly owned treatment works (POTW) which produce sewage sludge and are regulated by the division pursuant to an NPDES permit required under article eleven of this chapter,

a sewage sludge processing permit shall be a part of the existing water pollution control permit and shall include a sewage sludge management plan approved by the director.

(d) On and after the tenth day of April, one thousand nine hundred ninety-three, any facility seeking to land apply, compost, incinerate or recycle sewage sludge shall first apply for and obtain a permit from the division. No such permit may be issued until the rule provided for in subsection (b) of this section is effective.

(e) All sewage sludge placed in, or upon, or used by a solid waste facility or processed or handled, pursuant to a permit issued by the division, shall be subject to the same tipping and other fees levied by this chapter on the disposal of solid waste and shall be included in said facility's total tonnage, subject to the limitations established in this article and the provisions of article four, chapter twenty-two-c: *Provided,* That no land within a solid waste facility, but outside a landfill disposal cell, be allowed to accept the permanent application of so much sewage sludge as to exceed the agronomic rate or a rate of fifteen dry tons per acre per year, whichever is less: *Provided, however,* That no such fees, excepting assessment fees provided for in subdivision (12), subsection (b) of this section shall be levied upon the application of sewage sludge to land outside a solid waste facility in accordance with this section.

NOTE: The purpose of this bill is to mandate the adoption

of the federal sewage sludge regulations as the standard for the concentration of pollutants in the soil resulting from land application of sewage sludge.

Strike-throughs indicate language that would be stricken from the present law, and underscoring indicates new language that would be added.

Delegate Compton

Envir.

Mary Pearl
Compton
(304) 772-5786
delegate Monroe Co.
Sludge

* judic. committee took it up last year
Brian Gallagher
sees no reason for the rule

* no effect on landowners / not true
legis had no intent for the sludge to be placed on landowners prop.
w/ ↑ mineral content

* modification to proposed rule

PSC may say NO to ↑ charges

legislature worked on it

95R338

H. B. 2204

(By Delegate Prunty)

(Introduced January 24, 1995; referred to the Committee on the Judiciary.)

A BILL to amend and reenact section ten, article fifteen, chapter twenty-two of the code of West Virginia, one thousand nine hundred thirty-one, as amended, relating to solid waste disposal and limiting to three percent the amount of solid waste originating from out-of-state sources that may be disposed of at solid waste facilities.

Be it enacted by the Legislature of West Virginia:

That section ten, article fifteen, chapter twenty-two of the code of West Virginia, one thousand nine hundred thirty-one, as amended, be amended and reenacted to read as follows:

ARTICLE 15. SOLID WASTE MANAGEMENT ACT.

§22-15-10. Prohibitions; permits required; priority of disposal.

(a) Open dumps are prohibited and it is unlawful for any person to create, contribute to or operate an open dump or for any landowner to allow an open dump to exist on the landowner's property unless that open dump is under a compliance schedule approved by the director. Such compliance schedule shall contain

an enforceable sequence of actions leading to compliance and shall not exceed two years. Open dumps operated prior to the first day of April, one thousand nine hundred eighty-eight, by a landowner or tenant for the disposal of solid waste generated by the landowner or tenant at his or her residence or farm are not a violation of this section if such open dump did not constitute a violation of law on the first day of January, one thousand nine hundred eighty-eight, and unauthorized dumps which were created by unknown persons do not constitute a violation of this section: *Provided*, That no person shall contribute additional solid waste to any such dump after the first day of April, one thousand nine hundred eighty-eight, except that the owners of the land on which unauthorized dumps have been or are being made are not liable for such unauthorized dumping unless such landowners refuse to cooperate with the division in stopping such unauthorized dumping.

(b) It is unlawful for any person, unless the person holds a valid permit from the division to install, establish, construct, modify, operate or abandon any solid waste facility. All approved solid waste facilities shall be installed, established, constructed, modified, operated or abandoned in accordance with this article, plans, specifications, orders, instructions and rules in effect.

(c) Any permit issued under this article shall be issued in

compliance with the requirements of this article, its rules and article eleven of this chapter and the rules promulgated thereunder, so that only a single permit is required of a solid waste facility under these two articles. Each permit issued under this article shall have a fixed term not to exceed five years: *Provided,* That the director may administratively extend a permit beyond its five-year term if the approved solid waste facility is in compliance with this article, its rules and article eleven of this chapter and the rules promulgated thereunder: *Provided, however,* That such administrative extension may not be for more than one year. Upon expiration of a permit, renewal permits may be issued in compliance with rules promulgated by the director.

(d) For existing solid waste facilities which formerly held division of health permits which expired by law and for which complete permit applications for new permits pursuant to this article were submitted as required by law, the division may enter an administrative order to govern solid waste activities at such facilities, which may include a compliance schedule, consistent with the requirements of the division's solid waste management rules, to be effective until final action is taken to issue or deny a permit for such facility pursuant to this article, or until further order of the division.

(e) No person may dispose in the state of any solid waste,

whether such waste originates in state or out of state, in a manner which endangers the environment or the public health, safety or welfare as determined by the director: *Provided,* That the carcasses of dead animals may be disposed of in any solid waste facility or in any other manner as provided for in this code. Upon request by the director, the commissioner of the bureau of public health shall provide technical advice concerning the disposal of solid waste or carcasses of dead animals within the state.

(f) A commercial solid waste facility shall first ensure that the disposal needs of the wasteshed in which it is located are met. If one or more local solid waste authorities in the wasteshed in which the facility is located determine that the present or future disposal needs of the wasteshed are not being, or will not be, met by the commercial solid waste facility, such authorities may apply to the director o to modify the applicable permit. The director, in consultation with the solid waste management board, may then modify the applicable permit in order to reduce the total monthly tonnage of out of wasteshed waste the facility is permitted to accept by an amount that shall not exceed the total monthly tonnage necessary to ensure the disposal needs of the wasteshed in which the facility is located.

(g) No solid waste facility may accept any solid waste originating from out-of-state sources in excess of three percent

of the total amount of solid waste received at that facility. In order to protect the public health and the environment of the state, the director of the division of natural resources shall coordinate disposal of solid waste originating from out-of-state sources and shall monitor the total tonnage of solid waste generated and disposed at solid waste facilities in this state. The director is authorized and shall enforce compliance with the provisions of this section.

~~(g)~~ (h) In addition to all the requirements of this article and the rules promulgated hereunder, a permit to construct a new commercial solid waste facility or to expand the spatial area of an existing facility, not otherwise allowed by an existing permit, may not be issued unless the public service commission has granted a certificate of need, as provided in section one-c, article two, chapter twenty-four of this code. If the director approves a permit or permit modification, the certificate of need shall become a part of the permit and all conditions contained in the certificate of need shall be conditions of the permit and may be enforced by the division in accordance with the provisions of this article.

~~(h)~~ (i) The director shall promulgate legislative rules pursuant to article three, chapter twenty-nine-a of this code which reflect the purposes as set forth in this section.

The director of the ~~department~~ division of natural resources

shall promulgate rules pursuant to chapter twenty-nine-a of this code which reflect the purposes as set forth in this article.

NOTE: The purpose of this bill is to limit disposal of solid waste at any single facility originating from out-of-state to not more than 3% of the total tonnage of solid waste disposed in that facility.

Strike-throughs indicate language that would be stricken from the present law, and underscoring indicates new language that would be added.

4942

95R842

H. B. 2464

(By Delegate Everson (By Request)

)

(Introduced February 13, 1995; referred to the Committee on the Judiciary.)

A BILL to amend and reenact section seven, article fifteen, chapter twenty-two of the code of West Virginia, one thousand nine hundred thirty-one, as amended, relating to a special provision for residential solid waste disposal.

Be it enacted by the Legislature of West Virginia:

That section seven, article fifteen, chapter twenty-two of the code of West Virginia, one thousand nine hundred thirty-one, as amended, be amended and reenacted, all to read as follows:

§22-15-7. Special provision for residential solid waste disposal.

All commercial ~~and public~~ solid waste facilities shall establish and publish a yearly schedule providing for one day per month on which a person not in the business of hauling or disposing of solid waste, who is a resident of the wasteshed in which the facility is located, may dispose of an amount of residential solid waste up to one pick-up truckload or its equivalent, free of all charges and fees.

NOTE: The purpose of this bill is to remove public solid waste facilities from the requirements that they provide one day per month for persons to use the facilities free of charge.

Strike-throughs indicate language that would be stricken from the present law, and underscoring indicates new language that would be added.

SENATE BILL NO. 544 95R1262

(By Senator Plymale)

[Introduced February 20,1 995; referred to the Committee on Natural Resources.]

A BILL to amend and reenact section eleven, article eleven, chapter twenty-two of the code of West Virginia, one thousand nine hundred thirty-one, as amended, relating to authorizing the division of environmental protection to reopen permits that are more stringent than federal requirements.

Be it enacted by the Legislature of West Virginia:

That section eleven, article eleven, chapter twenty-two of the code of West Virginia, one thousand nine hundred thirty-one, as amended, be amended and reenacted to read as follows:

ARTICLE 11. WATER POLLUTION CONTROL ACT.

§22-11-11. Procedure concerning permits required under article; transfer of permits; prior permits.

(a) The chief or his or her duly authorized representatives shall conduct such investigation as is deemed necessary and proper in order to determine whether any such application should be granted or denied. In making such investigation and

determination as to any application pertaining solely to sewage, the chief shall consult with the director of the office of environmental health services of the state bureau of public health, and in making such investigation and determination as to any application pertaining to any activity specified in subdivision (7), subsection (b), section eight of this article, the chief shall consult with the director of the state geological and economic survey and the chief of the office of oil and gas of the division, and all such persons shall cooperate with the chief and assist him or her in carrying out the duties and responsibilities imposed upon him or her under the provisions of this article and the rules of the director and board; such cooperation shall include, but not be limited to, a written recommendation approving or disapproving the granting of the permit and the reason or reasons for such recommendation, which recommendation and the reason or reasons therefor shall be submitted to the chief within the specified time period prescribed by rules of the director.

(b) The division's permit shall be issued upon such reasonable terms and conditions as the chief may direct if: (1) The application, together with all supporting information and data and other evidence, establishes that any and all discharges or releases, escapes, deposits and disposition of treated or untreated sewage, industrial wastes or other wastes, or the effluent therefrom, resulting from the activity or activities for which the application for a permit was made will not cause

pollution of the waters of this state or violate any effluent limitations or any rules of the board or director: *Provided,* That the chief may issue a permit whenever in his or her judgment the water quality standards of the state may be best protected by the institution of a program of phased pollution abatement which under the terms of the permit may temporarily allow a limited degree of pollution of the waters of the state; and (2) in cases wherein it is required, such applicant shall include the name and address of the responsible agent as set forth in subsection (e), section six, article six of this chapter.

(c) Each permit issued under this article shall have a fixed term not to exceed five years: *Provided,* That when the applicant, in accordance with agency rules, has made a timely and complete application for permit reissuance, the permit term may be extended by the chief, at his or her discretion. An extension may be granted for a period not to exceed twelve months beyond its expiration date. Successive extensions may be granted for periods not to exceed twelve months if the chief determines additional time is necessary in order to process the application for permit reissuance. Upon expiration of a permit, a new permit may be issued by the chief upon condition that the discharges or releases, escapes, deposits and disposition thereunder meet or will meet all applicable state and federal water quality standards, effluent limitations and all other requirements of this article. <u>The chief may revise a site-specific, general or any other permit during its terms, to eliminate or modify any</u>

requirement which is more stringent than a counterpart federal requirement.

(d) An application for a permit incident to remedial action in accordance with the provisions of section sixteen of this article shall be processed and decided as any other application for a permit required under the provisions of section eight of this article.

(e) A complete application for any permit shall be acted upon by the chief, and the division's permit delivered or mailed, or a copy of any order of the chief denying any such application delivered or mailed to the applicant by the chief, within a reasonable time period as prescribed by rules of the director.

(f) When it is established that an application for a permit should be denied, the chief shall make and enter an order to that effect, which order shall specify the reasons for such denial, and shall cause a copy of such order to be served on the applicant by registered or certified mail. The chief shall also cause a notice to be served with a copy of such order, which notice shall advise the applicant of the right to appeal to the board by filing a notice of appeal on the form prescribed by the board for such purpose, with the board, in accordance with the provisions of, and within the time specified in, section seven, article one, chapter twenty-two-b of this code. However, an applicant may alter the plans and specifications for the proposed activity and submit a new application for any such permit, in

which event the procedure hereinbefore outlined with respect to an original application shall apply.

(g) A permit is transferable to another person upon proper notification to the chief and in accordance with applicable rules. Such transfer does not become effective until it is reflected in the records of the office of water resources.

(h) All permits for the discharge of sewage, industrial wastes or other wastes into any waters of the state issued by the water resources board prior to July one, one thousand nine hundred sixty-four, and all permits heretofore issued under the provisions of former article five-a, chapter twenty of this code, and which have not been heretofore revoked, are subject to review, revocation, suspension, modification and reissuance in accordance with the terms and conditions of this article and the rules promulgated thereunder. Any order of revocation, suspension or modification made and entered pursuant to this subsection shall be upon at least twenty days' notice and shall specify the reasons for such revocation, suspension or modification and the chief shall cause a copy of such order, together with a copy of a notice of the right to appeal to the board as provided for in section twelve of this article, to be served upon the permit holder as specified in said section twelve.

NOTE: The purpose of this bill is to authorize the Chief of the Office of Water Resources of the Division of Environmental Protection to reopen a water pollution permit during its term to

eliminate or modify any requirement which is more stringent than a counterpart federal requirement.

Strike-throughs indicate language that would be stricken from the present law, and underscoring indicates new language that would be added.

HOUSE OF DELEGATES
WEST VIRGINIA LEGISLATURE
BUILDING 1, ROOM M-212
1900 KANAWHA BLVD., EAST
CHARLESTON, WV 25305-0470
PHONE (304) 340-3200

March 29, 1995

The Honorable Ken Hechler
Secretary of State
State Capitol
Charleston, WV 25305

Dear Mr. Hechler:

RE: Sewage Sludge Management Emergency Rule

On March 20, 1995, the Division of Environmental Protection (DEP) filed an emergency rule with the Secretary of State relating to Sewage Sludge Management. The provisions contained in the proposed emergency rule are similar to those which were specifically rejected by the Legislature previously.

In 1993, the DEP filed Sewage Sludge Management Regulations as both an emergency and a legislative rule. In ERD 23-93, the Secretary of State disapproved the emergency rule on November 16, 1993. The proposed legislative rule was approved as modified by the Legislative Rule-Making Review Committee after extensive discussion on Table 3 of the rule and the need for setting maximum allowable soil concentations of certain pollutants.

The Legislature passed Enrolled Senate Bill 1005 on March 16, 1994, which authorized the DEP to promulgate the Sewage Sludge Management Regulations as modified and amended. A copy of those amendments relating to maximum allowable soil concentation are attached.

It is my concern that this emergency rule violates the statutory requirement of W.Va. Code, §22-15-20, which requires the Director of DEP to promulgate legislative rules which shall contain, at a minimum, regulations regarding "Each location that the sewage sludge is stored, land applied or otherwise disposed of; the amount so stored, land applied to or otherwise disposed of; and the capacity of that location to accept sewage sludge".

The DEP asserts in its statement of circumstances attached to the emergency rule that Table 3 does not contain soil conservation data which is based on "sound technical and scientific

data". The Division asserts that it will take several months to collect such data. The DEP's solution is to remove all regulation in the interim. Not only is this statutorily prohibited, the DEP is not acting in the public's best interest by removing this standard. Once the DEP has collected significant technical data to amend Table 3, then an emergency rule may be appropriate.

It is also obvious that the DEP is attempting through an emergency rule to negate the intent of the full Legislature. The emergency rule attempts to enforce provisions on which the Legislative Rule-Making Review Committee and the Legislature debated at length. I have spoken with several members of the Committee and they are in agreement with me that the emergency rule should not be approved. I respectfully request that you deny the Division of Environmental Protection's request to promulgate the emergency rule relating to Sewage Sludge Management Regulations.

Sincerely,

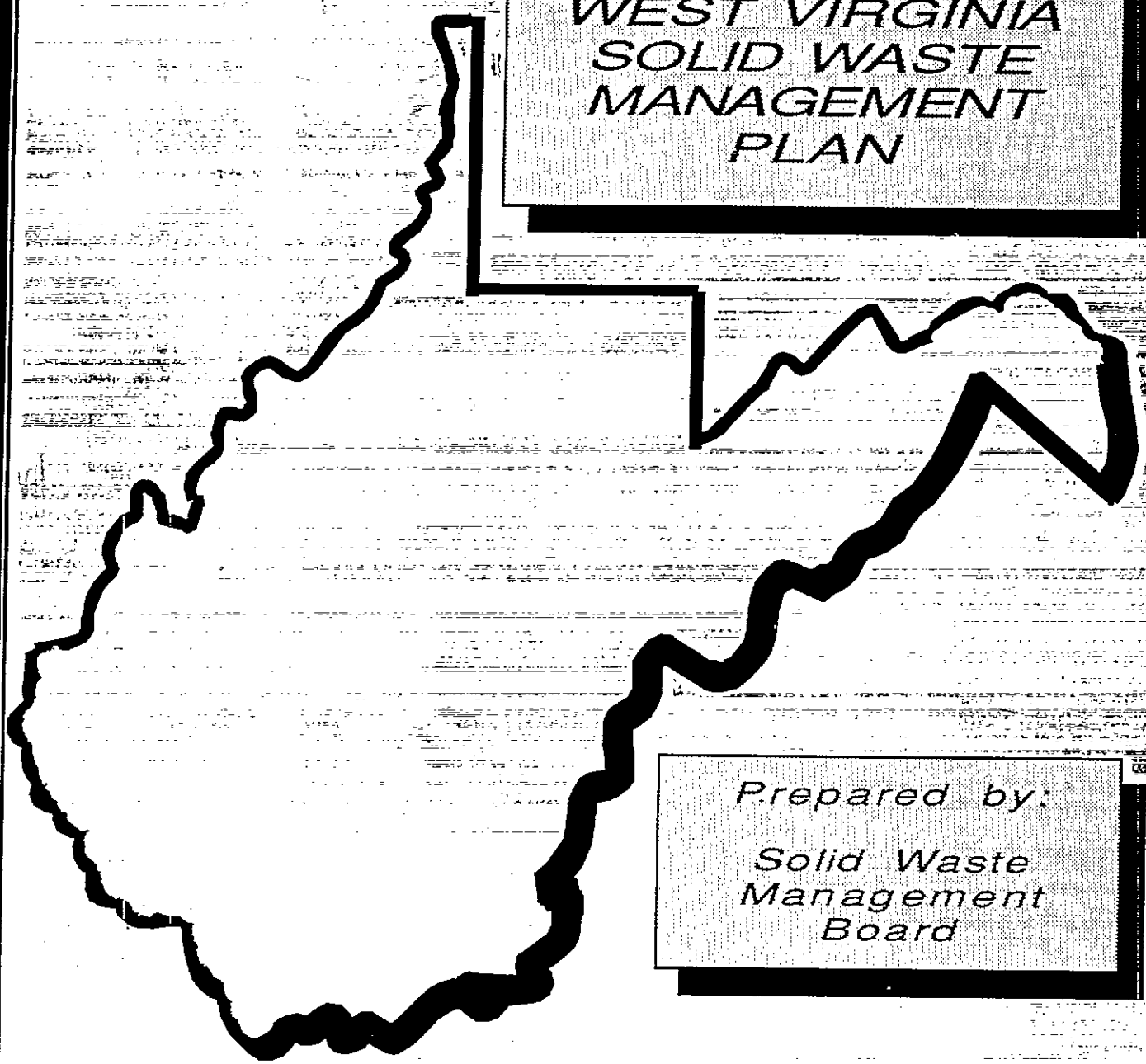
Mary Pearl Compton

Mary Pearl Compton
Delegate

MPC:mgn

cc: Delegate Vickie Douglas
Delegate Brian Gallagher
Senator Don Macnaughtan

WEST VIRGINIA SOLID WASTE MANAGEMENT PLAN



Prepared by:

Solid Waste Management Board

GASTON CAPERTON
GOVERNOR

Department of Commerce, Labor and Environmental Resources

January 1994

TABLE 2-1
SOLID WASTE MANAGEMENT BOARD
WASTESHED **POPULATION** PROJECTIONS

COUNTY	1990 CENSUS	PROJECTED POPULATION 1995	2000	2005	2010	2015	2020
WASTESHED "A"							
Brooke	26,992	26,392	25,891	25,561	25,361	25,248	25,198
Hancock	35,233	33,862	32,575	31,431	30,518	29,804	29,226
Marshall	37,356	36,610	35,893	35,267	34,815	34,534	34,310
Ohio	50,871	49,374	48,109	47,226	46,692	46,324	46,030
Tyler	9,796	9,841	9,935	10,024	10,134	10,230	10,308
Wetzel	19,258	19,155	19,042	18,928	18,861	18,832	18,798
TOTALS	179,506	175,234	171,445	168,437	166,381	164,972	163,870
WASTESHED "B"							
Barbour	15,699	16,190	16,637	17,059	17,452	17,797	18,096
Braxton	12,998	13,123	13,259	13,393	13,547	13,718	13,885
Clay	9,983	9,965	9,921	9,944	9,996	10,050	10,077
Doddridge	6,994	7,238	7,414	7,558	7,667	7,772	7,869
Gilmer	7,669	7,458	7,307	7,239	7,270	7,318	7,380
Harrison	69,371	67,255	65,572	64,364	63,626	63,183	62,821
Lewis	17,223	17,055	16,904	16,811	16,735	16,667	16,615
Marion	57,249	54,781	52,647	50,991	49,740	48,728	47,856
Monongalia	75,509	77,641	79,327	81,766	83,923	85,358	86,244
Preston	29,037	29,324	29,522	29,639	29,713	29,748	29,736
Randolph	27,803	28,252	28,582	28,953	29,353	29,738	30,050
Taylor	15,144	15,325	15,458	15,591	15,707	15,858	15,983
Tucker	7,728	7,616	7,513	7,445	7,390	7,365	7,350
Upshur	22,867	23,393	23,845	24,311	24,781	25,192	25,512
TOTALS	375,274	374,616	373,908	375,064	376,900	378,492	379,474
WASTESHED "C"							
Jackson	25,938	26,537	26,993	27,365	27,691	27,973	28,185
Pleasants	7,546	7,732	7,847	7,948	8,045	8,127	8,198
Ritchie	10,233	10,031	9,864	9,735	9,669	9,653	9,632
Wirt	5,192	5,527	5,824	6,106	6,338	6,547	6,718
Wood	86,915	87,360	87,534	87,661	87,925	88,250	88,508
TOTALS	135,824	137,187	138,062	138,815	139,668	140,550	141,241

TABLE 2-1 (CONTINUED)

COUNTY	1990 CENSUS	PROJECTED POPULATION 1995	2000	2005	2010	2015	2020
				WASTESHED "E"			
Grant	10,428	10,758	11,075	11,389	11,693	11,998	12,265
Hampshire	16,498	17,772	18,896	19,880	20,756	21,523	22,170
Hardy	10,977	11,339	11,680	12,046	12,427	12,798	13,115
Mineral	26,697	26,828	26,991	27,148	27,297	27,437	27,534
Pendleton	8,054	8,224	8,372	8,496	8,579	8,642	8,683
Berkeley	59,253	64,962	70,150	74,958	79,440	83,547	87,082
Jefferson	35,926	39,163	42,137	44,831	47,178	49,120	50,671
Morgan	12,128	12,701	13,215	13,662	14,084	14,489	14,853
TOTALS	179,961	191,747	202,516	212,410	221,454	229,554	236,373
				WASTESHED "F"			
Greenbrier	34,693	34,928	35,134	35,369	35,671	35,999	36,285
Nicholas	26,775	26,840	26,839	26,849	26,877	26,935	26,952
Pocahontas	9,008	9,359	9,595	9,801	10,019	10,243	10,440
Webster	10,729	10,679	10,709	10,769	10,852	10,945	11,029
TOTALS	81,205	81,806	82,277	82,788	83,419	84,122	84,706
				WASTESHED "G"			
Fayette	47,952	46,416	45,236	44,571	44,273	44,098	43,909
McDowell	35,233	31,914	29,136	26,903	25,112	23,651	22,471
Mercer	64,980	64,448	63,969	63,639	63,510	63,523	63,569
Mingo	33,739	32,994	32,446	32,055	31,739	31,444	31,117
Monroe	12,406	12,725	13,008	13,287	13,539	13,767	13,968
Raleigh	76,819	76,206	75,622	75,161	74,827	74,662	74,532
Summers	14,204	14,365	14,507	14,659	14,864	15,156	15,457
Wyoming	28,990	27,696	26,450	25,342	24,376	23,545	22,788
TOTALS	314,323	306,764	300,374	295,617	292,240	289,846	287,811
				WASTESHED "H"			
Boone	25,870	25,130	24,408	23,777	23,192	22,645	22,116
Cabell	96,827	95,739	95,085	95,130	95,499	95,896	96,138
Calhoun	7,885	7,876	7,836	7,794	7,784	7,784	7,768
Kanawha	207,619	203,614	199,639	196,228	193,742	192,015	190,697
Lincoln	21,382	21,631	21,882	22,119	22,364	22,543	22,672
Logan	43,032	41,059	39,337	37,786	36,444	35,330	34,359
Mason	25,178	25,353	25,375	25,349	25,343	25,330	25,301
Putnam	42,835	45,452	47,577	49,263	50,685	51,961	53,009
Roane	15,120	15,429	15,686	16,018	16,428	16,781	17,025
Wayne	41,636	41,593	41,465	41,374	41,399	41,480	41,512
TOTALS	527,384	522,876	518,290	514,838	512,880	511,765	510,597
WV TOTALS	1,793,477	1,790,230	1,786,872	1,787,969	1,792,942	1,799,301	1,804,072

COMPOSTING FRONTIERS

Providing Direction on Composting for Waste Management

Volume II, Issue 1
AUTUMN 1993

The year-old USEPA (United States Environmental Protection Agency) CWA 503 Regulations governing the use and disposition of sewage sludge and sludge products *[For an analysis of the USEPA CWA 503 Regulations see* COMPOSTING FRONTIERS, Volume I, Issue 3.*]* have caused controversy within a variety of sectors across the United States, from university-based soil scientists to farmers; from lending institutions to state governments. In almost every quarter, awareness is growing of the problems and uncertainty inherent in assessing their short- and long-term implications, no less in establishing appropriate monitoring, oversight, and enforcement programs to ensure compliance with them.

The 1991 ban on ocean dumping, added to sludge disposal exigencies arising from widespread opposition to incineration, declining landfill space, and the high costs of transportation and appropriate landfilling, lent immediacy to an already urgent need for alternative sludge disposal. Thus, it is within an atmosphere of intense political and economic pressure that scientists, agricultural associations, farmers, and lending institutions, among others, are grappling with questions arising from possibly conflicting societal goals: "beneficial use," through land-application, of sewage sludge and other wastes, and protection of public health and the environment, including irreplaceable United States farmland.

Considering those involved in this effort, it may seem surprising, though it is certainly logical, that perhaps the earliest, most effective, and least ambiguous public exposition of the issue has come from the Farm Credit Bank of Springfield, the Northeast region's largest agricultural lender.

Foreseeing the possibility of such heavy fines and clean-up costs for sludge-caused contamination of farmland that farmers would abandon their farms and leave lenders liable, and seeking to protect its mortgage investments in tens of thousands of acres of New England, New York and New Jersey farmland, the Farm Credit Bank issued a sludge application "policy," effective October 20, 1993. One intent of the policy is to alert the community at large – and the agricultural community, especially – to the uncertain affects and potential societal costs of agricultural sludge-application. Another is to shift long-term liability from farmers – and their lenders – to the sludge-generating community at large by requiring that landowners wishing to spread sludge obtain insured indemnification agreements from sludge generators.

The Farm Credit Bank anticipates that liability might stem from a variety of causes, including new information leading to establishment of additional standards and existing ones being made stricter; the spreading of contaminated sludge received from unscrupulous disposal contractors; financial losses arising from unfavorable public perception regarding produce grown on sludge-amended land, and damage to property value near sludge application sites; and environmental degradation from improper sludge application, or adherence to existing national and state sludge regulations that ignore site particularity.

An August 1992 Farm Credit Bank of Springfield report, *Land Application of Municipal Sludge: Impact on Springfield District Farm Credit*, by John A. Detweiler, states that, "Chief among the pitfalls of sludge application to agricultural lands are the long-term effects of trace contaminants on the soil and groundwater. There is a general scarcity of scientific research on the long-term (20 years +) effects of trace metals.... Should metals be found to pose health risks at lower levels than initially thought, stricter sludge regulations could be enacted, raising the risk of noncompliance for farmers with long-standing sludge spreading practices.

"There is reason to believe that the... EPA regulations are not based on exhaustive scientific research. The Agency has clearly stated that multi-year sludge applications were not used to determine loading rates ..., potentially underestimating the effects of metals over long periods of time.

"Farmers must also assess the risk from sludge deriva-

COMPOSTING FRONTIERS

Editor
Susan Mazzocchi

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tives or products that have been chemically altered, typically treated with lime, and marketed as a fertilizer. Drawbacks to using these sludge by-products include that, unlike commercial fertilizer, ingredients are not guaranteed. Sample tests of large batch quantities have shown that nutrients can vary by batch. In addition, because such sludge derivatives are regulated as compost, not sludge, application rates are less stringent in some states, allowing for the remote possibility that metals could eventually exceed cumulative loading limits for sludge."

It is too early to judge what overall affect Farm Credit Bank's policy will have. It is thought unlikely that municipalities would enter into indemnity agreements, or be able to afford to insure them. It is also unlikely that private insurers, who presently provide $1- to perhaps $10 million in coverage to some sludge-product vendors, would be able to provide enough insurance to back such agreements. Thus, if Farm Credit's policy provokes similar action by other lenders, as some believe it will, it could effectively argue against sludge application to northeastern agricultural land, unless some mechanism for liability apportionment is found.

According to Dennis Connolly, of Johnson and Higgins, one of the eight or so largest insurance brokers in the United States, "There are an increasing number of insurance policies available in the environmental area. Almost all environmental policies are *claims-made* policies, whereby a claim can be made only during the policy period. Yet, a characteristic of environmental liability is that damages and hazards are often discovered a long time later. Insurance companies can't take the risk that laws and science might change, leading to claims in the future.

"Significant members of the insurance industry feel that the industry has been severely, if not fatally, harmed by environmental liability. Insurers are insuring for the future. At present, we have a Draconian liability system in which environmental liability standards are almost absolute. A safe harbor to operate in would be a system where there would be no liability when actions complied with existing state-of-the-art. However, liability definition would have to be changed through state and federal legislation and it is highly unlikely that this will occur.

"In terms of sludge-related liability, the tightest sludge standards in the world wouldn't be insurable. If society has decided that sludge should be put on land, then society must accept the risks. Insurance companies can't handle them."[1]

Ellen Gulbinsky, Executive Director of the Association

of Environmental Authorities, comprised of New Jersey agencies with responsibility for water and sewage treatment, and solid waste and sludge management, feels frustrated that, "lending institutions are throwing up roadblocks to agricultural sludge application. The Authorities feel that they have increased the quality of their sludges. Yet, obstacles render New Jersey's 'beneficial use' policy a policy in word only.

"Aside from financing and insurance being a great deterrent, canneries won't accept vegetables grown on sludge-amended land. They are afraid of a renegade virus or pathogen. Since New Jersey's policy was put into effect, more sludge is being sent out of state to be landfilled or used for land reclamation than ever before.

"Sewage authorities are not liable for contamination caused by land-application of sludge. New Jersey law places cradle to grave responsibility for environmental contamination on the sludge producer, the homeowner/municipality. And farmers should be responsible for protecting the lands they own by seeing to it that sludge application is done properly."[2]

An additional threat to farmland anticipated by the Farm Credit Bank is that financially-strapped farmers might opt for short-term monetary gain over long-term agricultural sustainability. Again, from the 1992 report: "Currently, most sludge spread on Northeast Farmland offers the farmer little to no financial reward.... However, as municipal sludge becomes more difficult to dispose of, financial incentives are likely to increase. This trend is supported by municipal sludge disposal practices in New Jersey where farmers can earn significant income from applying sludge to their land ... as high as $800 per acre per year.... Indeed, such high compensation may justify spreading sludge on farmland and offset the long-term risks involved.

"... farmers also benefit from reduced fertilizer expenses on cropland, often placed at around $50-70 per acre for corn. '...this compensation, both direct and indirect, is attractive for farmers ... [as] ... an easy way to improve net income. These lucrative opportunities are limited ... to a minority of farmers in the northeastern district, primarily in New Jersey."

Some farmers would be interested in becoming sewage sludge brokers, according to Richard S. Brown, a retired farmer/landowner in Burlington County, New Jersey. He sees nothing wrong with that, because he believes that, "the majority of sewage plants are producing product acceptable for land application, which, if done well, would solve a statewide problem while benefiting agriculture. It's New Jersey's waste product. I don't go along with dumping my trash in someone else's backyard. It doesn't belong in a landfill. If it will benefit mankind, then I think farmers should take it. I firmly believe it can be made safer than a lot of fertilizing products, including animal wastes and chemicals.

"But there is still the liability question. Not too long ago, farmers suggested the creation of a statewide insurance fund from a small tax on every ton of sludge to be used. The agricultural community feels that it is already taking a beating in overregulation. Guidelines, monitoring and enforcement are matters for state and federal agencies to solve."[3]

While seeking to improve farmers' understanding of the risks associated with agricultural sludge application, Farm Credit Bank realizes that open discouragement of it could create conflict between farmers, like Richard Brown, and their lenders in states whose environmental authorities support the practice. Indeed, Jack Batchellor, of Garden State Farm Credit Bank, in Bridgeton, New Jersey, said that his lending institution which has been "here the longest and is in it for the long haul, prefers to take a low-key approach.

"We placed the news release on Farm Credit's sludge application policy in a local paper probably not read by too many farmers. And we are not planning to notify farmers about it because we don't want to be perceived as being on the 'cutting edge' by farmers who want to take sludge. We're trying to educate farmers to accurately assess the risk involved, to be financially sound. We want them to be pushing for indemnification agreements, to start moving in that direction. But do we want to deny farmers mortgages because they're putting sludge on their land? No."[4]

The attitude in New York State is quite different. According to Dennis Rapp, New York State Deputy Commissioner of Agriculture, and former Director of Policy for the New York State Department of Conservation, "The informal position of the New York State Department of Agriculture and Markets is that although there are some benefits to farmers from using sludge as a soil amendment, beneficial use is very marginal.

"The New York State Department of Agriculture and Markets is considering issuing an advisory to farmers. We are concerned about application rates. Most farmers don't have scientific or technical training. Application is imperfect. Though some farmers have been trained at land grant colleges, their practices are often at odds with their training. The vast majority of farmers have not had land-grant-college training. Capital-intensive farming leads to using whatever chemicals give the greatest crop yield.

Thus, farmers tend to follow directions provided by the chemical industry.

"There are many unanswered questions about the land application of sludge which create uncertainty and thus, controversy. In order to approve of sludge application to farmland, there would have to be some assurance that the risk is practically zero. New York State will not allow sludge application to food-crop land; it will be applied only to feed-crop land, which comprises about 65% of all New York agricultural land."

Mr. Rapp is concerned that the USEPA CWA 503 Regulations, which he says are based on research under Western and Midwestern climatic soil conditions, are not safe for New York State conditions. He worries about heavy metals build-up in soil, and about the relationship between soil acidity and heavy metals adsorption. The USEPA CWA 503 Regulations assume that farmers will take care of soil pH as part of normal farming practice. However, a survey conducted by the New York State Department of Agriculture and Markets found that fewer than 30% of farmers test their soil.[5]

Farm Credit Bank has taken the lead in exploring avenues for limiting, managing and sharing liability. Some of the questions it raises regarding limiting liability are, What precautions should be taken in applying the current USEPA CWA 503 regulations? How should appropriate application be geared to particular sites, particular soils, particular regions, taking into account soil background contaminant and nutrient levels, and site-specific conservation requirements? What mechanisms need to be established for nutrient management? How should monitoring and record-keeping be accomplished, and by whom? How can application oversight be accomplished, and by whom? What standardized testing protocols should be utilized? How can these be made uniform nationwide so that sludge is not transported across state lines simply to avoid stringent testing? How will all of the above be financed?

The Bank also has questions concerning managing and sharing liability, including, Who should bear liability? How might liability be apportioned under various arrangements? What liability-sharing mechanisms exist or might be developed? In the absence of risk predictability, can such mechanisms be established now? What should the time frame for liability be? and, In terms of liability, how should contamination be measured now and in the future? Considering government's commitment to the "beneficial use" of sludge and sludge products, might legislation be created granting liability exemption for contamination arising from compliance with regulations in existence at the time of sludge generation/application?

The questions raised by the Farm Credit Bank illustrate the complexities of the issue and the overwhelming difficulties in limiting, no less in fairly apportioning risk liability stemming from sludge-related damages. The only way to minimize sludge-related risk is through redoubling efforts to reduce sources of sludge contamination. Yet, although significant progress has already been made, the relative permissiveness of the United States metals standards is discouraging additional efforts to clean up sludges and sludge-derived products. In fact, the standards are being used to justify lessening efforts, or not making any at all, to improve product quality.

Focus on liability, at this time, implies acceptance of probable sludge-caused damage. The question of liability aside, current controversy among scientists is a warning against reliance upon the USEPA CWA 503 regulations to protect irreplaceable farmland. Considering what is at stake, we ought not to ignore it.

– Susan Mazzocchi
Editor

References
1. Telephone conversation, November 18, 1993.
2. Telephone conversation, November 1, 1993.
3. Telephone conversation, November 3, 1993.
4. Telephone conversation, October 30, 1993.
5. Telephone conversation, October 28, 1993.

INTERVIEW WITH R. DENNY BLEW

Chief Operating Officer, Centerton Nursery, Inc.
Citizen Advisor, New Jersey Center for Agricultural Molecular Biology
President of the Cumberland County Board of Agriculture
Founder & Chairman, Eastern Container Association of Nurserymen
May 12, 1992

What is the potential agricultural market in New Jersey for absorption of waste-derived soil amendment products?

RDB: According to the latest figures – tempered with some professional opinion – of total New Jersey agricultural land, soil amendment products could be used on approximately 779,250 acres. Of this, 450,000 acres are in vegetable, fruit, grain and hay production; 29,250 acres in nursery, greenhouse and sod production; 300,000 acres in forest, pasture, fallow, or in a transitional stage. This acreage is spread among eight thousand farm owners with operations ranging in size from two to two thousand acres, the average being about one hundred. Approximately 500,000 acres – fruit, grain, vegetable, hay, and pasture land – are food-chain related, 279,250 acres are not.

Please tell me a little bit about the nursery industry.

RDB: Although nursery production represents only 3.7% farmland usage, it generates one third of all New Jersey cash farm receipts ($217 million). New Jersey's nursery industry today is largely a non-food-chain business. Of the 29,250 acres in the nursery industry, 17,000 are nursery stock, 12,000 are devoted to sod production, and the remaining 250 are in short-term greenhouse production of herbaceous annuals and holiday crops.

Nursery stock production itself is divided into two major categories – container production and field production – each of which can be broken down into numerous niches. Container production, a relatively young industry only twenty-five years old, is a very high front-end investment business. It is also high risk and extremely intensive.

Modern container production facilities utilize only man-made "soil" mixes and new soil is created for each new crop. This is also true for greenhouse production. The industry still has a multitude of unanswered questions. Unexplained – many times, positive – phenomena are commonplace: extended flowering periods, two- to seven times growth rates, lack of pH significance, etc.

How does this compare with field nursery production?

RDB: Field production is a traditional form of farming. It began as a commercial business 200 years ago, supplying fruit tree seedlings to orchards. Although there have been advances, field production technology has changed very little over the years. Comparatively, it is a lower investment, lower risk business.

Crops are grown in our typical New Jersey inorganic, mineral soils. Due to this and a number of other factors, growth is decidedly slower and more predictable in field than in container culture. Only in rare instances, are soil conditioners such as peat moss, leaf or wood compost used.

How much waste-derived amendment could the nursery production industry consume?

RDB: My rough estimate of soilless mix usage in New Jersey is 556,000 cubic yards per year. If New Jersey container growers were to replace one of the soilless mix's major components, representing 40% of the mix, it would consume a total of 222,000 cubic yards of material annually.

The remaining nursery industry in field- and sod production, with a combined acreage of 27,000, could use 1.8 million cubic yards of a solid-waste-derived amendment, assuming an annual application rate of one-half inch, or 67 cubic yards per acre. This field facet of the industry cares much less about time and space than do container growers, and, given proof of performance and believable economics, is a potentially large user of such material. However, I would guess that to capture a significant portion of this market would require a price of $6 or less per yard, delivered (one half the price of peat). A $3 pricetag would increase this market many-fold.

Sludge is produced every day of the year. Would there be unlimited capacity for its use as a soil amendment on non-nursery field crops?

RDB: Yes, if the price were right and it were free of contaminants. Because organic matter content in New Jersey soils is extremely low, about 2%, there's a lot of room for improvement. In addition, depletion of the soil is a problem both in field nursery and sod production because of the unavoidable removal of a certain amount of soil with each harvest, and because of natural erosion from wind and runoff.

However, because of the large quantities of conditioners that would be needed to affect the tremendous area of any given parcel of soil, cost could be a prohibiting factor.

If sludge-derived compost were found suitable, would farmers expect to purchase it, receive it cost-free, or be paid to take it?

RDB: In traditional farming it would be difficult for farmers to pay very much because they're in economically dire straits right now; their margin of profit is very slim. If cost is a large factor in nursery field production, which generates a few thousand dollars per acre, can you imagine what that factor must be for the green bean grower who grosses $500 to $600 per acre? Or wheat, which brings $150 to $200 per acre?

If the amendment were in the form of compost and relatively contaminant-free, it could give tremendous benefit to the farming community by improving crop production. Right now, to a large degree, we're using various kinds of fertilizers. We used to use manures. Most of it came from dairy farms with cows, pigs and chickens. That's a tough business, a segment of our agricultural heritage which has been all but driven out of the state by regulation and taxes. So now we use ground-cover fertilizers and chemical fertilizers, as well as peat moss, mainly from Canada.

However, although an appropriate waste compost might enhance their soils, most traditional farming operations are in no position to pay for something they've done without, and can live without indefinitely.

Would sludge be utilized as a fertilizer, an organic amendment, or both?

RDB: If it's a fertilizer, you're going to apply it when you think you need it and that would depend on the crop grown, the area of the country, and a lot of other things. If it's to be used as an organic amendment to build soil value, it doesn't matter when it's applied.

Then I suppose the question is, is sludge unavoidably a fertilizer?

RDB: I don't think we know. If it were to be used as a fertilizer it would depend on nutrient content. One of things that's restricting us from calling it a fertilizer *per se* is that most of it contains undesirable contaminants – heavy metals and mineral concentrations that are too high for growing some varieties of plants. Depending on source, location of the sampling area and time of day, there might be any number of contaminants.

What are the farm community's greatest concerns about government's encouragement of "beneficial use" of sludge?

RDB: We are concerned about the product's short-term safety for the people who handle and work with it, and its long-term safety in terms of groundwater protection. In addition, we are concerned about whether or not we're being given correct information. We fear having to face legal and financial problems as a result of misguidance.

For instance, numerous financial lending institutions require affidavits from sellers assuring buyers that the land they are about to purchase has never – I repeat *never* – had waste products applied to it. If we don't sign the affidavit, we can't sell our property. If we have used sludge, we must assume total responsibility for any problems this may cause down the line. For whatever reason, the waste products are viewed as a potential source of controversy in both food-chain and non-food-chain applications.

How do you feel about utilizing a waste-derived soil amendment?

RDB: At Centerton Nursery, we grow plants in containers. If we could get the performance we get right now and the price were in line, we would purchase it. The finest quality soilless ingredients usually comprise less than 7% of total production costs, so mix costs are a secondary or tertiary consideration for us. The hidden, and by far the greatest, cost in this industry is the use of space over a given period of time. Therefore, top performance is the brawny #1 factor. Under no circumstances would we at Centerton sacrifice performance for savings on soil amendments – even if the amendments were free.

What kinds of things do you grow?

RDB: All kinds of ornamental plants. We wholesale to retailers, to nurseries, to people who sell flowering plants. Even with that kind of business there is concern about phytotoxics. We are not a monoculture type of operation. To survive today's marketplace our farm must grow hundreds of varieties, many of which have different requirements, different sensitivities. Even with class A sludge it would be a big conversion for us, which would require research.

We would need to know the percentages of all the minerals and nutrients we'd use in our mix, aside from what's in the sludge, because we'd have to make adjustments. The nutrients come in different forms, different size molecules and we would have to understand about the forms of the nutrients. We would want Rutgers University to do this research; their research determined the mixes we now use.

What kinds of mixes are currently used for container production in the nursery industry?

RDB: Typical soilless mixes for container production would consist of 40% stick-free peat moss, 40% vermiculite (popcorn size) and 20% #2 washed sand. Another, cheaper and more popular mix is 40% peat moss, 40% composted pine bark, and 20% construction sand. At Centerton we use the former. Some of the qualities we looked for in designing this mix were:

- high performance growth media (peat is excellent)
- sterile ingredients free of weeds, insects and diseases
- high cation exchange capacity
- low initial nutrient value
- low toxins
- high buffering capacity
- high water retention and oxygen content
- predictable results
- absolute consistency; uniformity from pot to pot, crop to crop
- amenability to mechanical mixing and potting
- ballast with minimal drainage reduction
- good soilless-to-soil interface for consumer ease

Would it make any difference to you if the compost were derived from municipal solid waste?

RDB: Not if we could get a standardized product, uniform and consistent from batch to batch, year after year. The presence of heavy metals, incomplete pasteurization and intermediate compounds from anaerobic activities render compost too capricious for widespread agricultural use.

The viability of waste compost as an amendment comes down to local situations and specific markets. With most current municipal solid waste composting processes there's too much inconsistency from batch to batch. Test results vary from processor to processor, location to location within the mass, and hour to hour within a given location. This makes it simply too difficult to deal with the products.

When the product funnels down to one micro-seedling or the toxin analysis in one slice of tomato, we cannot speculate, philosophize or offer principles without applications. The potential use of it comes down to quality. What's in it? What's in each batch of it? And would that analysis be consistent with what one might find in any mere handful of it? The products will not be marketable until those questions can be answered.

Forcing agriculture to deal with a dynamic waste-derived compost product is the same as telling Coca-Cola that it must process soft drinks in randomly shaped bottles and fluctuating syrup concentrations. It isn't practical, it doesn't conform to successful business management; and it makes the product undesirable.

What type of soil amendment would you want to use?

RDB: I would prefer compost because it would be pasteurized. Compost could be used as a soil amendment in both soil and soilless mixes. However, it must be a consistent, fully pasteurized, aerobic compost, free of contaminants, with mineral and metals levels that are safe to use on a wide array of food, feed, fiber and ornamental crops.

Accepted, economically successful production practices are not easily altered at the expense of risk. So, we're awaiting product improvement and research data on performance, as well as acknowledgement of a problem which exists.

What problem is that?

RDB: The New Jersey agricultural community has been told by the New Jersey Department of Environmental Protection and Energy (NJDEPE) that we must take sludge. Right now there are battles in this area of the county. Sludge processors in cooperation with powerful government agencies are attempting to forcefeed waste products to agricultural communities. There is growing public perception of this as collusive.

Sludge processors have had some success at marketing their product for use in New Jersey. Sludge companies and haulers, who need to get rid of the material, are going to landowners and offering them money to put sludge on their land. There are some who are trying to make this illegal. Others believe that sludge is a natural product which should be land applied.

Why is it a problem that farmers accept sludge for money?

RDB: We have reason to suspect that, unfortunately, some distribution companies are offering money to financially-strapped, desperate landowners, who are applying the materials at higher – perhaps many times higher – than recommended levels. The thing that scares me is that they have gone to farmers, who have financial problems, and paid them more money to take tonnage to put on their ground than their crops would bring in.

These farmers have cut their own children off at the ankles because they're not going to be able to get money from the bank to continue to farm the land. And they're not going to be able to sell that land. So they've written off the farm.

We don't really know if the material is okay, and whether or not this will lead to detrimental environmental effects

down the road. It might threaten groundwater, or future crops, or animals.

This exercise in greed will eventually haunt the waste management industry as a whole.

Can you give me a recent example of this kind of thing?

RDB: We just had an open public township meeting on this subject. We had a farmer in the township who wanted to apply large quantities of sludge from Philadelphia, and some concerned citizens wanted to prevent it. The local board of health has the power to give or withhold approval. In this case, the local board of health refused to approve the application. Then NJDEPE came in with an injunction prohibiting the county from preventing the sludge application.

They can force us to take it. They can pay the farmer to take it. But they will not accept responsibility down the road. They will not say that if something happens, they will accept the financial risk. Who pays for the land when you can't sell it?

You said that you are awaiting research data on performance. What kind of research and by whom?

RDB: In order to prove that waste-derived products are usable in the agriculture-related industries, extensive research must be conducted by our state universities. If the research proves that use of the product is feasible, it is imperative that an endorsement from the university accompany that proof.

Each of our state universities should also establish best management practices and parameters based upon the specific sources of the wastes from which the amendments are derived, as well as upon local site conditions.

Research should cover the following critical areas:

- the products' physical characteristics – particle size(s), structural makeup, variability within lots and from lot to lot, weight, physical shrinkage and settling, oxygenation properties, water-holding capacity, etc.
- the products' chemical makeup – toxins, heavy metals, CEC, nutrient levels, variability of these within lot and from lot to lot, etc.
- the products' other characteristics – pathogens for plants, animals and humans, undesirables such as weeds and weed seeds, insects in any stage of life cycle, etc.
- testing product performance compared to existing agricultural practices in all facets of food-chain and non-food-chain industries – container nursery and field nursery/sod cultures, vegetable/fruit production and animal/animal by-product production. Performance testing should be carried out in the controlled environment of the university laboratory and field situation, then eventually as university-directed experimentation out in the private sector.

Isn't there a problem with food processors accepting food grown on sludge-amended land?

RDB: Most New Jersey food processors are stating forcefully that they will not process vegetable or animal products produced on land that has ever received applications of waste products. They want farmers to sign affidavits saying they will not use and have *never* used sludge or waste products on food-bearing land. Requirement of the word, 'never,' is kind of scary.

Food processors fear that consumers will have the mental association – Flush the toilet; the bean crop should be real tasty this year! When a product is derived from sewage sludge or some other waste, there is an image problem to be overcome when it's associated with the food chain. Whether or not these concerns are legitimate, they are powerful deterrents to using waste products.

The processors also fear potential liability from the ramifications of some hazardous compound in the parts per trillion range being detected later on. What if someone said to them, "I ate your spinach last year and my wife had a miscarriage."?

But we have that problem right now. Lead arsenate on citrus crops. Nitrates in spinach and cranberries.

RDB: But we're talking about a new product now whose standards are based on cost-benefit – my rear end vs the environment.

Government appears to be saying that it will redefine contamination.

RDB: They've passed regulations before and then they come back – the pesticide thing is a perfect example. They said, "Use it the way we say and you will have no problems." The farmers did and then they changed the regulations.

Agriculture needs a formal assurance from government, just as we have for pesticide use, that government will accept responsibility for their recommendation and encouragement to us to use these kinds of products. We need assurance that we would not incur liability if the products were used in accordance with governmental recommendations.

Considering waste management imperatives, what is the level of trust within the farm community in governmental advice, governmental standards for product quality and application, and government-funded research?

RDB: There's diminished confidence right now. One of the reasons is that while agriculture is admonished to use sludge and accept the liability, government, itself, really has not embraced the product through its deliberate, publicized use on federal, state and municipal properties and projects. So what they're saying is, "This is fine to use, but not on national or state forests." They're going to have to put their money where their mouth is.

And by the way, by 'publicize,' we don't mean the use of such statements as, "recycled materials used." We mean that they should tell it like it is, in the same way we'd be required to notify our neighbors. It should be a billboard that might say something like "COMPOSTED SEWAGE SLUDGE USED ON THIS PROJECT!"

If the government issued standards, would you have any means of assessing them? [The United States Environmental Protection Agency issued sludge quality standards in November, 1992. See *COMPOSTING FRONTIERS, Volume I, Issue 3.*]

RDB: We'd compare them to data on what we're using right now. In terms of heavy metals, there's data on what different plant species can tolerate. We really do need standards and some type of control. For instance, there's the potential for contaminant spikes in sewage plants in industrial areas, perhaps caused by periodic surges of contaminants when a machine is flushed out.

Once the product quality issue is straightened out, we would take the products if we had a reason to. We're willing to contribute towards recycling, but we cannot risk losing our livelihood to do that.

With confidence in government running low, whose advice do you trust?

RDB: The New Jersey agricultural community is very close to Rutgers Cooperative Extension Service. They are very grassroots, working with us all the time, and they are very close to the State Department of Agriculture. So they watch the watchdog, the watchdog being megagovernment with a problem on their hands right now that they've got to get rid of. The university really has a tremendous responsibility.

What would convince you that the forthcoming EPA and State standards will be okay?

RDB: Unbiased university research. And constant analysis to assure consistency. But they say that this is not economically feasible. Beneficial use of sludge should be a societal goal, but right now we have a problem with a lot of our sludges. I think we really have to know what we're doing. We have a lot of unanswered questions.

It would be great to gain the benefits of a waste-derived compost, but not if it means degrading prime land or contaminating the food chain. We're concerned about the safety of our families, employees and consumers. And we need assurance that future generations will want to use this land. Our concern is for the long-term because farming is a family business that gets handed down from generation to generation.

For further information, contact R. Denny Blew, Centerton Nursery, Inc., R.D. #5, Box 498B, Route 553, Bridgeton-Centerton Road, Bridgeton, New Jersey 08302-9343. Phone (609) 455-0926.

FARM CREDIT BANK OF SPRINGFIELD
SPRINGFIELD BANK FOR COOPERATIVES

NEWS RELEASE

For Immediate Release
October 20, 1993

Farm Credit Announces Policy Regarding Use of Municipal Sewage Sludge on Farmland

Now that the U.S. Environmental Protection Agency has banned the ocean dumping of municipal sewage sludge, communities are looking for alternative disposal methods. High among the options is agricultural land, where sludge can be a valuable soil amendment and source of nutrients.

With that in mind, the Farm Credit Bank of Springfield, a major farm lender in the Northeastern U.S., has announced a policy on the application of sewage sludge to land where the bank holds a mortgage.

According to Roger Allbee, a vice president at the bank, "Clearly, the goal of nutrient recycling on farm land is worthwhile. We confirmed this by conducting our own studies, and by hiring an independent consultant to evaluate current literature regarding the practice.

"However, the way in which the practice is implemented can be of concern to the farmer, abutters, local communities, lenders and consumers.

"By adopting a formal policy, our board of directors wants to ensure that landowners who hold mortgages with Farm Credit weigh the potential benefits against short- and long-term risks, and then only use sludge of appropriate quality and apply it according to an acceptable management plan."

Allbee said that, while EPA regulations include strict application and testing guidelines, they do not limit the environmental liability of even the most prudent farmers. Lenders could be at risk, too, Allbee added.

"If crops, livestock, and the land itself are damaged, destroyed or devalued," said Allbee, "a farmer's income and assets will be affected, perhaps leaving the farmer with few financial resources. Both the farmer and the lender could be exposed to potential losses. Obviously, we don't want that to happen."

Allbee explained that Farm Credit's new policy for its mortgage customers, effective October 20, 1993, has four key points, outlined in the Background Statement which follows.

Allbee summed up the policy announcement by saying, "Farm Credit believes that the interest of farmers, the bank and local communities are best served by the bank's support of careful stewardship of land and water resources. The policy helps ensure the achievement of this objective."

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BACKGROUND STATEMENT

The Position of the Springfield Farm Credit Bank on the Application of Sewage Sludge to Agricultural Land

The U.S. Environmental Protection Agency's prohibition of ocean dumping of municipal sewage sludge has forced communities to look more closely at land disposal. Consequently, many communities in the Northeast are evaluating land-based options, including the application of sewage to agricultural land.

The Farm Credit Bank of Springfield is a major lender to agricultural businesses in the Northeast and holds mortgages on tens of thousands of acres of agricultural land in New England, New York and New Jersey. Thus, the bank has a vested interest in the short- and long-term effects of sewage disposal on farmland.

Farm Credit Bank has always supported the proper stewardship of land and water resources through the appropriate handling of potential contaminants. Our borrowers' interests and the bank's own financial well-being are best served by this position.

Recently, the management of the Farm Credit Bank of Springfield completed a study to assess the benefits and risks associated with the land application of sewage sludge. The first phase of the study involved an extensive literature search and consultations with knowledgeable professionals. The bank compiled its initial findings in a research report, *Land Application of Municipal Sludge: Impact on Springfield*

District Farm Credit, which is available upon request.

To date, it is apparent that there are still many unanswered questions and differences of expert opinion regarding the advantages, disadvantages and costs concerning the long-term effects of land application.

For example, the EPA has adopted regulations on land application designed to promote maximum benefit to farmers and minimal risk to the environment. The EPA has directed that sludge must be of the highest quality from known sources, properly tested and applied according to acceptable agronomic rates. The EPA also notes that improper handling, testing or application could expose farmers, and in turn, their lenders, to the risk of liability for damages and cleanup.

However, while EPA regulations include enforcement measures regarding testing and application of sludge, they do not limit the environmental liability of prudent farmers and lenders who accept sludge in good faith and follow optimum land management practices. Thus, if application results in damage to crops, livestock and the land itself, a farmer may be exposed to serious financial loss.

Farm Credit believes that prudent farmers (and their lenders) who accept high-quality sludge and apply it according to accepted agronomic rates should be protected from liability.

Thus, following our investigation, Farm Credit Bank recommends that anyone wishing to apply sewage sludge on land where the bank holds a mortgage should proceed cautiously.

Based on our findings, our most significant conclusion is that the bank would not recommend the application of sewage sludge on agricultural land mortgaged to Farm Credit without proper contractual indemnification underwritten by a financially responsible party.

With this in mind, the Farm Credit Bank has adopted the following four-point policy:

- Before applying sewage sludge, farmers should become familiar with safe application procedures, understand risks, and become acquainted with EPA and state regulations and related land management practices as recommended by state universities.
- Farmers should follow prudent land management practices, such as the use of high-quality sludge from reliable sources, the performance of regular testing, and conformance to standards of composition and purity. Farmers should apply sludge according to agronomic standards and be sensitive to the implications of marketing products grown on sludge-amended soils. Farmers must also take appropriate steps to ensure the safety of individuals who have access to the land.
- Farmers should protect themselves from the risks outside their control by securing an indemnification agreement with the sludge generator, underwritten by an appropriate private or public insurer.
- Borrowers requesting permission to apply sludge or sludge-derived materials on land mortgaged to Farm Credit must demonstrate to the bank that they have taken the steps described above as a condition to receiving the lender's permission.

Farm Credit recognizes that scientific investigation continues on the long-term benefits of sludge application to agricultural land. The bank has noticed a particular need for investigation regarding the interaction among sludge, soil chemistry, and crop production under conditions unique to the Northeastern United States.

For this reason, bank management will evaluate its policy on an ongoing basis to promote the best interests of borrowers and Farm Credit cooperatives, and to ensure that the bank's policies do not jeopardize the productivity of the land.

The Farm Credit Bank of Springfield has held a closed symposium on this issue for about thirty participants, including representatives of state and federal government, university-based scientists, insurance experts, farm organization leaders, sludge industry officials, and environmentalists.

For further information on the Farm Credit Bank's sludge application policy contact Mr. Roger N. Allbee, Vice President, Farm Credit Bank of Springfield, Post Office Box 141, Springfield, Massachusetts 01102. Phone: (413) 786-7600.

RISKS ARISING FROM LAND APPLICATION OF SEWAGE SLUDGE ON NORTHEASTERN FARMLAND

Report to the Springfield District Farm Credit Council

Dr. Charles M. Benbrook
Benbrook Consulting Services
June 25, 1993 Version
[Abridged and Edited]

Application of sludge, and sludge-based products on agricultural land links rural and urban America in new ways. There is much to be gained and lost on both sides of the transaction. Society's challenge is to capture the benefits while minimizing risks and assuring that the costs remain predictable, affordable, and equitably shared.

Summary and Conclusions

Risk, its size and management, is the key cost factor facing the Farm Credit System. The evaluation of risks arising from the application of sewage sludge to farmland is enormously complex. The variables are many and often unpredictable, both on the farm and in the waste stream and treatment/composting processes. Farmers cannot predict when heavy spring rains will cause flooding; a municipal waste water treatment manager cannot anticipate a chemical spill inside a local manufacturing facility and the resultant spike in the concentration of some chemical moving through the plant and then onto the land. Yet both events occur periodically, and damaging consequences may follow, particularly when such events overlap, as they sometimes will.

The Bottom Line

My basic conclusion is two-fold: most sewage sludge *can* be recycled safely on agricultural land, but in the real world, some of it won't be. Rapid growth in the percentage of sludge applied to land is contemplated, indeed encouraged by USEPA in its new regulations. Such expansion, especially if carried out hurriedly, will broaden the risk profile and raise the odds that unforeseen problems will surface.

Problems may arise as a result of economic incentives structured by regulations, or by inadvertent error and/or technical surprises. The Northeast is more vulnerable than the rest of the country for reasons noted below. Yet the factors giving rise to the region's vulnerability have not been adequately addressed by the scientific community or by government agencies, who, despite lingering concerns, have become spirited advocates of land application.

Some argue that concerns expressed in the Northeast are unfounded in light of years of experience with land application of sludge in other regions of the country. I disagree, especially if state regulations through the region are relaxed in accordance with EPA's recently issued Clean Water Act, Section 503 Sludge Regulations (CWA 503 Regulations). Circumstances differ markedly in much of the Northeast. The ratio of the volume of sludge to cultivated land differs at least tenfold; most Northeastern soils are acidic, enhancing the prospect that heavy metals may be more available than in other parts of the country; the topography is rolling, and patterns of cropping and livestock land uses are more variable; and community expectations differ.

Advocates argue that, "done wisely," potential problems with land application can be largely avoided, or, in any event, be detected and dealt with before serious harm is done. Technically such proponents are on solid ground; institutionally they are not. The rush to move ahead with large scale land application is likely to get ahead of efforts to establish the technical and institutional building blocks essential to assure that sludges are applied safely in the real world.

A critically important question is how much confidence to place in government's ability, through research, regulations and compliance activities, to assure that reality approaches the technological and managerial state of the art upon which safety judgements are based. While the answer varies markedly across the region, rapid growth in the volume of sludge applied to land, coupled with challenges inherent in implementing USEPA's new CWA 503 Regulations, are likely to overwhelm most state government agencies responsible for controlling potential risks associated with land application. This is why many people are now pushing for what amounts to the deregulation of "clean" sludges and sludge-based products.

The Costs of Uncertainty

The major issue the agricultural community and the

Farm Credit System must confront is the magnitude and distribution of costs associated with the management of risk arising from land application of sludge. Such costs may eventually include:

- monitoring of land and sludge quality, and associated technical assistance needed to assure application of sludge in accordance with recommended practices;
- restrictions on when and how land can be used following sludge applications;
- the undermining of agricultural markets or land values, or future restrictions on land use due to health scares;
- higher insurance premiums and/or limitations on the scope of coverage;
- higher interest rates to secure capital and service loans;
- government regulatory, reporting, and associated compliance costs;
- litigation expenses in the event of nuisance or other lawsuits.

Such costs are now modest, generally on the order of $10.00 to $25.00 per acre treated with sludge at an agronomic rate. But these costs are bound to rise as sludge is used more intensively, and as USEPA's new regulations take affect. Costs will rise over time as a function of actual and perceived levels of risk. The degree of public attention paid to the ongoing controversy over land application of sludge will be an important variable driving costs, as will the scope and degree of disagreement among scientists over risks.

Still, per-ton costs are likely to remain modest compared to alternative disposal options. Strong economic pressures are building to accommodate land application of sludge; it's not a matter of whether, but of how fast, where, and under what conditions it will occur.

RISKS FROM LAND APPLICATION OF SLUDGE

There is strong evidence that recycling sludge on land can deliver significant environmental and economic gains *relative* to other disposal options. The risks associated with land application are different from those arising from incineration and landfill disposal. Those who face the risks and bear the costs of dealing with them also differ, as do the technologies and processes needed to monitor and control risks. The nature and level of risk will also vary markedly according to the quality of the sludge or sludge-based product. The institutions and regulations needed to assure that land application is carried out safely are markedly different, and in many respects more complex and costly than those needed to control incineration or landfill operations.

Heavy Metals

Soil contamination with heavy metals remains a legitimate concern despite encouraging progress in cleaning up sludge. Problems may arise from four interrelated factors, each of which is addressed in more detail later. They are:

- Sludges in the Northeast contain widely variable levels of heavy metals; in general, sludges from urban/industrial areas contain higher and more variable levels of metals than sludges from smaller cities and rural areas.
- There is much uncertainty over the bioavailability of metals to various crops and grazing livestock, and to the environment through runoff and leaching.
- Significant downward adjustments may be necessary in estimating safe levels for humans and livestock as states and the USEPA adopt more sophisticated risk assessment methodologies, and as toxicologists gain better insight into hazards associated with low-level exposures; developmental affects facing pregnant women and children, and male reproductive system affects are emerging as areas of particular concern.
- Laws and policies leading to the estimation of safe levels may become more prudent.

Variability in Metal Levels. New York's Legislative Commission on Solid Waste Management recently carried out an assessment of New York Department of Environmental Conservation (DEC) sludge quality data collected from twenty-three Publicly Owned Treatment Works (POTW's) in seven regions from October, 1991, through late 1992. The data, as follows, show that some sludges contain clearly worrisome levels of metals, and that the degree of variability is significant.

Cadmium. CWA 503 Maximum Allowed Level for High Quality Sludge, 39 ppm; New York Class I (proposed), 10 ppm; Massachusetts Class I, 2 ppm. Of the 23 POTW's tested, twenty had cadmium levels below 10 ppm; the other three had much higher levels: 106 ppm, 18.6, and 15.1 ppm.

Zinc. CWA 503, 2,800 ppm; New York and Massa-

chusetts Class I, 2,500 ppm. Ten POTW's had zinc levels below 1,000 ppm, but four were above 2,500 ppm; the highest levels were 7,488 ppm and 4,886 ppm.

Copper. CWA 503, 1,500 ppm; New York and Massachusetts Class I, 1,000 ppm. Fifteen of 23 POTW's had copper levels below 1,000 ppm; two had much higher levels, 4,475 ppm and 2,299 ppm.

Molybdenum. CWA 503, 18 ppm; New York Class I, 35 ppm. Thirteen POTW's were below 12 ppm, but seven exceeded USEPA's standard with levels of 117 ppm, 86 ppm, 36 ppm, 25.9 ppm, 20.3 ppm, 19.3 ppm, and 18.2 ppm.

Bioavailability and Environmental Fate. Heavy metals in soil, from whatever source, are more bioavailable to plants and the environment at lower pH levels. Soils in much of the Northeast test well below 6.0 pH; corn and other crop yields do not respond to liming above pH levels around 5.2 to 5.5. Yet the difference between 5.2 and 6.0 is often significant relative to the availability of heavy metals.

Based on careful studies with lime-stabilized sludges using the N-Viro process, available zinc can fall from 8.25 mg/liter at pH 5.55 to 0.3 mg/l at pH 7.5; chromium can fall from 0.57 mg/l at pH 5.4 to 0.17 at pH 6.2; and nickel can fall from 2.9 mg/l at pH 5.5 to 1.31 at pH 7.0. Other metals – copper and lead, for example – are less sensitive to pH levels.

Northeastern field topography and variable soil types, to a greater extent than those of other regions, can also affect the distribution of metal concentrations. Sloping land, coupled with surface runoff and subsurface lateral flows may tend to concentrate metals in low-lying parts of fields. This is likely to be a particular problem with grazing land on which sludge-based products are surface applied; surface water runoff from pastures onto low-lying fields may also expose cattle to dangerous pathogen levels in freshly-applied sludge.

Potential heavy metal risk in the Northeast is, therefore, more sensitive to cropping system design and management practices than in regions with more homogeneous, generally level fields/soils. Accordingly, worst-case scenarios not plausible in other regions warrant attention in the Northeastern region, until there is a reasonable basis to conclude that mechanisms have been put in place, and will be adhered to, which render the scenarios implausible.

Significant institutional challenges must be faced in devising such mechanisms: assuring that desirable soil pH levels will be maintained for many years after sludge application has ceased; maintaining and assuring access to accurate records regarding metal levels and past application rates; enforcing compliance with land-use restrictions and precautions many years after application has stopped; and dividing the near-term and long-run costs and liability exposure inherent in land application.

Safety Standards. On June 28, 1993, the National Academy of Sciences (NAS) released the long-awaited report on pesticides in the diets of infants and children. This report recommends major changes in the way dietary exposure to pesticides is estimated for the purposes of setting "safe" pesticide-residue tolerance levels. USEPA is expected to act quickly to adopt the Academy's suggestions, and not just in the pesticide program. The new exposure assessment methodology will undoubtedly be used to reassess tolerable levels of metal and chemical contaminants in other media, including sludges.

In general, the NAS recommendations are likely to lead to a two- to ten-fold increase in exposure estimates among certain population subgroups. As a result, there would have to be proportional tightening of levels considered "safe." In addition, new studies on developmental and reproductive system effects are very likely to result in upward adjustment of heavy metal risk profiles, at least for a few compounds – mercury, lead, and cadmium among them. Thus, stricter standards for at least some metals can be expected in the next two- to ten years.

Uncertainty over standards dictates considerable near-term prudence in estimating "safe" sludge application rates. Consider the possible outcome of tightened standards utilizing current recommended rates of application of N-Viro soil from the Syracuse, New York, plant run by Waste Stream Environmental, Inc. (WSE). Under current metal standards and recommended application rates, WSE has calculated that forty applications, or ten wet tons per acre can be made on a given field, based on the cumulative loading limit for copper, present in the product at 160 ppm. *If* new information lowered the acceptable standard for copper ten-fold, the cumulative loading limit for copper could be reached in as few as four years. Recall that some New York sludges tested by DEC have copper levels more than 25 times that level.

Another reason that the loading limit might be reached sooner than expected, is that there are other probable routes through which copper is reaching Northeastern croplands. For example, copper contamination of European soils from the spreading of hog manure has recently become a major concern. Yet, all of EPA's estimates of safe, cumulative

heavy metal loading limits rest upon the assumption that sludges are the sole source of the metal, and that baseline levels are the same as background levels. Both assumptions are likely to often prove faulty. Thus, fields receiving sludges should be assessed first to determine baseline levels, and greater attention should be directed toward quantifying other sources of metals, especially cadmium in commercial fertilizers.

Laws and Policy. Standards are subject to adjustment when new information becomes available, or when policies change. Current heavy metals standards are intended to avoid appreciable risk using best available risk assessment methods and data. These standards are then used to calculate acceptable cumulative loadings.

There are many different ways to set "safe" limits; none can be proven inherently correct. Other countries favor a non-degradation standard, resulting in far stricter standards than USEPA's risk assessment-based method. As better data on exposure and toxicity emerge, the gap between today's risk assessment-based standards and non-degradation standards will narrow for many metals. Political pressure – already evident in New York – may increase to move toward a nondegradation standard. Public debate on this issue will lead to more scrutiny of actual metal levels in agricultural soils, and more careful assessment of how land application of sludge has affected levels. Data will be collected to provide perspective, and some lands are likely to be found to exceed acceptable levels, particularly if standards are tightened. As a result, the public may call upon regulators to place restrictions on future agricultural use or other development of such lands.

In sum, there is great variability in the levels of metals in sludge, considerable uncertainty as to their bioavailability and environmental fate, and many reasons to expect new science and/or changes in policy to result in more stringent standards for at least some contaminants. Moreover, these sources of uncertainty may well prove at least additive in characterizing worst-case scenarios.

Bacteria, Pathogens and Viruses

Disease-causing organisms in sewage sludge pose acute risks to both humans and animals. The greatest risk arises from those organisms that can regrow in sludge after treatment and prior to land application, specifically bacteria like salmonella, campylbacter, and shigella. Viruses and protozoa of concern do not survive outside a mammalian host, and hence find sludge a very hostile environment.

Bacterial hazard is a function of the quality and method of treatment. Lime-stabilized sludge-based soil amendments are virtually free of viable salmonella, and the levels of other pathogens are reduced far below standards applicable to Class A sludges. Properly composted sludge is nearly pathogen-free with no pathogen regrowth. However, pathogen levels in liquid sludges and composts produced in improperly-controlled systems can pose significant risks, especially in the case of bacteria that can rapidly regrow.

The new USEPA rule also contains a curious provision allowing POTW's the option of reporting pathogen levels for multiple species, in effect, allowing them to choose to only report a species meeting the standard. For example, if a partially stabilized sludge product fails to meet the Class A standard for salmonella, but meets it for E. coli, the POTW can report only the latter and retain Class A designation. This provision may well need to be reexamined.

Pathogen testing methods are sometimes difficult and can be costly. USEPA concludes that, "Monitoring sewage sludge on a regular basis to determine the types and densities of pathogenic bacteria present is desirable but impractical." There is, moreover, considerable uncertainty over how frequently tests for pathogens must be conducted. Currently, USEPA requires that tests be carried out monthly in large POTW's, and only once a year in small plants. Yet, for a sludge-based product to be sold as a High Quality product, USEPA requires monitoring for salmonella or E. coli "every load."

Guidance has not yet been given whether "every load" means every one-ton pickup load, every twenty-ton truckload, or every shipment to a farm, which could mean 1,000 tons, figuring treatment of 100 acres at 10 tons per acre. The difference in cost is sizeable, since just an E. coli screen costs about $80 per sample, and a thorough screen involving pH, nutrient and metal levels, and other pathogens costs about $250 per sample. An expenditure of $250 to test sludge product quality spread over a 1,000-ton delivery is affordable at $0.25 per ton, but would be prohibitive for a one-acre application at ten tons per acre, or $25 per ton.

Use of improperly-treated sludges, or sludge-based products on pastures should raise concerns throughout the dairy-producing regions of the Northeast. European studies cited by the USEPA in the pathogen Technical Support Document point to serious risk of salmonellosis in dairy and beef cattle from sludge application on pastures. For this reason, Germany and Switzerland require disinfection of any sludge applied to pasture. But USEPA concludes that the adverse European findings reflect very

high salmonella population levels not indicative of United States circumstances and practices, as long as sludge is processed to reduce fecal indicator densities to 2,000,000 CFU (colony forming units) or MPN (Most Probable Number) per gram, and cows are not allowed to graze on affected pastures for one month following application.

The one-month grazing restriction is critical, since viable salmonella populations decline sharply once sludge is land-applied. USEPA estimates that 99% die off within thirty days. But if within a month of application rain washes surface-applied sludge, or sludge-based products from one pasture down onto a bottom-land field where cows are grazing, or fences break, or a gate is left open by mistake, cattle may be at risk for exposure.

Water Contamination

Commercial fertilizer, pesticides, and animal manures are important sources of water pollution throughout the Northeast. Limits are bound to be placed on routine land application of sludges, driven by concerns about heavy metals. It is hard to imagine sewage sludge accounting for more than a small fraction of the soil nutrients available from all sources within a watershed. For this reason, efforts to reduce agricultural N and P losses to water should be directed toward development of farm-specific nutrient management plans and practices; nutrients from sludges should clearly be considered in the course of developing such plans, but the principal focus should be on the major sources of nutrients – fertilizer, animal manure, and legume nitrogen fixation.

Certain circumstances may increase the seriousness of sludge-related risks from heavy metal contamination of groundwater. Under current regulations, a POTW dependent upon land application, or land application contractors can minimize costs by applying the heaviest possible rates of application on each acre, by working out agreements with farmers nearest to the plant, and developing ongoing relationships with customers, so that N and P, *or soil*-liming needs are met each year by sludge-based products. Such patterns of application would tend to gradually raise heavy metal levels across a significant portion of the land base within certain watersheds. Accordingly, it is possible that cumulative loading limits for sludge will be reached on much of the land within a watershed within the same five- to ten-year period. Such an area might then be abandoned as a large-scale sludge receiving area.

As long as soil pH levels are maintained at or above 6.0 on lands treated with sludge, most of the metals present presumably would remain tied up. But if changes in the farm economy, unusual weather, changes in land use, or some other factor were to create a set of circumstances leading to declining pH levels, a flush of metals could be released from the soil across a wide area within a few years. Such an event could conceivably elevate levels in drinking water in certain localized regions, creating a serious dilemma for both individuals and communities.

Nuisance Suits

Nuisance lawsuits brought against landowners and sludge applicators are likely to allege offensive odors, water contamination, and perhaps, in some cases, human health problems or adverse impacts on pets or livestock. Certain lawyers specialize in locating possibly aggrieved parties, such as anyone living next to, or downstream from a field on which sludge has been applied. Sometimes a "guilty" verdict accompanied by a significant monetary settlement in a well-publicized case in one part of the country will generate literally hundreds of "copy-cat" law-suits in other areas. Even when defendants feel complaints are spurious, settlements of $5- to $15 thousand are common, because the costs of mounting a credible, science-based defense in court would be much higher, with no guarantee against an adverse judgement.

LIMITING RISKS AND EQUITABLY SHARING COSTS: OPTIONS FOR THE FARM CREDIT SYSTEM

Beyond adopting a "Just Say No" policy, agricultural lenders can influence how and where sludge is applied to agricultural land only indirectly. Yet they may end up incurring sizeable costs as a consequence. For this reason, it is appropriate for the Farm Credit System to monitor developments in both the regulatory and scientific communities. In addition, before the new USEPA regulations spur a significant increase in the volume of sludge land applied, the Farm Credit System should assess more thoroughly the range of options lenders could pursue to protect their – and agriculture's – interests.

Careful attention to this issue is particularly important now, as states begin the process of implementing USEPA's new Section 503 Regulations. These long-awaited regulations are clearly designed to encourage land application of sludge, by lessening regulatory hurdles and relaxing certain key standards, most notably allowable cadmium loadings and levels.

Following is a summary of what lenders can and should do, if, and where, it is judged that stronger steps are needed to assure that the long-term productivity of agricultural land is not compromised in the rush to reduce near-term sewage waste-disposal costs.

Stay Abreast of Changing Regulations and the Comparative Economics of Alternative Disposal Options

Reliance on land application is bound to grow, and rapidly in some regions. The greatest hazards will arise in communities where a large new facility is built, all of a sudden creating the need to land-apply thousands of tons of sludge-based products per year. Once such a plant starts up, the products will have to be moved, sometimes in the absence of much local experience or appreciation of the possible hazards, or of how to minimize them. That's why the Farm Credit System, within each region, should continuously assess how changing regulations and policies, and the economics of disposal, affect the methods that will be used when sludge is land applied, and the cost of land application relative to other disposal options – especially when there is a major change in a community's or region's method of disposal, or when large volumes of sludge are shipped into a region from another.

Diligence is in order because while lenders have a twenty-, thirty-, or forty-year interest in a piece of land, land-application decisions are driven by short-run, interrelated financial and waste management concerns.

Low-Key Farm Credit System Responses

Lenders need policies governing how they will evaluate and act upon environmental and other hazards that may affect the long-term value of a farm. Certain provisions and/or policies should be invoked when setting the terms and contract provisions associated with a new mortgage. Related provisions should be developed to use in the case of refinancing actions, foreclosures, and/or in the context of annual loan performance reviews. The goal should be development of credible, technically- and economically-sound, risk-based capital investment standards, which will serve Farm Credit System associations, their borrowers and investors, and the communities in which the system is active.

Public policies will affect directly the Farm Credit System's exposure to risk. For this reason the system needs to assess emerging policies in order to assure that risks generated by society at large are not disproportionally concentrated in agricultural communities. In the case of land application of sewage sludge, the System should assess, and when judged necessary, pursue the following policies:

- **Avoid high-risk scenarios** by placing a moratorium on all sludge application on dairy farms and fruit and vegetable operations until more research and analysis can be completed, and until liability and related issues can be more thoroughly addressed, or by restricting application to only those landowners and operators who agree to follow necessary conservation, nutrient balancing, and related management practices.

- **Adopt prudent regulatory standards and compliance provisions until scientific uncertainty is narrowed (also allowing time for public confidence to grow).** Support continuation of state standards more stringent than USEPA's Section 503 regulations, as well as policies requiring annual permits for all applications of sludge over five or ten tons.

  Require government permitting authorities to carry out baseline monitoring prior to land application; prohibit application where problems are already apparent; monitor changes in metal levels every two years following sludge application, to assure that levels are not rising faster than expected; and take appropriate steps where they are found to be higher, or rising faster than deemed acceptable.

- **Set conditions for new loans.** *At a minimum*, add provisions to mortgages requiring lender notification prior to land application; and a baseline characterization of soil properties – pH, nutrient and heavy metal levels – to assure that the soil is not already partially contaminated; and, if certain critical levels are exceeded, either prohibiting land application or allowing it only under carefully defined circumstances.

A reasonable, readily-defended policy might state that the Farm Credit System discourages any agricultural management practice that may result in the buildup of heavy metals or other toxic contaminants beyond one-half the level currently considered acceptable by USEPA. To translate such a policy into operational practice, mortgage contracts could contain a provision requiring those wanting to land-apply sludge to produce credible evidence showing that existing, baseline soil contaminant levels are less than 50% of the maximum allowed, and that, at the proposed rate of application, if continued over the life of the loan sought, levels would not exceed the 50%-of-the-maximum-allowed goal.

- **Test for soil contaminants when contemplating foreclosure** on a property on which sludge has been applied. The lender should retain the right to secure

from an independent expert an up-to-date soil test showing key contaminant levels. This allows the lender to make an informed judgement regarding whether foreclosure or some other kind of action should proceed, or whether liability issues for soil contamination need to be resolved first.

Under a *more aggressive policy*, a lender might attach additional clauses to mortgage contract provisions, or impose a more conservative goal in terms of requiring contaminant levels to be much lower than those now judged safe by USEPA. A risk-averse association might choose limits 25%, or even 10% of the CWA 503 standards.

Additional provisions could strive to encourage prudent decision-making regarding where sludge is applied, as well as adherence to best management practices when actually testing and applying sludge. Types of actions that would minimize risks are requiring periodic sampling and reporting of contaminant levels following a few years of application; and insisting that soil testing be carried out, and sludge-management plans developed and put in place by certified, independent crop- and environmental consultants.

Other actions, which would vest the risk of contamination on those generating it, rather than allowing it to be attached, *de facto*, to the land, and to lenders, are insisting on an indemnification clause in contracts between sludge generators and landowners, protecting both the lender and farmer in the event of losses from sludge application or legal actions from aggrieved neighbors; and requiring that a sludge generator and/or applier post a bond in the name of the lender/borrower, to be held until a loan is paid off.

The purpose of the bond would be to assure that there is a source of capital that can be tapped easily in the event of a loss, even if such a loss occurs several years after the sludge is applied, and possibly years after the business responsible for generating the sludge has ceased operations. The size of the bond should be sufficient to cover any increases in annual operating expenses (maintaining pH levels, for example); and/or any loss in per-acre value as a result of restrictions that might be placed on future land use. Such loss could exceed the agricultural value of land if a parcel of farmland is condemned for development uses because of excessive contaminant levels.

A third set of provisions could alter the cost of borrowing as a function of the degree of risk a given borrower accepts as a result of carrying out certain risky practices or behaviors. Lenders may have to cover some portion of a landowner's legal fees, or assume responsibility for the costs of maintaining soil pH at required levels. In the event of a sizeable judgement, a lender might conceivably have to cover part of the liability, or would, at a minimum, incur legal fees defending against such a motion before a court. Insurance premiums may rise over time. To cover such costs, the minimum level of equity in a property could be adjusted based on whether or not a borrower wishes to retain the option of land applying sludge in the future, or costs to borrowers wishing to land apply sludge could be made higher, perhaps by higher interest rates.

Restricting land that has received sludge to the production of cash grain crops, or other nonfood crop uses, would markedly undermine agricultural land values. Food, milk, for example, produced on sludge-amended land may be shunned by buyers or consumers as a result of concern about sludge-associated risks, even if groundless.

A number of realistic contingency plans must be developed, and funded up front, through binding legal instruments, so that they can be implemented when necessary. Examples of the kinds of scenarios such plans would cover are: a POTW or sludge-based product manufacturer ceases business or engages in fraudulent record-keeping or financial practices; a farm runs into disrepair during litigation over a will; a community-based activist group sues a plant and all landholders receiving sludge; a major contamination incident is caused by illegal dumping of toxic wastes into the waste stream.

Ideally, the cost of capitalizing these contingencies should be covered as part of the initial transaction when a farmer agrees to land-apply sludge or a sludge-based product. Clearly, such provisions and related costs will vary in accord with the quality of the sludge, or sludge-based product, and how much is applied on a given piece of land.

Assuring Technical Competence

Safe application of sludge to farmland will require a high degree of foresight and technical competence. Careful attention to detail must be maintained in running equipment and monitoring processes. Applicable rules must be adhered to; credible monitoring programs must be developed and used to assure compliance with standards. A high degree of professional ethics must pervade the process in order to win and sustain public confidence.

The Farm Credit System is not in a position to directly influence the level, quality, or nature of professional certification that might be adopted through the sewage sludge treatment and land application industries. But the lending community, as well as insurance providers, surely should continuously monitor such developments to deter-

mine how much confidence can and should be placed in the integrity of the system, since a financial institution's risk profile is a direct function of how carefully and wisely land application is carried out in practice.

Many details need to be assessed on an ongoing basis. Equipment must be routinely checked for proper calibration; laboratories doing tests need to be certified, and participate in appropriate QA/QC (quality assurance/quality control) programs whereby samples are checked by other laboratories; and new test methods and equipment should be carefully appraised and calibrated prior to widespread use.

The importance of an initial screen of soil nutrient and contaminant levels was stressed above. Such a screen should establish a set of baseline indicators, from which changes can be monitored over time. It would also provide the data needed to set agronomic rates. Similar tests should be required perhaps every two years for the first four to ten applications, to check heavy metal, pH, and soil nutrient levels. Deviation from expected and desirable levels can then be corrected before a possibly serious problem materializes. The screens should be undertaken by trained, certified and independent professionals; the cost of these screens should be covered by the sludge generator or applicator.

Trouble-shooting capacity should be built into the process in several ways. Periodic, unannounced sampling should be done of sludge, and sludge-based products at all stages in the process to assure that records match reality. In addition, regulatory agencies should require the prompt reporting of any unexpected laboratory finding – for example, a cadmium level above 80 ppm (twice EPA's allowable level) – to the permitting agency so that steps may be taken to determine to the point source of the contaminant.

Applied research and demonstration plots should be operated by universities throughout the region, to continuously test actual levels of contaminants in the environment and the performance of different sludge treatment and application methods. Such data are essential in improving the accuracy of risk assessment methods which will, in turn, narrow the range and reduce the cost of dealing with uncertainty.

Equitable Sharing of Risks

Basic fairness requires that the generator of a risk should remain responsible for liability exposure related to it. New legal instruments and financial mechanisms will be needed to assure that landowners and lenders are held harmless in the event of lost land value, fees or fines, or legal judgments brought on account of land application of sludge.

Such instruments, as noted above, might include model insurance policy contracts and coverages, special provisions in land contracts, indemnification funds, the posting of bonds, and/or the imposition of fees on each ton of sludge land applied, to capitalize a state-run fund for needed research, monitoring system performance, and underwriting the cost of liability insurance.

Dealing with indirect threats to the financial integrity of a region's farming economy will be more difficult. Such threats could arise from the collapse of consumer confidence in food products grown or processed in a region, or in an area's safety or quality of life. The role and responsibilities of government in protecting against such problems is clear, yet government's capacity to respond if some unforeseen problem arises is uncertain, at best.

Research and public education can help limit this source of risk. It is worth keeping in mind, however, that research is also likely to sharpen society's ability to delineate acceptable from unacceptable risks. Occasionally, new information will tip the scales so that once acceptable risks become unacceptable. This will no doubt happen with some sludge contaminants and affect some land on which sludge has been applied.

As cooperatives, Farm Credit System associations have to be sensitive to costs imposed by certain borrowers or practices on the financial health of institutions within the system, as well as the system as a whole. The health of the system influences the cost of capital and level of service that can be provided to all members. Hence, the need for a policy governing land application of sludge, and related sources of environmental risks is not likely to disappear.

Certain additional investments in technical competence and knowledge will have to be made in order for the land application of sludge in the Northeast to be done safely. It is unclear who will make the initial investment and who will cover the cost of routine monitoring and oversight. A process of negotiation is needed to settle the division of costs and benefits, and to more clearly specify individual and lender rights. The role of government also needs to be much more thoroughly articulated. What could be viewed as a new social contract may evolve from this process, establishing an urban-rural partnership that strengthens all communities within the region at the expense of none.

For further information contact Dr. Charles M. Benbrook, Benbrook Consulting Services, 409 First Street S.E., Washington, D.C. 20003. Phone: (202) 546-5089.

MARCH 30, 1993 LETTER TO MR. FRANCIS SERBENT ADMINISTRATIVE LAW JUDGE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION OFFICE OF HEARINGS

On the letterhead of Cornell University
College of Agriculture and Life Sciences
Department of Soil, Crop and Atmospheric Sciences

Dear Mr. Serbent:

The undersigned ask that the following scientific facts, scientific judgements, and resultant implications be considered when formulating the final NYCRR Part 360, Subpart 360-4 Land Application and Other Sewage Sludge Management Facilities, and Subpart 360-5, Composting and Other Distribution and Marketing Facilities.

From the standpoint of beneficial use, State 360 regulations should not restrict use of the best ('Grade A') sludges when applied to the soils least influenced by sludges, and when growing crops least likely to be influenced by constituents in sludges, and when used by growers and landowners who, after an informed decision-making process, have decided that application is an appropriate land management practice. Our purpose is to protect the soil resources of New York, while at the same time establishing conditions under which present-day sludges and composts can safely be added to soils.

We understand that the recently promulgated EPA 503 regulations are the result of extensive health and environmental risk analysis by respected soil and plant scientists and that these rules will be used as a basis for the new 360's. We applaud both EPA and DEC for supporting nutrient recycling by land application through the formation of regulations protective of the environment, agriculture and the consumer.

We differ with USEPA on at least two counts. The first is that the field plot data base is strongly biased towards the midwest and western soils and cropping systems. Acidic rainfall and naturally falling soil pH values in the east are not taken into account. It is gratifying that the proposed NYS Cd limit remains at 2.5 mg/kg *[Editor's note: Class II sludge; Class I is 10 mg/kg.]*, for the above reasons. But is this low enough to protect the environment and human health when sludge applications stop and soil pH control ceases? We're not certain that it does. The problem of perpetual pH control remains with us.

Secondly, potential toxicity of organic chemicals is not included in the regulations. Cornell toxicologists are not satisfied that this risk can be dismissed in the short term for sludge-treated soils, food crops, and grazing animals. To protect farm families, rural populations, and the consumer, we suggest that crops for direct human consumption (fresh vegetables, fruits, potatoes and wheat) not be grown on recently sludge-amended land.

Statements of Scientific and Land Management Facts

- Copper, zinc, cadmium and several other metals will remain in soils for decades; for all practical purposes any additions must be considered permanent and any restrictions these additions place on the soil are permanent, such as pH maintenance to prevent metal movement into the food chain, or leaching into water sources.

- Copper and zinc are essential for plants and animals but yields of crops are reduced by excessive additions of these metals as well as by nickel and chromium. Growth of some non-crop plants is not reduced by the same excessive (for crops) levels.

- Cadmium is a non-essential element which accumulates in the liver and kidneys from food; excessive accumulations lead to dysfunction of these organs in humans and beneficial wildlife.

- The controversy arises over what is excessive.

- The probability of adverse effects on crop growth and animal health from these elements increases as soils become coarser-textured, and the pH and organic matter decreases.

- The identity of only a very short list of the toxicants in sludge and sludge products are known. They include metals (Cd, Pb, Hg, Ni, Ci, Cu, Zn), PCB's, dioxins, nitrosamine, polycyclic aromatics, solvents, asbestos, cutting oils, flame retardants, organotins, and other halogenated industrial compounds.

- Unlike metals and asbestos, organic molecules have a finite residence time in the soil, but we don't know what it is in most cases. Their impact on crop production and consumer safety is unknown. However, empirically there

have been few reported problems from organics in field situations.

• Soil and water conservation practices and other BMP's (Best Management Practices) are required on sludge-amended cropland to prevent runoff, erosion, and surface and groundwater pollution.

Issues of Concern

• In New York we have such a small area of prime agricultural land that supports a large proportion of our viable agricultural industry, that we cannot afford to place restrictions on its use by applying sludge.

• In New York we raise a bewildering array of crops with widely different tolerance to excesses of copper and zinc (e.g. twelve varieties of snap beans often raised on acid sandy soils). *In addition, EPA's maximum metal concentrations in sludge for Zn, Cu, Cr, and Ni were set for 50% crop growth reduction in the early stages of growth. [Italics added.]* This is not a viable option for growers. We recommend limits which under certain conditions produce a maximum of 10% yield reduction. Limits would be those in NE Bulletin 851 *[Northeast Regional Research Bulletin, published by Pennsylvania State University Department of Agriculture]*, i.e. 2500, 1000, 1000, and 20 mg/kg dry weight for Zn, Cu, Cr and Ni, respectively.

• In New York most edible-crop farm income is derived from milk, vegetables, fruit and wheat, all of which are directly consumed by people; we must maintain consumer confidence in these products by erring on the safe side in setting guidelines, at least for the time being.

• In the absence of a geographically large production and marketing system, much of our New York State product is consumed locally, and hence any dilution factor in processing associated with a wide commodity acquisition system may be small.

• Many soils in New York were very acid in their native state and only periodic additions of lime maintain the pH above about 5.0 to 5.2. Maintenance of soil pH is a necessary condition during the period when the land is being used for land spreading to reduce mobility of metals and therefore becomes a permanent requirement.

• The sludges will maintain the organic matter content during the period of application; this may mask the effects of excessive amounts of metals. Once applications of organic matter cease, the organic matter will decrease causing an increase in metal mobility so that crop yields and quality are reduced in the long run. This situation would be especially troublesome in the absence of long-term pH control.

• The adverse effects of cadmium on health are cumulative and hence more evident as people age. Will our understanding of what constitutes safe, lifetime cumulative loads remain the same as now? If the recommended limit is reduced at some future period then we may find many of our soils will have restricted usage because of the permanent nature of the cadmium amendments. We recommend the sludge content limit be at least as low as 25 mg/kg (dry weight).

• The control of inputs into the sewage stream must continue. Currently septage and landfill leachate are inputs which are difficult to control. On-site pretreatment by industry must continue to be required.

• One scenario under which the EPA 503 regulations would probably be acceptable with few of the above troublesome caveats is the following: application to land owned by the sewage treatment works and dedicated to growing corn for grain under best management practices. Forest and other non-cropland applications would be acceptable, assuming appropriate non-point source controls for water quality protection, and that pH control continues in some way after applications cease.

In the case of unrestricted use on agricultural land, we feel stricter, more conservative standards should apply, as outlined above for pH control and Cd levels, especially. Monitoring of the sludge product quality, tonnage delivered and applied, and soil testing must be continued and enforced vigorously.

Signed:

Dave Allee, Professor
Murray McBride, Professor
Tom Richard, Senior Extension Associate
Don Lisk, Professor
John Peverly, Professor
Dave Pimentel, Professor
Stu Klausner, Sr. Extension Associate
Kenn Cobb, Sr. Extension Associate
Doug Haith, Professor

COMMENTS BY DR. MURRAY B. MC BRIDE

Department of Soil, Crop and Atmospheric Sciences
College of Agriculture and Life Sciences, Cornell University
A signer of the Above Letter
During a Telephone Conversation, November 10, 1993

"Is it realistic that we could manage to utilize sludge safely? I'm kind of doubtful for the following reasons. First, cadmium levels, for example, depend on the source of the sewage. Monitoring at the treatment plant might be done a few times a year at most. Yet heavy metal levels can vary; there is some variability – sometimes extreme variability – due to spikes. So we don't know the quality of sludge being trucked, and I understand that there is no plan for monitoring at the farm location, truckload by truckload.

"Second, we can't be sure that farmers will follow best management practices. Some ignore them. When we look at the pH of New York State farm soils submitted to the Cornell University testing laboratory, we find that about one quarter are below pH 5.5 – on the other hand, if the pH gets too high, this can make some metals more soluble. In addition, I don't think that loading limits will be followed rigorously in the field, given the practical problems of spreading these materials.

[Editor's Note: In a written statement titled, Why National Regulations are not Appropriate for New York, *D.R. Bouldin and W.S. Reid, of the Department of Soil, Crop and Atmospheric Sciences, Cornell University, stated, "Despite what Ryan and Chaney* imply, many crops in New York do not respond to soil pH above about 5.2 (e.g. corn). On the order of 500 to 1000 pounds of limestone are required to maintain soils at about 6 and even more is required to maintain soil pH at 6.5. Farmers lime periodically, and during the intervals between lime applications the pH will drift downward toward 5.0. Thus there are large areas of crop land in New York devoted to profitable crop production with a pH less than 5.5. This means sludge applications in New York should consider the experimental data where soil pH was less than 5.5, not an average of experiments at all soils pH values.]*

"Heavy metals affect soil microbes. They modify the microbial population. Heavy metals particularly affect nitrogen-fixing microbes, preventing nitrogen fixation. The USEPA data supporting the heavy metal loading limits are not that long-term. What they are extrapolating from is usually no more than three- to five years of application, then perhaps a few years' resting period. The validity of such extrapolation is questionable. The tendency of metal availability to drop then stabilizes. The important question is, will you be in a worse or better condition after one hundred years?

"Long-term binding for the toxic elements has not been proven. EPA assumes that soil has no role to play. Organic matter in sludge has a half-life of about ten years. Because organic matter decays away, you can't rely on it to persistently bind metals. Copper and zinc are plant-toxic at high levels and make soil less productive. Over time, heavy metals buildup may cause soil to become unproductive.

"The question to ask of the Ryan/Chaney approach is why would you condemn soil to twenty years? What do you do then? Behind the USEPA CWA 503 regulations is the sort of thinking that has gotten many businesses into trouble; in other words, thinking in terms of five- to ten years. For heavy metals you must think in terms of several hundred years or perpetuity, if you're going to protect productivity of the land.

"It is my guess that there is little prime farmland to open up; so we cannot afford to diminish the productivity of the prime farmland that we have. If we were talking about spreading sludge out over the country, that would be one thing, but a relatively small number of farms will, likely, take most of it.

"The CWA 503 Regulations do not allow for changing agricultural land use. For example, if sludge is applied at rates not suitable to food crops, this reduces the profitability of the land. What if, in the future, a different crop becomes more profitable to the farmer? Perhaps he will do what he wants. This could bring heavy metals into the food chain.

"In any case, there are not too many agricultural uses for sludge in New York State. New York State agriculture is very different from agriculture in the Midwest, where, in some states, two crops, corn and soybeans, take up most of the acreage. These crops provide several protection barriers in terms of cadmium translocation from the root to the edible parts of the plant. It is of concern that the yearly uptake by some crops of cadmium, one of the most toxic of the heavy metals, seems to increase more or less in proportion to the *cumulative loading* of sludge (and cadmium) in the

soil over extended periods of annual sludge applications. The numbers EPA used for the risk assessment on which the cadmium standard is based can be questioned. It is important to note that, generally, metal uptake efficiencies of plants in eastern soils is greater than in many western soils.

"Some people like to point out that chemical fertilizers add cadmium to soil too. However, at about 100 lbs/acre/year, annual phosphate loading is small and you may have about 100 years of application to reach the same level you would get with sludge in a few years, figuring sludge-loading in tens of tons/acre/year. Nevertheless, if their cadmium levels are relatively high, phosphate fertilizers may need to be regulated in some way. Incidentally, in terms of the agronomic rate, if you apply sludge for nitrogen use, you get too much phosphorus for the crop to utilize.

"In New York State, dairy farming takes up 70–80% of the entire agricultural acreage. Farmers have more nitrogen, in the form of manure, than they can handle. A major dairy farmer has already been sued for nitrate pollution. For beneficial sludge application, you need cropland where no manure is used.

"In any case, dairy farming is the worst scenario for sludge application. Cattle ingest soil. Rain may not wash sludge off pastures, and sometimes farmers don't observe the waiting period between sludge application and grazing. In addition, we need to know more about resistant organics that survive sewage treatment processes, like PCB's, which concentrate in body fat. Some of these chemicals are mutagenic or carcinogenic.

"Mercury volatization is another issue. There is some research showing that it is measurable in sludge-treated soils.

"There is no doubt that the chemistry of sludge-metal-soil systems is dynamic, extremely complex and site-specific, and no one should claim to understand them to a degree sufficient to make predictions of metal availability on a time scale of decades to centuries and at a particular location. There is also no doubt that few, if any, field experiments have been conducted over the time interval necessary to resolve questions having to do with heavy metals soil loading.

"To protect our productive agricultural lands and the public health, it would be prudent at this time to consider the application of metal-contaminated sludges to farmland an undesirable practice."

*James A. Ryan, USEPA Risk Reduction Engineering Laboratory / Rufus L. Chaney, USDA Agricultural Research Service, Environmental Chemistry Laboratory in their paper, *Regulation of Municipal Sewage Sludge under the Clean Water Act Section 503: A Model for Exposure and Risk Assessment for MSW-Compost.* See *COMPOSTING FRONTIERS*, Volume I, Issue 3.

Senate Mark 0007

STATE OF NEW YORK

6171

1993-1994 Regular Sessions

IN ASSEMBLY

March 18, 1993

Introduced by M. of A. PARMENT -- read once and referred to the Committee on Agriculture

AN ACT to amend the agriculture and markets law, in relation to the application of certain wastes within agricultural districts

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. Legislative intent. The legislature hereby declares that agricultural lands are irreplaceable state assets. This declaration recognizes the importance of a healthy and viable agriculture to a prosperous state economy. It is further declared that the state must explore ways to sustain the state's valuable farm economy and the land base associated with it. Implicit in this policy is the need to preserve and protect the soil which is literally the foundation of New York state's most important industry. Since a federal ban recently went into effect prohibiting the disposal of sludges in the ocean, land application of sludges has been increasing. Utilization of sludges on agricultural land poses a number of problems. The presence of heavy metals and other substances in sludges can reduce soil productivity and crop production, and adversely affect animal health. Therefore, it is the declared policy of the state to protect land used in agricultural production located within an agricultural district, or land receiving an agricultural assessment from the potentially harmful effects of the land application of sludge, septage, or sewage sludge as defined herein.

§ 2. Paragraph i of subdivision 4 of section 305 of the agriculture and markets law is relettered paragraph j and a new paragraph i is added to read as follows:

i. Notwithstanding any other provision of law to the contrary, no septage, sewage sludge or other sludge or composted solid waste products made from septage, sewage sludge or other sludge, shall be applied upon

EXPLANATION--Matter in *italics* (underscored) is new; matter in brackets [ ] is old law to be omitted.

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land used in agricultural production located within an agricultural district, or upon land receiving an agricultural assessment pursuant to this article. Nothing contained herein, however, shall be deemed to prohibit such continued application on land where such application is lawfully made prior to the effective date of this paragraph. For purposes of this paragraph:

"Sludge" means any solid, semisolid or liquid waste generated from a wastewater treatment plant, water supply treatment plant, or air pollution control facility but does not include the treated effluent from a wastewater treatment plant, or the food processing wastes generated from a food processing establishment licensed pursuant to the provisions of article twenty-C of this chapter,

"Septage" means the contents of a septic tank, cesspool, or other individual sewage treatment facility which receives domestic sewage wastes, and

"Sewage sludge" means the accumulated semisolids or solids resulting from treatment of wastewaters from publicly or privately owned or operated sewage treatment plants.

§ 3. This act shall take effect immediately.

Organic Toxicants and Pathogens in Sewage Sludge and Their Environmental Effects

J.G. BABISH, D.J. LISK, G.S. STOEWSAND, and C. WILKINSON

CONSIDERATIONS

In discussing the possible hazards of using sewage sludge on land, it is critical that certain facts be clearly stated.

1. Ninety per cent of the total mass of sludge generated in New York State is produced in cities. This is also the sludge which is most contaminated from industrial users. Land area near cities where sludge can be applied is greatly limited. Since trucking costs are very expensive, the rate of application is high in order to dispose of the mass of sludge being continually produced. Also, rates of application of 50 to 100 tons per acre are required in order to observe any *noticeable improvement in soil physical structure* when applied to clayey or other poorly structured soils. Thus, increasing potential benefits from sludge application by increasing the rate of application necessarily increases the risk.

2. Municipal sludges represent the solidified mass of all of the waste products of industrial and domestic users. Typically, more than 100 to 200 industries may flush wastes into a single treatment plant. Therefore, literally thousands of chemicals may be present in a single sludge. Numerous metabolites and degradation products of these compounds formed during sewage treatment will also be present. These can be either more or less toxic than the parent compound. The final hazard from sludge use, therefore, will be determined by the additive, synergistic, and antagonistic effects of all of these, depending on relative exposure levels.

It is not surprising that the nation's largest food processor, Del Monte Corporation, has banned the use of sludge on any land used for growing its food crops (47).

TOXIC ORGANIC COMPOUNDS IN SLUDGE

Organic compounds in sludges, with particular reference to the health risks associated with land application of municipal sludges, have been reviewed by Kover (36), Dacre (15,16), Kowal and Pahren (37), Pahren, et al (51), and briefly by Connery (13).

Polychlorinated biphenyls (PCBs) have demonstrated both acute and chronic toxicity. Acute symptoms in humans include eye discharge and swelling of upper eyelids, acne-form eruption, and pigmentations of the skin (27). The demonstrated chronic toxicities of PCBs include carcinogenicity (46), teratogenicity (42), and chromosomal alterations (53). The prevalence of PCBs in sludge is well documented. Furr et al (26) found PCBs in concentrations up to 23 ppm in all sludges from 18 American cities. PCBs have been found in municipal sludges of Canadian cities (39). Tucker et al (60) found that the stability of PCB isomers in sludge is directly proportional to their degree of chlorination. The related polyhalogenated biphenyl compounds and their levels found in sludges in various areas of the United States are shown in Table 1. These are average values, e.g. the range in the Midwest was 240 to 1,700 ppm with an average value of 765 ppm.

Table 1.—Polyhalogenated compounds in municipal sewage sludge in the United States.

Compound	State	ppm(dry matter)	Reference
PCBs	Mass.	10.8	(22)
PCBs	Wisc.	20-79	(20)
PCBs	Midwest	765	(6)
PBBs	N.J.	831	(17)

Many organochlorine insecticides occur in sludges. DDT was banned by the Environmental Protection Agency in 1973, aldrin/dieldrin in 1974, and Chlordane in 1975. Table 2 indicates levels of these insecticides present in sludges.

Table 2.—Organochlorine insecticides in municipal sewage sludge.

Insecticide	Country	ppm(dry weight)	Reference
DDT	USA	0.35	(23)
DDD	USA	0.25	(23)
Dieldrin	Netherlands	7.5	(19)
Dieldrin	USA	0.31	(26)
Aldrin	USA	16.2	(23)
Chlordane	USA	16.0	(23)

Other chlorinated compounds have been identified in

sewage sludge by Erikson and Pellizzari (25). The origins and toxic properties of these individual compounds are not well known. Dacre (15) has identified additional chlorinated compounds in wastewater, and it is almost certain that many of these highly toxic, including potentially carcinogenic, compounds will be concentrated in municipal sludges (Table 3).

Table 3.—Chlorinated compounds found in sewage sludge and those probably present in sewage sludge.

Compounds Found	Probably Present
Dichlorobenzene	Endrin
Trichlorobenzene	Heptachlor
Tetrachlorobenzene	Endosulfan
Chloroaniline	Kepone
Dichloroaniline	Lindane (gamma BHC)
Dichloronaphthalene	2,4,-Dichlorophenoxyacetic Acid
Tetrachloronaphthalene	2,4,5-Trichlorophenoxyacetic Acid
Trichlorophenol	Dioxins
Chlorobiphenyl	Pentachlorophenol
Dichlorobiphenyl	
Trichlorobiphenyl	
Tetrachlorobiphenyl	
Pentachlorobiphenyl	

Polynuclear aromatic compounds (PAH) have been identified in sludge (48). The compounds include fluoranthrene, benzo(b)fluoranthrene, benzo(k)fluoranthrene, benzo(a)pyrene, benzo(ghi)perylene, and indeno(1,2,3,c,d)pyrene at concentrations of 90 to 1,600 ppb. Additionally, a number of PAH have been observed in municipal sewage sludge including two proven carcinogens, benzo(a)pyrene and benzofluoranthene (Table 4) (29).

Table 4.—Polynuclear aromatic hydrocarbons in municipal sewage sludge.

Compound	ppm (mean of 5 sludge samples)
Chrysene	3.6
Benzo(b)fluoranthene	3.2
Benzo(k)fluoranthene	.
Benzo(a)pyrene	1.7
Perylene	0.5
Dibenz(a,j)anthracene	0.26
Indeno(1,2,3,c,d)pyrene	1.3*

Petroleum hydrocarbons, possibly resulting from industrial cutting oils, have been found in sludge (40). Such petroleum hydrocarbons would expectedly be herbicidal since waste oil has long been used as a spray for control of unwanted plant growth along roadways. Phytotoxic effects in plants grown on sludge-amended soils have been observed by various investigators. Up to 180 ppm of the flame retardant pentabromotoluene has been found in sewage sludge (41).

Trimethylamine in sewage is converted to the potent carcinogen dimethylnitrosamine (2,3). Dimethylnitrosamine formed in soil to which dimethylamine and nitrite were added, but only when organic matter was present (43). Dimethylnitrosamine and diethylnitrosamine continue to volatilize from soils for several weeks following incorporation (49). The half-life of these compounds in soil is about 3 weeks (50).

PATHOGENIC BACTERIA AND VIRUSES IN SLUDGE

A number of pathogenic micro-organisms have been found in sewage sludges. Dudley et al (21) found bacteria among the following genuses in Texas sludges: *Staphylococcus, Clostridium, Mycobacterium, Klebsiella,* and *Enterogacteriaceae. Salmonella* species were found in 68 to 96 per cent of sludges sampled in England (35). Poliovirus was found in sludges in Sweden (7). Non-vaccinal strains of polio virus and various other enteroviruses were found in sludge from Laval, Canada (52). Viral transport to groundwater at a wastewater land application site has been recently reported (44).

EFFECTS OF ORGANIC CONSTITUENTS IN SLUDGES ON THE ENVIRONMENT

Land application of sewage wastewater reportedly can result in the passage of detectable concentrations of many of the synthetic compounds to the groundwater (59). In sandy or gravelly soils, the possibility of the movement of dimethyl or dipropylnitrosamine into groundwater is real (18,56). The movement of pathogenic bacteria and viruses downward through soil from applied sewage wastewater and rainfall and their survival time in soils does not rule out a potential hazard from this source (9,21,38,58).

CONTAMINATION OF PLANTS AND ANIMALS BY TOXIC ORGANICS IN SLUDGE APPLIED TO SOIL

PCBs in sludges applied to soils have been reported to cause plant contamination. The plants involved were corn and grass (14), soybeans (61), and spruce trees (45). Contamination of carrots grown in PCB-treated soil (34) as well as corn and golden rod (10) have been found. Fries (25) has stated that plants do not translocate many PCBs from the soil, but plants become contaminated by volatilization of these compounds.

Although PCB residues found in plants usually are not large, as little as 5 ppb of such fat soluble chlorinated compounds in the diets of dairy cows rapidly show detectable levels in milk (30). The more highly chlorinated PCBs found in sludge are most apt to be excreted in milk since they are more stable and also more fat soluble. The more highly chlorinated PCBs are also much more efficient in induction of hepatic microsomal mixed-function oxidases in animals (11,27).

Crops grown on sludge-amended soils are probably contaminated by sludge which becomes occluded or absorbed owing to splashing by rain and deposition of PCBs which vaporize from the soil surface (10,24). The danger of PCB contamination of animals allowed to graze on sludge-amended soil is considerable (51). Cows which have been autopsied typically exhibit a layer of soil several centimeters deep in their abomasum. This occurs because plant roots with absorbed soil particles are torn loose dur-

ing grazing. Also, swine allowed to forage in sludge treated areas can expect to uproot the surface and injest sludge-amended soil.

Cabbage grown on sludge alone was fed to sheep and guinea pigs. PCBs were elevated 275 per cent in the cabbage and significantly increased in the livers of guinea pigs. In addition, induction of intestinal and hepatic microsomal enzymes was observed in the guinea pigs as compared to corresponding control animals fed soil grown cabbage (4,32). Histopathologic lesions (swollen mitochondria, cell necrosis) were observed in the livers of sheep fed sludge-grown corn silage (33,57) and induction of hepatic microsomal mixed-function oxidases occurred in mice fed sludge- grown lettuce (12).

In a study on the mutagenicity of New York State sewage sludges, it was determined that 50 per cent of the sludges demonstrated a mutagenic response in the *Salmonella*/mammalian-microsome assay. Using the same test, other researchers have presented similar findings for sludges from Chicago (61). More than 80 per cent of the positive responses required metabolic activation, indicating the effect was due to environmentally inert compounds which exert their biological effect when undergoing biotransformation.

Under agricultural or laboratory conditions, sludge induced both point mutations and cytogenic aberrations in plant systems (54). *Zea mays* (homozygous for wx-90) grown in maximum treatment plots (equivalent to 21 MT/ha dry sludge) had a 10-fold increase in reversion frequency over controls. Dilutions of liquid sludge also induced a dose-dependent increase of micronuclei in *Tradescantia*.

Rats fed diets containing cabbage or red beets grown on sludge-amended soil exhibited detectable mutagenic activity in the urine. This activity was observed only in the presence of a metabolic activation system (8).

The demonstrated carcinogen, dimethylnitrosamine, which can form in sludge, has also been shown to be absorbed by spinach and lettuce (18).

Finally, there may be risks to individuals applying sludge to soil or cultivating such soils when PCB contamination of sludge is high. PCB levels in the serum of sludge applicators markedly increased, with a concomitant increase in their plasma triglyceride levels indicating altered lipid metabolism (5).

SUMMARY AND RECOMMENDATIONS

In general, the characteristics of organic compounds in sludge as noted by Dacre (15) are:

1. Very low water solubility.
2. Do not degrade readily—long half life in soils.
3. High lipid affinity—bioaccumulates in tissue.
4. Compounds may translocate in the food chain.
5. Many compounds are known carcinogens.

It is known that native soil biota degrade chemicals. However, certain molecules have structures that are never encountered in natural products. This is a cause for concern (31). Application of any level of sludge to soils is a definite risk since sludge is so variable in make-up and since few toxicological and/or in-depth analytical studies have been done on the extremely complex soil-plant-consumer (animal/human) relationship.

The disposal of sewage sludges on land which currently or in the forseeable future grows crops for human or animal consumption is not justified at the present time. There are many economic, environmental, and health uncertainties associated with agricultural use of sludges, and sufficient data are not available to engineer safe systems. Who is willing to assume the responsibility for possible future health consequences? Furthermore, other viable disposal methods such as incineration, landfilling, land reclamation, and spreading on parks and forests do exist. As long as such alternatives are available, or until such time as it is shown that agricultural use involves less risks to the environment and health than these other alternatives, we feel that it should be the general policy of the State of New York to discourage and prohibit, if possible, application of sewage sludges to agricultural land. Sludge can be disposed of by incineration using combustible urban refuse (paper, cardboard) as the fuel to dry and ignite the sludge. This method greatly reduces the need for fossil fuels. The city of Duluth, Minnesota now disposes of its sludge in this manner. Also, hundreds of other fossil fuel-fired incinerators are presently in use for sludge disposal.

LITERATURE CITED

1. Ames, B. N., J. McCann, and E. Yamaski. 1975. Methods for detecting carcinogens and mutagens with the *Salmonella*/mammalina-microsome mutagenicity test. Mutation Res. 31:347-364.
2. Ayanaba, A. and M. Alexander. 1974. Transformations of methylamines and formation of a hazardous product, dimethylnitrosamine, in samples of treated sewage and lake water. J. Environ. Qual. 3:83- 89.
3. Ayanaba, A., W. Verstraete, and M. Alexander. 1973. Possible microbial contribution to nitrosamine formation in sewage and soil. J. Natl. Cancer Inst. 50:811-813.
4. Babish, J. G., G. S. Stoewsand, A. K. Furr, T. F. Parkinson, C. A. Bache, W. H. Gutenmann, P. C. Wszolek, and D. J. Lisk. 1979. Elemental and polychlorinated biphenyl content of tissues and intestinal aryl hydrocarbon hydroxylase activity of guinea pigs fed cabbage grown on municipal sewage sludge. J. Agr. Food Chem. 27:399-402.
5. Baker, E. L., P. J. Landrigan, C. J. Glueck, M. M. Zack, Jr., J. A. Liddle, V. W. Burse, W. J. Housworth, and L. L. Needham. 1980. Metabolic consequences of exposure of PCBs in sewage sludge. Am. J. Epidem. 112:553-563.

6. Bergh, A. K. and R. S. Peoples. 1977. Distribution of polychlorinated biphenyls in a municipal wastewater treatment plant and environs. Sci. Total Environ. 8:197-204.
7. Bottiger, M. 1978. Isolation of viruses from sewage, with special regard to poliovirus. Bul. World Health Organization. 56:937-943.
8. Boyd, J. N., G. S. Stoewsand, J. G. Babish, J. N. Telford, and D. J. Lisk. In Press. 1982. Safety evaluation studies of vegetables cultured on municipal sewage sludge-amended soil. Arch. Environ. Contam. and Toxicol.
9. Brown, K. W., S. G. Jones, and K. C. Donnelly. 1980. The influence of simulated rainfall on residual bacteria and virus on grass treated with sewage sludge. J. Environ. Qual. 9:261-265.
10. Buckley, E. H. 1979. Differential uptake of airborne PCBs by plants. 56th Ann. Rpt., Boyce Thompson Institute for Plant Research at Cornell Univ., p. 6.
11. Bunyan, P. J. and J. M. J. Page. 1978. Polychlorinated biphenyls. The effect of structure on the induction of quail hepatic microsomal enzymes. Tox. Appl. Pharm. 43.507-518.
12. Chaney, R. L., G. S. Stoewsand, C. A. Bache, and D. J. Lisk. 1978. Cadmium deposition and hepatic microsomal induction in mice fed lettuce grown on municipal sludge amended soil. J. Agr. Food Chem 26:992-994.
13. Connery, J. L. 1979. Health implications of sludge disposal alternatives: ocean disposal, incineration, land application, and land filling. *In*: Workshop on the health and legal implications of sewage sludge composting. Vol. 2, Position Papers. Chap. 9. Energy Resources, Co., Inc., Cambridge, MA.
14. Curry, N. A. 1977. PCBs in the environment. Clearwaters New York State Water Pollution Control Assoc. 7:6-8.
15. Dacre, J. C. 1980. Potential health hazards of toxic organic residues in sludge-health risks of land application. Eds. G. Britton, B. L. Damon, G. T. Edds, and J. M. Davidson. Ann Arbor Science Publ., Inc., Ann Arbor, MI. pp. 85-102.
16. Dacre, J. C. 1978. The potential health hazards and risk assessment of toxic organic chemicals in municipal wastewaters and sludges with special reference to their effects on the food chain. *In*: Proc. Conf. on Risk Assessment and Health Effects of Land Application of Municipal Wastewaters and Sludges. San Antonio, TX.
17. DeCarlo, V. J. 1979. Studies on brominated chemicals in the environment. Ann. N. Y. Acad. Sci. 320:678-681.
18. Dean-Raymond, D. and M. Alexander. 1976. Plant uptake and leaching of dimethylnitrosamine. Nature. 262:394-396.
19. deHaan, F. A. M. 1977. The effects of long-term accumulation of heavy metals and selected compounds in municipal wastewater on soil. *In*: Wastewater Renovation and Reuse. Vol. 3., D'Itri Ed. Marcel Dekker, Inc., New York. Chap. 9.
20. Dube, D. J., G. D. Veith, and G. F. Lee. 1974. Polychlorinated biphenyls in treatment plant effluents. J. Water Pollut. Control Fed. 46.966-972.
21. Dudley, D. J., M. N. Guentzel, M. J. Ibarra, B. E. Moore, and B. P. Sagik. 1980. Enumeration of potentially pathogenic bacteria from sewage sludges. Appl. Environ. Microbiol. 39:118-126.
22. Erickson, M. D. and E. D. Pellizzari. 1979. Analysis of municipal sewage sludge samples by GC/MS computer for polychlorinated biphenyls and other chlorinated organics. Bul. Environ. Contam. Toxicol. 22:688-694.
23. Farrell, J. B. and B. V. Salotto. 1973. The effect of incineration on metals, pesticides, and PCBs in sewage sludge. *In*: Proc. of a National Symposium on Ultimate Disposal of Wastewaters and Their Residuals. McJunkin and Visilind, Eds. Water Resources Research Inst., Raleigh, NC.
24. Fries, G. F. 1981. An assessment of potential residues in animal products from application of sewage sludge containing PCBs to agricultural land. In press. J. Environ. Qual.
25. Fries, G. F. 1980. An assessment of potential residues in animal products from application of sewage sludge containing polychlorinated biphenyls to agricultural land. *In*: Sludge-Health Risks of Land Application. Eds. G. Bitton, G. L. Damon, G. T. Edds, and J. M. Davidson. Ann Arbor Science Publishers, Inc., Ann Arbor, MI. pp. 348-349.
26. Furr, A. K., A. W. Lawrence, S. S. C. Tong, M. C. Grandolfo, R. A. Hofstader, C. A. Bache, W. H. Gutenmann, and D. J. Lisk. 1976. Multielement and chlorinated hydrocarbons analysis of municipal sewage sludges of American cities. Environ. Sci. Technol. 10:683- 687.
27. Goldstein, J. A. 1979. The structure-activity relationships of halogenated biphenyls as enzyme inducers. Ann. N. Y. Acad. Sci. 320:164-178.
28. Goto, M. and K. Higuchi. 1969. The symptomatology of Yusho (chlorobiphenyl poisoning) in dermatology. Fujuoja Acta Med. 60:409.
29. Grimmer, G., H. Bohnke, and H. Browitzky. 1978. Profile-analysis of polycyclic aromatic hydrocarbons in sewage sludge by gas chromatography. Fresenius Z. Anal. Chem. 289:91-95.
30. Hardee, D. D., W. H. Gutenmann, G. I. Keenan, G. G. Gyrisco, D. J. Lisk, F. H. Fox, G. W. Trimberger, and R. F. Holland. 1964. Residues of heptachlor epoxide and telodrin in milk from cows fed part per billion insecticide levels. J. Econ. Entomol. 57:404- 407.
31. Hartenstein, R. 1981. Sludge decomposition and stabilization. Science. 212:743-749.
32. Haschek, W. M., A. K. Furr, T. F. Parkinson, C. L. Heffron, T. Reid, C. A. Bache, P. C. Wszolek, W. H. Gutenmann, and D. J. Lisk. 1979. Element and PCB deposition and effects in sheep fed cabbage grown on municipal sludge. Cornell Vet. 69:302-314.

33. Heffron, C. L., J. T. Reid, D. C. Elfving, G. S. Stoewsand, W. M. Haschek, J. N. Telford, A. K. Furr, T. F. Parkinson, C. A. Bache, W. H. Gutenmann, P. C. Wszolek, and D. J. Lisk. 1980. Cadmium and zinc in growing sheep fed silage corn grown on municipal sludge- amended soil. J. Agr. Food Chem. 28:58-61.
34. Iwata, J. and F. A. Gunther. 1976. Translocation of the PCB aroclor 1254 from soil into carrots under field conditions. Arch. Environ. Contam. Toxicol. 4:44-59.
35. Jones, P. W., L. M. Reeeison, V. H. Lewin, and D. L. Redhead. 1980. The occurrence and significance to animal health of salmonellas in sewage and sewage sludges. J. Hyg. Camb. 84:47-61.
36. Kover, F. D. 1976. Considerations relating to toxic substances in the applications of municipal sludge to cropland pastureland (a background summary). EPA 560/8-76-004. EPA, Washington, D. C.
37. Kowal, N. E. and H. R. Pahren. Health effects associated with wastewater treatment and disposal. J. Water Pollut. Control Fed. 51:1301-1315.
38. Lance, J. C. and C. P. Gerba. 1980. Poliovirus movement during high rate land filtration of sewage water. J. Environ. Qual. 9:31-34.
39. Lawrence, J. and H. M. Tosine. 1977. PCB concentration in sewage and sludges of some waste treatment plants in southern Ontario. Bul. Environ. Contam. Toxicol. 17:49-56.
40. Liu, D. 1980. Fate of petroleum hydrocarbons in sewage sludge after land disposal. Bul. Environ. Contam. Toxicol. 25:616-622.
41. Mattsson. P. E., A. Norstrom, and C. Rappe. 1975. Identification of the flame retardant pentabromotoluene in sewage sludge. J. Chrom. 111:209-213.
42. Miller, R. W. 1971. Cola-colored babies. Chlorobiphenyl poisoning in Japan. Teratology. 4:211-212.
43. Mills, A. L. and M. Alexander. 1976. Factors affecting dimethylnitrosamine formation in samples of soil and water. J. Environ. Qual. 5:437-440.
44. Moore, B. E., P. B. Sagik, and C. A. Sorber. 1981. Viral transport to ground water at a wastewater land application site. J. Water Pollut. Control Fed. 53:1492-1502.
45. Moza, P. N., I. Scheunert, W. Klein, and F. Korte. 1979. Long-term uptake of lower PCBs and their conversion products by spruce trees (*Picea Abies*) from soil treated with sewage sludge. Chemosphere. 6:373-375.
46. National Institute for Occupational Safety and Health. 1976. Suspected Carcinogens, 2nd ed. p. 188. Cincinnati, Ohio.
47. Newkumet, C. 1980. The Del Monte decision: Banning crops grown in sludge-amended soils. Sludge. Sept.-Oct. pp. 18-21.
48. Nicholls, T. P., R. Perry, and J. N. Lester. 1979. The influence of heat treatment on metallic and polynuclear aromatic hydrocarbon content of sewage sludge. Science Total Environ. 12:137-150.
49. Oliver, J. E. 1979. Volatilization of some herbicide related nitrosamines from soils. J. Environ. Qual. 8:596-601.
50. Oliver, J. E., P. C. Kearney, and A. Kontson. 1979. Degradation of herbicide-related nitrosamines in aerobic soils. J. Agr. Food Chem. 27:887-891.
51. Pahren, H. R., J. B. Lucas, J. A. Ryan, and G. K. Dotson. 1979. Health risks associated with land application of municipal sludge. J. Water Pollut. Control Fed. 51:2588-2601.
52. Payment, P., Y. Larose, and M. Trudel. 1979. Polioviruses and other enteroviruses in urban sewage from Laval (Canada): presence of non-vacinal strains of poliovirus. Can. J. Microbiol. 25:1305- 1309.
53. Peakall, D. B., J. L. Lincer, and S. E. Bloom. 1972. Embryonic mortality and chromosomal alterations caused by Aroclor 1254 in ring doves. Environ. Health Perspectives. 1:103-104.
54. Plewa, M. J., E. D. Wagner, S. Wood, and P. K. Hopke. 1981. Mutagenicity of Chicago sewage sludge in *Zea mays* and *Tradescantia paludosa*. Abstract 12th Annual Mtg. Environ. Mut. Soc.
55. San, R. H. C., H. F. Stich, A. B. Acton, and L. Maus. 1981. Human sewage: A source of environmental mutagens? Abstract 12th Annual Mtg. Environ. Mut. Soc.
56. Saunders, D. G., J. W. Mosier, J. E. Gray, and A. Loh. 1979. Distribution, movement, and dissipation of N-nitrosodipropylamine in soil. J. Agr. Food Chem. 27:584-589.
57. Stoewsand, G. S., J. T. Reid, W. M. Haschek, J. N. Telford, and D. J. Lisk. 1980.. Hepatic changes in lambs fed corn silage grown on municipal sludge amended soil. *In*: Sludge-Health Risks of Land Application. Eds. G. Britton, B. L. Damon, G. T. Edds, and J. M. Davidson. Ann Arbor Science Publ., Inc., Ann Arbor, MI. p. 359.
58. Temple, K. L., A. K. Camper, and G. A. McFeters. 1980. Survival of two enterobacteria in feces buried in soil under field conditions. Appl. Environ. Microbiol. 40:794-797.
59. Tomson, M. B., J. Dauchy, S. Hutchins, C. Curran, C. J. Cook, and C. H. Ward. 1981. Groundwater contamination by trace level organics from a rapid infiltration site. Water Res. 15:1109-1116.
60. Tucker, E. S., V. W. Saeger, and O. Hicks. 1975. Activated sludge primary biodegradation of PCBs. Bul. Environ. Contam. Toxicol. 14:705-713.
61. Weaver, D. L., P. K. Hopke, J. B. Johnston, and M. J. Plewa. 1981. Mutagenicity of Chicago municipal sewage sludge in the *Salmonella*/microsome reverse mutation test. Abstract 12th Annual Mtg. Environ. Mut. Soc.
62. Weber, J. B. and E. Mrozek, Jr. 1979. PCBs: phytotoxicity, absorption, and translocation by plants and inactivation by activated carbon. Bul. Environ. Toxicol. Contam. 23:412-417.

This report was prepared by a Subcommittee on Organics in Sludge of Cornell University's College of Agriculture and Life Sciences. Members of the Subcommittee are: J. G. Babish, Department of Preventive Medicine, New York State College of Veterinary Medicine; D. J. Lisk, Toxic Chemicals Laboratory; G. S. Stoewsand, Department of Food Science and Technology, New York State Agricultural Experiment Station, Geneva; and C. Wilkinson, Director, Institute of Comparative and Environmental Toxicology.

ENVIRONMENTAL ISSUES

Toxic Metal Accumulation from Agricultural Use of Sludge: Are USEPA Regulations Protective?

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ABSTRACT

The new USEPA regulations for the use of sewage sludges will permit concentrations of particular toxic metals to increase locally on agricultural land by a factor of a hundred or more above present soil concentrations. Short-term field experiments have shown that the adsorptive properties of sludges themselves often prevent excessive uptake of many of these metals into crops, a protection attributable largely to the added organic matter. This protection cannot be considered to be permanent or effective for all toxic metals, as indicated by data from old sludged sites. Differences in degree of protection are evident for greenhouse and field experiments, largely attributable to different rooting patterns and degree of sludge mixing in these two situations. The USEPA reliance on field data for metal uptake by corn (*Zea mays* L.) has led to an underestimation of phytoxicity thresholds applicable to a wider range of crops, in part because corn is able to root deeply and is metal-tolerant. Also, the decision to use 50% yield reduction and plant top (rather than root) concentrations of heavy metals as phytotoxicity indicators may have obscured incipient toxicity. Long-term field observations (several decades) often show that sludge-applied metals can remain sufficiently available, even in nonacid soils when total metal concentrations are below the proposed EPA limits, to harm sensitive crops and microbes. It is concluded that the ultimate impact of toxic metals from sewage sludges at levels approaching the proposed USEPA limits on various soil-crop systems is potentially harmful.

THE LEVELS OF a number of heavy metals are increasing slowly in agricultural soils due to atmospheric deposition, additives in animal feeds, and commercial fertilizer use (Andersson, 1992; Billet et al., 1991; Jones, 1991). Although widespread increases of metals such as Cd, Hg, and Pb on agricultural soils in Europe have been estimated to be on the order of 10 to 15% since the turn of the century, these increases are small compared with the potential localized increases from sewage sludge use in agriculture.

Soils amended with municipal sewage sludges will be permitted (by the USEPA Clean Water Act 503 Regulations; USEPA, 1993) to accumulate metals such as Cr, Cd, Cu, Pb, Hg, Ni, Se, and Zn to levels from 10 to >100 times the present background concentrations of these metals in most soils. The comparison in Table 1 shows the USEPA Regulations to be very permissive for most metals by international standards. Defenders of the 503 Regulations believe that sludge-amended soils maintain an ability to immobilize toxic metals in nonavailable forms. Indeed, Chaney and Ryan (1993) have stated that "all evidence available indicates that the specific metal adsorption capacity added with sludge will persist as long as the heavy metals of concern persist in the soil." These scientists reject the argument that the slow mineralization of organic matter in sludge could release metals into more soluble forms, often termed the sludge time bomb hypothesis. Instead, they argue that the residuum of sludge decomposition can perpetually maintain heavy metal solubilities at very low levels. This could be termed the sludge protection hypothesis. The field observation that "plant uptake reaches a maximum as sludge application increases" (Ryan and Chaney, 1993) is used to support this hypothesis. Based on this reasoning, even if sludge were applied to soil for a sufficiently long time to convert the surface soil almost completely into sludge residue, the uptake of trace elements would be, at worst, a linear function of cumulative sludge application, because the sludge itself is adding adsorptive capacity to the soil. Thus, heavy metal availability or solubility in sludge-amended soils would depend linearly on the total heavy metal content of the soil, as illustrated by curve a of Fig. 1. Because uptake of metals into plants often becomes less efficient at higher metal loadings in soil, Curve b has been proposed to describe this saturation effect. On the other hand, because soils have a finite capacity to immobilize metals by adsorption or precipitation reactions, without the protective effect of the sorptive materials in the sludge itself, a Langmuir-type relationship (Curve c, Fig. 1) would be expected. This is the relationship found for metals added to soils in the soluble salt form (Hendrickson and Corey, 1981). Given the serious consequences of a response similar to Curve c for heavy metal additions on crop quality and yield, it is essential to know whether the added protective effect of the sludge residue arises from the organic or inorganic materials, because much of the added organic matter eventually decomposes. Nevertheless, there is evidence that a fraction of the organic matter resists decomposition, and could provide protection against metal uptake for decades. Inorganic residues in sludge most likely to provide long-term retentive capacity for some heavy metals are phosphates, silicates, and Fe, Al, and Mn oxides. Although carbonates and sulfides may exist in

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Abbreviations: EDTA, ethylenediaminetetraacetic acid; CEC, cation-exchange capacity; DTPA, diethylenetriaminepentaacetic acid; PT_{50}, phototoxicity threshold; LOAEL, lowest observed adverse effect level.

Table 1. Maximum permitted metal loadings in soil (kg/ha) established by the USEPA-503 regulations, compared with other standards.† The international standards are based on total metal content in soil, including background level.

Metal	USEPA-503	N.E.‡	Germany	Netherlands§	Ontario
As	41	–	–	60 (100)	14
Cd	39	5	6	10 (40)	1.6
Co	–	–	–	100 (600)	30
Cr	3000	500	200	500 (1600)	210
Cu	1500	125	200	200 (1000)	150
Hg	17	–	4	4.0 (20)	0.8
Mo	18	–	–	80 (400)	4
Ni	420	50	100	200 (1000)	32
Pb	300	500	200	300 (1200)	90
Se	100	–	–	–	2.4
Zn	2800	250	600	1000 (6000)	330

† For direct comparison, standards based on mg/kg units have been converted to kg/ha using a factor of 2. The exact conversion depends on soil density and depth of sludge mixing.
‡ Data from Northeastern U.S. Regional Research, 1985.
§ The values are considered to represent moderate soil contamination requiring additional study, while those in parentheses are considered to represent a serious threat to humans or the environment.

sludges, they cannot be assumed to persist in most soils, and their dissolution could increase heavy metal solubility over time. For this reason, the chemical nature of sludges needs to be better described before predictions about long-term fate of heavy metals are possible.

Research funding has been of such a nature that long-term research on the behavior of sludge-applied metals in soils has been hampered. Consequently the USEPA had the difficult task of developing a risk-analysis for land use of sewage sludge, in which it was necessary to extrapolate from short-term experiments at relatively low metal loadings to long-term with higher metal loadings. The USEPA-503 heavy metal loading limits, listed in Table 1, have not been reached (except in a few cases for a few metals) in field experiments, and it remains to be proven that they are safe. The important question that needs an answer before the USEPA limits can be considered environmentally and agriculturally acceptable is: What happens to toxic metals over the very long-term following the cessation of sludge application? It is generally agreed that the organic matter level in the soil must eventually return to a value not much greater than that of the original soil. The half-life of organic decomposition has been estimated to be ≈ 10 yr (Bell et al., 1991), but this may be an overestimate of decomposition rate over a period of several decades (Terry et al., 1979).

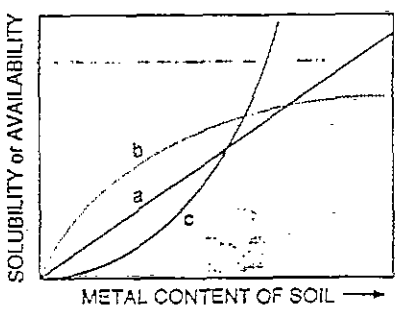

Fig. 1. Possible trends in heavy metal solubility (or plant availability) as a function of metal content of soils. These trends represent (*a*) the constant partitioning model, (*b*) the solubility limit (saturation) model, and (*c*) the Langmuir sorption model.

Nevertheless, part of the *metal-complexing capacity* of the soil is gradually lost over several decades. The sludge protection hypothesis requires that the *inorganic* materials (phosphates, Fe and Al oxides, and silicates) in the sludge either adsorb or precipitate the toxic elements so that metal availability will remain low or further decrease in the long term. Although many soil scientists believe that soil chemistry is also very important in controlling the solubility of trace elements in the long-term, the USEPA 503 Regulations pay no heed to the characteristics of the soil, other than to recommend that the pH be maintained at 6.5 or higher. Thus, the USEPA 503 regulations are rationalized on the basis of the efficacy of permanent materials in sludges for metal immobilization. Our purpose is to analyze existing evidence and determine whether there is convincing support for the hypothesis that the sorptive capacity of sludges is sufficient to prevent heavy metals from impairing crop productivity or quality over the long-term.

PROBLEMS IN QUANTIFYING SLUDGE PROTECTION

It is important to recognize that, since much of the information on metal availability in sludge-treated soils is obtained indirectly by measuring the metal content of plant tops, a plateau in metal uptake as a function of total metal content in the soil does not necessarily mean that Curve b (Fig. 1) describes metal availability to roots (or soil microbes). There may not be a strong correlation between metal solubility (or availability to roots) and the concentration in the tops. This depends on the many factors affecting translocation, including species and cultivar of plant, environmental conditions, and competing ions. One could easily conclude that the soil is providing protection against metal uptake at high loadings of the metal in the soil when uptake is in fact being suppressed by changes in the translocating efficiency of the plant. Although the edible portion of the plant may contain acceptably low concentrations of toxic metals in either case, the true extent of metal bioavailability and toxicity to roots and soil microbes could be underestimated.

Evidence for metal solubility or availability increasing according to Curve c is seen where metals have been added as soluble (or insoluble) salts to soils. Although such metals show some tendency to diminish in bioavailability with time, experience with Cu salts accumulated in orchards, vineyards, and other agricultural sites suggests that total soil Cu in the range of several hundred milligrams per kilogram causes phytotoxicity in some crops (Merry et al., 1986a; Lexmond, 1980), but not in all (Payne et al., 1988). As the concentration of Cu in orchard soils increases with time from cumulative application, a larger fraction of the total Cu can be extracted by ethylenediaminetetraacetic acid (EDTA) (Dickinson et al., 1988), suggesting adherence of Cu availability to Curve c (Fig. 1). Similarly, as the level of Pb in soil is increased by pollution from inorganic solids, it becomes increasingly extractable by mild chemical treatments (Nicklow et al., 1981; Stiles et al., 1993). It appears, from these studies of long-polluted soils that decades or

even centuries of aging metal pollutants added in inorganic form to soils is insufficient to convert them to nonavailable forms. Consequently, the USEPA heavy metal limits for sludge application (which would permit, i.e., ≈750 mg Cu/kg soil) can be considered generally safe only if materials in the sewage sludge itself permanently immobilize most of the metals. Organic matter in the sludge is probably critical in metal immobilization for years or decades, but cannot be regarded permanent in the soil. This leaves the inorganic constituents of sludge to provide protection against metal uptake by crops.

Certain points of general consensus seem to have been reached from short- and medium-term field studies of sludge application. Availability of sludge-borne metals to plants is generally the highest immediately following application of sludge to soil, diminishing thereafter (Bidwell and Dowdy, 1987; Chang et al., 1987a; Hinesly et al., 1979). The cause of the initially high bioavailability may be, at least in part, rapid organic matter decomposition that produces soluble organic carriers of metals (Alloway and Jackson, 1991; Chaney and Ryan, 1993; Minnich et al., 1987). Organic matter appears to have quite different roles in controlling trace metal uptake by plants, depending upon whether it is soluble (fulvic acid) or insoluble (humic acid). Insoluble organic matter very effectively inhibits uptake of metal cations such as Cu^{2+}, which bind strongly with organic matter and are thereby prevented from diffusing to roots. Conversely, soluble organics raise the carrying capacity of soil solutions for Cu^{2+} and other metal cations at any particular pH by forming soluble metal-organic complexes (McBride, 1994). Because the plant is able to extract trace metals from these complexes once they diffuse to the root (Nor and Cheng, 1986), the high level of soluble organics found in soils recently amended with sludge could promote absorption of trace metals by roots. With time, organic decomposition rates and levels of soluble organics diminish, total dissolved metals presumably stabilize at lower values, and bioavailability is reduced.

Higher initial bioavailability in some field experiments may result from incomplete initial mixing of sludge with soil. Sludge particles may only slowly reach equilibrium with the soil matrix, so the impact of soil adsorptive properties on metal solubility may be gradual. It needs to be stressed, however, that this decreasing metal availability, often described as being longterm, is most pronounced in the first few years after ceasing sludge application, and has generally been based on experiments in which the soils have been monitored for no more than about six years following the cessation of sludge application.

REANALYSIS OF THE STUDY OF MAHLER ET AL., 1987

Chaney and Ryan (1993) reference the study of Mahler et al. (1987) as evidence supporting the sludge protection hypothesis. In that study, 12 soils with relatively long histories of sludge application (5–30 years), along with the unsludged control soils, were amended with Cd (as $CdSO_4$) at the levels of 0, 5, and 10 mg Cd/kg soil. The sludged soils then contained Cd from two sources: old Cd from the earlier sludge applications, and new Cd from the added $CdSO_4$. The unsludged control soils contained no Cd from sludge, and generally <1.0 mg/kg of native Cd. The exception to this was the Salinas (fine-loamy, mixed, thermic Pachic Haploxeroll) soil from California, which naturally contained 4.2 mg Cd/kg. Swiss chard (*Beta vulgaris* subsp. *cicla* (L.) Koch) and corn were grown in these soils in growth chambers with and without lime addition (1% $CaCO_3$, w/w). Plant tops were harvested after 5 wk of growth and analyzed for Cd content.

Although this experiment is unrealistic in the sense that Cd added to fields from sludge is initially in the sludge matrix rather than a salt form, it is still useful in establishing whether aged soils containing sludge residue possess a higher capacity to immobilize Cd against plant uptake relative to unsludged soil. Despite the claim of Chaney and Ryan (1993) that the Mahler et al. (1987) study demonstrates "the persistence of the *sludge effect* on metal sorption," no clear answer is evident from the study. Although a number of the soils did show a positive effect of previous sludge addition on limiting plant uptake of newly added Cd salts, this was not generally the case. Soils such as the Congaree (fine-loamy, mixed, nonacid, thermic Typic Udifluvent) and Ross (fine-loamy, mixed, mesic Cumulic Hapludoll), which had markedly higher organic matter content than the control soils due to sludge addition, showed substantially lower Cd uptake into both corn (Fig. 2 and 3) and Swiss chard (data not shown). On the other hand, soils having low organic matter content (evidently due to sludge decomposition), despite having received substantial sludge applications, revealed no significant advantage of sludge addition in limiting Cd uptake by the two crops. This is quite evident for the sludged Pembroke (fine-silty, mixed, mesic Mollic Paleudalf) and Burkhardt (sandy, mixed, mesic Typic Hapludoll) soils (Fig. 2), reported to contain 2.3 and 2.1% C, respectively, not much higher than the same soils in the unsludged condition. The Blount (fine, illitic, mesic Aeric Ochraqualf) and Russell (fine-silty, mixed, mesic Typic Hapludalf) soils, that had received high Cd loadings (≈200 and 70% of the USEPA limit of 39 kg/ha) from sludge addition, also failed to show a convincing sludge protection effect (Fig. 3). In these soils, the sludge Cd was sufficiently available that, even if no additional Cd salts were added to the soil, Cd levels in the crops greatly exceeded levels in the crops grown on the unsludged soils. With 5 mg/kg, and sometimes 10 mg/kg, Cd added as salts, the sludged soils still allowed greater uptake of Cd than the unsludged soils. The one soil with a naturally high level of Cd, Salinas, also failed to show the protective effect of sludge treatment (Fig. 3). The remaining soils usually showed inconsistent results as illustrated by the Del Rey soil (Fig. 2). Although the Cd concentrations are plotted for corn only in Fig. 2 and 3, a fairly similar pattern was observed for Swiss chard.

How then did the authors reach the conclusion that the sludge provides a protective effect? It is based on the argument that the Cd *increase* in plants in response

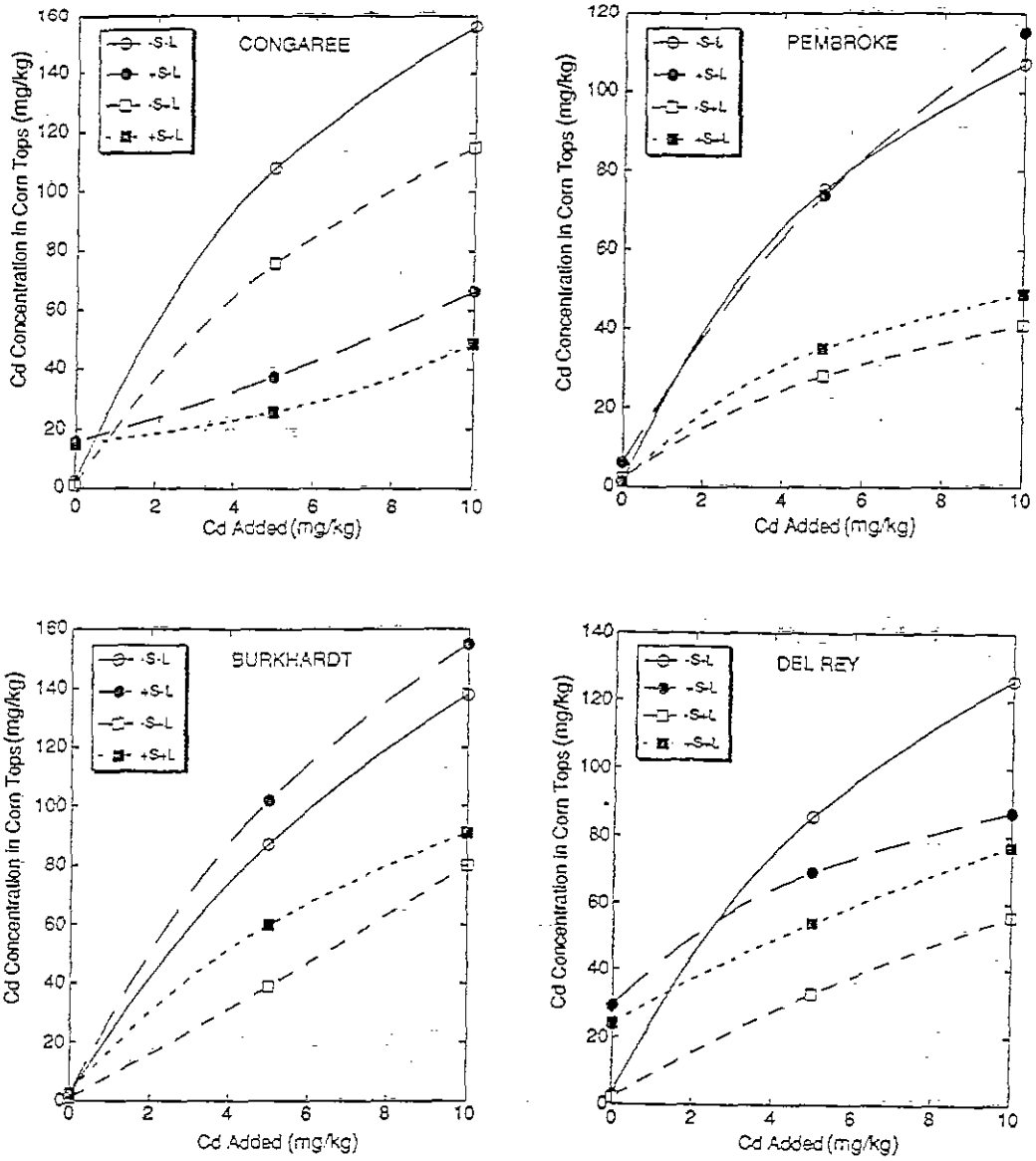

Fig. 2. Concentration of Cd in corn tops (mg Cd/kg dry tissue) after growing in the Congaree, Pembroke, Burkhardt, and Del Rey soils with and without sludge (+S, −S) and lime (+L, −L), and with increasing levels of soluble Cd ($CdSO_4$) added. Data in this and subsequent figures taken from Mahler et al. (1987).

to added Cd salt was less for the sludged soils than for the control soils (Mahler et al., 1987). This can be seen in the tendency for the response curves for sludged soils in Fig. 2 and 3 to have *lower* slopes than the curves for the corresponding control soils. A soil-by-soil comparison, however, suggests that the cause of the lower slopes may be the adsorptive capacity of organic matter. The clearly protective effect of sludge against Cd uptake from the Congaree soils (Fig. 2) can be attributed to the very large difference in organic matter content between the sludged (23% C) and control (1.3% C) soils. The nonprotective effect of sludge for the Pembroke and Burkhardt (Fig. 2) may be due to the rather small difference in organic matter content in these soils. The Pembroke contained 2.3% C (sludged) and 1.8% C (unsludged), while the Burkhardt contained 2.1% C (sludged) and 1.5% C (unsludged). The Blount and Russell, heavily loaded with Cd from sludge applications, showed *some* protection against Cd uptake (based upon slopes of the response curves in Fig. 3), but this may have been due at least in part to a substantially higher organic matter content in the sludged soils. The Blount contained 3.5% C (sludged) and 2.5% C (unsludged), while the Russell contained 3.2% C (sludged) and 1.9% C (unsludged). The sludged Salinas soil had very little more organic matter (3.0% C) than the unsludged Salinas (2.7% C), perhaps explaining the lack of a protective effect of sludge in this soil (Fig. 3).

It appears from this analysis of the data of Mahler et al. (1987) that a stronger case can be made for the

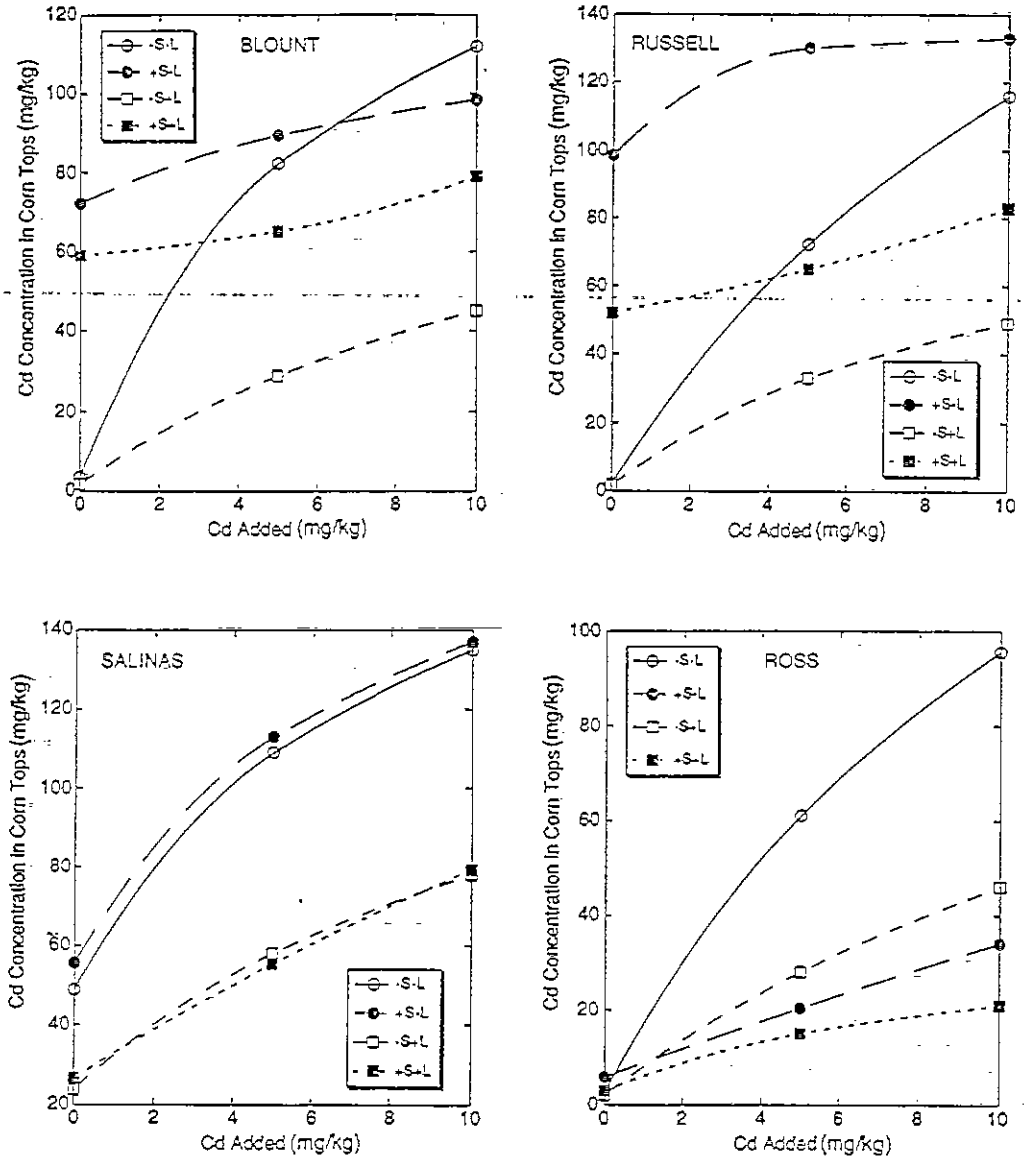

Fig. 3. Concentration of Cd in corn tops (mg Cd/kg dry tissue) after growing in the Blount, Russell, Salinas, and Ross soils with and without sludge (+S, −S) and lime (+L, −L), and with increasing levels of soluble Cd ($CdSO_4$) added.

protective effect of *organic matter* as opposed to that of the inorganic constituents of sludge. In fact, the importance of organic matter in limiting Cd availability is suggested by the relationships plotted from the Mahler et al. (1987) data in Fig. 4 and 5. In these Figures, a correlation is shown between Cd uptake from all the sludged soils (with no Cd salts added) and the soil Cd to soil organic carbon (Cd/C) ratio. There is a tendency for soils with low Cd/C ratios to limit plant uptake relative to soils with higher Cd/C ratios. While this is not conclusive proof that organic matter is critical to limiting availability of Cd in soils with histories of sludge application, there is little in the Mahler et al. (1987) data to suggest that inorganic materials have a dominant role in controlling Cd availability. It should be noted also that the behavior of two of the most Cd-polluted soils, Blount and Russell, largely determines the steepness of the best-fit curves in Fig. 4 and 5. Thus, the mathematically described relationship between Cd uptake and Cd/C ratio based on this study is very uncertain. Since the Blount soil had a higher pH and cation-exchange capacity (CEC) than the Russell soil, even after sludge addition, adsorption reactions in the Blount soil may have reduced Cd uptake.

In summary, the data from the Mahler et al. (1987) study fail to support the sludge protection hypothesis, because those sludge-amended soils that had lost most of the added organic matter due to decomposition generally permitted greater Cd uptake than those that still retained considerably higher levels of organic matter. The study does, however, support the USEPA position that sludge quality (i.e., Cd concentration in sludge) must be consid-

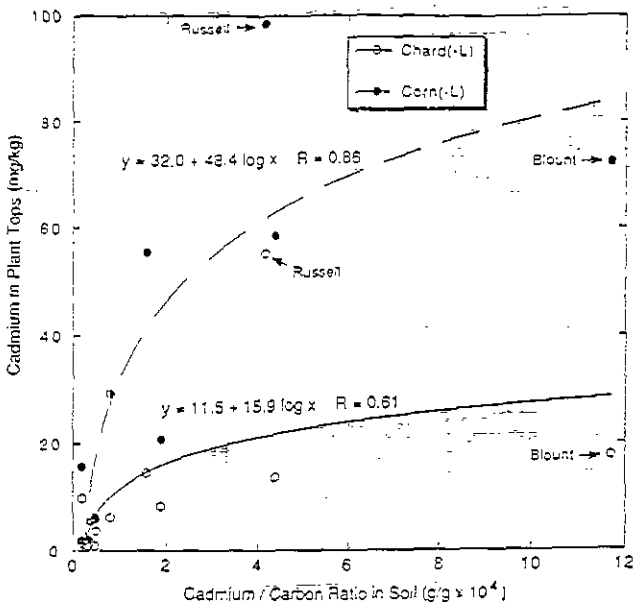

Fig. 4. Concentration of Cd in Swiss chard and corn tops (mg Cd/kg dry tissue) after growing in 12 different soils with 5 to 30 yr histories of sludge application, reported as a function of the total soil Cd to total organic C ratio. This figure is based on the data of Mahler et al. (1987) in which no soluble Cd had been added to the unlimed soils.

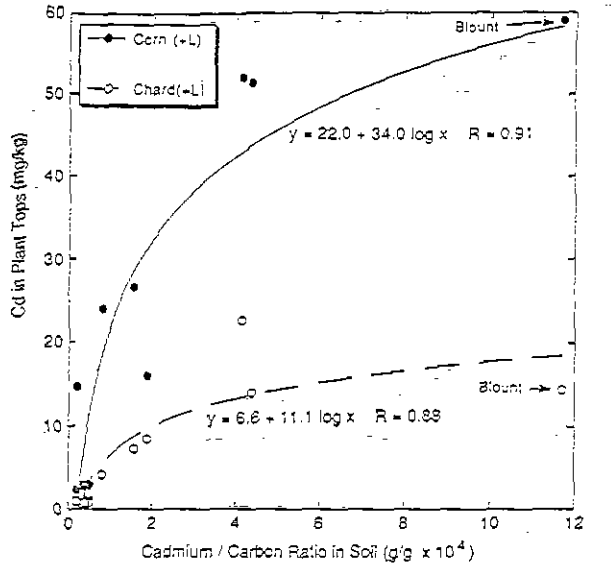

Fig. 5. Concentration of Cd in Swiss chard and corn tops (mg Cd/kg dry tissue) after growing in 12 different soils with 5 to 30 yr histories of sludge application, reported as a function of the total soil Cd to total organic C ratio. This figure is based on the data of Mahler et al. (1987) in which no soluble Cd had been added to the limed soils.

ered as well as total metal loading limits, since the Cd/C ratio is an important parameter. As sludged soils age, the ratio of heavy metals to organic matter increases, and Fig. 4 and 5 predict plant uptake of Cd to increase in response to this change. While inorganic residues in the sludge persist, their effectiveness as adsorbates for heavy metals must depend on the chemistry of the specific mineral material in sludges. Iron salts, Al salts, Ca oxides, and other materials have been used in processing sludges, but most research fails to consider the macrochemical composition of the sludge when assessing trace metal solubility. It is unrealistic to expect that the chemical behavior of trace metals in sludges would not be affected by the types of sorptive minerals present (oxides of Fe and Al, carbonates, or phosphates); however, there is no allowance made for this in the USEPA regulations.

An additional note in reference to the analysis of slopes of Cd uptake response curves, as done by Mahler et al. (1987), is warranted. In general, uptake of Cd and other metals by plant tops does not occur in *linear* response to concentration (or activity) of the metal in solution, except at a low range of concentration. This has been illustrated for Cd by various studies, including the hydroponic experiments of Jarvis et al. (1976) on ryegrass (*Lolium multiflorum* Lam.), where the Cd concentration in both the plant tops and roots increased curvilinearly. That is, the efficiency of metal uptake by many plant species tends to diminish at higher soil solution concentrations of the metal, particularly as the threshold of toxicity for that metal is approached. Many of the sludge-treated soils of the Mahler et al. (1987) study provided high baseline uptake of Cd before any addition of Cd salts. Thus, plants grown on such soils may have been on the flatter upper portion of the response curve even before Cd salt addition. Their uptake of additional Cd is unlikely to be as efficient as that for plants grown on unsludged soils that are relatively free of Cd. Some sludges supply large amounts of several potentially toxic metals such as Cu, Zn, and Ni, to soils simultaneously and these are likely to alter Cd uptake response curves by competition and other effects (Choudhary et al., 1993). Because heavy metal toxicity to roots can be somewhat additive and even synergistic when several metals are present (Hassett et al., 1976; Wallace and Berry, 1989), soils approaching the USEPA limits for several of the phytotoxic elements may show yield reductions at lower concentrations than expected if a single element is at an elevated concentration. For this reason, there has been debate about the extent to which the phytotoxic effects of metals such as Zn, Cu, and Ni are additive and whether individual metal limits should be lowered to reflect this additivity (Sanders et al., 1986; Davis and Carlton-Smith, 1984). Antagonism between potentially toxic metals such as Cd and micronutrients such as Zn, Mn, and Cu can reduce root and top growth as well as micronutrient content in the plants (Jalil et al., 1993). Symptoms of Mn deficiency, for example, are observed in some old sludge sites (Trocme et al., 1950). It cannot be ruled out that such deficiencies are caused by excesses of metals such as Zn or Cu, since these metals are higher in the tissues of chlorotic plants from these sites (Leeper, 1978).

HEAVY METAL AVAILABILITY ESTIMATED BY MULTI-YEAR FIELD STUDIES

Field studies are sometimes interpreted to support the sludge protection hypothesis. If the hypothesis is correct,

as application of sludge continued from year to year, the levels of heavy metals in tissues of indicator crops might increase in the first few years, but then would level off or decrease in later years as metals are gradually converted into less soluble (nonavailable) forms. In many cases, however, the overall pattern is one of uptake in response to *cumulative* loading of Cd in the soil. For example, the data of Chang et al. (1987b) show that, for radish (*Raphanus sativus* L.) and Swiss chard leaves, tissue Cd concentration tends to increase yearly with each sludge application, although there is considerable year-to-year variability. Other field studies have shown evidence of Cd and Zn accumulation in plant leaf tissues in approximate proportion to total cumulative loading of these metals in the soil from sludges (Hinesly et al., 1984; Vlamis et al., 1985; Kiemnec et al., 1990; Davis, 1984). This relationship is, however, much less evident in grain tissues of the same crops because of the tendency of plants to exclude these metals from the grain. The relationship for Cd appears to be most pronounced for sludges of relatively high Cd content (Vlamis et al., 1985) and for soil with low organic matter (Hinesly et al., 1984), again suggesting the importance of organic matter in suppressing Cd uptake. A field study using a low Cd sludge (7.6 mg Cd/kg) failed to show Cd concentrations in snap beans (*Phaseolus vulgaris* L.) to increase in proportion to total cumulative loading of Cd in the soil (Dowdy et al., 1978), although Zn and Cu in the leaf tissue did increase with cumulative loading of these metals. In some field experiments, there is a stronger statistical relationship of Cd uptake in crops to the amount of Cd added in the *most recent* sludge application than to the *cumulative* Cd loading (Hinesly et al., 1977; Webber and Beauchamp, 1979). This has been taken as evidence for residual sludge protection, but can perhaps be attributed to slow equilibration of sludge with the soil matrix, especially if sludge mixing in the field is initially incomplete. Discrete sludge particles can be observed in soils for years after initial application, and it is possible that the solubility of metals within these particles is not controlled by pH and other chemical properties of the soil for some time. As the soil–sludge system approaches equilibrium, heavy metal solubility should diminish if the soil is strongly adsorptive. It must be emphasized that most of the field studies described here spanned 3 to 7 yr, with only one study exceeding a decade.

COMPARISON OF GREENHOUSE AND FIELD EXPERIMENTS

Greenhouse experiments, in which sludge mixing with soil is generally more thorough and plant roots are restricted in pots to the volume of soil containing the sludge, more convincingly show a relation of metal uptake to total metal content of soil than do field experiments (Kuo et al., 1985). While pot studies generally overestimate metal phytoavailability found under field conditions, the reason for this discrepancy has not been clearly established. Climatic differences (temperature, humidity, and light quality and intensity) are suspected (de Vries and Tiller, 1978), but rooting pattern seems to be most critical. Experiments with Swiss chard grown outside the greenhouse in pots under field conditions have shown a strong relation of Cd and Zn in leaf tissue to total Cd and Zn content of the soil (Kuo et al., 1985), suggesting that climatic factors in themselves do not explain the differences observed between greenhouse and field experiments. While several other variables, such as differences in rhizosphere effects and fertilizer distribution in field and pot experiments need to be considered (Chaney and Ryan, 1993), the reason (or reasons) for the difference in apparent availability of metals in pot and field experiments remains open to question. Although the USEPA Regulations for heavy metals are based on the premise that only field experimental results are relevant in establishing the permitted metal loading rates, field experiments usually represent a poorly controlled situation of soil–sludge mixing, climate and root distribution in the soil. In fact, those who conducted field experiments with deep-rooting crops such as corn are aware that most of the mature root system may occupy a volume of soil that contains none of the applied sludge (Hinesly et al., 1977). Even for relatively shallow rooted plants, avoidance of toxic metals in the sludge-treated surface layer of soil could explain the relative lack of metal uptake in some field experiments (de Vries and Tiller, 1978). Thus, metal uptake in field experiments depends strongly on variables in addition to the inherent chemical lability or solubility of the metals in the soil, and consequently shows a high degree of unexplained variability. Although the results from these experiments represent reality for the plant–soil systems studied, extrapolation of such metal uptake data to other soils, crops, and climates would be risky, since it could underestimate metal uptake. For example, as sludge is applied repeatedly with cultivation, the metals are worked deeper into the soil, and avoidance of metals by less deep-rooted crops could diminish with time. The data used to generate the USEPA regulations are based heavily on results from field studies of corn, and metal avoidance may be an important factor in interpreting uptake data for this crop. This means, however, that very different metal uptake behavior may be seen in crops with shallower rooting systems.

Plant tissue concentrations of heavy metals are sometimes stated to have no correlation (to a statistically significant degree) with extractable or total heavy metals in the soil (Hinesly et al., 1984; Chang et al., 1992), probably due in part to uncontrolled factors in field experiments. A lack of statistical significance in a correlation between variables does not, however, prove that the variables are not related: it means that the apparently random variability in the data is too great to prove or disprove the existence of a correlation with an arbitrarily chosen degree of certainty. Since agronomists typically choose a confidence level of 95% to test significance, this means that there is a high chance of a Type II statistical error; that is, accepting the false null hypothesis that there is no correlation between the variables. Consequently, it is likely that many field experiments, which have failed to show at the 95% confidence level a correla-

tion between the concentration (or extractability) of heavy metals in soils and the uptake of these metals by plants, have resulted in the rejection of a correct hypothesis that such a correlation does exist. One example of this use of statistics is a field study of Cd and Zn uptake from sewage sludge by corn (Hinesly et al., 1984). Although a tendency for Cd in corn leaves to increase with cumulative Cd in the soil was indicated by the best-fit linear regression of the data, this trend was not significant at the 95% level of confidence and it was concluded by the authors that repeated sludge applications to the soil did *not* cause concentrations of Cd in corn leaves to increase. There is a strong possibility that this conclusion is incorrect, that is, that the hypothesis of no correlation between total soil Cd and Cd in corn leaves is invalid.

Field studies of metal uptake by particular crops have generally been conducted in an empirical manner, frustrating efforts to generalize observations from one particular sludge–crop–soil system to another. Relatively little has been learned from field studies about fundamental processes that determine solubility and chemical form of the heavy metals in the sludge and soil, or uptake into roots and translocation into tops of plants. Yield is commonly used as the index of toxicity for metals, but Beckett and Davis (1977) have argued that because yield is affected by many factors, the onset of a metal toxicity can be obscured by variables that tend to increase yield. For sludge, these variables include micronutrients and the effects of organic matter on soil physical structure and water holding capacity. These additional variables can only be accounted for in those sludge experiments where the control treatment uses a low-metal sludge for yield comparison.

Because of the inherent variability of field data, the present USEPA limits on Cd loading in soil, for example, are based on field data in which the ratio of Cd uptake to metal content in soil ranges across about *four* orders of magnitude. Since a single-point estimate of this ratio was used in the USEPA risk-assessment analysis, it fails to factor in the uncertainty of the data (Stern, 1993).

CHANGES IN HEAVY METAL SOLUBILITY AND AVAILABILITY FOLLOWING THE CESSATION OF SLUDGE APPLICATION

In relatively short-term experiments where the annual sludge application was terminated, Cd uptake by corn was shown to decrease for several successive crops, then level off and hold steady for ≈3 yr (Bidwell and Dowdy, 1987). In beans, uptake of Zn and Cu was found to remain elevated for the 4 yr during which the crops were monitored following cessation of sludge application (Dowdy et al., 1978). For 3 yr following the cessation of sludge application on a calcareous soil, Webber and Beauchamp (1979) noted no real change in Cd uptake by corn. Davis (1984) noted a decrease in Cd uptake by ryegrass for 3 yr following a single sludge application, followed by a small rebound in the fourth year.

The review of Alloway and Jackson (1991) addresses the important issue of long-term changes in bioavailability of heavy metals in sludge-amended soils. In some longer-term sludge experiments (in which the loadings of phytotoxic metals were well below the USEPA-503 limits), there was little or no evidence of a long-term decline in either heavy metal uptake by plants or metal extractability by reagents such as EDTA or acetic acid (Berrow and Burridge, 1981; Leriche, 1968). McGrath (1987) noted that most studies of trends in metal availability following the termination of sludge application observed availability to remain fairly constant. Sauerbeck and Styperek (1986) noted a tendency for heavy metal availability to decrease with time in some sites for certain crops, but the trend was inconsistent. Even for studies in which sludge application had ceased >20 yr earlier, almost 30% of the organic matter from the sludge remained in the soil (McGrath and Cegarra, 1992). The possible role of residual organic matter in maintaining heavy metals in a relatively nonavailable form for a long time may have to be considered, since Terry et al. (1979) found that >50% of sludge organic matter was resistant to decomposition. It is possible that some of this resistance is provided by the toxic effects of heavy metals on microbes, although this does not seem to be the case for Cu, at least in the early stages of sludge decomposition (Minnich and McBride, 1986).

In the long-term market garden experiment at Woburn, England, which spanned an interval of time from the 1940s to the 1980s, during which time sludge was applied only before 1962, the $CaCl_2$-exchangeable Cd in the soil changed little from the early 1950s to the early 1980s, remaining much higher than exchangeable Cd in the control soils (fertilizer-treated, without sludge) over the entire interval investigated (McGrath and Cegarra, 1992). Similarly, the extractability by EDTA of Cu, Pb, Zn, Ni, and Cr changed little following the termination of sludge application, and the sludge-amended soil generally had a much higher percentage of heavy metals in EDTA-extractable form than the unsludged (control) soil. This evidence suggests a fairly stable situation, in which the loss of a large fraction of added organic matter has not substantially altered the chemical forms of metals in the soil. It is possible that inorganic materials in the sludge are limiting metal uptake, but the properties of the soil, which was maintained at a pH of 6.5 by liming, may have had a strong influence on metal solubility on the long time scale of this experiment.

Although none of the studies reported here provide clear evidence for increased availability of heavy metals with time following the cessation of sludge application, neither do they indicate that most soils are able to gradually convert a large portion of the added heavy metals to insoluble, unavailable forms, even when they are applied at concentrations well below the USEPA-503 limits.

Field experiments are unable to discern the relative importance of organic and inorganic constituents in sludge with respect to limiting heavy metal availability. Certainly, inorganic materials added to soils *can* immobilize heavy metals in relatively insoluble forms (Mench et al., 1994). Phosphates or carbonates in sludges are expected to adsorb or precipitate Pb and Cd, while Fe and Al oxides are known to have a strong tendency to

adsorb metals such as Cu, Pb, and Zn. These mechanisms are, however, highly selective, competitive, and pH dependent, and do not necessarily reduce solubility sufficiently to markedly lower plant availability. Manganese oxides appear to be much more effective in reducing bioavailability of metals than phosphates, carbonates or Fe oxides (Mench et al., 1994). Because the inorganic solids initially present in sludges are at least partially noncrystalline (Baldwin et al., 1983), they may age to more crystalline phases in the soil, ejecting coprecipitated metals that are not of proper radius and charge to be accommodated by the crystal lattice (McBride, 1978, 1989). Thus coprecipitated heavy metals may actually be concentrated at surfaces, not buried within structures. The high degree of extractability of Pb, Cu, Zn, and Cd by EDTA in old sludge sites and orchard soils (Merry et al., 1986a; Dickinson et al., 1988; McGrath and Cegarra, 1992) suggests that many of the heavy metals have a limited ability to diffuse or coprecipitate into soil minerals over a period of decades. In fact, a large part of these metals is probably associated with organic matter in the sludge (Baldwin et al., 1983). Thus, even over relatively long periods of time, a large fraction of certain heavy metals from sludges remain in potentially plant-accessible forms. Bell et al. (1991) found that about the same fraction (50%) of Cd in a soil was extractable with diethylenetriaminepentaacetic acid (DTPA) whether the Cd had been added in sludge, or as $CdCl_2$ salt. Since the Cd had been applied ≈ 9 yr earlier, this observation contradicts both the sludge protection hypothesis and the argument that reversion of Cd to less plant-available forms occurs. Similarly a high degree of extractability of Cd from old sludge sites by EDTA has been measured (McGrath and Cegarra, 1992). In fact, numerous pot and field studies have shown highly significant correlations between EDTA, DTPA, or $CaCl_2$-extractable Cd, Zn, Cu, Ni, and uptake of these metals into the tops of a number of crops (Sanders et al., 1986; Lee et al., 1983; Hooda and Alloway, 1994; Kuo et al., 1985; Latterell et al., 1978; Barbarick and Workman, 1987; Bidwell and Dowdy, 1987; Minnich et al., 1987). Metals extracted by the chelating agents, DTPA and EDTA, are largely in exchangeable, organically-complexed, and carbonate forms, and tend to correlate with metal uptake by plants (Latterell et al., 1978; Walsh et al., 1972). It has been cautioned, however, that it should not be too readily assumed that these chelating agents actually measure availability (Tiller and Merry, 1981; Beckett et al., 1983). For example, while DTPA extractability of Pb and Cu may increase with increasing soil pH, plant uptake sometimes decreases (Merry et al., 1986b). Also, decreases in plant uptake of Cd have been noted in successive years of cropping on sludged soils despite steady levels of DTPA-extractable Cd (Bidwell and Dowdy, 1987). Since there is a tendency for DTPA-extractable heavy metals to increase with metals concentration in the soil, and for uptake in crops to increase in response to increased metals in the soil, the correlation between DTPA-extractable metals and plant uptake may in some cases be fortuitous (O'Connor, 1988; Beckett et al., 1983). It should be stressed, however, that availability of metals is best measured from contents of these metals in root rather than tops. Since DTPA extractability can be a better predictor of metal content in roots than plant tops (Minnich et al., 1987), its usefulness for testing heavy metal availability may be to some degree underestimated because of the tendency of most studies to use metal levels in plant tops.

The most convincing evidence that sludge-applied metals can remain labile and therefore plant-available is found for Cd. In isotope exchange studies, Lloyd et al. (1981) found almost all of the Cd in a long-term sludge site to be in the labile form. Another experiment on the isotopic exchangeability of Cd in soils treated with sludge in 1976 showed a marked increase in Cd lability from 1976 to 1993 (Xia et al., 1993), although part of this increase may have been due to the downward drift in pH at the site. Alloway (1990) reported that a sludge-amended sandy soil (pH 6.4) in southwestern France, which had reached a low level of organic matter (1.8%), had a very high Cd solubility (>3% of total soil Cd soluble in water). Alloway noted that no such trend toward increased solubility was seen in a sludge site in England nearly 30 yr after cessation of sludge application, but indicated that this may have been due to the difference in climate and its effect on organic matter decomposition.

EVIDENCE FOR LONG-TERM LOSS OF HEAVY METALS FROM FIELD SITES

For most of the heavy metals of concern, the experimental evidence in the field suggests that there is relatively little movement of sludge-applied metals below the surface soil, even over periods of several decades (Alloway and Jackson, 1991; Dowdy and Volle, 1983). In some of the longer-term field experiments, however, evidence for metal percolation, perhaps facilitated by mobile colloidal particles or soluble anionic and uncharged complexes of inorganic or organic ligands, has been found. In one case, downward migration was observed 7 yr after sludge application, where both organic matter and soluble Cu and Zn were higher at the 40 to 60-cm depth in the sludge-treated than in the untreated soil (Campbell and Beckett, 1988). In acid soils, the movement of Zn to a depth of 60 to 90 cm was observed following 6 yr of sludge application (Robertson et al., 1982). Dowdy et al. (1993) noted that, while most of the monitored trace metals did not migrate below 30-cm depth after 19 yr of sludge application, Cr and Cu were increased in the subsoil (below 45 cm). Both of these metals have a high affinity for organic matter, suggesting that movement was caused by the leaching of soluble or colloidal organics. In general, however, unless soils are coarse-textured or very acid, the mobile fraction of most sludge-applied metals is small, at least as long as organic matter from the sludge persists. Nevertheless, even if a very small fraction of a highly toxic element, such as Hg, is converted into a more mobile or volatile form, as may be the case for conversion of the immobile Hg^{2+} ion to methylmercury or Hg° (Steinnes, 1990), the risk to groundwater and the environment could be significant.

Over very long time periods, with continued applica-

tion of sludge, the effect of slow metal movement to greater depths in the soil (by leaching, bioturbation, or deep tilling) is likely to increase metal uptake by deep-rooted crops because avoidance by deep roots is no longer possible. Support for the sludge protection hypothesis has been based in part on measured gradual reductions in Cd uptake by successive crops over extended periods of time. This special attention given to Cd behavior is a consequence of the element's relatively high mobility (compared with Cu and Pb) and phytoavailability in soil, and its high toxicity to animals and humans. However, it has generally been assumed in interpreting the time-related reduction in Cd bioavailability that all of the added Cd has remained within the rooting zone during the period of study. This is expected to be the case as long as soil pH is maintained at 6.5 or higher, but the Cd^{2+} ion in acid soils is mobile (Brams and Anthony, 1988; Tyler and McBride, 1982). There is limited evidence that Cd in sludge applications is lost from surface soils in field experiments (Davis, 1984). Bell et al. (1991) noted that their Cd mass balance on field plots, which had been treated with either Cd salt or Cd in sludge form, accounted for only $\approx 50\%$ of the total applied Cd in both treatments. These soils were somewhat acid (below pH 6.0) and had received the Cd treatments ≈ 8 yr earlier. McGrath and Lane (1989) also noted loss of heavy metals from sludged field plots over long periods of time. In some of these field studies, apparent heavy metal loss may have been due to dilution into subsoil by deep cultivation or lateral movement into adjacent plots by repeated cultivation. Indications of the latter process are seen, for example, in the control (no sludge) plot data of McGrath and Cegarra (1992) and Chang et al. (1987b), in which soil exchangeable Cd and plant tissue Cd, respectively, were seen to increase over a period of years. If high-sludge plots gradually contaminate adjacent low-sludge (or control) plots, a bias results in comparing relative uptake of heavy metals by sludge-treated and untreated soil. For example, many agricultural soils have low native levels of Cd (most New York State mineral soils that have been analyzed have no more than ≈ 0.15 mg/kg total Cd). If a sludge containing 30 mg/kg Cd (dry weight basis) is applied at a rate of 10 metric tons/ha/yr, this would add ≈ 0.15 mg/kg annually to this total. Consequently, one year of addition of the sludge would double the total Cd in the soil, and a decade of sludge application would increase total Cd by a factor of 10. Furthermore, the Cd (and a number of the other heavy metals) added in sludge is typically found to be more easily extracted chemically from the soil that the native Cd (McGrath and Cegarra, 1992), suggesting that it also is more bioavailable than natural Cd. Thus, movement of a relatively small fraction of soil from sludge-treated to control plots by cultivation, erosion, or other processes could raise the bioavailable Cd in the control plots substantially. This is important if plant uptake data are interpreted on the basis of comparison with uptake from control plots.

PHYTOTOXICITY IN SLUDGE-AMENDED SOILS

If metals can become more soluble as organic matter decays, one would expect numerous reported instances of losses in soil productivity at old sludge sites. There are few well-documented cases, however, in which the organic matter from sludge application on soil has had time to decompose sufficiently to create clearly identifiable metal toxicity problems. Leeper (1978) described three cases of long-term application of sewage on land-sewage farms near the cities of Paris, Berlin, and Melbourne. He argued that two of these three cases (Paris and Melbourne) provided favorable evidence for sewage application to land. Leeper acknowledged, however, that a severe micronutrient imbalance had developed in crops of the Paris farm, attributed to Mn depletion in the soil due to chemical reduction and leaching by excessive sewage application (Trocme et al., 1950). Although this problem could be corrected by foliar application of Mn, the fact that the least healthy plants had higher tissue concentrations of Zn and Cu could mean some involvement of these metals in the micronutrient imbalance. High levels of heavy metals in sludge can cause tissue levels of Mn to decrease (de Haan, 1975). The second favorable case, Melbourne, while having received liquid raw sewage since 1893, had accumulated metals far below the concentration limits of the USEPA Regulations, and can not be judged a test of the safety of metal applications at the levels to be permitted under the USEPA-503 Regulations. The third case, Berlin, showed chlorosis in crops on those sites with higher Cu and Zn in the soil (Leeper, 1978). Since all of these sewage farms had greatly elevated levels of organic matter in the soil at the time of study, the sludge time bomb hypothesis can only be tested a long time following the termination of sludge application at these sites. Furthermore, these were not experiments based on well-controlled treatments, but rather investigations of problems with soil fertility that developed on sewage farms. They are useful to the extent that they show that heavy sewage or sludge applications can produce micronutrient imbalances in crops. Such imbalances could arise from the complex interaction among several trace metals at the root or within the plant (Wallace and Berry, 1989).

The most critical soil parameter that indicates whether that soil has exceeded the threshold of metal phytotoxicity for any particular crop is not the total heavy metal content, but the activity of the free metal cation in soil solution. Free metal cations are generally more toxic than the same metals in soluble complexed forms, although soluble metal-fulvic acid complexes are probably plant-available (Nor and Cheng, 1986). Unfortunately, few estimates of heavy metal activities have been made in aged sludge-treated sites. Several activity measurements have, however, been made in more freshly prepared soil–sludge mixtures. In a study of beans grown in sludge-treated soils, Minnich et al. (1987) found that a Cu^{2+} activity higher than 10^{-7} resulted in elevated concentrations of Cu in plant tissues. No more than 300 mg Cu/kg soil was present in the soil–sludge mixtures. Fujii et

al. (1983), using a chelate addition method, estimated free Zn^{2+}, Cu^{2+}, and Ni^{2+} activities at $\approx 2 \times 10^{-6}$, 2×10^{-9}, and 6×10^{-9} in a sludge-treated soil (pH 6.2) containing ≈210, 94, and 196 mg/kg of these metals, respectively. Campbell and Beckett (1988) reported marked increases in soil solution concentrations of Zn and Cu in a nonacid soil that had been amended 7 yr earlier with sewage sludge, despite the fact that the Zn and Cu loadings were well below the USEPA-503 limits.

McBride and coworkers (1994, unpublished data) have measured Cu and Zn solubility in a nonacid soil treated with sludge almost 20 yr earlier, to give Cu and Zn loadings of 21 and 974 kg/ha, respectively. These solubilities, measured by anodic stripping voltammetry (soil pH ≈6.9), were 5×10^{-6} *M* and 3×10^{-5} *M*, respectively, and represent total soluble concentration. For comparison, free Cu^{2+} activity and total soluble Cu in uncontaminated soils have been estimated around 10^{-10} to 10^{-12} (Sanders, 1982; McBride, 1994, unpublished data), and 10^{-6} to 10^{-8} *M* (McBride, 1981; Sanders, 1982; Kabata-Pendias and Pendias, 1984), respectively. Comparable activity and total solubility values for Zn in uncontaminated soils tend to be somewhat higher than those for Cu.

It appears from these few measurements that substantial increases in activity and solubility of phytotoxic metals can persist long after sludge additions (within the USEPA 503 metal limits), but research is needed to establish whether these increases would cause reductions in soil productivity for a wide variety of crops. Furthermore, long-term research is needed to determine if the solubility or activity of these metals changes significantly as sludges further decompose in the soil. There is some circumstantial evidence that this may occur even when low-metal sludges decompose. At an old site of sludge dumping in Pennsylvania, the soil has been reported to be toxic to plant life (D. Baker, 1993, personal communication), despite analytical data to show that the sludge had heavy metal concentrations well below the USEPA maximum concentrations for land-applied sludges. At this site, the organic content of the sludge has been largely lost, presumably by decades of decomposition. The present total metal content of the soil is below (or near, for Cu) the limits set by the USEPA-503 Regulations, with Cd = 12, Cr = 312, Cu = 805, Pb = 129, Ni = 144, Zn = 636 mg/kg, and the pH is 6.3. These metal levels do, however, exceed the recommended maxima for Zn, Cu and Ni based upon studies of phytotoxicity in several crops (Williams, 1983; McGrath and Smith, 1990; Kiekens, 1990). Williams (1983) has recommended that total concentrations of Zn, Cu, and Ni in sludge-treated soils should not exceed ≈275, 110, and 85 mg/kg, respectively, in order to protect more sensitive crops. Davis and Carlton-Smith (1984) have suggested maxima ≈300, 100, and 200 mg/kg for Zn, Cu, and Ni in soils at pH 7. The phytotoxicity of Ni appears to be particularly sensitive to soil pH, and it tends to become more toxic than Cu in acid soils.

Numerous other experiments indicate that the USEPA-503 metal limits for phytotoxic metals (Table 1) are too high for many crops. Pot experiments with nonacid soils show phytotoxic effects from Zn, Cu, and Ni at much lower metal concentrations than permitted by the USEPA-503 regulations (Sanders et al., 1987). Yield reductions at Cu, Zn, and Ni concentrations in nonacid soils far below the USEPA-503 limits have been observed in sludge field experiments, particularly with dicotyledonous crops (Lübben et al., 1991; Williams et al., 1986; Siegenthaler and Stauffer, 1991; Sauerbeck and Styperek, 1986). Similarly, experience with pig manure application indicates that additions of Cu to nonacid soils in excess of ≈300 kg/ha can be toxic for some crops (Unwin, 1981; Coppenet, 1981). Lexmond (1981) has argued that HNO_3-extractable Cu should not exceed 30 mg/kg for each percentage of organic matter in slightly acid soils in order to avoid toxicity to crop plants. This guideline is based on the observation that the Cu/C ratio seems to exert control over Cu solubility (or Cu^{2+} activity). Consequently, the absolute amount of Cu added to soils in sludge influences plant availability less than the concentration in the sludge, because of the protective effect of the sludge. This concept has been verified in pot experiments with beans (Minnich et al., 1987), where a given amount of Cu added to soil in sludge resulted in less plant uptake if the Cu was diluted in a larger amount of sludge. The importance of metal concentration in sludge has been incorporated into the USEPA-503 regulations, which place limits on acceptable concentrations for sludges to be used agriculturally. However, because much of the protective effect may come from organic matter, as suggested by the importance assigned to the Cu/C ratio in limiting bioavailability, it cannot be assumed that protection will persist at a high level for the long term.

The USEPA-503 regulations define the phytotoxicity threshold (PT_{50}) as the plant top tissue concentration that results in 50% yield (vegetative growth of shoots) reduction for plants grown in solution culture. The USEPA chose 40 mg/kg as the PT_{50} for Cu, basing this value on the solution culture corn study of Lexmond and van der Vorm (1981). That study, however, demonstrated large effects of soluble Cu on root surface area and Fe and PO_4 uptake at shoot Cu concentrations well below 40 mg/kg. Lexmond and van der Vorm (1981) concluded that "the use of dry matter production as the measure of root growth can thus obscure an inhibition of growth." They demonstrated that Cu toxicity is initially manifested as inhibition of fine root growth without any notable reduction in root weight. At higher Cu concentration, root weight is reduced, but shoot growth is not immediately inhibited. Ultimately, shoot growth is retarded, but at this advanced stage of toxicity, shoot concentrations of Cu actually level off or diminish as the toxic level of Cu appears to impair translocation of Cu from roots.

A similar complex response to a phytotoxic metal may explain the puzzling data presented by the USEPA (USEPA, 1992), in which the probability of exceeding the PT_{50} level for Zn and Ni in corn shoots is shown to *decrease* once a certain loading of the respective metal in the soil is *exceeded*. This led the USEPA to the conclusion that "as cumulative loadings (of nickel) *in-*

crease, the probabilities of nickel concentrations in corn leaf exceeding the PT_{50} *decrease*" (emphasis added). This conclusion makes sense only if plant functions such as translocation have been impaired by the metal or if roots have avoided phytotoxic regions of the soil.

The effects of incipient phytotoxicity on root surface area and function may influence top growth much less in short-term solution culture experiments than in longer-term field experiments, where root surface area is critical for the plant to obtain sufficient water and nutrients to thrive. Furthermore, yield as defined by short-term vegetative growth in plants may not predict harvestable yield in the agronomic sense, and could underestimate the degree to which crop production is affected by metal toxicity over a full growing season.

In summary, the USEPA has selected LOAEL (lowest observed adverse effect level) values for Cu and Zn that are difficult to defend scientifically. The PT_{50} of 40 mg/kg for corn shoots does not agree with the upper critical level for toxicity of 21 mg/kg or less reported by MacNicol and Beckett (1985). Similarly, the PT_{50} for Zn in corn shoots of 1975 mg/kg is much higher than the 200 mg/kg critical level from other studies (MacNicol and Beckett, 1985). In part, the very high PT_{50} values used in the USEPA-503 regulations arise from the decision to set the LOAEL at 50% yield reduction, whereas the upper critical levels of MacNicol and Beckett (1985) are based on 10% yield reduction. Also, corn is generally more tolerant of phytotoxic metals than most dicotyledonous plants. Even so, it is difficult to find support for the USEPA position that these tissue concentrations of Cu and Zn represent the lowest observed adverse effect level.

Based on field and greenhouse studies with a range of crops in neutral and slightly acid soils, then, the USEPA-503 metal loading limits for the phytotoxic metals, Cu, Zn, and Ni (Table 1) are too high. As there is reason to believe that the toxic effects of these elements can be additive to some degree (Coppenet, 1981; Beckett, 1981; Davis and Carlton-Smith, 1984), soils loaded near the limits for all three metals would be even more likely to manifest toxicity. The USEPA limits may be biased by a heavy reliance on data from corn (maize) yields in the field (USEPA, 1992), as corn is one of the least sensitive crops to Cu and Zn toxicity (Lübben et al., 1991). Furthermore, USEPA apparently employed an extrapolation to determine the level of phytotoxic metal that would have to be added to soil in order to produce a tissue metal level causing yield reduction. This was necessary because few soils have received sufficient sludge to approach, for example, the 2800 kg/ha limiting value for Zn (see Table 1). Consequently, the effect of this soil concentration of Zn on yield has not actually been field-tested. Perhaps certain types of soils (e.g., calcareous ones) with certain crops (e.g., corn) can tolerate concentrations of toxic metals approaching the USEPA-503 limits without substantial yield reduction, but most studies with a range of crops in slightly acid to neutral soils do not support these limits.

SUMMARY

The long-term consequences of the application of metal-laden sewage sludges at the loadings permitted by the USEPA-503 regulations are still unknown. While there is no doubt that sludges initially provide a strong protection against metal uptake by plants, it is likely that the nature of the major inorganic constituents in sludges (Fe, Al, Ca, or P) as well as the native properties of the soil receiving the sludge will *ultimately* exert greater control over the solubility of toxic elements as organic matter decays to low levels. Nevertheless, the USEPA-503 regulations make no allowance for differences in soil and sludge chemistry, and are based on the argument that the inorganic constituents of all sludge materials will permanently retain potentially toxic metals in insoluble forms. The available evidence suggests that organic matter is more effective than these inorganic constituents in keeping Cd unavailable. Although certain phytotoxic metals such as Cu and Ni are bonded more strongly than Cd by inorganic phases, these metals may nevertheless inhibit microbial activity and plant growth at soil concentrations below those permitted by the USEPA-503 regulations.

Leeper (1978) noted that "it is no light matter to decide to multiply the naturally occurring burden of heavy metals in soils by a factor of 3 to 4," and yet the USEPA-503 regulations permit very much larger increases than this for a number of toxic elements. Because no soils known to this author have been simultaneously loaded with several of the heavy metals at the limits set by the USEPA-503 regulations, predictions of no adverse affects on crops are evidently extrapolations that remain to be tested. These predictions also assume that the protective effect of the sludge does not diminish with time. The inorganic solids in soils with properties most conducive to the permanent burial of high levels of initially available heavy metals are manganese oxides (Leeper, 1978). Because these are minor minerals in most soils, their capacity to adsorb or coprecipitate heavy metals is limited. Other solids tend to be too soluble or weatherable in the long term (e.g., carbonates) or are unable to accommodate many of the heavy metal cations in their structure (e.g., Fe oxides). Phosphates may have a significant role in coprecipitating Cd and Pb, but the effectiveness of this mechanism in lowering bioavailability of these heavy metals has not been established.

Most of the agriculturally productive soils in this country are presently in use; food production cannot simply be relocated if existing farm land is degraded. Our best agricultural soils need to have their productivity and crop quality protected, not for 10, 20, or even 100 yr, but in perpetuity. To this end, a cautious approach to the application of toxic metals in sludges to agricultural soils would be prudent.

REFERENCES

Alloway, B. 1990. Cadmium. p. 100-124. *In* B.J. Alloway (ed.) Heavy metals in soils. Blackie, Glasgow.

Alloway, B.J., and A.P. Jackson. 1991. The behaviour of heavy metals in sewage-sludge amended soils. Sci. Total Environ. 100: 151-176.

Andersson, A. 1992. Trace elements in agricultural soils. Fluxes, balances and background values. Swedish Environmental Protection Agency Rep. 4077. Solna, Sweden.

Baldwin, A., T.A. Brown, P.H.T. Beckett, and G.E.P. Elliot. 1983. The forms of combination of Cu and Zn in digested sewage sludge. Water Res. 17:1935–1944.

Barbarick, K.A., and S.M. Workman. 1987. Ammonium bicarbonate-DTPA and DTPA extractions of sludge-amended soils. J. Environ. Qual. 16:125–130.

Beckett, P. 1981. Copper in sludge—are the toxic effects of copper and other heavy metals additive? p. 204–215. *In* P. L'Hermite and J. Dehandtshutter (eds.) Copper in Animal Wastes and Sewage Sludge. D. Reidel, Dordrecht.

Beckett, P.H.T., and R.D. Davis. 1977. Upper critical levels of toxic elements in plants. New Phytol. 79:95–106.

Beckett, P.H.T., E. Warr, and R.D. Davis. 1983. Cu and Zn in soils treated with sewage sludge: their 'extractability' to reagents compared with their 'availability' to plants. Plant Soil. 70:3–14.

Bell, P.F., B.R. James, and R.L. Chaney. 1991. Heavy metal extractability in long-term sewage sludge and metal salt-amended soils. J. Environ. Qual. 20:481–486.

Berrow, M.L., and J.C. Burridge. 1981. Persistence of metals in available form in sewage sludge treated soils under field conditions. p. 202–204 *In* Proc. Int. Conf. Heavy Metals in the Environment, Amsterdam. 1981. CEP Consultants, Edinburgh.

Bidwell, A.M., and R.H. Dowdy. 1987. Cadmium and zinc availability to corn following termination of sewage sludge applications. J. Environ. Qual. 16:438–442.

Billet, M.F., E.A. Fitzpatrick, and M.S. Cresser. 1991. Long-term changes in the copper, lead, and zinc content of forest soil organic horizons from north-east Scotland. Water Air Soil Pollut. 59:179–192.

Brams, E., and W. Anthony. 1988. Residual cadmium in a soil profile and accumulation in wheat grain. Plant Soil 109:3–8.

Campbell, D.J., and P.H.T. Beckett. 1988. The soil solution in a soil treated with digested sewage sludge. J. Soil Sci. 39:283–298.

Chaney, R.L., and J.A. Ryan. 1993. Heavy metals and toxic organic pollutants in MSW-composts: Research results on phytoavailability, bioavailability, fate, etc. p. 451–506. *In* H.A.J. Hoitink and H.M. Keener (ed.) Science and engineering of composting: design, environmental, microbiological and utilization aspects. Renaissance Publ., Worthington, Ohio.

Chang, A.C., T.C. Granato, and A.L. Page. 1992. A methodology for establishing phytotoxicity criteria for chromium, copper, nickel and zinc in agricultural land application of municipal sewage sludges. J. Environ. Qual. 21:521–536.

Chang, A.C., J.D. Hinesly, T.E. Bates, H.E. Doner, R.H. Dowdy, and J.A. Ryan. 1987a. Effects of long-term sludge application on accumulation of trace elements by crops. p. 53–66. *In* A.L. Page et al. (ed.) Land application of sludge: Food chain implications. Lewis Publ., Chelsea, MI.

Chang, A.C., A.L. Page, and J.E. Wernicke. 1987b. Long-term sludge application on cadmium and zinc accumulation in Swiss chard and radish. J. Environ. Qual. 16:217–221.

Choudhary, M., L.D. Bailey, and C.A. Grant. 1993. Effect of Zn application on Cd concentration in durum wheat (*Triticum turgidum* L. *var durum*) as affected by soil temperature and growth stages. p. 27. *In* Agronomy abstracts. ASA, Madison, WI.

Coppenet, M. 1981. Copper accumulation in Brittany soils through enriched pig slurry: Phytotoxic risks. p. 154–161. *In* P. L'Hermite and J. Dehandtschutter (ed.) Copper in animal wastes and sewage sludge. D. Reidel, Dordrecht.

Davis, R.D. 1984. Cadmium—a complex environmental problem: II. Cadmium in sludges used as fertilizers. Experientia 40:117–126.

Davis, R.D., and C.H. Carlton-Smith. 1984. An investigation into the phytotoxicity of zinc, copper and nickel using sewage sludge of controlled metal content. Environ. Pollut. ser. B 8:163–185.

de Haan, S. 1975. Land application of liquid municipal wastewater sludges. J. Water Pollut. Control Fed. 47:2707–2710.

de Vries, M.P.C., and K.G. Tiller. 1978. Sewage sludge as a soil amendment, with special reference to Cd, Cu, Mn, Ni, Pb and Zn—comparison of results from experiments conducted inside and outside a glasshouse. Environ. Pollut. 16:231–240.

Dickinson, N.M., N.W. Lepp, and G.J.K. Surtan. 1988. Further studies on copper accumulation in Kenyan *Coffea arabica* plantations. Agric. Ecosyst. Environ. 21:181–190.

Dowdy, R.H., C.E. Clapp, D.R. Linden, T.R. Halbach, and R.C. Polta. 1993. Partitioning of applied sludge-borne trace metals within a watershed cropped with corn continuously for 19 years. p. 314. *In* Agronomy abstracts, ASA, Madison, WI.

Dowdy, R.H., W.E. Larson, J.M. Titrud, and J.J. Latterell. 1978. Growth and metal uptake of snap beans grown on sewage sludge-amended soil: a four-year field study. J. Environ. Qual. 7:252–257.

Dowdy, R.H., and V.V. Volle. 1983. Movement of heavy metals in soils. p. 229–240. *In* D.W. Nelson et al. (ed.) Chemical mobility and reactivity in soil systems. SSSA Spec. Publ. 11. SSSA and ASA, Madison, WI.

Fujii, R., L.L. Hendrickson, and R.B. Corey. 1983. Ionic activities of trace metals in sludge-amended soils. Sci. Total Environ. 28: 179–190.

Hassett, J.J., J.E. Miller, and D.E. Koeppe. 1976. Interaction of lead and cadmium on maize root growth and uptake of lead and cadmium by roots. Environ. Pollut. 11:297–302.

Hendrickson, L.L., and R.B. Corey. 1981. Effect of equilibrium metal concentrations on apparent selectivity coefficients of soil complexes. Soil Sci. 131:163–171.

Hinesly,T.D., R.L. Jones, E.L. Ziegler, and J.J. Tyler. 1977. Effects of annual and accumulative applications of sewage sludge on assimilation of zinc and cadmium by corn (*Zea mays* L.). Environ. Sci. Technol. 11:182–188.

Hinesly, T.D., K.E. Redborg, R.I. Pietz, and E.L. Ziegler. 1984. Cadmium and zinc uptake by corn (*Zea mays* L.) with repeated applications of sewage sludge. J. Agric. Food Chem. 32:155–163.

Hinesly, T.D., E.L. Ziegler, and G.L. Barret. 1979. Residual effects of irrigating corn with digested sewage sludge. J. Environ. Qual. 8:35–38.

Hooda, P.S., and B.J. Alloway. 1994. The plant availability and DTPA extractability of trace metals in sludge-amended soils. Sci. Total Environ. 149:39–51.

Jalil, A., F. Selles, and J.M. Clarke. 1993. Effect of cadmium on the growth and nutrient uptake of durum wheat. p. 36. *In* Agronomy abstracts. ASA, Madison, WI.

Jarvis, S.C., L.H.P. Jones, and M.J. Hopper. 1976. Cadmium uptake from solution by plants and its transport from roots to shoots. Plant Soil 44:179–191.

Jones, K.C. 1991. Contamination trends in soils and crops. Environ. Pollut. 69:311–326.

Kabata-Pendias, A., and H. Pendias. 1984. Trace elements in soils and plants. CRC Press, Boca Raton, FL.

Kiekens, L. 1990. Zinc. p. 261–279. *In* B.J. Alloway (ed.) Heavy metals in soils. Blackie, Glasgow.

Kiemnec, G.L., D.D. Hemphill, M. Hickey, T.L. Jackson, and V.V. Volk. 1990. Sweet corn yield and tissue metal concentration after seven years of sewage sludge applications. J. Prod. Agric. 3:232–237.

Kuo, S., E.J. Jellum, and A.S. Baker. 1985. Effects of soil type, liming, and sludge application on zinc and cadmium availability to Swiss chard. Soil Sci. 139:122–130.

Latterell, J.J., R.H. Dowdy, and W.E. Larson. 1978. Correlation of extractable metals and metal uptake of snap beans grown on soil amended with sewage sludge. J. Environ. Qual. 7:435–440.

Lee, C.R., B.L. Folsom, and D.J. Bates. 1983. Prediction of plant uptake of toxic metals using a modified DTPA soil extraction. Sci. Total Environ. 28:191–202.

Leeper, G.W. 1978. Managing the heavy metals on the land. Marcel Dekker, New York.

Leriche, H.H. 1968. Metal contamination of soil in the Woburn Market-Garden experiment resulting from the application of sewage sludge. J. Agric. Sci. (Cambridge) 71:205–208.

Lexmond, Th.M. 1980. The effects of soil pH on copper toxicity to forage maize grown under field conditions. Neth. J. Agric. Sci. 28:164–183.

Lexmond, Th.M. 1981. A contribution to the establishment of safe copper levels in soil. p. 162–183. *In* P. L'Hermite and J. Dehandtshutter (ed.) Copper in animal wastes and sewage sludge. D. Reidel, Dordrecht.

Lexmond, Th.M., and P.D.J. van der Vorm. 1981. The effect of pH

on copper toxicity to hydroponically grown maize. Neth. J. Agric. Sci. 29:217–238.
Lloyd, C.A., R.L. Chaney, and P.J. Mastradone. 1981. Labile cadmium in soils of long-term sludge utilization farms. p. 29. *In* Agronomy abstracts. ASA, Madison, WI.
Lübben, S., E. Rietz, and D. Sauerbeck. 1991. Metal uptake and crop growth on sewage sludge field trials with heavy metal contents near the recommended limit values. p. 535–543. *In* P. L'Hermite (ed.) Treatment and use of sewage sludge and liquid agricultural wastes. Elsevier, New York.
MacNicol, R.D., and P.H.T. Beckett. 1985. Critical tissue concentrations of potentially toxic elements. Plant Soil 85:107–129.
Mahler, R.J., J.A. Ryan, and T. Reed. 1987. Cadmium sulfate application to sludge-amended soils I. Effect on yield and cadmium availability to plants. Sci. Total Environ. 67:117–131.
McBride, M.B. 1978. Retention of Cu^{2+}, Ca^{2+}, Mg^{2+} and Mn^{2+} by amorphous alumina. Soil Sci. Soc. Am. J. 42:27–31.
McBride, M.B. 1981. Forms and distribution of copper in solid and solution phases of soil. p. 25–45. *In* J.F. Loneragan et al. (ed.) Copper in soils and plants. Academic Press, New York.
McBride, M.B. 1989. Reactions controlling heavy metal solubility in soils. Adv. Soil Sci. 10:1–56.
McBride, M.B. 1994. Environmental chemistry of soils. Oxford Univ. Press, New York.
McGrath, S.P. 1987. Long-term studies of metal transfers following application of sewage sludge. p. 301–317. *In* P.J. Coughtrey, M.H. Martin and M.H. Unsworth (ed.) Pollutant transport and fate in ecosystems. Blackwell Scientific Publ., Oxford.
McGrath, S.P., and J. Cegarra. 1992. Chemical extractability of heavy metals during and after long-term applications of sewage sludge to soil. J. Soil Sci. 43:313–321.
McGrath, S.P., and P.W. Lane. 1989. An explanation for the apparent losses of metals in a long-term experiment with sewage sludge. Environ. Pollut. 60:235–256.
McGrath, S.P., and S. Smith. 1990. Chromium and nickel. p. 125–150. *In* B.J. Alloway (ed.) Heavy metals in soils. Blackie, Glasgow.
Mench, M.J., V.L. Didier, M. Löffler, A. Gomez, and P. Masson. 1994. A mimicked in-situ remediation study of metal-contaminated soils with emphasis on cadmium and lead. J. Environ. Qual. 23: 58–63.
Merry, R.H., K.G. Tiller, and A.M. Alston. 1986a. The effects of contamination of soil with copper, lead and arsenic on the growth and composition of plants: I. Effects of season, genotype, soil temperature and fertilizers. Plant Soil 91:115–128.
Merry, R.H., K.G. Tiller, and A.M. Alston. 1986b. The effects of soil contamination with copper, lead and arsenic on the growth and composition of plants: II. Effects of source of contamination, varying soil pH and prior waterlogging. Plant Soil 95:255–269.
Minnich, M.M., and M.B. McBride. 1986. Effect of copper activity on carbon and nitrogen mineralization in field-aged copper-enriched soils. Plant Soil 91:231–240.
Minnich, M.M., M.B. McBride, and R.L. Chaney. 1987. Copper activity in soil solution: II. Relation to copper accumulation in young snapbeans. Soil Sci. Soc. Am. J. 51:573–578.
Nicklow, C.W., W.A. Norvell, and J.Spittler. 1981. Predicting total soil lead from an acetic acid-sodium acetate buffered solution. Commun. Soil Sci. Plant Anal. 12:239–245.
Nor, Y.M., and H.H. Cheng. 1986. Chemical speciation and bioavailability of copper: uptake and accumulation by *Eichornia*. Environ. Toxicol. Chem. 5:941–947.
Northeastern U.S. Regional Research. 1985. Criteria and recommendations for land application of sludges in the Northeast. U.S. Regional Research Bull. 851. Pennsylvania State Univ., University Park.
O'Connor, G.A. 1988. Use and misuse of the DTPA soil test. J. Environ. Qual. 17:715–718.
Payne, G.G., D.C. Martens, C. Winarko, and N.F. Perera. 1988. Form and availability of copper and zinc following long-term copper sulfate and zinc sulfate applications. J. Environ. Qual. 17: 707–711.
Robertson, W.K., M.C. Lutrick, and T.L. Yuan. 1982. Heavy applications of liquid-digested sludge on three ultisols: I. Effects on soil chemistry. J. Environ. Qual. 11:278–282.
Ryan, J.A., and R.L. Chaney. 1993. Regulation of municipal sewage sludge under the clean water act section 503: a model for exposure and risk assessment for MSW-compost. p. 422–450. *In* H.A.J. Hoitink and H.M. Keener (ed.) Science and engineering of composting: Design, environmental, microbiological and utilization aspects. Renaissance Publ., Worthington, OH.
Sanders, J.R. 1982. The effect of pH upon the copper and cupric ion concentrations in soil solutions. J. Soil Sci. 33:679–689.
Sanders, J.R., S.P. McGrath, and T. McM. Adams. 1986. Zinc, copper and nickel concentrations in ryegrass grown on sewage sludge-contaminated soils of different pH. J. Sci. Food Agric. 37: 961–968.
Sanders, J.R., S.P. McGrath, and T. McM. Adams. 1987. Zinc, copper and nickel concentrations in soil extracts and crops grown on four soils treated with metal-loaded sewage sludges. Environ. Pollut. 44:193–210.
Sauerbeck, D.R., and P. Styperek. 1986. Long-term effects of contaminations. p. 318–325. *In* P. L'Hermite (ed.) Processing and use of organic sludge and liquid agricultural wastes. D. Reidel, Dordrecht.
Siegenthalar, A.F., and W. Stauffer. 1991. Environmental effects of longterm slurry and sewage sludge application: reasons and measures. p. 82–89. *In* P. L'Hermite (ed.) Treatment and use of sewage sludge and liquid agricultural wastes. Elsevier, New York.
Steinnes, E. 1990. Mercury. p. 222–236. *In* B.J. Alloway (ed.) Heavy metals in soils. Blackie, Glasgow.
Stern, A.H. 1993. Monte Carlo analysis of the USEPA model of human exposure to cadmium in sewage sludge through consumption of garden crops. J. Exposure Anal. Environ. Epidemiol. 3:449–469.
Stiles, C.A., J.E. Foss, and R.J. Lewis. 1993. Lead fractions in soil samples from Hadrian's Villa, Italy. p. 305. *In* Agronomy abstracts. ASA, Madison, WI.
Terry, R.E., D.W. Nelson, and L.E. Sommers. 1979. Carbon cycling during sewage sludge decomposition in soils. Soil Sci. Soc. Am. J. 43:494–499.
Tiller, K.G., and R.H. Merry. 1981. Copper pollution of agricultural soils. p. 119–137. *In* J.F. Loneragan et al. (ed.) Copper in Soils and Plants. Academic Press, New York.
Trocme, S., G. Barbier, and J. Chabannes. 1950. Chlorosis, caused by lack of manganese, of crops irrigated with filtered water from Paris sewers (in French). Ann. Agron. 1:663–685.
Tyler, L.D., and M.B. McBride. 1982. Mobility and extractability of cadmium, copper, nickel and zinc in organic and mineral soil columns. Soil Sci. 124:198–205.
Unwin, R.J. 1981. The application of copper in sewage sludge and pig manure to agricultural land in England and Wales. p. 102–116. *In* P. L'Hermite and J. Dehandtshutter (ed.) Copper in animal wastes and sewage sludge. D. Reidel, Dordrecht.
U.S. Environmental Protection Agency. 1993. Clean water act. Section 503. Vol. 58. No. 32. USEPA, Washington, DC.
USEPA. 1992. Technical support document for land application of sewage sludge. Vol. I. USEPA 822/R-93-001a and Vol. II. EPA 822/R-93-001b. USEPA, Washington, DC.
Vlamis, J., D.E. Williams, J.E. Corey, A.L. Page, and T.J. Ganje. 1985. Zinc and cadmium uptake by barley in field plots fertilized seven years with urban and suburban sludge. Soil Sci. 139:81–87.
Wallace, A., and W.L. Berry. 1989. Dose-response curves for zinc, cadmium, and nickel in combinations of one, two or three. Soil Sci. 147:401–410.
Walsh, L.M., W.H. Erhardt, and H.D. Seibel. 1972. Copper toxicity in snapbeans (*Phaseolus vulgaris* L.). J. Environ. Qual. 1:197–200.
Webber, L.R., and E.G. Beauchamp. 1979. Cadmium concentration and distribution in corn (*Zea mays* L.) grown on a calcareous soil for three years after three annual sludge applications. J. Environ. Sci. Health B14(5):459–474.
Williams, J.H. 1983. Zinc, copper and nickel – suggested safe limits in sewage sludge treated soils. p. 82–90. In R.D. Davis et al. (ed.) Environmental effects of organic and inorganic contaminants in sewage sludge. D. Reidel, Dordrecht.
Williams, J.H., K.A. Smith, and J.R. Jones. 1986. Varietal tolerance in cereals to metal contamination in a sewage treated soil. p. 537–542. *In* P. L'Hermite (ed.) Processing and use of organic sludge and liquid agricultural wastes, D. Reidel, Dordrecht, Holland.
Xia, K., P.A. Helmke, and T.S. Morris. 1993. Concentrations of isotopically exchangeable zinc and cadmium in soils. p. 238. *In* Agronomy abstracts. ASA, Madison, WI.

Waste Not
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Comparison of United States, Dutch, German and Canadian Compost Quality Standards

mg/kg dry weight

	ARSENIC	BORON	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	ZINC
UNITED STATES COMPOST QUALITY STANDARDS												
Arizona	-	-	10	1000	-	450	250	10	-	50	-	900
Florida	-	-	15	-	-	450	500	-	-	50	-	900
Iowa	-	-	4.4	-	-	450	500	-	-	125	125	-
Maine	-	-	10	1000	1000	1000	700	10	-	200	-	2000
Massachusetts	-	300	2	1000	-	1000	300	10	10	200	-	2500
Minnesota	-	-	10	1000	-	500	500	5	-	100	-	1000
New Hampshire	-	-	10	1000	-	1000	500	10	-	200	-	2500
New York	-	-	10	1000	-	1000	250	10	-	200	-	2500
North Carolina	-	-	10	1000	-	800	250	10	-	200	-	1000
Pennsylvania	-	-	-	1000	-	1000	1000	10	-	200	-	2500
Vermont	-	-	10	1000	-	1000	250	10	-	200	-	2500
Stds. For CWA 503 High Quality Sludges/ Sludge Composts	41	-	39	1200	-	1500	300	17	18	420	36	2800
CWA 503 Ceiling Concentrations	75	-	85	3000	-	4300	800	57	75	420	100	7500
DUTCH COMPOST SLUDGE QUALITY STANDARDS												
Compost until 12/31/94	25	-	2	200	-	300	200	2	-	50	-	900
Clean Compost Until 12/31/94	15	-	1	70	-	90	120	0.7	-	20	-	280
Compost After 1/1/95	15	-	1	50	-	60	100	0.3	-	20	-	200
Very Clean Compost After 1/1/95	5	-	0.7	50	-	25	65	0.2	-	10	-	75
Sludge	15		1.25	350	-	75	100	0.75	-	30	-	300
GERMAN COMPOST & SLUDGE QUALITY STANDARDS												
Compost	-	-	1.5	100	-	100	150	1.0	-	50	-	400
Sludge	-	-	1-1.5	10	-	6	100	1.0	-	5	-	150-200
CANADIAN COMPOST QUALITY STANDARDS												
Ontario	10	-	3	50	25	60	150	0.15	2	60	2	500
British Columbia	13	-	2.6	210	-	100	150	.8	-	50	-	500
National Guidelines on Compost	13	-	2.6	210	26	128	83	0.83	7	32	2.6	315

Excerpts from COMPOSTING FRONTIERS, Spring 1993. Edited by Susan Mazzocchi.

UNITED STATES

"The United States Environmental Protection Agency (USEPA) has no plans, at present, to develop standards for composts derived from municipal solid waste (MSW). However, the Agency has indicated that such standards ultimately will be established utilizing risk assessment methodology similar to that developed for the **Clean Water Act, Section 503 Sludge Regulations** (CWA 503 Regulations) promulgated in November, 1992. The CWA 503 Regulations concern the use or disposition of sewage sludge and sludge products, including composts derived from sludge alone or in admixture with MSW. Unrestricted use of such materials is permitted if they meet quality sludge specifications for metals concentrations, pathogen reduction, and vector (disease-carrying animals, such as rodents and vermin) attraction prevention. According to USEPA, the standards for metals concentrations in sludge set forth in the CWA 503 Regulations should be acceptable for MSW compost products...USEPA has characterized the approach used to develop the Regulations as science-based 'reasonable-risk' methodology. Underlying it are the following assumptions: that change in soil is inevitable; that safety factors can be mathematically predicted with certainty utilizing existing scientific data; and that currently available scientific information is sufficient to set standards ensuring no harm to human health or the environment. While acknowledging that neither the dynamics of contaminant and soil interaction, nor ecological risks are well understood, EPA has concluded that, '...there are virtually no effects when sludge is disposed of on the land or used as a soil conditioner or fertilizer in compliance with...[CWA 503]...rules.' And that, '...MSW composts and sewage sludge can provide significant benefit to sustainable agriculture; compost utilization can safely continue for an indefinite period without risk to agriculture or the environment.' The U.S. standards are permissive compared ... particularly [with] those of The Netherlands and the Canadian Province of Ontario."

THE NETHERLANDS

"The Netherlands were the first of the European Community (EC) members to develop standards for soil quality conservation under their Soil Protection Act of 1987. Guided by the principle of 'good stewardship,' or sustainability, of the land, compost quality standards were calculated to reverse presently occuring accumulation of pollutants in soil by preventing their addition in amounts greater than are *acceptably* removed via leaching and plant uptake. *Acceptable* leaching means no addition of contaminants to ground water beyond current mean values, and *acceptable* plant uptake is defined by food quality standards. Central to the Dutch concept of good stewardship is maintenance of land use options for future generations through preservation of *essential soil functions* - such things as recreation, water filtering, plant growth, crop production, and the cycling of carbon, nitrogen and sulfur. In order to establish scientifically-based soil quality standards, the Dutch Government requires more research-derived information than presently exists. In the meantime, the stringent Dutch compost quality standards are meant to guard, or allow for timely reparation of, *soil multifunctionality*, feared threatened by the current rate of heavy metals accumulation in soil. Since protection of essential soil functions is thought to rely on the eventual elimination of *all* sources of soil contamination, fertilizers and diffuse atmospheric deposition are also targeted for regulation."

* * *

"The following [is a] statement by U.S. Government scientists involved in the development of CWA 503 Regulations '...just because lower concentrations of metal residue can be reached in MSW composts *[through source separation of organic waste]* doesn't mean that they have to be attained to make utilization of MSW compost on cropland a valuable practice of sustainable agriculture.' The marked contrast between EPA's conception of agricultural sustainability and that of the Dutch is striking."

ONTARIO, CANADA

"Ontario has issued interim *guidelines* for compost production and use. The guidelines contain metals standards, based on concentrations in rural 'background' -defined as non-point-source-contaminated- Ontario soils. These levels are thought to provide an appropriate foundation for compost quality standards, pending additional research-based information. An element in this decision is the desire to leave open the possibility for future agricultural use of nonagricultural lands. Ontario standards assume minimal metals leaching and plant uptake, and a compost application rate of 100 tons per hectare every five years for 55 years before relatively conservative maximum allowable metals concentrations in soil are reached. Neal Ahlberg, of the Ontario Ministry of Environment and Energy's Waste Reduction Office, has been involved in the ongoing process of standards development. 'For us deciding on standards was different than choosing acceptable levels for cleaning up already contaminated lands,' he said. 'We did not want to set limits for how much we could dirty-up clean lands.'... Risk assessment was not utilized for establishing Ontario's standards. 'The problem with risk assessment is that there are too many unknowns. To us, it seems a bit dangerous; our knowledge is too limited. There are many differences of opinion, even among experts. And there are historical examples of significant harm caused by insufficient knowledge,' said Dr. Lambert Otten, former member of two Canadian standards-development advisory bodies..."

* * *

"Results from pilot projects in Ontario indicate that composts produced from source-separated food and yard wastes are able to comply with the contaminant limits in the Guidelines. Several Ontario municipalities are planning composting projects based on source-separated organic materials from residential, commercial and industrial sources..." "Ontario's Guidelines for Compost Production and Use," by Neal Ahlberg

WASTE NOT # 241. *A publication of Work on Waste USA, published 48 times a year. Annual rates are: Groups & Non-Profits $50; Students & Seniors $35; Individual $40; Consultants & For-Profits $125; Canadian $US50; Overseas $65. Editors: Ellen & Paul Connett, 82 Judson Street, Canton, NY 13617. Tel: 315-379-9200. Fax: 315-379-0448.*

Printed on recycled paper, naturally

POTENTIAL IMPACT OF CURRENT LANGUAGE IN SLUDGE LAW

Land application of sewage sludge has been recognized by the federal government and the State of West Virginia as a viable disposal/reuse option which is environmentally sound and beneficial. The current statute includes a provision intended to limit long term accumulation of certain metals in those soils receiving sludge amendments. During the last year as municipalities have collected the information necessary to begin implementing the law, soils samples in many West Virginia counties indicate that natural levels for several metals exceed the targets established by the regulations. Those targets were not scientifically defensible, but at the time, it was determined that safeguards be developed and that target levels in soils be established for long term environmental protection.

While that concern is still valid, the current language in the law and the limits in the regulations have in effect prohibited land application in at least 28 counties in West Virginia where soils data have been collected. (See attached map) In those counties, facilities will not be allowed to land apply sludge. Municipalities will be forced to dispose of their sludge in landfills, if landfills are available to accept it. The difference in cost between land application and landfill disposal in those counties will be borne by the municipality and the citizens. Approximately 60,000 tons of sludge is generated by the municipalities in these counties. At $30 to $40 per ton it would cost them between $1.8 and $2.4 million to dispose of this sludge in landfills. Land application fees for that same sludge would cost $60,000.

Municipalities must have access to environmentally acceptable and economically achievable disposal options. Without such options, sludges may end up in streams or in areas where significant environmental harm may occur.

In order for the current sludge management activities related to land application of sewage sludge to continue effectively and with minimal impact to the environment, **the statute must be amended.**

DIVISION OF ENVIRONMENTAL PROTECTION

Soil Sample Results

County	As	Cd	Cr	Cu	Pb	Hg	Mo	Ni	Se	Zn	Method
Grant	3.9		80		18.4	*0.1*		40	2.9		SW-846
Greenbrier	2.2		*13*	25	12.1	*0.1*	*0.25*	25	0.5	30	CFR-136
Hardy	7.6	0.4	40	25	15.9	0.3		45	1.2	115	CFR-136
Jefferson	9.9		255		23.4	*0.1*		160	8.7		SW-846
Jefferson	15		340		23.8	*0.1*		150	1.7		SW-846
Jefferson	6.1		375		23.9	0.2		175			SW-846
Lewis	16.6	0.4	60	35	30.4	*0.1*	0.8	55	4.3	110	CFR-136
Mercer	3.1		30	25	18.3	*0.1*		10	*0.5*	105	CFR-136
Mercer	5.8		*13*	15	13	*0.1*		10	2.2	60	CFR-136
Mercer	3.2		*13*	15	10.6	0.3		10	0.5	55	CFR-136
Mineral	18		290		18	*0.1*		100	1.8		SW-846
Morgan	10.7		105		17.3	*0.1*		50	1.1		SW-846
Pocahontas	7.4		60	15	17.8	*0.1*		40	*0.5*	55	CFR-136
Putnam	16.2		60	30	43.5	0.2	*0.25*	50	1.5	120	CFR-136
Putnam	6.7	0.1	55	15	20.2	*0.1*	1.4	55	*0.5*	60	CFR-136
Putnam	4.6		50	25	15.6	0.2		50	*0.5*	60	CFR-136
Wood	6.4		50	30	17	0.2		50	*0.5*	115	CFR-136
Wood	9.4	0.3	55	20	29.7	*0.1*	0.7	30	1.5	90	CFR-136
Wood	14.6	0.3	80	20	25.9	*0.1*	0.6	35	*0.5*	85	CFR-136
Wood	8.5	0.1	*13*	15	23.7	*0.1*	0.5	20	*0.5*	75	CFR-136
Wood	10.4	0.4	*13*	25	30.3	*0.1*	1.1	30	*0.5*	90	CFR-136
Wood	4.7	0.2	45	5	19.4	*0.1*	0.7	20	*0.5*	55	CFR-136
Wood	11.7	0.1	45	25	25.8	*0.1*	1.2	45	*0.5*	85	CFR-136
Wood	10.8	0.1	75	25	27.4	*0.1*	0.6	45	*0.5*	80	CFR-136
Wood	9.8	0.2	55	25	26.5	*0.1*	2.2	35	*0.5*	90	CFR-136
Wood	11.2	0.2	85	30	27.9	*0.1*	1.1	45	*0.5*	95	CFR-136
Wood	16.7	0.3	115	45	39	*0.1*	3	45	*0.5*	115	CFR-136
Wood	4.2	0.1	75	15	24.5	*0.1*	*0.25*	20	*0.5*	60	CFR-136
Wood	6.2	0.2	80		25.5	*0.1*	0.5	10	*0.5*	45	CFR-136
Wood	6.2	0.3	40	15	21.8	*0.1*	*0.25*	10	*0.5*	75	CFR-136
Wood	8.8	0.3	75	25	33.3	*0.1*	*0.25*	30	*0.5*	85	CFR-136
Average	8.923	0.235	88.39	22.71	23.22	0.126	0.824	48.23	1.23	80.4	
Maximum	18	0.4	375	45	43.5	0.3	3	175	8.7	120	
Minimum	2.2	0.1	13	5	10.6	0.1	0.25	10	0.5	30	
State Limit	5.7	1.4	140	140	35	2	2.5	28	5	350	

Blank Spaces Indicate No Sample Results Available.

When values reported from the laboratory are below the minimum detection limit, one half of the detection limit value is used for averaging purpose. These values are italicized.

GASTON CAPERTON
GOVERNOR

DIVISION OF ENVIRONMENTAL PROTECTION
1201 Greenbrier Street
Charleston, WV 25311-1088

DAVID C. CALLAGHAN
DIRECTOR

TO: Doug Brown

FROM: Clifton Browning

Here are the counties that we would like to have colored:

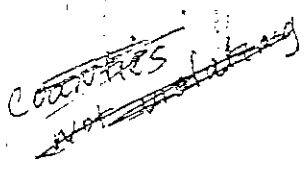
Brooke, Tyler, Wood, Jackson, Mason, Putnam, Wayne, McDowell, Wyoming, Raleigh, Mercer, Summers, Monroe, Greenbrier, Pocohantas, Lewis, Monongalia, Preston, Grant, Hardy, Mineral, Morgan, Taylor and Jefferson.

We would like to have it titled:

COUNTIES VIOLATING MAXIMUM SOIL CONCENTRATIONS FOR METALS

We need approximately 50 copies. I can pick them up if they can not be sent to us by Monday AM. Thanks

Clifton Browning



greater bluefield chamber of commerce
WEST VIRGINIA AND VIRGINIA
POST OFFICE BOX 4098
BLUEFIELD, WEST VIRGINIA 24701
(304) 327-7184
FAX (304) 325-3085

April 24, 1995

The Honorable Ken Hechler
Secretary of State
State of West Virginia
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, WV 25305-0770

Re: Division of Environmental Protection Water Resources & Solid Waste Management -- Proposed Emergency Rule to Title 47, Section 38D (Sewage Sludge Management Rule)

Dear Secretary Hechler:

At its regular board meeting held on April 20, 1995, the Board of Directors for the Greater Bluefield Chamber of Commerce, Inc., had the opportunity to consider the proposed emergency rule submitted by DEP, the effect of which is to eliminate Table 3 from Section 38D (Sewage Sludge Management Rule) of Title 47. The Greater Bluefield Chamber of Commerce believes that the approval of the emergency rule is in the best interests of the citizens of Mercer County, West Virginia, as well as the citizens of the entire State of West Virginia. If Table 3 is allowed to continue in effect, the land application of sludge on farms in the State of West Virginia will be effectively precluded; the result of such an action will prove to be a financial disaster for the citizens for the State of West Virginia and the citizens of Mercer County in particular. If sludge cannot be applied to farms, then the only practical alternative available to the various municipal sanitary boards and public service districts in the State of West Virginia is to have said sludge disposed of at public landfills. As you are aware, the cost of operating these landfills is substantially increasing each and every year and the Mercer County Landfill is no exception. If the landfills are required to handle the disposal of sludge, the life of the landfills will be drastically reduced placing further financial and environmental burdens on the counties and the citizens. Additionally, the use of landfills will drastically increase the cost of sludge disposal which will result in substantial rate increases to all users of all sewage systems in the State of West Virginia.

Therefore, the Board of Directors of the Greater Bluefield Chamber of Commerce, Inc. voted unanimously to seek the approval of the emergency rule deleting Table 3 from the aforesaid rule.

Greater Bluefield Chamber of Commerce, Inc.

By: _____

Its: Executive Director

P.O. Box 245
Cowen, WV 26206
April 23, 1995

Mr. Ken Hechler
WV Secretary of State
Building 1, Suite 157-K
State Capitol Complex
Charleston, WV 25305

RE- Sewage Sludge Management Regulations, Title No. 47.

Dear Mr. Hechler:

Thank you for disapproving the emergency amendment that would have weakened the sewage sludge dumping regulations that the Division of Environmental Protection had proposed. You are indeed a true friend of the citizens of West Virginia.

Sincerely
Doyle Coakley
Doyle Coakley

Memo:

RE: DEP - Water Resources/Waste Management Rule, Series 38D
Sewage Sludge Management Rules:

This rule was filed as an emergency on March 20, 1995.
On April 18, 1995, this office disapproved the rule as an emergency on the following basis:

1. The rule was submitted to Legislative Rule Making Review Committee in 1993 without the "Table 3".

2. Table 3 was added after several rule making meetings and filed with the modified rule by DEP in January, 1994.

3. The complete rule, with Table 3, was introduced in the 1994 Legislative session and passed with Table 3 still being included with the rule.

4. Three separate Senate Bills (528, 533, and 583) were introduced in the 1995 session, dealing with Sewage Sludge and removing the restrictions that are included in Table 3. Each of these three bills died in Committee.

5. Only two or three days after the close of the 1995 Legislative session, this rule was filed as an emergency rule.

6. It is clear that the Legislative intent is for Table 3 to be included, and any attempt to remove it through emergency rule procedure is an effort to bypass the Legislative process and the Legislative intent.

7. This does not stop DEP from going forward and trying to get Table 3 changed through normal rule making channels.

REPORT ON DEP EMERGENCY RULE 47-38D COMMENTS-- APRIL 17, 1995

We have received several letters both for and against the e.r. The way this breaks down is as follows:

FOR APPROVING THE EMERGENCY RULE:

West Virginia Municipal League, Charleston, WV
Delegate Roy E. Givens, 2nd District -- Wellsburg, WV
City of Wellsburg City Manger
City of Lewisburg
City of St. Albans
The Sanitary Board of Bluefield
City of Beckley, Emmett S. Pugh III, Mayor
Mayor of Parkersburg, Eugene A. Knotts
The Sanitary Board City of Parkersburg, Wayne Boone, Plant Supervisor
The Sanitary Board City of Parkersburg, Clarence Cox, Jr., Superintendent
Senator Tony E. Whitlow
Senator Leonard Anderson (He is on LRMRC)

FOR DISAPPROVING THE EMERGENCY RULE:

A very lengthy call from Senator Macnaughten detailing how this was discussed in LRMRC (He is on LRMRC)
Delegate Mary Pearl Compton, who also called several times and discussed at length her opposition (She is on LRMRC)
Herbert L. Heiss, New Martinsville, WV
Rose Chromchik, senior citizen of West Virginia
Raymond Rodriguez, new citizen of WV - replying to newspaper article
Brooke County Solid Waste Authority
Concerned Citizens of the Environment - Catherine Rodriguez; Richard L> Rodriguez; Donna S. Hartley; Joann Brookover; Thomas W. Martin; David Brokrom; Charles D. Clelland; Rose Chromchik; David Lee Jones; Carl E. Robinson and another name I can't read
Donna S. Hartley, Rivesville, WV
Joseph Cavalier, Rivesville, WV
Genevieve "Penny" McGill, Rivesville, WV
Joseph D. Haldeman; Irene O. Haldeman
Mrs. Ruth B. Kolar, Grant Town, WV
Larry Linch (He is on LRMRC)
Tom Degen, Chloe, WV (Very lengthy report)

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APR 21 11 24 AM '95

OFFICE OF WEST VIRGINIA
SECRETARY OF STATE

April 2, 1995

Ms. Judy Cooper
Director of Administrative Law Division
Secretary of State
State Capitol
1900 Kanawka Blvd. E.
Charleston, WV 25305

Dear Ms. Cooper:

This letter is in opposition to the Emergency Rule proposed by Director David Callahan that weakens Rule 47 CSR 38D by raising the limits of heavy metals to be land applied in sludge.

Why is there an emergency NOW! In reviewing the promulgation history for Rule 47 CSR 38D, public comment period began on May 24, 1993 and concluded with Date the Rule became effective, May 1, 1994. Now almost one year later Director Callahan states there is an emergency. Is he not circumventing the legislative process to accommodate an international waste management company, thereby showing contempt for the citizens' constitutional right to pass laws through the legislative process?

When the legislature was in session this year, an attempt was made to change the sludge regulations with Senate Bill528. This bill was introduced on February 20 and referred to the Committee on Natural Resources. By February 24, the bill died in committee because of the overwhelming negative response by the citizenry.

In regard to the economic burden that supposedly will be placed on the Publicly Owned Treatment Works (POTW), This is a smoke screen. During a comprehensive investigation last year concerning a sewage sludge composting facility in Marion County, it was determined through contacts with various POTW's in wasteshed B (the largest wasteshed in the state) none currently had a sewage sludge disposal problem, nor did they anticipate one.

In addition, information by Clifton Browning, the manager of the sludge program for the Water Resources Section of the DEP, gave the cost range for implementing an even higher funded program only varied between .03 (Fairmont) and .21 (Summersville) per household per month. I ask where is the economic burden.

Thus we are asking you to please consider these points when determining the acceptability of this action by the Director of the DEP, David Callhan.

Sincerely,

Catherine Rodriguez

Catherine Rodriguez, President
Concerned Citizens of the Environment
Rt. 1, Box 109B
Rivesville, WV 26588

Mercer County Commission

Courthouse Square
P.O. Box 5469
Princeton, West Virginia 24740

(304) 487-8306
TDD (304) 487-8353

BETTY LONG
Administrator

VICKY REED
Secretary

T.A. "BUDDY" WARDEN
Route 4, Box 534
BLUEFIELD, WV 24701

JOHN K. RAPP
P.O. Box 747
ATHENS, WV 24712

JOHN P. ANDERSON
1426 Main Street
PRINCETON, WV 24740

April 20, 1995

The Honorable Ken Hechler
Secretary of State
Building 1, Suite 157K
Charleston, WV 25305-0770

Dear Mr. Hechler:

The Mercer County Commission would like to go on record in support of the Sewage Sludge Management, Title 47, Emergency Rule amending 38D which contains Table #3.

We understand the purpose of the rule is to eliminate Table #3 and which table, if not removed, will ultimately cause all sludge to be transported to local landfills. The Department of Environmental Protection has tested 22 counties under the new rule and has determined they will not be able to dispose of sludge by land application if the Emergency Rule is not put into effect. Mercer County was one of the 22 counties so tested.

To eliminate the use of sludge on farm land and causing it to go to landfills will reduce the life expectancy of the landfills creating a tremendous expense when we have to open new areas.

We are requesting your assistance in supporting the rule to eliminate Table #3 as indicated above by implementing the Emergency Rule.

Sincerely,

T. A. Warden, Jr.
President

John K. Rapp
Commissioner

John P. Anderson
Commissioner

KEN HECHLER
Secretary of State

MARY P. RATLIFF
Deputy Secretary of State

A. RENEE COE
Deputy Secretary of State

CATHERINE FREROTTE
Executive Assistant

Telephone: (304) 558-6000
Corporations: (304) 558-8000

STATE OF WEST VIRGINIA

SECRETARY OF STATE

Building 1, Suite 157-K
1900 Kanawha Blvd., East
Charleston, WV 25305-0770

WILLIAM H. HARRINGTON
Chief of Staff

JUDY COOPER
Director, Administrative Law

DONALD R. WILKES
Director, Corporations

(Plus all the volunteer help we can get)

FAX: (304) 558-0900

April 24, 1995

Mercer County Commission
Courthouse Square
P.O. Box 5469
Princeton, WV 24740

Thank you for taking the time to write about the emergency rules that DEP filed, Title 47-38D, "Sewage Sludge Management Rules". This rule was disapproved as an emergency on April 18, 1995.

As you probably know, a rule cannot be submitted as an emergency to temporarily bypass the legislative process. Since Table 3 was added to this rule through the Legislative Rule Making Review Committee meetings, and it went through the 1994 Legislative session with Table 3 still intact and since three separate bills were introduced in the 1995 Session trying to remove Table 3 failed to get Legislative approval, it is apparent that at this time it is the Legislative intent to keep Table 3 in this rule.

This does not stop DEP from going forward with their studies and trying to get Table 3 changed through the normal rule making channels.

Once again, thank you for taking your time to comment on this matter.

Sincerely,

Ken Hechler
Secretary of State

HOUSE OF DELEGATES
WEST VIRGINIA LEGISLATURE
BUILDING 1, ROOM M-212
1900 KANAWHA BLVD., EAST
CHARLESTON, WV 25305-0470
PHONE (304) 340-3200

TOM AZINGER
600 13TH AVENUE
P. O. BOX 5400
VIENNA, WV 26105
PHONE (304) 295-8581

Committees:
Banking & Insurance
Government Organization
Industry & Labor

April 21, 1995

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APR 24 1 00 PM '95
OFFICE OF WEST VIRGINIA SECRETARY OF STATE

The Honorable Ken Hechler
Secretary of State
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, West Virginia 25305-0770

Dear Ken:

The West Virginia Department of Environmental Protection has filed with your office a proposal to amend Legislative Rule 47 CSR 38D, which would remove Table 3 from the existing rule and adopt appropriate provisions of 40 CFR 503 regarding land application of sludge according to federal regulations.

This letter is to express my support of the Sewage Sludge Management Rule amendment filed with your office on March 20, 1995 and I urge you to support this amendment.

Sincerely,

Tom

Thomas A. Azinger
WV House of Delegates

TAA:sah

cc: Eugene A. Knotts, Mayor
City of Parkersburg

KEN HECHLER
Secretary of State

MARY P. RATLIFF
Deputy Secretary of State

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Director, Corporations

(Plus all the volunteer help we can get)

FAX: (304) 558-0900

April 24, 1995

The Honorable Thomas A. Azinger
West Virginia House of Delegates
P.O. Box 5400
Vienna, WV 26105

Dear Tom:

Thank you for taking the time to write about the emergency rules that DEP filed, Title 47-38D, "Sewage Sludge Management Rules". This rule was disapproved as an emergency on April 18, 1995.

As you probably know, a rule cannot be submitted as an emergency to temporarily bypass the legislative process. Since Table 3 was added to this rule through the Legislative Rule Making Review Committee meetings, and it went through the 1994 Legislative session with Table 3 still intact and since three separate bills were introduced in the 1995 Session trying to remove Table 3 failed to get Legislative approval, it is apparent that at this time it is the Legislative intent to keep Table 3 in this rule.

This does not stop DEP from going forward with their studies and trying to get Table 3 changed through the normal rule making channels.

Once again, thank you for taking your time to comment on this matter.

Sincerely,

Ken Hechler

Ken Hechler
Secretary of State

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WAYNE S. STONESTREET
PHILLIP A. SCANTLEBURY *
HOBERT F. MUNCEY, JR.
ROBERT H. MILLER, II * *
DAVID L. HARMON *
GREGORY S. MATNEY *
EDWARD L. PAULEY

* WV & VA BARS
* * WV & NC BARS

LEROY KATZ
1940-1994

April 21, 1995

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APR 24 1 03 PM '95
OFFICE OF WEST VIRGINIA SECRETARY OF STATE

Honorable Ken Hechler
Secretary of State
State of West Virginia
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, WV 25305-0770

Re: Division of Environmental Protection Water Resources & Solid Waste Management -- Proposed Emergency Rule to Title 47, Section 38D (Sewage Sludge Management Rule)

Dear Secretary Hechler:

As the attorney for the Sanitary Board for the City of Bluefield, I recently spoke at the public hearing in Nitro regarding the above-captioned matter and encouraged you to adopt and implement the emergency rule proposed by DEP. My concern about the existing rule which is known as Table 3 and which would be eliminated by the proposed emergency rule is that the application of the existing rule as set forth by Table 3 will basically preclude the land application of sludge in the State of West Virginia. This, of course, will be financially prohibitive to all users of municipal sanitary boards and public service districts throughout the state and will deprive farmers throughout the State of West Virginia of a valuable source of soil conditioner. Please bear in mind that Tables 1 and 2, which are not affected by the emergency rule, strictly govern the concentration of metals in sewage sludge for land application and fully comply with EPA Regulation 503; in fact, Tables 1 and 2 are more stringent than the EPA requirements.

A part of our opposition to the existing Table 3 is that there is no scientific basis for the rule and there were not studies to justify the validity of the rule. EPA studied the land application of sludge for sixteen years and developed its 503 regulations; the West Virginia table for maximum concentration of metals in sewage sludge for land application (Table 1) is the same as the EPA 503 table for pollutant concentrations. The West Virginia table for provisional concentration of metals and sewage sludge for land application (Table 2) is the same as EPA 503 ceiling concentrations.

The West Virginia table for maximum background concentration of metals and soil where sludge may be land applied has no corresponding 503 EPA regulation and any one who says that it does is either deliberately or mistakenly misleading the public, the legislature and you. In fact, the West Virginia table for the maximum background concentration of metal and soil where sludge may be applied (the existing Table 3) and which is the subject of the emergency rule, was adopted without benefit of any responsible or reliable scientific study and was, in fact, devised by a few individuals in a hurried back room meeting and then passed on to the legislature as the result of a scientific study.

Unfortunately, DEP was misled by the proposer of the rule and allowed the rule to be passed into law. However, after considerable study and practical application, DEP now realizes it has been misled and further realizes that the application of the existing Rule 3 would preclude the use of sludge in West Virginia and would unduly and unjustifiably penalize West Virginia sanitary boards, public service districts and the citizens of West Virginia in general. DEP further recognizes that a serious scientific study should be undertaken at West Virginia University or some other comparable institution to truly evaluate Table 3 and to determine if there is, in fact, any scientific justification for the table. Thus, by DEP writing the emergency rule and submitting it to you, DEP, in effect, recommends its implementation (the implementation of the emergency rule). Please bear in mind that the existing Table 3 is severely penalizing every West Virginia sanitary board and public service district and has made the land application of sludge an impossibility in West Virginia and an enormous unnecessary cost to the citizens of this state. As an example, in Bluefield the cost would go from handling sludge at a present rate of approximately $5.00 per ton disposal cost to at least $250.00 per ton disposal cost or an annualized yearly increase in costs at this time of $168,000.00, with it being further understood that this annualized cost would increase each year hereafter.

The table that we are seeking to have removed by the emergency rule is not a table that applies to the quality of the sludge and will not inhibit the introduction of out of state sludge in either landfills or land application. There are those who say that the existence of the rule (Table 3) precludes the introduction of out of state sludge into West Virginia and such is simply not the case. The table under consideration when tested by DEP in twenty-two counties found that the natural soil background, metal concentration already exceeded the limits imposed by the table. Thus, you cannot use sludge in these counties for land application. Mercer County is one of the counties that has been tested and the

continued existence of Table 3 means that there can be no land application in Mercer County, a practice which has been safely and effectively used for a number of years to the benefit of not only the sanitary boards and the public service districts, but to the benefit of the farmers in Mercer County as well.

The alternative to the rejection of the emergency rule is to require a county such as Mercer to ship the sludge out of state at enormous costs or to go to a public landfill and there dispose of the sludge at an extreme cost to the users of the systems and the landfills are not obligated to take the sludge. Thus, the sanitary boards and the public service districts can and will be faced with both an intolerable and insolvable problem unless the emergency rule is adopted.

It should be further noted that if landfills in West Virginia are required to take sludge from sanitary boards and public service districts, the life of each and every landfill will be considerably shortened which will pose separate and additional problems for all county commissions and citizens of the State of West Virginia which have not even begun to be addressed by the proposer of the original Table 3. Landfill costs are already excessive, but if sludge is required to be deposited in landfills, the cost of operating the landfills will increase, the life expectancy of the landfill will be shortened and any new replacement landfills will be even more costly than the existing landfill system. Landfills are primarily used to take care of garbage and related material from citizens and residents of the various counties throughout the state. As you are aware, the development of proper landfills in today's environmental climate is an extremely costly procedure and much land in this state is simply not suitable for landfill use. Thus, if sludge is also taken to landfills, along with garbage, the problem is only magnified. The obvious effect on the sanitary boards throughout the state and the public service districts throughout the state is to be required to substantially increase rates they charge their customers in order for sanitary boards and the public service districts to handle the increased cost by using the landfills for the disposal of sludge. You must bear in mind that when sludge is applied for land application on the farm in West Virginia, there is, generally speaking, no cost at all to the sanitary boards or the public service districts because the farmers gladly want the sludge because it is such a suitable fertilizer and because it meets stringent safety requirements as called for by existing Tables 1 and 2 and which tables are not effected by the proposed emergency rule. There are those who would suggest that somehow if landfills usage is increased, there are substantial profits to be derived. I can only state that sanitary boards and public service

districts are not in the business of making profits; that increased landfill usage will result in no profits for any West Virginia municipality or public service district and will only result in increased costs and which costs must be borne by the users of the system.

There are a few well-meaning individuals who oppose the emergency rule, but, unfortunately, there is no provable or tested scientific basis for their fears. Additionally, the opponents to the application of the proposed emergency rule have simply produced no facts or solutions for the handling of sludge, nor have they suggested how to solve all the problems that the increased landfill use is going to create. It is rather easy to be against something as you in your long successful tenure in public service readily recognize. However, I should note that frequently those who are against rules and regulations fail to provide alternative methods or solutions and frequently simply want to ignore the problems that are created. Sanitary boards and public service districts are not in the business of creating environmental problems and in today's environmental and legislative climate they are in the business of trying to clean up the environment. Virtually, every municipal sanitary board in the state and every public service district in the state and the many trained professionals who operate the sanitary boards and public service districts have joined in support of the emergency rule because they fully recognize and understand the problems by leaving in effect the existing Table 3.

Thus, on behalf of the Sanitary Board of the City of Bluefield, I urge you to implement the emergency rule.

Sincerely,

KATZ, KANTOR & PERKINS

Norris Kantor

NK/slm

cc: William Looney, Chairman of the Sanitary Board of Bluefield
cc: Dave Shields, Mayor of the City of Bluefield
cc: Sanitary Board for the City of Bluefield

KEN HECHLER
Secretary of State

MARY P. RATLIFF
Deputy Secretary of State

A. RENEE COE
Deputy Secretary of State

CATHERINE FREROTTE
Executive Assistant

Telephone: (304) 558-6000
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STATE OF WEST VIRGINIA
SECRETARY OF STATE
Building 1, Suite 157-K
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Charleston, WV 25305-0770

WILLIAM H. HARRINGTON
Chief of Staff

JUDY COOPER
Director, Administrative Law

DONALD R. WILKES
Director, Corporations

(Plus all the volunteer help we can get)

FAX: (304) 558-0900

April 24, 1995

Norris Kantor
Katz, Kantor & Perkins
Attorneys at Law
P.O. Box 727
Bluefield, WV 24701

Dear Norris:

Thank you for taking the time to write about the emergency rules that DEP filed, Title 47-38D, "Sewage Sludge Management Rules". This rule was disapproved as an emergency on April 18, 1995.

As you probably know, a rule cannot be submitted as an emergency to temporarily bypass the legislative process. Since Table 3 was added to this rule through the Legislative Rule Making Review Committee meetings, and it went through the 1994 Legislative session with Table 3 still intact and since three separate bills were introduced in the 1995 Session trying to remove Table 3 failed to get Legislative approval, it is apparent that at this time it is the Legislative intent to keep Table 3 in this rule.

This does not stop DEP from going forward with their studies and trying to get Table 3 changed through the normal rule making channels.

Once again, thank you for taking your time to comment on this matter.

Sincerely,

Ken Hechler
Secretary of State

April 17, 1995

From: Robert C. Bricker, Jr.
766 Weaver St.
Morgantown, WV 26505
(304) 296-4573

To: Judy Cooper, Office of The Secretary of State of West Virginia
RE: Emergency Sewage Sludge Management Rule

To Whom it may Concern,

While reviewing DEP communications relative to the current situation limiting land application of sewage sludge, I have observed a general ignorance and lack of understanding on behalf of DEP personel concerning interaction of various elements in the complex media we refer to as soil. Soil is the primary environment at the earth's surface where microbial activity produces compounds necessary for plant growth. This activity is dependent upon an appropriate environment: adequate water, oxygen, and heat; abundant energy sources; a balanced supply of nutrients; proper soil reaction (pH); **balanced soil chemistry, and absense or immobilization of toxic elements.** Soils with such an appropriate environment are described as fertile; soils in which an imbalance occurs may only be marginally fertile at best. Keeping that knowledge in mind, please consider these comments in opposition to enactment of the emergency sewage sludge management rule proposed by WVDEP.

Sewage sludge has indeed been shown to be beneficial for plant growth when applied in moderate amounts. However, when sewage sludge is land-applied, the chemistry of the amended soil is permanently altered. Elements in the composition of the sludge compete with essential plant nutrients for absorption sites in the soil. Accumulation of any one or several of the 'heavy metals' referred to in DEP's reports, and Table 3 of the sludge regulations, has the potential to affect the long-term fertility of a soil.

The current exasperation displayed by DEP over the soil standards is the result of higher than normal concentrations of arsenic and nickel found in a few soils and limited to a relatively small area. Yet, DEP wishes to abolish all soil standards at this time. This is an entirely unreasonable request on their part. Maintaining stringent soil standards is vital to human health and soil fertility. At abnormally high concentration (quantity relative to respective element), arsenic, nickel, cadmium, copper, chromium, lead, mercury, molybdenum, selenium, and zinc (the regulated 'heavy metals') have each, individually, been found to adversely effect plant growth, and most are known to be toxic to plants, humans, and/or other animals. The degree of toxicity is relative to the concentration, and may be antagonized by the presence of other toxic elements. It is important to note that, as soil concentration of these elements increase, their mobility increases regardless of soil pH or soil organic matter content.

Comments concerning DEP memorandum from James Summers to Mike Zeto (12/8/94), and to Clifton Browning (1/11/95), which form the basis of the rational for DEP's request to enact the emergency rule:

* *Reference to CFR Part 503 (USEPA) regulations as establishing safe standards or loading limits for soils which far exceed those adopted by the WV Legislature.* At this time, USEPA is re-evaluating those regulations as the regulations are thought to be too lenient.

Mr. Summers contends that liming the soil, thereby increasing the pH, immobilizes the elements of concern.* This is only **a temporal condition. Microbial activities and chemical reactions associated with the land application of sewage sludge will cause the pH to decrease over a period of 2-3 years. Mineralization of sludge-born nitrogen, decomposition of sludge organic matter, and hydrolysis reactions associated with iron and aluminum hydroxides (which are relatively plentiful in sewage sludge) all produce acid. Over time the soils buffering capacity weathers and the elements of concern become mobile.

Mr. Summers states that sludge competes with soil for available metals.* This is **very unlikely to occur. Metals may be chelated by organic matter in sludge and in soil. Recent research has shown that soil organic matter has very little capacity to retain sludge-born metals. The metals in the sewage sludge are bound by the sludge organic matter. As that organic matter is decomposed, the sludge metals mobilize and are available for plant uptake. Long-term maintainence of soil pH is imperative for land to which sewage sludge is applied, but is not required by West Virginia law. This fact alone is sufficient to retain stringent soil standards for land to which sewage sludge may be applied, especially if the product grown on that land is in the human food chain.

Refers to background levels of elements found in soils as being 'naturally occurring'.* There is no scientific evidence presented to indicate the claim of naturally occurring. The concentration range of both arsenic and nickel that have been found in soil samples are, in fact, very unnatural for soils in West Virginia. Mr. Summers refers to concentration ranges reported in literature, and states that those concentrations far exceed West Virginia's soil standards established by regulation. The reference he uses is from a study on soils derived from all types of rock, i.e. igneous, metamorphic, and sedimentary. All of the soils in West Virginia, with the exception of the very extreme eastern tip (the Blue Ridge Mountains) are derived from sedimentary rock. Concentrations of the elements of concern are much lower in soils formed from sedimentary rock than in those formed on metamorphic or igneous rock, e.g., the **normal range for arsenic is 1-5 ppm, not 0.1-40 ppm referred to by Mr. Summers. Nickel concentrations ranging to 40 or 50 ppm, as in the data reported by DEP, *naturally* occur only in soils derived from ultra-mafic rock. **There are no such agricultural soils in West Virginia.**

The background levels of elements being observed in the soils reported include the naturally occurring concentrations **and** depositions originating from anthropogenic (human) activities. These activities include, but are not limited to application of fertilizers (arsenic, cadmium) and/or pesticides (arsenic, lead, chromium), production of fertilizers and pesticides

(same as for fertilizer application), land application of oil ash (nickel), land application of tannery sludge (chromium, manganese), primary metal production (arsenic, copper, chromium, lead, nickel, selenium, zinc), and burning of fossil fuel, especially **fuels containing iron sulfide** as well as other sulfide minerals(arsenic, copper, chromium, lead, nickel, selenium, zinc).

Of these sources mentioned, I would only rule out fertilizers. Most fertilizers used in WV are derived from sedimentary phosphatic rock which has relatively low concentrations of arsenic and/or cadmium. It may be possible to rule out pesticide application in some places. However, previous studies have shown orchard soils in the eastern panhandle to have extremely high concentrations of lead attributed to application of **lead-arsenate** pesticides before they were banned. As these pesticides were applied heavily and frequently, at times under windy conditions, it would not be unusual for soils in adjoining woodlots to have high concentrations of lead and arsenic. The same pesticides used on orchards were used on other agricultural crops as well before regulation by USEPA.

The data reported by DEP shows a strong relationship among elevated concentrations of arsenic and nickel, and lead concentrations over 20 ppm. A substance which would contain all of these elements at sufficient levels to effect soil concentrations is particulates produced by burning bituminous coal. It is possible that deposition of particulates, **prior to imposition of requirements of the Clean Air Act**, has caused increased soil concentrations of these elements. Traditionally, the Ohio River Valley and Kentucky have been primary centers for production of electricity from burning coal. This would have left a rather disperse regional effect reflected by moderately elevated concentrations in the soil of elements associated with sulfide minerals. As many local industries and institutions utilized coal as an energy source for heat, etc., a more localized effect may be noticed in diverse areas. Similarly, concentrations of heavy metals have been found to be elevated in soils near industrial sites related to primary metals production and/or processing.

There are some apparent anomalies in the data collected by DEP. The high concentration of chromium found in Jefferson County soils, and in one Mineral County soil, is very unnatural. The data suggests that 600-800 lbs. of chromium per acre occurs in these soils. **Chromium** concentrations that high indicate that **tannery sludge** may have been applied to the land at some previous time. In the past, there was at least one tannery in each of these areas. A soil in Grant County is high in nickel, but not arsenic. Application of phosphate to soil displaces arsenic from absorption sites. Is this an agricultural soil? Is it downwind from an old smokestack?

If DEP personel were qualified and performing their jobs in a professional manner, I would not be asking such questions. If persons taking soil samples would fill in the soil series name on the forms associated with the respective samples, the relationship of concentrations of certain elements to geologic parent material could be determined, as well as current land use. Quite simply stated, lack of organization and lack of will to perform basic scientific investigation (or to even incorporate scientific principle in daily activities) on DEP's part does not constitute a statewide emergency regarding the sewage sludge management regulations.

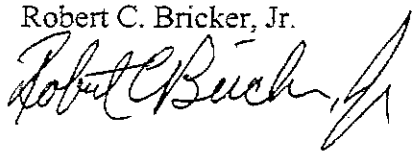
One of the most important points to be emphasized concerning this discussion about soil chemistry is that the fate of all elements added to soil and their reactions with the soil must be collectively considered. It is sheer fallacy to consider any one element without due consideration for the simultaneous fate of any and all other elements. Great care must be taken to not overwhelm a soil's ability absorb added pollutants, and thereby diminish its fertility. The purpose of the soil standards, as they were promulgated, was to assure the long-term fertility of soils to which sewage sludge would be applied, as well as to protect water quality and human health. The soils are important as sources of either feed or food. Farmers are dependent upon fertile soils for their livelihood. Fertile soil is a resource which we cannot live without. Therefore, it is a resource which we must sustain.

I hope that the Secretary of State, or his appointed representative, can facilitate an agreement among the parties concerned with this matter. The sewage sludge regulations approved by the legislature provide an incentive for sewage treatment works operators to incorporate effective pre-treatment programs in their operations, and to maintain productive soils where the sludge is land-applied. Certainly, the public-owned treatment works in Wood County need some form of relief to land-apply their sewage sludge. A compromise background soil concentration for arsenic and possibly nickel should be sought. In addition, the sewage sludge management program must be founded on traditional scientific principles and managed through application of accepted scientific methods. At the present time, I have found the program to be grossly lacking in professionalism and managed with a haphazard, even cavalier, attitude.

As for my personal qualifications to address this matter: (i) I received B.S. Agriculture, Plant and Soil Sciences (Soil Science), cum laude, from West Virginia University in December 1992; (ii) since completion of the undergraduate studies, I have been a Graduate Research Assistant in Agronomy (Soil Science) at WVU. The research I performed involved the land-application of sewage sludge for beneficial use.

Sincerely,

Robert C. Bricker, Jr.



DATE: April 14, 1995

TO: DEP/OWR&SW
10 McJunkin Rd.
Nitro, WV 25143
Attn: Roger T. Hall

The Honorable Ken Hechler
Secretary of State
Building 1, Suite 157K
Charleston, WV 25305
Attn: Judy Cooper

FROM: Sue Maguire
Rt. 1-Bx. 48
Auburn, WV 26325

RE: Comment on Title 47, Series 38D
Sewage Sludge Management Rule

I have served on SWICC and was Coordinator for the Ritchie Co. SWA for the past four years. Much time has already been spent on formulating the exsisting sewage sludge rule. These regulations help protect all West Virginians. There was ample time to develop scientific foundation for establishing the soil concentration standards. In fact, DEP never wanted to establish a concentration other than federal limits. These are inadequate. Table 3 should be kept in these regulations as it is based on sound scientific data. POTW'S should consider composting sludge or perform pre-treatments to make the levels of toxins acceptable for land application. Composting regulations are in place and more municipalities or counties will be establishing facilities to deal with yardwaste that will be banned from WV landfills. WV has all but completed the process of having only lined, safe landfills for waste disposal. Sludge that can't be land applied under Table 3 belongs in a landfill. It should not be put on land to pollute the environment. Proper handling of this toxic material should be a priority over any other considerations for the welfare of all.

The legislature felt no need to change the rule during the session that just ended, and DEP has no justification for any emergency now. Situations are the same now as when the current rule was written, went through the public input process and then past by the legislature.

Thank you for attention to this matter.

April 15, 1995

Dear Sir:

I would like to get a copy of a grievance decision Patricia Ramey VS D.V. of Veteran Affairs 91-VA-115.

I was told by the grievance board that they were kept in your library.

Thank You,

Patricia Ramey
#4 Brenda Street
Milton, WV 25504
743-0503

April 17, 1995

Attn: Judy Cooper
Secretary of State
State Capitol Building
Charleston, WV 25305

RE:

Reasons for Rejecting the Proposed Emergency Sewage Sludge Management Rule Amendment

On behalf of the West Virginia Chapter of Sierra Club, I am requesting that the proposed emergency sewage sludge management rule amendment be rejected. This request is based on 1) the lack of an emergency as defined in 29A-3-15 (f) and 2) the proposed amendment contradicts the language of 22-15-20, thereby exceeding the scope of the law under which it is being promulgated. In summary, the reasons for these arguments are as follows:

1. Expenses for sludge producers which result in environmental protection for soils do not constitute an emergency, but are consistent with the relief of the emergency which resulted in the legislation in the first place.

2. Elimination of Table 3 would place at permanent risk many farms and soils and would create, not relieve an emergency.

3. There is no evidence for DEP's contention that the levels of metals found in some soils which exceed the standards established in Table 3 are "naturally -occurring". If the exceedances reported are associated with human-induced deposition, the purpose of Table 3 is being achieved by identifying those soils which have already been contaminated beyond acceptable levels. The fact that the rules are working as intended is not a basis for declaring an emergency or for undoing the legislative intent on which the rules are based.

4. Even if the exceedances reported are associated with naturally-occurring levels of metals in the soil, the source of the metals causing the exceedance does not provide a basis for ignoring the environmental and human health risks associated with high levels of metals or for exacerbating those risks by allowing INCREASED deposition of metals to those soils.

5. The only scientifically valid reason for amending the rules is if an environmental and human health risk determination showed that the levels in Table 3 were more stringent than necessary to maintain environmental quality and protect human health. Since no such risk assessment has been presented, there is no valid basis for amending the rule.

6. Even if an assessment showed that the levels in Table 3 were more stringent than necessary, the appropriate amendment would be to adjust the levels in Table 3, not to abolish the Table altogether.

Rebuttal to WV-DEP

The WV-DEP claims, as a foundation for declaring an emergency, that "it has been determined through scientific sampling and analysis that many native soils throughout the state exhibit naturally-occurring levels of metals which exceed the standards established in Table 3." and that " The results of these determinations are that lands containing these naturally-occurring metals preclude the land application of sewage sludge. This poses a serious health and economic problem for Publicly Owned Treatment Works (POTW's) which are .... forced to either store the sewage sludge on site or dispose of it in permitted landfills."

Contrary to WV-DEP's assertion, the only data collected are scientifically inadequate to draw such conclusions. According to DEP personnel, the soil analyses collected to date have been based on composite sampling of. usually, several fields and several soil types on a given landowners property. Because metals concentrations are often quite variable among soil types and soil histories, scientifically valid sampling requires that a sample be representative of only one soil type and from an area with a uniform soil history. Compositing of several fields and several soil types into one sample for analysis means that an occasional high metals level in one soil type would bias the entire composite sample and leads to the inappropriate conclusion that the entire farm exceeds the standard, when only a small portion of the farm actually does. The WV DEP has further exacerbated this error by apparently concluding that whole counties exceed the standard when, in some cases, only one composited (and potentially biased) sample from one farm has been analyzed. If in fact whole counties violated the metals standards in Table 3, there might be some basis for reaching the conclusion that an emergency exists, but no valid data have been provided to support that contention and the data which have been provided cannot validly be used to reach such a broad conclusion. The data available further show that when enough farms were sampled, at least some of the farms met the standards, even in the most heavily contaminated county.

As stated in reasons 1 through 6 above, no data have been provided to demonstrate that the metals measured are naturally-occurring. In fact, it is not clear that any scientific test exists to distinguish natural from "unnatural" (presumably human-induced) sources of toxic metals. More importantly, the source of the metals is irrelevant to the health and environmental risks associated with the metals. Furthermore, no distinction between natural versus human sources of metals is made in the statute. Thus the conclusion that high metals concentrations in West Virginia soils means that the standards should be relaxed is entirely fallacious, illogical, and inappropriate.

Moreover, to go further and eliminate the Table altogether would be to recreate much of the condition that caused the Legislature to declare an emergency and adopt the sewage sludge management regulations in the first place. The only scientifically valid means of preventing excessive contamination of soils by metals in sludge is to prohibit sludge applications on land which exceeds safe levels of metals. The only way of knowing that is to evaluate the levels of metals in soils prior to application. The emergency amendment, by striking all standards. eliminates any means of evaluating the levels of metals found. In essence. the amendment leaves no soil standard. ANY soil, no

matter how heavily contaminated with metals, would be deemed acceptable for land application of sludge.

The potential cost associated with alternative disposal methods seems to be the real motive for declaring an emergency. Yet no cost benefit analyses have been provided to determine the economic impact. The added cost of sludge disposal in landfills amounts to pennies per day on a per person basis. The cost of remediating just one contaminated farm could well exceed the statewide economic benefits supposedly justifying this emergency amendment.

The WV DEP has other options in resolving the problems created by their analyses. For example, the statute authorizes WV-DEP to establish bonding for sites receiving sludge, so that if health or environmental problems were created by sludge application, the cost of remediation is borne by the entity creating the problem. This approach would allow innocent farmers to continue receiving the benefits of the sludge without incurring the risk of solving someone else's problem. If the sludge is relatively innocuous, such bonding should be relatively easy to arrange. If the sludge is heavily contaminated, the costs of bonding would provide a needed incentive to the sludge generator to clean up the sources of those metals in his sludge, thereby encouraging pollution prevention.

The WV DEP could also create a "clean" category of sludge by creating a new set of levels in Table 1. Such "clean" sludge would have levels of metals that are low enough to assure that no increased risk is associated with land application, regardless of the background levels of metals in the soil. Thus, requirements for soil testing prior to land application could safely be waived for sludge in this "clean" category. Both the bonding and the categorization of sludge by level of contaminant are consistent with the statute and were advocated in public comment during the original promulgation of the rule in 1993.

Most importantly, if an actual emergency had existed, the WV-DEP could have still used the normal Legislative rule-making process. The data on which DEP relies was obtained well before the start of the 1995 legislative session. In fact several bills to revise sewage sludge regulation were introduced during the session, but, after substantial public input, each was soundly rejected by the Legislature. Clearly, the Legislature did not intend to undo the rules adopted for sludge regulation. To now do so through the emergency rule-making provision in statute is a miscarriage of the democratic process.

Certainly, some adjustment of the standards in Table 3 may be warranted as scientific information becomes available regarding sources, health effects, and environmental exposures to these toxic heavy metals. However, no data have yet been provided to determine whether the standards should be less stringent or MORE stringent than those in Table 3. Numerous scientific studies have demonstrated the health effects of heavy metals and have raised legitimate concerns regarding land application of metal-contaminated sewage sludge. Any adjustment in the standards in Table 3 should be based on health effects and environmental exposures, not simply on the finding that potentially high levels already exist in soils.

Therefore, since no emergency exists, since the data presented by DEP are inadequate to demonstrate any such emergency, since the proposed rule amendment is counter to existing law, and since other remedies for the purported problem exist within state law, the proposed emergency amendment should be rejected. The WV Legislative Rule-Making Review Committee has authority and can consider changes as appropriate. within the normal democratic process without sidestepping the will of the people through an emergency rule.

Sincerely,

James Kotcon
State Government Programs Chair
WV Sierra Club
Rt. 12, Box 400
Morgantown, WV 26505
(304) 594-3322

REPORT ON DEP EMERGENCY RULE 47-38D COMMENTS-- APRIL 17, 1995

We have received several letters both for and against the e.r. The way this breaks down is as follows:

FOR APPROVING THE EMERGENCY RULE:

West Virginia Municipal League, Charleston, WV
Delegate Roy E. Givens, 2nd District -- Wellsburg, WV
City of Wellsburg City Manger
City of Lewisburg
City of St. Albans
The Sanitary Board of Bluefield
City of Beckley, Emmett S. Pugh III, Mayor
Mayor of Parkersburg, Eugene A. Knotts
The Sanitary Board City of Parkersburg, Wayne Boone, Plant Supervisor
The Sanitary Board City of Parkersburg, Clarence Cox, Jr., Superintendent
Senator Tony E. Whitlow
Senator Leonard Anderson (He is on LRMRC)

FOR DISAPPROVING THE EMERGENCY RULE:

A very lengthy call from Senator Macnaughten detailing how this was discussed in LRMRC (He is on LRMRC)
Delegate Mary Pearl Compton, who also called several times and discussed at length her opposition (She is on LRMRC)
Herbert L. Heiss, New Martinsville, WV
Rose Chromchik, senior citizen of West Virginia
Raymond Rodriguez, new citizen of WV - replying to newspaper article
Brooke County Solid Waste Authority
Concerned Citizens of the Environment - Catherine Rodriguez; Richard L> Rodriguez; Donna S. Hartley; Joann Brookover; Thomas W. Martin; David Brokrom; Charles D. Clelland; Rose Chromchik; David Lee Jones; Carl E. Robinson and another name I can't read
Donna S. Hartley, Rivesville, WV
Joseph Cavalier, Rivesville, WV
Genevieve "Penny" McGill, Rivesville, WV
Joseph D. Haldeman; Irene O. Haldeman
Mrs. Ruth B. Kolar, Grant Town, WV
Sen. Larry Linch (He is on LRMRC)
Tom Degen, Chloe, WV (Very lengthy report)
WV Sierra Club, James Koteon, Morgantown, WV

DEP EMERGENCY RULE 47-38D -- APRIL 6, 1995

We have received several letters both for against the emergency rule (e.r.). The way this breaks down is as follows:

FOR APPROVING THE EMERGENCY RULE:

West Virginia Municipal League, Charleston, WV
Delegate Roy E. Givens, 2nd District -- Wellsburg, WV
City of Wellsburg City Manager
City of Lewisburg
City of St. Albans
The Sanitary Board of Bluefield
City of Beckley, Emmett S. Pugh III, Mayor
Mayor of Parkersburg, Eugene A. Knotts
The Sanitary Board City of Parkersburg, Wayne Boone, Plant Supervisor
The Sanitary Board City of Parkersburg, Clarence Cox, Jr., Superintendent

FOR DISAPPROVING THE EMERGENCY RULE:

A very lengthy call from Senator Macnaughten detailing how this was discussed in LRMRC.
Delegate Mary Pearl Compton, who also called several times and discussed at length her opposition
Herbert L. Heiss, New Martinsville, WV
Rose Chromchik, senior citizen of West Virginia
Raymond Rodriguez, new citizen of WV - replying to newspaper article

April 12, 1995

Ms. Judy Cooper
Dir. of Administrative Law Division
Secretary of State
State Capitol
Charleston, WV 25305

FILED
APR 14 9 48 AM '95
OFFICE OF WEST VIRGINIA
SECRETARY OF STATE

Dear Ms. Cooper:

This letter is in vehement opposition to Division of Environmental Protection Director David Callahan's effort to amend the state's sewage sludge management regulations, 47 CSR 38D. I feel his claim for an emergency rule change is merely an attempt to circumvent the constitutional legislative process by eliminating the voice of the people.

Information I have received leads me to believe the DEP was aware that a problem may exist with the land application of sludge by Publicly Owned Treatment Works (POTWs) as early as November 1994. The fact no mention of this was presented for public perusal during the sixty day legislative session compromises the emergency claim. Although during the session bills designed to weaken the sludge standards were defeated by overwhelming public outcry, I feel Director Callaghan realized the futility of relaxing sludge regulations via the constitutional process. Thus, his attempt to wait until after the Legislative session to show this sleight of hand. This appointed position should not afford him the right to change laws without legislative oversight.

Please consider these points when reviewing the merits of the arguments for allowing this emergency rule change. I am very upset that the average citizen has to be so dogged about environmental issues that come before an agency that is purported to be looking out for the public good. Have we not learned from the past 150 years that environmentally exploitative industries have left us with enough pollution.

Sincerely,

Joseph Cavalier

Joseph Cavalier
202 Phillips Ave.
Rivesville, WV 26588
(304) 278-9812

Ms. Judy Cooper, Director
Administrative Law Division
Secretary of State Office
State Capitol
1900 Kanawha Blvd. East
Charleston, WV 25305

April 12, 1995

Dear Ms. Cooper,

This letter states our opposition to Director of the Division of Environmental Protection, David Callaghan's, proposed change of Emergency Rule 47 CSR 38D, eliminating Table 3, thus allowing higher limits of heavy metals in sludge to be land applied. Upon review of this Emergency Rule change, we feel there are several fundamental reasons this is not a necessary action, but an attempt by Mr. David Callaghan, Director of the Division of Environmental Protection, to circumvent the constitutional legislative process. One obvious reason being that three Legislative bills, introduced during the last ten days of the session (S.B. 528, S.B. 533, and S.B. 583) and designed to lessen sludge standard, were soundly defeated by tremendous response from the citizens of WV. Their enraged protests to reducing heavy metal standards proves their vigilance and commitment to exercising their right to determine policy through democracy. Their objective was to ensure the future health and safety of their family and homes. It's amazing that three weeks ago when the bills were introduced in the legislature, the DEP had no sludge problem, but now the session is over, they have the need to eradicate years of time and work developing and debating the regulations at taxpayer expense.

We feel this circumventing action, using POTWs as a smoke screen, designed to accommodate a small frustrated group, shows true contempt for the citizens' constitutional right to pass laws through the legislative process. As we are aware several industries have hazardous waste and sludge disposal problems, rather than make them come into compliance, we suspect the Division of Environmental Protection is simply changing the laws to accommodate by lessening standards industries should strive to meet, showing little concern for the future environmental problems these changes create. This is a step backward. Their responsibility is not to accommodate but to protect (note agency's name.) It's truly absurd and obscene the Director feels the need to misrepresent publicly deemed laws as a burden or a hardship when lobbyists are thwarted by overwhelming public response.

Secondly, contrary to Director Callaghan's claim that putting higher contaminated sludge in landfills poses a serious health and economic problem to the public, spreading higher contaminated sludge all over the ground, all over the state, would pose a more serious health hazard through surface and ground water contamination, risks to wildlife through the food chain, and a disastrous cumulative loading of heavy metals, PCB's, and dioxins in the soil, rendering it useless for future crop production.

As for the economic burden-will the Municipal League pay for the superfund cleanup of contaminated soil? Now, that cost will be an economic burden on the citizens, who will ultimately foot the bill. It seems we were misled in believing the propaganda Amendment Three (to the tune of 300 Million) was to update and upgrade municipal waste treatment plants and services relieving them of some economic burden. How many times and how many ways must we pay and still get dumped on?

Furthermore, during a comprehensive investigation last year in regard to a sewage sludge coomposting facility, it was determined through contact with various POTWs in Wasteshed B (the largest wasteshed in the state) none currently had a sewage sludge disposal problem, nor did they anticipate one. According to information provided by Clifton Browning, Manager of the Office of Water Resources, Division of Environmental Protection, the cost range for implementing an even higher funded sludge program only varied between .03¢ and .21¢ per household per year in a representative sampling of cities. Does this represent an economic burden? We say no!

Thus we are asking you to please consider these points when determining the acceptability of this 'Emergency Rule' change by the appointed (not elected) Director of the Division of Environmental Protection. We thank you for your time and attention to this letter.

Sincerely,

Board of Directors
Concerned Citizens of the Environment, Inc.

Pres.
Catherine Rodriguez
V. Pres
Richard L. Rodriguez
Sec.
Donna S. Hartley
Treas
Joann Brookover

Board of Directors, Concerned Citizens of the Environment, Inc.

Thomas W. Martin

David Bradshaw

Charles D. Clelland

Rose Chromchik

David Lee Jones

Carl E. Robison

Ms. Judy Cooper, Director
Administrative Law Division
Secretary of State Office
State Capitol
1900 Kanawha Blvd. East
Charleston, WV 25305

April 12, 1995

FILED
APR 14 9 46 AM '95
OFFICE OF SECRETARY OF STATE

Dear Ms. Cooper;

The purpose of this letter is to state opposition to the effort by Division of Environmental Protection Director, Mr. David Callaghan, to change 'Emergency Rule' 47 CSR 38D, circumventing the Legislative process, by removing the voice of the people of WV to democratically decide policy through our elected officials. Three times during the last weeks of the session, bills designed to lessen the heavy metal standards and remove certain wastes from the 'Solid Waste Law' were defeated by overwhelming objections from people around the state. These voices were heard by the duly elected Legislature and these bills died in committee. An appointed official should not have the power to eradicate laws which citizens fought so hard to establish through contact with the Legislature.

Last year while providing input to the DEP on these sludge regulations, our mistrust of the Division met with amazement by members of the agency. Well, I feel efforts like this provide justification for this feeling. As the Director was aware of disposal problems some Publicly Owned Treatment Works (POTWs) faced last December there is a question as to why this matter was not presented to the Legislature during the sixty day session, yet is being touted as an emergency just a few weeks later.

After reading his request for an emergency rule change, I find the same problem exists with this procedure as in the past. Namely promulgating laws without proper study and research It is contradictory for Director Callaghan to say the State developed the regulations without proper soil testing and scientific analysis, yet that is exactly what he proposes again by eliminating Table 3 without a comprehensive soil analysis on the various soil types in the state. The DEP needs research to develop standards compatible to soils with naturally occurring higher limits thus, ensuring protection for areas that fall outside that realm. They have the funding to develop a workable solution and they had years to do the job. Don't let them repeat mistakes of the past generating new problems by eliminating Table 3, leaving all our state open to dangerous exploitation.

If using economic burden is a motivation for the change, doesn't rehashing the same problem every year waste even more taxpayer money. As many POTWs have no trouble with the background limits, their cost is not a factor in the issue. In support of this, during a survey I conducted last year on POTWs in Wasteshed B, showing the amount of sludge they generate, how they dispose of it, and the cost, managers of all places surveyed said they had no problems dealing with sludge nor did they anticipate one.

Please consider these points when reviewing this 'Emergency Rule' request. Thank you for your time and attention to this letter.

Sincerely,

Donna S. Hartley

Mrs. Donna S. Hartley
Rt.2 Box 169A
Rivesville, WV 26588

WETZEL COUNTY SOLID WASTE AUTHORITY

200 North Street, Box 9, • New Martinsville, WV 26155 • Phone: (304) 455-5262

April 17, 1995

FILED
APR 17 4 09 PM '95
OFFICE OF WV SECRETARY OF STATE

The Honorable Ken Hechler
Secretary of State
Capitol Building
Charleston, WV 25305

Attention: Judy Cooper

Dear Ms. Cooper:

During its regular monthly meeting on April 6, 1995 the Wetzel County Solid Waste Authority moved to direct me to write a letter to your office protesting the emergency filing of title 47, Series 38D the Sewage Sludge Management Rules and Regulations.

The Wetzel County Solid Waste Authority is objecting to the emergency filing of this rule because it violates existing code and no emergency exists. WV Code 22-15-(b)(6) states "That no person be allowed to apply sewage sludge to land in a manner that will result in exceeding the maximum soil concentration for all pollutants, including, but not limited to, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium and zinc." The elimination of table 3 in the rule ignores this mandate and therefore violates WV code.

Furthermore, during the regular session of the 1995 West Virginia State Legislature, Senate Bill 528 was proposed to weaken sewage sludge standards. No emergency was found by the legislature and the bill was never taken up. Indeed by eliminating Table 3, the DEP ignores the findings of its own report issued in December that suggested only raising the legal limit of arsenic and nickel. The proposed emergency rule is as illegal as the emergency rule the DEP proposed in 1993. It is yet another attempt by Director Callaghan to circumvent the legislative process. Please deny the emergency rule of Title 47, Series 38D.

Sincerely,
Martha Huffman
Martha Huffman
Wetzel County SWA

Genevieve "Penny" McGill
Route 1, Box 73
Rivesville, WV 26588 Home Phone: (304) 278-7550

April 02, 1995

Judy Cooper
Director of Administrative Law Division
Secretary of State Office
Building 1, Suite 157-K
1900 Kanawha Blvd., East
Charleston, West Virginia 25305

Dear Ms. Cooper:

WHEN DOES "NO" MEAN "NO?" HOW MANY WAYS MUST WE SAY "NO" TO THE ILLEGAL SLUDGING OF WEST VIRGINIA BEFORE OUR REPRESENTATIVES IN CHARLESTON UNDERSTAND "NO" MEANS "NO?"

In the pursuit of justice, I am writing this letter to protest the Division of Environmental Protection's use of emergency rule; to circumvent the legislative process, to enact laws they could not otherwise achieve! This letter of protest is in response to the DEP proposed changes to State regulated hazardous substance. Published in the Times-West Virginian, Sunday, March 26, 1995 edition. The published change (emergency rules) eliminates limits on how much arsenic, mercury and similar hazardous materials that can be in sewage sludge dumped and how much can accumulate in the soil were sludge is dumped.

I do not have a problem and do not feel there is a problem with treatment plant storage or land-filling of West Virginia's sewage sludge caused by State Legislated Environmental Standards. I do not feel DEP implied increase of public sewage cost reflects/ justifies emergency rules and I question DEP motives for so-called emergency rule!

The public response, "NO," to lowering state sewage sludge regulations defeated three-Senate Bills (S.B. 528, S.B. 533, S.B. 539) February 20, 1995, sponsored by and died in the Department of Natural Resource Committee. By ignoring the public's outcry "NO" to lowering regulations, I feel the DEP emergency rules creates favoritism/financial gain for one group intent upon establishing West Virginia as a wholesale marketplace to dump their illegal sludge. Now we write to the Secretary of State Office, Director of Administrative Law Division, to echo "NO" to the illegal sludging of WV and trust that our demand for justice will be heard!

Genevieve "Penny" McGill
Route 1, Box 73
Rivesville, WV 26588 Home Phone: (304) 278-7550

It is my opinion the DEP proposed rules create an emergency by illegal sludging of West Virginia (contamination of ground water, wells, etc., cumulative loading of heavy metals in the soil rendering it useless for future crop use; adversely effecting plant and animal life; all of which, will ultimately contaminate the food chain!) I think the DEP created illegal sludge emergency will increase not decrease public sewage cost and will jeopardies the health and safety of West Virginia for generations to come!

I feel the only West Virginia Environmental Emergency is caused by those in defeat refusing to take "NO" for an answer, without legislative process, imposing their own laws upon the people of West Virginia!

In the name of justice, I condemn the DEP Emergency Rules as an abuse of power that weakens the very foundation of the office they have sworn to uphold; and as an act of betrayal of the people of West Virginia, for whom, their appointed office was entrusted by the Governor of West Virginia.

Sincerely,

Genevieve E. McGill

Genevieve McGill

cc: The Honorable Gaston Caperton
Governor of West Virginia

David Calaghan
Director, Division of Environmental Protection

April 17, 1995

From: Robert C. Bricker, Jr.
766 Weaver St.
Morgantown, WV 26505
(304) 296-4573 (H)
293-6258 (W)

To: Judy Cooper, Office of The Secretary of State of West Virginia
RE: Emergency Sewage Sludge Management Rule

To Whom it may Concern,

While reviewing DEP communications relative to the current situation limiting land application of sewage sludge, I have observed a general ignorance and lack of understanding on behalf of DEP personel concerning interaction of various elements in the complex media we refer to as soil. Soil is the primary environment at the earth's surface where microbial activity produces compounds necessary for plant growth. This activity is dependent upon an appropriate environment: adequate water, oxygen, and heat; abundant energy sources; a balanced supply of nutrients; proper soil reaction (pH); **balanced soil chemistry, and absense or immobilization of toxic elements.** Soils with such an appropriate environment are described as fertile; soils in which an imbalance occurs may only be marginally fertile at best. Keeping that knowledge in mind, please consider these comments in opposition to enactment of the emergency sewage sludge management rule proposed by WVDEP.

Sewage sludge has indeed been shown to be beneficial for plant growth when applied in moderate amounts. However, when sewage sludge is land-applied, the chemistry of the amended soil is permanently altered. Elements in the composition of the sludge compete with essential plant nutrients for absorption sites in the soil. Accumulation of any one or several of the 'heavy metals' referred to in DEP's reports, and Table 3 of the sludge regulations, has the potential to affect the long-term fertility of a soil.

The current exasperation displayed by DEP over the soil standards is the result of higher than normal concentrations of arsenic and nickel found in a few soils and limited to a relatively small area. Yet, DEP wishes to abolish all soil standards at this time. This is an entirely unreasonable request on their part. Maintaining stringent soil standards is vital to human health and soil fertility. At abnormally high concentration (quantity relative to respective element), arsenic, nickel, cadmium, copper, chromium, lead, mercury, molybdenum, selenium, and zinc (the regulated 'heavy metals') have each, individually, been found to adversely effect plant growth, and most are known to be toxic to plants, humans, and/or other animals. The degree of toxicity is relative to the concentration, and may be antagonized by the presence of other toxic elements. It is important to note that, as soil concentration of these elements increase, their mobility increases regardless of soil pH or soil organic matter content.

Comments concerning DEP memorandum from James Summers to Mike Zeto (12/8/94), and to Clifton Browning (1/11/95), which form the basis of the rational for DEP's request to enact the emergency rule:

* *Reference to CFR Part 503 (USEPA) regulations as establishing safe standards or loading limits for soils which far exceed those adopted by the WV Legislature.* At this time, USEPA is re-evaluating those regulations as the regulations are thought to be too lenient.

Mr. Summers contends that liming the soil, thereby increasing the pH, immobilizes the elements of concern.* This is only a **temporal condition. Microbial activities and chemical reactions associated with the land application of sewage sludge will cause the pH to decrease over a period of 2-3 years. Mineralization of sludge-born nitrogen, decomposition of sludge organic matter, and hydrolysis reactions associated with iron and aluminum hydroxides (which are relatively plentiful in sewage sludge) all produce acid. Over time the soils buffering capacity weathers and the elements of concern become mobile.

Mr. Summers states that sludge competes with soil for available metals.* This is **very unlikely to occur. Metals may be chelated by organic matter in sludge and in soil. Recent research has shown that soil organic matter has very little capacity to retain sludge-born metals. The metals in the sewage sludge are bound by the sludge organic matter. As that organic matter is decomposed, the sludge metals mobilize and are available for plant uptake. Long-term maintainence of soil pH is imperative for land to which sewage sludge is applied, but is not required by West Virginia law. This fact alone is sufficient to retain stringent soil standards for land to which sewage sludge may be applied, especially if the product grown on that land is in the human food chain.

Refers to background levels of elements found in soils as being 'naturally occurring'.* There is no scientific evidence presented to indicate the claim of naturally occurring. The concentration range of both arsenic and nickel that have been found in soil samples are, in fact, very unnatural for soils in West Virginia. Mr. Summers refers to concentration ranges reported in literature, and states that those concentrations far exceed West Virginia's soil standards established by regulation. The reference he uses is from a study on soils derived from all types of rock, i.e. igneous, metamorphic, and sedimentary. All of the soils in West Virginia, with the exception of the very extreme eastern tip (the Blue Ridge Mountains) are derived from sedimentary rock. Concentrations of the elements of concern are much lower in soils formed from sedimentary rock than in those formed on metamorphic or igneous rock, e.g., the **normal range for arsenic is 1-5 ppm, not 0.1-40 ppm referred to by Mr. Summers. Nickel concentrations ranging to 40 or 50 ppm, as in the data reported by DEP, *naturally* occur only in soils derived from ultra-mafic rock. **There are no such agricultural soils in West Virginia.**

The background levels of elements being observed in the soils reported include the naturally occurring concentrations **and** depositions originating from anthropogenic (human) activities. These activities include, but are not limited to application of fertilizers (arsenic, cadmium) and/or pesticides (arsenic, lead, chromium), production of fertilizers and pesticides

(same as for fertilizer application), land application of oil ash (nickel), land application of tannery sludge (chromium, manganese), primary metal production (arsenic, copper, chromium, lead, nickel, selenium, zinc), and burning of fossil fuel, especially **fuels containing iron sulfide** as well as other sulfide minerals(arsenic, copper, chromium, lead, nickel, selenium, zinc).

Of these sources mentioned, I would only rule out fertilizers. Most fertilizers used in WV are derived from sedimentary phosphatic rock which has relatively low concentrations of arsenic and/or cadmium. It may be possible to rule out pesticide application in some places. However, previous studies have shown orchard soils in the eastern panhandle to have extremely high concentrations of lead attributed to application of **lead-arsenate** pesticides before they were banned. As these pesticides were applied heavily and frequently, at times under windy conditions, it would not be unusual for soils in adjoining woodlots to have high concentrations of lead and arsenic. The same pesticides used on orchards were used on other agricultural crops as well before regulation by USEPA.

The data reported by DEP shows a strong relationship among elevated concentrations of arsenic and nickel, and lead concentrations over 20 ppm. A substance which would contain all of these elements at sufficient levels to effect soil concentrations is particulates produced by burning bituminous coal. It is possible that deposition of particulates, **prior to imposition of requirements of the Clean Air Act**, has caused increased soil concentrations of these elements. Traditionally, the Ohio River Valley and Kentucky have been primary centers for production of electricity from burning coal. This would have left a rather disperse regional effect reflected by moderately elevated concentrations in the soil of elements associated with sulfide minerals. As many local industries and institutions utilized coal as an energy source for heat, etc., a more localized effect may be noticed in diverse areas. Similarly, concentrations of heavy metals have been found to be elevated in soils near industrial sites related to primary metals production and/or processing.

There are some apparent anomalies in the data collected by DEP. The high concentration of chromium found in Jefferson County soils, and in one Mineral County soil, is very unnatural. The data suggests that 600-800 lbs. of chromium per acre occurs in these soils. **Chromium** concentrations that high indicate that **tannery sludge** may have been applied to the land at some previous time. In the past, there was at least one tannery in each of these areas. A soil in Grant County is high in nickel, but not arsenic. Application of phosphate to soil displaces arsenic from absorption sites. Is this an agricultural soil? Is it downwind from an old smokestack?

If DEP personel were qualified and performing their jobs in a professional manner, I would not be asking such questions. If persons taking soil samples would fill in the soil series name on the forms associated with the respective samples, the relationship of concentrations of certain elements to geologic parent material could be determined, as well as current land use. Quite simply stated, lack of organization and lack of will to perform basic scientific investigation (or to even incorporate scientific principle in daily activities) on DEP's part does not constitute a statewide emergency regarding the sewage sludge management regulations.

One of the most important points to be emphasized concerning this discussion about soil chemistry is that the fate of all elements added to soil and their reactions with the soil must be collectively considered. It is sheer fallacy to consider any one element without due consideration for the simultaneous fate of any and all other elements. Great care must be taken to not overwhelm a soil's ability absorb added pollutants, and thereby diminish its fertility. The purpose of the soil standards, as they were promulgated, was to assure the long-term fertility of soils to which sewage sludge would be applied, as well as to protect water quality and human health. The soils are important as sources of either feed or food. Farmers are dependent upon fertile soils for their livelihood. Fertile soil is a resource which we cannot live without. Therefore, it is a resource which we must sustain.

I hope that the Secretary of State, or his appointed representative, can facilitate an agreement among the parties concerned with this matter. The sewage sludge regulations approved by the legislature provide an incentive for sewage treatment works operators to incorporate effective pre-treatment programs in their operations, and to maintain productive soils where the sludge is land-applied. Certainly, the public-owned treatment works in Wood County need some form of relief to land-apply their sewage sludge. A compromise background soil concentration for arsenic and possibly nickel should be sought. In addition, the sewage sludge management program must be founded on traditional scientific principles and managed through application of accepted scientific methods. At the present time, I have found the program to be grossly lacking in professionalism and managed with a haphazard, even cavalier, attitude.

As for my personal qualifications to address this matter: (i) I received B.S. Agriculture, Plant and Soil Sciences (Soil Science), cum laude, from West Virginia University in December 1992; (ii) since completion of the undergraduate studies, I have been a Graduate Research Assistant in Agronomy (Soil Science) at WVU. The research I performed involved the land-application of sewage sludge for beneficial use.

Sincerely,

Robert C. Bricker, Jr.

Robert C Bricker, Jr.

Brooke County Solid Waste Authority

P.O. Box 50
Wellsburg, WV 26070
(304) 737-0780
FAX (304) 737-0781

April 11, 1995

Mr. Roger T. Hall
Division of Environmental Protection
Office of Water Resources &
Solid Waste Management
10 McJunkin Rd
Nitro, WV 25143

Re: Emergency Rule 47 CSR 38D
Sewage Sludge Management Rules

Dear Mr. Hall:

The Board of the Brooke County Solid Waste Authority at its March 28, 1995, regular meeting voted unanimously to advise the Department of Environmental Protection that weakening the sewage sludge management rules with the proposed amendment to the existing rule, 47 CSR 38D, is wrong. Therefore, please note of record the Brooke County Solid Waste Authority's opposition to the Emergency Rule filed on March 29, 1995, under the Notices of March 20.

West Virginia industry has been forced to reduce their fugitive emissions of heavy metals into our environment for obviously good reason. This proposed amendment will allow these same heavy metals to be land applied at a greater rate than is now permitted and will thus result in a leaching into the West Virginia water table, streams and rivers at an increased rate and create a need for more expensive water purification equipment. The purported "fact" that many native soils already naturally exceed the existing Table 3 standards is certainly no reason to increasingly add to those levels. If the Division of Environmental Protection is truly committed to the proper management of our water resources, it should not be a proponent of increasing the risks to those resources and neither the Division nor anyone else should advocate permitting these increased risks to occur indirectly when industry and others are not permitted to introduce these hazards directly.

The existing Solid Waste Management Regulations already condone the disposal of out of state garbage in West Virginia. This proposed amendment will open the door further for out of state sewage sludge to be brought to West Virginia and add to the potential contamination of our resources. If, as the Division states, "collection and analysis of such data will require several

months", obviously there has not yet been any analysis made of the impact of loosening the land application restrictions on the environmental aspects of West Virginia citizens and it cannot be seen how, in good conscience, the Division can assert that "the emergency rules have no affect on the rights of private property owners" -- notwithstanding any other considerations, there must be a potential affect on those large number of persons utilizing private water wells.

While land application of sewage sludge may be a good thing, too much of a good thing is harmful. Moderation is acceptable but excess is morally and legally unacceptable and, without a full analysis of the long-term risks to our resources and the health of our citizens, the State of West Virginia must no longer be a party to any contamination process. And this is true even on a short term basis for far too often have we all experienced the extreme difficulty in having a regulation or standard changed once it has been put into effect.

The Board notes that the same proposal as sought by this "Emergency Rule" was placed before the Legislature and, dispite apparent concerted effects by its proponents, the legislation was not acted upon. Again, this seems to be an effort to do indirectly through the appointive state officials what the proponents were unable to accomplish directly through the elected legislators which is not the manner by which we believe our systems of government is meant to work.

We are also reminded that the original Solid Waste Management Regulations as submitted on July 8, 1993, contained references to the Federal Rules, 40 CFR, Part 503, but that the existing Regulations filed after what is recalled to have been extensive comment on and withdrawal of the first proposed Regulation, then incorporated a provision "That in instances where similar provisions exist, the more stringent requirements (state or federal) shall apply." (47 SCR 38D - 3.1) It is apparent everyone previously had the benefit of Table 3 now sought to be eliminated and Part 503 for comparative purposes and, after due deliberation, chose to utilize Table 3. Now it seems that the results of that deliberation are sought to immediately reversed simply by the purported "emergency" rule process.

All in all, this proposed amendment shows on its face a lack of concern by the Division of Environmental Protection about the long term risks and, in the view of the Brooke County Solid Waste Authority, it is ill-advised. It is therefore requested that it be withdrawn by the Division and/or rejected by the Secretary of State.

Very truly yours,

Silvio Paesani

Silvio Paesani, Chairman
Brooke County Solid Waste Authority

cc: Honorable Gaston Caperton
Governor of the State of West Virginia
State Capital Building
Charleston, WV 25305

Honorable Ken Hechler
Secretary of State
Suite 157k
State Capital Building
Charleston, WV 25305

West Virginia Legislature
Legislative Rule Making Review Committee
Room M 152
State Capital Blg
Charleston, WV 25305

David C. Callahan, Commissioner
Bureau of Environment
10 McJunkin Rd
Nitro, WV 25343-2506

Darrell McGraw, Attorney General
Office of the Attorney General
State of West Virginia
State Capital Bldg
Charleston, WV 25305

Max Robertson
Division of Enviromental
Protection
1356 Hansford, Str
Charleston, WV 25301

Lisa Dooley
WV Municipal League
1620 Kanawha Blvd., East
Charleston, WV 25311

WV House of Delegates
Attn: House Clerk
Room 212 Main Bldg Complex
Capital Bldg 1
Charleston, WV 25305

WV Senate
Attn: Senate Clerk
Room 211 Main Bldg Complex
Capital Bldg 1
Charleston, WV 25305

April 11, 1995
Tom Degen
HC 75 Box 324
Chloe, WV 25235

Judy Cooper
Secretary of State's Office
Bldg 1, Suite 157K
1900 Kanawha Blvd. East
Charleston, WV 25305

Dear Ms. Cooper,

On March 20, 1995 the Offices of Water Resources and Solid Waste of the Division of Environmental Protection filed an emergency amendment to the Title 47 Series 38D Sewage Sludge Management Rule. I am writing this letter to request that the secretary of state disapprove this emergency amendment. I am aware that §29A-3-15a specifies the conditions under which the secretary of state can disapprove an emergency rule or amendment, therefore I have grouped my comments according to those criteria.

The agency has exceeded the scope of its statutory authority in promulgating the emergency amendment.

The Sewage sludge management act states in §22-15-20(b)(6):

> "That no person or entity be allowed to apply sewage sludge to land in a manner that will result in exceeding the maximum soil concentration for all pollutants, including, but not limited to, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium and zinc;"

Although the rule does contain this language in section 3.2.2., the means to implement this requirement is removed when Table 3, and all references to Table 3, are removed. Without some numbers to define "maximum soil concentration", the provision cannot be implemented. The Federal 503 rule does not address concentrations of metals *in soil*, only in sludge, so the incorporation of the 503 rule into the 47CSR38D rule does not implement the requirement of §22-15-20(b)(6) either.

If the agency feels that the numbers in the table need to be changed, that is one matter, but only the legislature can *remove* the requirement of §22-15-20(b)(6). As a point of fact, this matter was brought before the legislature this past session in the form of a bill, and the legislature chose *not* to act on it. It is clear that the agency is exceeding the scope of statutory authority in this attempt to disable the provision of §22-15-20(b)(6) by removing the table that implements it.

An emergency does not exist justifying the promulgation of the amendment to the rule.

The language of §22-15-20(b)(6) reflects the concern that the West Virginia Legislature has for soil as a valuable resource. The Federal 503 rule regulates the concentrations of pollutants in *sewage sludge*, but does not have any provisions to check concentrations of these pollutants in *the soil itself* either before, during or after sludge application. This is a significant omission, because it is not yet proven that the pollution concentrations allowed under the 503 rule are environmentally and agriculturally safe. "Chief among the pitfalls of sludge application to agricultural lands is the long-term effects of trace contaminants on the soil and groundwater. There is a general scarcity of scientific research on the long-term (20 years +) effects of trace metals. . ." (Mazzocchi). "The USEPA-503 heavy metal loading limits . . . have not been reached . . . in field experiments, and it remains to be proven that they are safe. The important question that needs an answer before the USEPA limits can be considered environmentally and agriculturally acceptable is: What happens to toxic metals over the very long-term following the cessation of sludge application?" (McBride). That this is a concern of the legislature is not surprising, it is shared by many, from soil scientists and farmers, to lending institutions and governments. Many other nations, provinces and states have adopted standards that are more stringent than those in the 503 rule (Connett)(McBride). The New York State Assembly introduced a bill that stated, in part: ". . . no septage, sewage sludge, . . . shall be applied upon land used in agricultural production . . ." (New York). New Jersey food processors will not process vegetable or animal products produced on land that has ever received applications of waste products (Blew). Del Monte Corporation has banned the use of sludge on any land used for growing its food crops (Babish, et al). The Farm Credit Bank of Springfield has concluded that ". . . the bank would not recommend the application of sewage sludge on agricultural land mortgaged to Farm Credit without proper contractual indemnification underwritten by a financially responsible party." (Farm Credit Bank).

The West Virginia Legislature has acted to protect its soils by requiring, among other things, that maximum *soil* concentrations for pollutants are not exceeded. The fact that there are soils in West Virginia that exceed these concentrations does indeed raise questions, the most significant of which may be "why are these concentrations present, how did these soils get these concentrations?" The DEP study by James Summers falls far short of proving that these are "naturally occurring levels". With all due respect to Mr. Summers, such a study should utilize the expertise of a much wider range of disciplines and perspectives than the offices of water resources and waste management can provide. Soil scientists, toxicologists, plant scientists, the department of agriculture, farmers, environmental groups, representatives from the financial community, the Soil Conservation Service, the US Economic and Geologic Survey, as well as the waste management community, should all be involved in determining if we already have soil health problems. If a thorough study of West Virginia soils shows that we do have soil health problems, then increasing the amount of pollutants that we allow to be land applied in sewage sludge will only exacerbate the problem. It is interesting to note that the agency currently has, and has had, an

arrangement with WVU Extension whereby an Extension Specialist for Sludge, currently one Mr. Ray Lovejoy, develops the land application loading rates and provides assistance with the soil analyses, testing, etc. This tremendous resource was apparently not utilized in this attempt to show that an emergency exists.

Regardless of the reason why the metal levels are high in the samples the agency obtained, the agency has not established that an emergency exists. Publicly Owned Treatment Works (POTW's), or any other entity, are not prohibited or prevented from properly managing sewage sludge, there are options available to them besides land applying sludge to soils that have high metal contents. The agency mentions two of these options, landfilling and composting on site, in the one-page Factors Constituting an Emergency that it filed with the amendment. A third option that comes to mind quite readily is simply land applying sewage sludge to soils that are not excessively high in metals. Since there are approved alternatives available to the POTWs, it can hardly be claimed that there is an immediate threat to the public peace, health, safety or welfare.

I have obtained, through the office of the Environmental Advocate, some material that the agency used to arrive at its conclusion that there is an emergency. The material is confusing, in that it is stated that ". . . at least 28 counties in West Virginia . . ." have been affected. It is further stated that approximately 60,000 tons of sludge is generated in these 28 counties and that at $30 to $40 per ton, it would cost between $1.8 and 2.4 million to dispose of that sludge in landfills. Nowhere in the material are the 28 counties named. Soil sample results are given for only eleven counties, and a list of 24 counties is given elsewhere. Working with such inconsistent information is difficult at best, but if one uses the figure of $1.8 and $2.4 million to dispose of 60,000 tons of sludge, and divides it by the population for the 24 counties that are listed (using 1990 census figures as presented in the West Virginia Solid Waste Management Plan prepared by the Solid Waste Management Board), the figure of $2.35 to $3.13 per person is arrived at. Assuming 2.5 people per household (a figure typical for WV), one arrives at a cost per household per year of between $5.88 and $7.83. It should be noted that there are four counties worth of population not figured into this equation since four of the 28 counties that produce the 60,000 tons of sludge are not named. It would perhaps be more accurate to use one half the state population, since 28 is roughly one half of the 55 counties in West Virginia. In that case, the cost per household would be between $5.03 and $6.70 per year, or between $.42 and $.56 per month. This hardly amounts to "substantial harm to the public interest", one of the three factors mentioned in §29A-3-15(f) as constituting an emergency. The agency has also not mentioned which of these counties may have already been landfilling sludge anyway, in which case there would be no additional cost to continue the practice.

The claim is made in Factors Constituting an Emergency that composting sludge ". . . poses an ever-present potential for health risks." This claim is utterly spurious, the 503 rule that is incorporated into this very rule lists composting as one of the several acceptable Processes to Further Reduce Pathogens that can be used to produce Class A sludge. It is ludicrous for the agency to claim that a process that its

own rule specifically lists as a means to make sewage sludge safe is "an ever present health risk".

It is further claimed that composting is an "expansive" process. I have to assume that this is a typographical error, and what is meant is "expensive". While in-vessel composting can be quite expensive, static pile or open windrow composting is technologically quite simple. In fact, static pile and open windrow composting may well be two of the least expensive methods mentioned in the rule. At any rate, the agency has presented no data to show that composting is more expensive than any other approved method of treating sewage sludge, or that it is expensive to the point of causing "substantial harm to the pubic interest."

For these reasons, I respectfully request that the secretary of state disapprove the emergency amendment to 47CSR38D Sewage Sludge Management Rule. I appreciate your attention to this matter.

Sincerely,

Tom Degen, member
Board of Directors
WV Environmental Council

Worksheet

	County	1990 pop.
1.	Brooke Co.	26,992
2.	Tyler Co.	9,796
3.	Wood Co.	86,915
4.	Jackson Co.	25,938
5.	Mason Co.	25,178
6.	Putnam Co.	42,835
7.	Wayne Co.	41,636
8.	McDowell Co.	35,233
9.	Wyoming Co.	28,990
10.	Raleigh Co.	76,819
11.	Mercer Co.	64,980
12.	Summers Co.	14,204
13.	Monroe Co.	12,406
14.	Greenbrier Co.	34,693
15.	Pocohantas Co.	9,008
16.	Lewis Co.	17,223
17.	Monongalia Co.	75,509
18.	Preston Co.	29,037
19.	Grant Co.	10,428
20.	Hardy Co.	10,977
21.	Mineral Co.	26,697
22.	Morgan Co.	12,128
23.	Taylor Co.	15,144
24.	Jefferson Co.	35,926
TOTAL		768,692

method # 1

$1,800,000 divided by 768,692 persons equals $2.35 per person. $2.35 multiplied by 2.5 persons per household equals $5.88 per household.

$2,400,000 divided by 768,692 persons equals $3.13 per person. $3.13 multiplied by 2.5 persons per household equals $7.83 per household.

method # 2

1,793,477 persons divided by 2 equals 896,738.5 persons, rounded up to 896,739 persons.

$1,800,000 divided by 896,739 persons equals $2.01 per person. $2.01 multiplied by 2.5 persons per household equals $5.03 per household. $5.03 divided by 12 months equals $ .42 per month.

$2,400,000 divided by 896,739 persons equals $2.68 per person. $2.68 multiplied by 2.5 persons per household equals $6.70 per household. $6.70 divided by 12 months equals $ .56 per month.

References

Mazzocchi, Susan. Editorial in Composting Frontiers. Volume II, Issue 1, Autumn 1993.

McBride, M.B. Environmental Issues, Toxic Metal Accumulation from Agricultural Use of Sludge: Are USEPA Regulations Protective? Journal of Environmental Quality, 24:5-18, 1995.

Connett, Dr. Paul. Waste Not #241. July 1993.

New York. State of New York 6171, 1993-1994 Regular Session, In Assembly, March 18, 1993.

Blew, R. Denny. Interview with R. Denny Blew. Composting Frontiers. Volume II, Issue 1, Autumn 1993.

Babish, J.G.; Lisk, D.J.; Stoewsand, G.S.; Wilkinson, C. Organic Toxicants and Pathogens in Sewage Sludge and Their Environmental Effects. Special Report No. 42. Subcommittee on Organics in Sludge of Cornell University's College of Agriculture and Life Sciences. December 1981.

Farm Credit Bank of Springfield. Background Statement, The Position of the Springfield Farm Credit Bank on the Application of Sewage Sludge to Agricultural Land. Composting Frontiers. Volume II, Issue 1, Autumn 1993.

Solid Waste Management Board. West Virginia Solid Waste Management Plan. January, 1994.

Herbert L. Heiss
RD 1 Box 148
New Martinsville
WV 26155
March 27,1995
304-455-3668

Secretary of State
Capitol Bldg.
Charleston WV 25305

Dear Mr.Hechler: re sewage sludge regulations

The enclosed letter to the editor of the Gazette is enclosed for your information,although it is so long I doubt it will be published.

Many of us consider you to be one of the few within the administration who are genuinely concerned about protecting the rights of WV residents.Is there any way you can use your influence(or authority) to end this travesty?How many times is Callaghan going to be allowed to disregard the desires of of the people?And by what authority?What real emergency exists THIS time,if any?

People like Callaghan cause the average citizen to lose confidence in state government.

Respectfully,

Herbert L. Heiss

Editor:

Once upon a time the czar and czarina of sludge decided to impose their "emergency sludge regulations" upon the peasants.Learned seers warned of dire consequences,and there was much unrest in the land.After a tumultuous time the czarina was deposed,satisfactory regulations were decreed and the populace rejoiced in the belief that they could live happily ever after.Alas,this was not to be.

When SB 288 was finally enacted (to legislate control of solid waste in WV) in 1993,the DEP was ordered to propose regulations controlling the disposal of sewage sludge within the state.DEP director Callaghan together with deputy director Ann Spaner concocted a proposal that was clearly not in conformance with the intent of SB 288 but favored commercial interests that were(are) influential within the DEP.The public outcry by environmentally concerned citizens caused the Sec.of State to reject these and order that a revision be presented.The first revision was not much better,as was indicated during a public hearing about July,1993.Finally an acceptable second revision was adopted,and all hoped that was the end of the matter.

During the recent legislative session the DEP prevailed upon a few misguided senators to propose a bill to undo what had been accomplished in 1993.This bill attracted so much negative attention that it was quietly shelved,and it died.

Now the sludge czar has the gall to once again disregard the long-term welfare of WV,and has ordered ANOTHER public hearing April 14 to yet again attempt to weaken our safeguards.Why is this being done?Gov.Caperton,why do you condone this outrageous behavior?

One of the stipulated reasons is that many WV cities produce sludge that is too contaminated to meet current requirements for land application.Instead of whining about their plight,these municipalities should demonstrate more environmental responsibilty and take care of the root problem.Since it is unlikely that residential sewage would create the contaminent heavy metals,the cities should exert more control over what industries are allowed to dump into the sewers.I know of one municipality that is even allowing a large landfill to dump its leachate into the municipal sewers in order to save the dump the cost of building a leachate treatment plant.

Another (unspoken) excuse probably involves parties interested in profiting from importing out-of-state sludge.We should have learned by now that the well-publicized restriction on "interfering with interstate commerce" will once again be invoked.Any relaxation of controls to supposedly benefit WV municipalities will be seized upon to allow the importation of sewage sludge so contaminated as to prohibit its disposal within the originating state. Rest assured that the amount of WV sludge affected by relaxed standards will be vastly exceeded by imported sludge.

Those concerned should write the DEP,the Governor,and appear at the April 14 hearing at the DEP headquarters in Nitro.

H.L.Heiss
RD 1
New Martinsville

March 30, 1995

Ms. Judy Cooper
Director of Administraive Law Division
Secretary of State
State Capitol
1900 Kanawka Blvd. E.
Charleston, WV 25305

Ms. Cooper:

I am writing this letter in the anticipated action by the Division of Environmental Protection (DEP) in raising the limits of the heavy metals to be land applied in sludge. I am thoroughly opposed to this action.

As a senior citizen I hope to enjoy my retirement years free from fear. But now I fear the contaminted water I may be exposed to because of this proposed change in the sewage sludge regulations. Last year I was involved with the Concerned Citizens of the Environment that lobbied and educated the legislators on this issue. Hopefully my efforts were not in vain.

I am once again fighting for my right to live in a clean and healthy environment.

Sincerely,

Rose Chromchik

Rose Chromchik

March 31, 1995

Ms. Judy Cooper
Director of Administrative Law Division
Secretary of State
State Capitol
1900 Kanawka Blvd E.
Charleston, WV 25305

Ms. Cooper:

I am writing this letter because of an article in the Times-West Virginian Newspaper on March 26, 1995. The article stated the DEP wants to raise limits of heavy metals to be land applied in sludge. I am opposed to this action by the DEP.

Having just recently returned to West Virginia to live, I am anxious to enjoy the varied wildlife and the natural beauty the state has to offer. I have purchased a small piece of land and watch wild turkey and deer graze on the hillside. I fear raising the limits of heavy metals will not only endanger the wildlife but also the people who eat the wild game.

Also, I am writing my legislatorss to inquire as to why this issue was not brought before them. The legislatorss were voted into office; Mr. Callahan was appointed by the Governor.

Sincerely,

Raymond Rodriguez

FILED

WEST VIRGINIA MUNICIPAL LEAGUE

MAYORS VILLAGE
SUITE 1B
1620 KANAWHA BOULEVARD, EAST
CHARLESTON, WEST VIRGINIA 25311
(304) 342-5564
1-800-344-7702

APR 17 12 00 PM '95

OFFICE OF WEST VIRGINIA
SECRETARY OF STATE

PRESS RELEASE

APRIL 17, 1995 CONTACT: LISA DOOLEY

"Municipal citizens will be paying millions of dollars this year in an unnecessary, unfunded mandate if the Secretary of State does not sign emergency rules and regulations now before him," said Lisa Dooley, Executive Director of the WV Municipal League.

Filed by the Department of Environmental Protection on March 20, 1995, the request seeks to amend the regulations contained in Chapter 22 of the WV Code, specifically Table 3, dealing with land application of biosolids (sewage sludge). The amended rules, if signed by the Secretary of State, will align the standards to Federal EPA regulations. The issue will then go before the Legislature during its regular session in 1996.

The Table in question was formulated without the benefit of scientific studies or testing. As written, native soils in WV naturally exceed the limits. At the April 14 public hearing, municipal officials from across the state supported the Department of Environmental Protection's filing of the request for emergency rules. Lisa Dooley stated that the only thing Table 3 provides is proof that WV soil is an environmental hazard, occurring from an Act of God. "Be assured," she said, "municipalities do not want to see weaker regulations, they want to comply with regulations which were implemented by the Federal Government after more than sixteen years of scientific evaluations and testing." When WV has completed scientific studies, and the findings render the necessity of such stringent rules, cities will diligently comply.

Mayors and city officials represent the same constituents who are demanding that belts be tightened at every level of government. This a typical tax increase disguised in this unnecessary unfunded mandate. If municipalities are forced to eliminate fertilizing farmland with the biosolids, landfilling will be the only alternative. Not only will the life of the WV landfills be shortened, the estimated costs will vault from the current $60,000.00 annually, to over $2.4 million dollars.

"The emergency is we just don't have the money," said Mayor Eddie Bassit of St. Albans and Treasurer of the WV Municipal League. "With municipal budgets stretched to their limits, our only choice will be to increase rates or cut essential services. We can't control our local budgets if the state continually writes checks we can't cover," he said.

W.V. Secretary of State

FILED

Comments on emergency sludge Rule change

Fax 304-558-0900

APR 17 12:00 PM '95

OFFICE OF WEST VIRGINIA SECRETARY OF STATE

In reviewing the report by DEP inspector Summers that preceded the proposed emergency Rule change in sewage sludge land application rates, I cannot see that the DEP has substantiated the need for or the emergency nature of the proposed change.

One of the primary tenants of the change is that background or "naturally" occurring levels of certain metals in soil, especially arsenic, are higher than expected. This should be a crisis in itself. Acceptable levels of metals in soil have been established in prior regulations. The fact that some areas already exceed these levels only reinforces the need for controls. These levels were assumed to be naturally occurring because pesticide,

herbicide or sludge use were ruled out by DEP staff. In my own county, Hardy, the only listed samples were from fields owned by a local poultry processor. However, were those levels naturally occurring? Since arsenic is a common feed additive in poultry production and where elevated soil arsenic levels have been a problem in other poultry areas, perhaps these results are from poultry waste disposal. Are there other counties out there that just might defy the background level theory? Throwing out maximums certainly assumes the degradation of our soils with these toxic and carcinogenic substances and is yet another attempt to throw safety and

good sense out the window. It is time the DEP stops caving in to short term special interests and realizes they are trying to mortgage our future with too much sludge.

Margaret C. James Dum
Resource Alliance
HC 67 Box 27aa
Mathews, WV 24812
304-897-6048
(MARGARET C JAMES DUM)

The Senate of West Virginia
Charleston

TONY E. WHITLOW
RR 3 Box 157
PRINCETON, 24740

COMMITTEES:
AGRICULTURE (CHAIRPERSON)
EDUCATION
ENERGY, INDUSTRY AND MINING
FINANCE
INTERSTATE COOPERATION
NATURAL RESOURCES

MAR 31, 1995

FILED
APR 11 9 25 AM '95
OFFICE OF WEST VIRGINIA SECRETARY OF STATE

Judy Cooper
SECRETARY OF STATES OFFICE
STATE CAPITOL BUILDING
CHARLESTON, WVA 25305

RE: DEP EMERGENCY RULE
REGARDING SEWER SLUDGE
MANAGEMENT

DEAR MS. COOPER:

IT IS MY UNDERSTANDING YOU HAVE AN EMERGENCY RULE PERTAINING TO TABLE 3 OF SEWER SLUDGE MANAGEMENT FROM THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

THIS EMERGENCY RULE SHOULD BE ACCEPTED. IT IS, IN MY OPINION IN COMPLIANCE WITH AGREED TO CHANGES LEFT OUT OF PRIOR LEGISLATION. ADDITIONALLY IT WILL ASSIST MUNICIPALITIES BY ALLOWING SOME LAND APPLICATION AT A MUCH LOWER COST THAN LANDFILL DISPOSAL.

YOUR FAVORABLE CONSIDERATION IS REQUESTED.

Tony E. Whitlow

Post-it® Fax Note 7672

To KEN Heckler
Company Sec. of State.
Location
Fax # 304-558-0900 Telephone #
Comments

No. of Pages 1 Today's Date 4-12-95 Time 12:50
From Senator Leonard Anderson
Company
Location Dept Charge
Fax # 466-0601 Telephone # 466-1800 Ext 361
Original Disposition: ☐ Destroy ☐ Return ☐ Call for pickup

FILED
APR 12 | 30 PM '95
OFFICE OF WEST VIRGINIA
SECRETARY OF STATE

April 11, 1995

The Honorable Ken Hechler
Secretary of State
State of West Virginia
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, West Virginia 25305-0770

Dear Mr. Secretary:

Please consider the emergency rules concerning the use of sewage sludge for land application. This is a widespread problem in the state of West Virginia.

I wholeheartedly support this Sewage Sludge Management Rule.

Sincerely,

Leonard W Anderson

Senator Leonard Anderson

OFFICE OF THE MAYOR

MAYOR
EUGENE A. KNOTTS

CITY OF PARKERSBURG
ONE GOVERNMENT SQUARE
P.O. BOX 1627
PARKERSBURG, W. VA. 26102
304-424-8420

March 29, 1995

The Honorable Ken Hechler
Secretary of State
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, West Virginia 25305-0770

Dear Mr. Secretary:

On March 20, 1995, the West Virginia Department of Environmental Protection filed with your office a proposed amendment of Legislative Rule 47 CSR 38D. Purpose of the filing is to remove Table 3 from the existing rule and to adopt appropriate provisions of 40 CFR 503 federal regulations regarding land application of sludge.

Parkersburg has for eight years applied sewage sludge to land in the area. Enforcement of Table 3 in 47 CSR 38D would require us to cease this program. Our only option at this point would be disposal of our sludge at a landfill. Assuming the landfill would accept 4,200 tons per year of sludge from us, Parkersburg would incur an additional $143,000 per year in landfill costs.

Like most communities, we diligently try to keep the cost of public services as reasonable as possible. Land application of sludge is the most cost-effective and useful means of dealing with sewage sludge. recycling of these "Biosolids" makes much more sense than burial in a landfill, especially when one considers the high cost and limited quantity of landfill space available.

Additional time is needed to help the State Legislature understand the unintended adverse impact of Table 3. On behalf of the City of Parkersburg, I wish to express my complete support of the Sewage Sludge Management Rule amendment filed with your office March 20, 1995, and I urge you to sign the amendment in your capacity as Secretary of State.

Sincerely,

Eugene A. Knotts, Mayor
City of Parkersburg

EAK/aof

The Sanitary Board City of Parkersburg

125 NINETEENTH STREET • PARKERSBURG, WV 26101 • (304) 424-8535

March 30, 1995

FILED
MAR 31 2 42 PM '95
OFFICE OF WEST VIRGINIA SECRETARY OF STATE

The Honorable Ken Hechler
Secretary of State
State of West Virginia
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, WV 25305-0770

Dear Mr. Secretary:

I urge that you sign the Amendment of Emergency Legislative Rule 47 CSR 38D, which was filed in your office March 20, 1995.

As proposed, the amendment would remove Table 3 from the existing rule, and would adopt the provisions of 40 CFR 503 Federal regulations pertaining to land application of sludge. It is most necessary that this action be taken. The maximum allowable concentrations of various metals in soil as defined in Table 3 are well below those levels which exist naturally in many parts of West Virginia. In its present form, Rule 47 CSR 38D needlessly prohibits the land application of sewage sludge in many parts of West Virginia.

40 CFR 503 regulations were adopted by the Federal government after extensive review, comment and participation by a wide variety of skilled people throughout the country. Among other things, the Federal regulations have taken into account existing (background) levels of metals in soils. This was addressed in the Federal loading rates and concentrations, which were adopted by the State. However, Table 3 in the State regulation was <u>not</u> based upon background levels and thus defeats the purpose of the Federal regulation.

The impact of Table 3 is to say that the soil in large portions of West Virginia is too "dirty" to permit the application of sewage sludge. This even includes forests, which have not been farmed for decades (if at all), and which are in some of the most remote portions of the state.

The net result of Table 3 is as follows:

1. Distrust of "government" by landowners who know the history of their soil and resent being told that they have "excessive" amounts of metals in their land.

2. Needless and significant additional expense imposed upon citizens throughout the state.

3. A tremendous waste of beneficial organic matter which can and is being used to improve the quality of land in the state, some of which would not otherwise be productive.

Again, please sign the Amendment of Emergency Legislative Rule 47 CSR 38D, and allow us additional time to help members of the Legislature understand the adverse impact of Table 3.

Sincerely,

Clarence Cox, Jr.

Clarence Cox, Jr.
Superintendent

cc: Mayor and Board Members
Joe Brown, Attorney
State Senators
State Delegates

The Sanitary Board City of Parkersburg

125 NINETEENTH STREET • PARKERSBURG, WV 26101 • (304) 424-8535

March 30, 1995

FILED
MAR 31 2 42 PM '95
OFFICE OF SECRETARY OF STATE

The Honorable Ken Hechler
Secretary of State
State of West Virginia
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, West Virginia 25305-0770

Dear Mr. Secretary:

A proposed amendment of existing Emergency Legislative Rule 47 CSR 38D was filed in your office March 20, 1995. Its purpose is to remove Table 3 (maximum allowable soil concentrations) from the existing rule, and adopt appropriate provisions of 40 CFR 503 regulations.

In reality, Table 3 in the existing rule effectively prohibits Parkersburg and local landowners from receiving the benefits of land application of municipal wastewater sludge. Through years of sampling and testing its sludge, Parkersburg has confirmed that it has a consistent and most suitable product to increase the nutrient level of soils and increase crop production. Parkersburg's land application program for sludge has operated successfully for 8 years, enriching and improving 700 acres of soil in the Parkersburg area.

Totally inappropriate restrictions in Table 3 will require landowners to purchase fertilizer, lime and other soil enrichment products at an approximate cost of $50 per acre to achieve results comparable to sludge application. At current landfill rates, Parkersburg will have to pay $143,000 per year in landfill costs that otherwise would not be incurred. Possibly the greatest long-term cost is that valuable landfill space will be wasted for a product already proven throughout this country and Europe to be beneficial for the enrichment of soil and improvement of soil productivity.

I wish to express total support of this proposed amendment, and I encourage that you sign the amendment in your capacity as Secretary of State.

Sincerely,

Wayne Boone

Wayne Boone, Plant Supervisor
PARKERSBURG SANITARY BOARD

cc: Mayor and Board Members
Joseph Brown, Board Attorney
State Senators
State Delegates

CITY OF BECKLEY

DRAWER AJ BECKLEY, WEST VIRGINIA 25802-2832

Phone 304/256-1750

EMMETT S. PUGH III
Mayor

March 21, 1995

The Honorable Ken Hechler
Secretary of State
State of West Virginia
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, West Virginia 25305-0770

Dear Mr. Secretary:

On March 20, 1995, the Department of Environmental Protection filed emergency rules concerning the use of sewage sludge in land applications.

It is my understanding that DEP is asking to delete Table 3 (Maximum Loading Rates) and replace that table with the Federal 503 Regulations.

The City of Beckley wholeheartedly supports this change and would ask that you sign the emergency rules in your capacity as Secretary of State.

The City of Beckley currently land applies sewage sludge on several farms in our area. If we were forced to use landfill disposal, our costs would dramatically increase due to the tipping fees. Also, we would incur approximately $750,000 in capital costs to properly dewater the sludge before it could be landfilled.

Implementation of these emergency rules will allow municipalities time to educate the legislature and, hopefully, amend the statute.

I hope you can support our position.

Best regards.

Sincerely,

Emmett S. Pugh III

MAYOR
CITY OF BECKLEY

ESP:llc
cc: State Senators
State Delegates

FILED

THE SANITARY BOARD OF BLUEFIELD

OFFICE NUMBER
304-325-3681

P.O. BOX 998
BLUEFIELD, WEST VIRGINIA 24701

MAR 28 10 17 AM '95

FAX NUMBER
304-325-6838

March 30, 1995

OFFICE OF WEST VIRGINIA
SECRETARY OF STATE

Honorable Ken Heckler
Secretary of State
State of West Virginia
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, West Virginia 25305-0770

RE: DEP Emergency Rule regarding Sewage Sludge Management.

Dear Mr. Secretary:

During the 1994 West Virginia State Legislative session a law was passed setting forth rules and regulations for the disposal of sewage sludge as it pertains to municipal wastewater treatment facilities. After much discussion it was thought by municipalities and public service districts that a happy medium had been reached as it pertains to the pollutant concentrations present in the soil and the method of assessing fees for the land application of sludge. To the astonishment of the municipalities and public service districts the bill was passed in its original form, with no reference to the agreed upon changes.

After six months of testing land application sites, tests revealed there were no available land applications sites that could meet the stringent pollutant concentration levels set forth in table three of the West Virginia sewage sludge regulations for the land application of municipal sludge.

The current state regulations prohibit land application of sludge in Mercer County, due to the natural metal concentration present in the soil being higher than the limits set fourth in table three. The City of Bluefield will be forced to dispose of its sludge in the Mercer County Landfill at a cost of $168,000.00 per year, verses a land application cost of only $6,000.00 per year. This would amount to a six percent increase in the Sanitary Board of Bluefield's operating budget. This difference in cost will have to be borne by our customers along with the customers of all of the sanitary districts through out the state.

Along with the financial burden placed on the state's sewer utilities, this regulation denies farmers access to a valuable fertilizer and soil conditioner, at no cost to the farmers, and will consume needed space in the states landfills.

There are those who will argue that the limits set forth in table three of the West Virginia sludge regulations are in fact

similar to those listed in part 503 of the U.S. Environmental Protection Agency regulations. While there are similar limits set forth in 503, they apply to the total accumulative sludge loadings per hectare not merely a milligram per kilogram concentration on existing soils as set forth in the West Virginia regulations. Table Three is not a limit placed on the sludge produced by the state's treatment facilities but an unrealistic an unattainable limit placed on the soils of this state.

The treatment of wastewater has become a highly technical and complicated process, the making of rules and regulations governing this process should be left up to those with the expertise and qualifications in this field. If the legislature so sees fit to adopt rules and regulations more stringent than those in part 503 of the U.S. Environmental Protection Agency regulations, the legislature should seek the advise of the professionals at West Virginia University for guidance in this matter.

In the mean time it is recommended that the state legislature direct the West Virginia State Division of Environmental Protection to adhere to part 503 of the U. S. Environmental Protection Agency regulations, until such time as the professionals at West Virginia University can provide the legislature with a viable alternative.

Please consider this emergency rule as being a help to the citizens of West Virginia.

If you have any questions concerning this matter or if you wish to discuss this matter in greater detail, please do not hesitate to contact me at your convenience.

Sincerely,

R. Terry Honaker
Executive Director

RTH/rld

City of St. Albans

P. O. BOX 1488 • ST. ALBANS, WEST VIRGINIA 25177

MAYOR
A. Eddie Bassitt
80 Olde Main Plaza

Telephone Numbers:
Mayor's Office...(304) 727-2971
City Hall 722-3391
Police & Fire Depts. 727-2251
Building Department ...727-2962
Manager's Office 727-2971
Parks & Recreation...722-4625
Sanitation Pick-Up ...72-CLEAN
Street Department ...722-4259

March 27, 1995

The Honorable Ken Hechler
Secretary of State
State of West Virginia
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, WV 25305-0770

Dear Mr. ~~Hechler~~ Ken:

On March 20, 1995, the Department of Environmental Protection Agency filed emergency rules concerning the use of sewage sludge in land use applications.

It is my understanding that DEPA is asking to delete Table 3 (Maximum Loading Rates) and replace that table with the Federal 503 Regulations. The City of St. Albans wholeheartedly supports this change and would ask that you sign the emergency rules in your capacity as Secretary of State as soon as possible.

The City of St. Albans currently land applies sewage sludge on several farms in our area. If we were forced to use landfill disposal, our costs would dramatically increase due to the tipping fees. Also, we would incur approximately $750,000 in capital costs to properly dewater the sludge before it could be landfilled.

Implementation of these emergency rules will allow municipalities time to educate the legislature and, hopefully, amend the statute.

I know you can support our position, since you have always been for the people of West Virginia.

Best regards.

Sincerely,

A. Eddie Bassitt

Mayor A. Eddie Bassitt
City of St. Albans

AEB/blc

CITY OF LEWISBURG

National Register Historic District

P.O. Box 548 • 119 W. Washington Street • Lewisburg, West Virginia 24901-0548
304/645-2080 • Fax 304/645-2194

April 4, 1995

Division of Environmental Protection
Office of Water Resources & Solid Waste Management
ATTN: Roger T. Hall
#10 McJunkin Road
Nitro, WV 25143

WRITTEN COMMENTS TO
SEWER SLUDGE MANAGEMENT RULE
TITLE NUMBER 47

The City of Lewisburg supports the emergency rule.

While cost is very important we also support the emergency rule because we believe that sludge disposal in the active surface soil layer is more environmentally wise than is burial in a landfill.

Disposal regulations should account for existing soil parameters. Restrictions need to be founded on sound scientific evidence. We believe that using the Federal 503 regulations as proposed is a wise emergency step and should be implemented as soon as possible.

Sincerely,

James R. Matheny
Mayor

JRM/bys

cc: Secretary of State

CITY OF WELLSBURG

CITY HALL
WELLSBURG, WV 26070
(304) 737-2104

March 28, 1995

The Honorable Ken Hechler
Secretary of State
State of West Virginia
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, WV 25305-0770

Dear Mr. Hechler,

On March 20, 1995, the Department of Environmental Protection filed emergency rules concerning the use of sewage sludge in land applications.

It is the City's understanding that DEP is asking to delete Table 3 (Maximum Loading Rates) and replace that table with the Federal 503 Regulations.

The City of Wellsburg supports this proposed change and would ask that your office sign the emergency rules when allowable.

The City of Wellsburg currently land applies sewage sludge on a farm in our area. If we were forced to use landfill disposal, our costs would dramatically increase due to the tipping fees. Also, the City would incur approximately $40,000 in capital costs to properly dispose the sludge before it could be landfilled.

The City of Wellsburg Combined Water and Sanitary Board appreciates your support in this matter.

Sincerely,

Mark S. Baldwin
City Manager

MSB/dlf

cc: State Senators
State Delegates

HOUSE OF DELEGATES
WEST VIRGINIA LEGISLATURE
BUILDING 1, ROOM E-210
1900 KANAWHA BLVD., EAST
CHARLESTON, WV 25305-0470
PHONE (304) 340-3121

March 30, 1995

ROY E. GIVENS
251 HILLCREST DRIVE
WELLSBURG, WV 26070
PHONE (304) 737-3635

Committees:
Constitutional Revision
Government Organization
Political Subdivisions

The Honorable Ken Hechler
Secretary of State
State of West Virginia
Building 1, Suite 157K
1900 Kanawha Boulevard, East
Charleston, West Virginia 25305-0770

Dear Ken:

I understand that the Department of Environmental Protection has filed emergency rules that would delete Table 3 (Maximum Loading Rates) and replace that table with the Federal Table 503 Regulations. This concerns the use of sewage sludge in land applications.

This is to inform you that I support this change and ask your approval of these emergency rules.

Best personal regards!

Sincerely,

Roy

Roy E. Givens
Delegate , 2nd District

prefers interim mail, April through December, at home address

WEST VIRGINIA MUNICIPAL LEAGUE

MAYORS VILLAGE
SUITE 1B
1620 KANAWHA BOULEVARD, EAST
CHARLESTON, WEST VIRGINIA 25311
(304) 342-5564
1-800-344-7702

March 27, 1995

The Honorable Ken Hechler
Secretary of State
State of West Virginia
Building 1, Suite 157-K
1900 Kanawha Boulevard, East
Charleston, WV 25305-0770

Dear Mr. Secretary:

The WV Municipal League supports the emergency rules filed by the Division of Environmental Protection concerning the State Regulations for the use and disposal of municipal wastewater sludge in 47 CSR 38D.

The current language in the law and the limits in the regulations (Table 3) have prohibited land application in over 28 counties in West Virginia (where soils data have been collected). We suspect, as data is collected, many more counties will naturally exceed the current limits. If land application is prohibited, citizens will be forced to pay for landfilling this sludge at an estimated $1.8 to $2.4 million dollars in tipping fees.

You are aware of many of the problems facing Municipalities because local problems are trying to be resolved with a blanket, state wide one-size-fits-all solution. This is a prime example of one of these so called solutions. Municipalities across the state are being forced to comply with regulations more stringent than even the federal regulations.

We ask you to sign the emergency rules in order to allow time for the DEP to complete the soils data collections; moreover, to assure the citizens of this State that scientific data is being used in the established levels for long term environmental protection.

Sincerely,

Lisa Dooley

Lisa Dooley
Executive Director

HOUSE OF DELEGATES
WEST VIRGINIA LEGISLATURE
BUILDING 1, ROOM M-212
1900 KANAWHA BLVD., EAST
CHARLESTON, WV 25305-0470
PHONE (304) 340-3200

April 11, 1995

LARRY A. LINCH–Vice Chairman
LEGISLATIVE RULE-MAKING REVIEW
609 BROADWAY
BRIDGEPORT, WV 26330
PHONE (304) 842-5431

Committees:
Agriculture & Natural Resources
Constitutional Revision
Judiciary

FILED
APR 11 3 41 PM '95
OFFICE OF WEST VIRGINIA SECRETARY OF STATE

The Honorable Ken Hechler
Secretary of State
State Capitol
Charleston, W. Va. 25305

Re: Sewage Sludge Management Emergency Rules

Dear Mr. Hechler:

It is my understanding that the DEP has submitted to your office emergency rules pertaining to sewer sludge management regulations.

I believe that this is an attempt by the DEP to circumvent the statutory requirement of W.Va. code 22-15-20. The division asserts in its statement of circumstances attached to the emergency rule that table three does not contain soil conversation data which is based on sound technical and scientific data. The division goes on to say that it will take several months to collect such data and their solution to this problem is to remove all regulations during this intrim.

i believe that this is not only statutorily prohibited but also not in the best interest of the general public. Obviously the Department of Environmental Protection is attempting through an emergency rule to negate the intent of the full Legislature.

Therefore, I respectfully request that you deny the Division of Environmental Protection's request to promulgate the emergency rule relating to Sewage Sludge Management Regulations.

Sincerely,

Larry A. Linch
Delegate

LAL/jmm

protect interim mail, April through December, at home address

HOUSE OF DELEGATES
WEST VIRGINIA LEGISLATURE
BUILDING 1, ROOM M-212
1900 KANAWHA BLVD., EAST
CHARLESTON, WV 25305-0470
PHONE (304) 340-3200

April 11, 1995

LARRY A. LINCH–Vice Chairman
LEGISLATIVE RULE-MAKING REVIEW
609 BROADWAY
BRIDGEPORT, WV 26330
PHONE (304) 842-5431

Committees:
Agriculture & Natural Resources
Constitutional Revision
Judiciary

FILED
APR 13 10 41 AM '95
OFFICE OF WEST VIRGINIA SECRETARY OF STATE

The Honorable Ken Hechler
Secretary of State
State Capitol
Charleston, W. Va. 25305

Re: Sewage Sludge Management Emergency Rules

Dear Mr. Hechler:

It is my understanding that the DEP has submitted to your office emergency rules pertaining to sewer sludge management regulations.

I believe that this is an attempt by the DEP to circumvent the statutory requirement of W.Va. code 22-15-20. The division asserts in its statement of circumstances attached to the emergency rule that table three does not contain soil conversation data which is based on sound technical and scientific data. The division goes on to say that it will take several months to collect such data and their solution to this problem is to remove all regulations during this intrim.

I believe that this is not only statutorily prohibited but also not in the best interest of the general public. Obviously the Department of Environmental Protection is attempting through an emergency rule to negate the intent of the full Legislature.

Therefore, I respectfully request that you deny the Division of Environmental Protection's request to promulgate the emergency rule relating to Sewage Sludge Management Regulations.

Sincerely,

Larry A. Linch
Delegate

LAL/jam

prefers interim mail, April through December, at home address

KEN HECHLER
Secretary of State

MARY P. RATLIFF
Deputy Secretary of State

A. RENEE COE
Deputy Secretary of State

CATHERINE FREROTTE
Executive Assistant

Telephone: (304) 558-6000
Corporations: (304) 558-8000

STATE OF WEST VIRGINIA

SECRETARY OF STATE

Building 1, Suite 157-K
1900 Kanawha Blvd., East
Charleston, WV 25305-0770

WILLIAM H. HARRINGTON
Chief of Staff

JUDY COOPER
Director, Administrative Law

DONALD R. WILKES
Director, Corporations

(Plus all the volunteer help we can get)

FAX: (304) 558-0900

April 4, 1995

Mr. Roger Hall
10 McJunkin Road
Nitro, WV 25143-2506

Dear Roger:

I have been reviewing Title 47-38D, "Sewage Sludge Management" rules that you submitted as an emergency rule on March 20, 1995, and I need some additional documentation.

In your "Factors Constituting an Emergency" you say "it has been determined through scientific sampling and analysis that many native soils throughout the state exhibit naturally-occurring levels of metals which exceed the standards established in Table 3." May we have a copy of this report and a copy of the actual analysis.

In the same notice, you said that because POTW's were not well trained or prepared to implement the additional sewage sludge that extra cost would be passed along to the public in the form of higher sewage and water bills. On what basis do you establish this? What was the cost prior to 47-38D becoming effective? Will this extra cost have to go before the PSC before being passed along to the consumer?

When the Legislative Rule Making Committee approved as modified this rule on January 12, 1994, Table 3 was added to the original filing along with other changes. Would you please submit the explanation which was used at that time to approve/disapprove this table?

Said did not support bill Next paragraph says different

What rationalization did you use when you presented this issue to the 1995 Legislature in SB 528, which died in committee, to try to get this Table removed? Please send us a copy of your history for this also.

No Info Are you aware of any out of state companies that are waiting for a chance to bring their sewage sludge and dispose of it in West Virginia? If so, who are they? When? What kind of sludge? etc.

I need this as soon as possible, no later that April 10, 1995. Thank you for your help in this matter.

558-5905
faxed to Clifton Browning
4/5/95

Sincerely,

Judy Cooper

Judy Cooper, Director
Administrative Law Division

Letters to OEP - Dec 1994 - Why wasn't this presented to the 1995 Leg?

Wendy Radcliff 4/6/95
called asking
about E.R. "how
we determine
procedural rules"

April 10, 1995

Ms. Judy Cooper
Director of Administrative Law Division
Secretary of State, State Capitol
1900 Kanawha Blvd. E,
Charleston, WV 25305

Dear Ms. Cooper:

David Callaghan, director of the Division of Environmental Protection (DEP) has proposed changing the sewage sludge regulations, Rule 47 CSR 38D.

He wants to raise the limits of heavy metals that can be land-applied in this State. He waited until after the legislative session was over before saying there was a perceived emergency.

This is a matter that should be brought before elected officials and not left to an official appointed by the governor.

We do not want the democratic process thwarted by such maneuvers, nor do we want to lose our voice in government!

One person should not be allowed to make detrimental decisions concerning sewage sludge regulations.

A bill was introduced during the last legislative session that would have weakened the sewage sludge regulations. Because of citizens opposition to the bill, it died in committee.

Mr. Callahan should not be allowed to circumvent the legislative process.

Sincerely,

Joseph D. Haldeman
Irene O. Haldeman

Irene Haldeman
Joseph D. Haldeman

Grant Town, WV
April 11, 1995

Dear Ms. Cooper,

Decisions that severely affect our environment must not be made by appointed officials.

Any ruling dealing with sewage sludge regulations must be made by the people who live in this state.

Only through the legislative system can our representatives voice our wishes.

Do not allow any changes to be made in Rule 47 CSR 38D outside of the legislative system.

Yours truly

(Mrs.) Ruth B. Polar
PO Box 13
Grant Town WV 26574

DIVISION OF ENVIRONMENTAL PROTECTION
10 McJunkin Road
Nitro, WV 25143-2506

GASTON CAPERTON
GOVERNOR

DAVID C. CALLAGHAN
DIRECTOR

April 6, 1995

FILED
APR 10 4 24 PM '95
OFFICE OF WEST VIRGINIA SECRETARY OF STATE

Ms. Judy Cooper, Director
Administrative Law Division
Secretary of State's Office
Building 1, Suite 157-K
1900 Kanawha Boulevard, East
Charleston, West Virginia 25305-0770

RE: Emergency Rule - CSR 37-38D

Dear Ms. Cooper:

In response to your letter dated April 4, 1995, we offer the following information:

1. Enclosed is the report compiled by our Division of Environmental Protection field inspectors depicting the results of the soils analyses from soils collected by our Office and Municipalities throughout the State. Copies of specific soil analyses conducted by the Office of Water Resources laboratory are also included.

2. Discontinuing land application of sewage sludge which would ultimately be the result of not approving the Emergency Rule would require that in-state municipal Publicly Owned Treatment Works (POTW's) send their sludge to landfills (at tipping fee costs ranging from $28 per ton to $40 per ton). Also, the POTW's treatment facilities are not able to meet the twenty percent (20%) solids requirement needed to landfill their sludge and would have to add bulking material (sawdust, wood chips, hay, straw, etc.) to meet this requirement, also adding to treatment and disposal costs. The POTW's will in all likelihood follow required procedures before the Public Service Commission to obtain the rate hikes necessary to cover these costs.

3. Table 3 was added to 47-38D during the 1994 Legislative Session. While the Division felt that cumulative loading rates, which would include background soil concentrations, was the best and most accurate method to carry out the intent of the sludge law, certain legislators involved in the review and approval of the regulations felt that additional protection was needed. During the negotiation process and at the will of the

Legislature, Table 3 was created based in part on a formula appearing in federal regulations at 40 CFR 503.13(c), using relatively minimal documentation and scientific support.

(4) Senate Bill 528 as introduced would have the effect of repealing the current rule on land application of sewage sludge and would have incorporated by reference the federal regulations. The agency (DEP) did not support this bill, but did develop a proposed amendment to the bill in the event it saw action (see attachment). The standards set forth in Table 3 of this rule is more stringent than federal law, a concept which the Legislature outlawed in 1994 (W.Va. Code 22-1-3a) without supporting technical and scientific evidence.

(4) Part of the rationale for the agency's position on Senate Bill 528 was that the Division has effectively managed a non-regulatory sludge program in conjunction with the permitting program (NPDES) governing disposal of sewage sludge by the POTW's of the state for seven (7) years with no environmental problems at all. In further support of this position, groundwater data collected by the Office of Water Resources and other agencies, crop production statistics, and surface water data indicate that while existing soils with high metals are occurring naturally, they are not having a negative impact in those areas.

(5) The agency has no documentation regarding out-of-state entities which are awaiting the opportunity to deposit sewage sludge in West Virginia. The part of the rule which addresses out-of-state sewage sludge remains in the emergency rule. All sewage, whether in state or out of state, must be tested and regulated by the agency. It is only the soil criteria for land application which is affected by the emergency rule.

If you need any additional information, do not hesitate to contact Mr. Clifton Browning of my staff at (304)558-2108, or by TDD at (304)558-2751.

Sincerely,

Roger T. Hall
Special Assistant to Director

RTH;CB:cc

cc: Mark Scott, Chief, OWR
Clifton Browning, OWR
James Summers, EE

COMMITTEE SUBSTITUTE

THE COMMITTEE ON NATURAL RESOURCES

THE 1995 REGULAR SESSION OF THE LEGISLATURE OF WEST VIRGINIA

SENATE BILL 528

On page three, beginning at line thirteen:

1. Reinstate the language which has been stricken through, and delete the underscored language.

2. After the word "zinc" at the end of the first sentence of paragraph (6) insert the proviso "provided, That, The director may, until the first day of July, one thousand nine hundred ninety seven , issue permits for the land application of sewage sludge notwithstanding the aforementioned maximum soil concentrations. During the interim time period the division of environmental protection will conduct studies to determine background soil concentrations in various soils, and evaluate the maximum soil concentration values established pursuant to this subsection."

Rationale: Experience by the Division of Environmental Protection has revealed that some soils in their natural state exhibit concentration values above the maximum established by regulation pursuant to subsection (a) of this section. Therefore it may be inappropriate to enforce the current standards until more is known about variability of concentration among different soil types. This proviso will allow two years for technically qualified staff and/or academic associates to evaluate the standards.

PASSED

REJECTED

DEPARTMENT OF COMMERCE, LABOR & ENVIRONMENTAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
1356 Hansford Street
Charleston, WV 25301-1401

Gaston Caperton
Governor
John M. Ranson
Cabinet Secretary

David C. Callaghan
Director
Ann A. Spaner
Deputy Director

December 9, 1994

MEMORANDUM TO: Max Robertson, Chief OWM
Mark Scott, Chief, OWR

RE: Changes Needed In Sludge Regulations

Attached is a report compiled by Inspector James Summers on the need to change some of the maximum allowable soil concentrations set by the sludge regulations. Background levels of heavy metals in the soil were apparently not considered when the values of the limits were calculated. Limits for arsenic and nickel were set below the average naturally occurring soil concentrations.

Necessary steps should be taken to initiate changes in the regulations. Adequate interim measures need to be implemented. Lack of action from DEP may ultimately result in environmental harm caused by lower quality effluent from wastewater treatment plants and illegal disposal of septage.

If you have any questions or need any assistance please contact me or James Summers at 558-2497.

Michael A. Zeto
Chief Inspector
Environmental Enforcement

JPS

Attachments

cc: Eli McCoy, Deputy Director
Dick Cooke, OWM
Clifton Browning, OWR
James Summers, EE

DEPARTMENT OF COMMERCE, LABOR & ENVIRONMENTAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
1356 Hansford Street
Charleston, WV 25301-1401

Gaston Caperton
Governor
John M. Ranson
Cabinet Secretary

David C. Callaghan
Director
Ann A. Spaner
Deputy Director

December 8, 1994

MEMORANDUM TO: Mike Zeto, Chief Inspector

RE: Soil Limits for Heavy Metals

Attached is my report on heavy metals in soil at sewage sludge land application sites. The main point of the report is that background levels were not considered when the soil limits were set in the sludge regulations. This is causing unnecessary problems for many POTW's throughout the state. The report proposes changes in the regulations and interim measures to be taken by DEP.

I have also pointed out problems with analytical procedures and the accuracy of low level results reported by contract laboratories.

James Summers
Environmental Inspector,
Environmental Enforcement

Background

All facilities which land apply sewage sludge in the State have taken (or are taking) soil samples for heavy metals at sites currently in use and sites planned for future sludge application. This is one of the requirements of the WV sludge management regulations effective June 1994.

The legislature set "maximum allowable soil concentrations" for ten heavy metals. The regulations state that "no person or entity shall be allowed to apply sewage sludge to land in a manner that will result in exceeding the maximum soil concentration for ..." these ten metals, and that "the director shall assign an individual and lifetime loading rate for each land application site by considering background soil concentrations and maximum allowable pollutant concentrations" in the sludge and soil.

A surprising number of soil samples have turned up higher than the limits set by law, with arsenic being the most common problem. Many of the sites with high values have never had sewage sludge applied to them.

Wood County Survey

The arsenic problem first came to light in Wood county with Parkersburg and Williamstown reporting concentrations in soil ranging from 6 to 27 mg/kg; the regulatory limit is 5.7 mg/kg. These results were from individual samples taken at 44 different farms spread over most of Wood county. All 44 had high arsenic.

From the beginning, the problem did not appear to be related to land application of sludge. Many of the farms had never had sludge on them and arsenic had not been detected in the sludge. Two explanations seemed possible. Either the arsenic was naturally occurring or it was a residual from past use of pesticides or herbicides.

On October 4-5, 1994 five farms were selectively sampled. Arsenic levels obtained by DEP ranged from 4.2 to 14.6 mg/kg. Of the 14 samples collected, the two highest values (11.7 and 14.6 mg/kg) came from the woodlands adjacent to or near the farms being sampled. No sludge had been applied in these areas and there is little chance of pesticide or herbicide usage.

Samples were collected in areas where sludge had been applied on only part of the field. There was little difference in metals concentrations in sludge application areas compared to unused areas. Results tended to be slightly lower for several parameters in the area where sludge had been applied. This may be due to an increase in the soil's cation exchange capacity caused by the sludge.

Results also seemed to vary with soil type. One farm field was sampled which had two very distinct soil types. The arsenic level in the clay soil was 10.4 mg/kg, while the level in the sandy soil was 4.7 mg/kg. No sludge had ever been applied to this field.

TCLP (Toxicity Characteristic Leaching Procedure) tests were ran on four of the soil samples. Total arsenic values on these soils was 8-12 mg/kg. The TCLP tests did not detect any leaching in these samples.

With 44 out of 44 farms effected county wide, no significant difference in metals concentrations between where sludge has been applied and where it has not, the highest metals concentrations found in non-agricultural areas, and no leaching of metals detected, the Wood county results seem to rule out sludge or pesticide application as the source of the arsenic.

State Wide

After the first report of high arsenic in Wood county, results began to come in from other areas in the state and more samples were taken by DEP. High values have been reported for arsenic, nickel, lead, selenium, chromium, and cadmium. High values have been obtained from Wyoming to Wood to Monongalia to Jefferson counties. Arsenic and nickel are the biggest problems.

The DEP results listed below come from 25 soil samples obtained from seven counties. I am still awaiting sample results from several other locations, but do not expect the results to change significantly. Literature values cited are from "Modern Methods of Trace Element Analysis", "Trace Elements in Soil", "Applied Trace Elements", and The Journal of Environmental Quality.

	Regulatory	DEP Results		Literature	
Parameter	Limit	Avg.	Range	Avg.	Range
Arsenic	**5.7**	**8.5**	**2.2-16.7**	**5-6**	**0.1-40**
Cadmium	1.4	0.5	0.1-5	0.2	0.1-1.1
Chromium	140.0	52	<25-170	100	0.1-4000
Copper	140.0	22	15-60	30	0.1-250
Lead	35.0	24	10-43	20	0.1-2000
Mercury	2.0	0.13	<0.2-0.3	0.1	.01-0.5
Molybdenum	2.5	0.9	<0.5-1.4	2	0.1-24
Nickel	**28.0**	**33**	**<20-55**	**40**	**1-5000**
Selenium	5.0	0.8	<1-4.3	0.2	0.1-40
Zinc	350.0	80	30-120	50	0.1-900

All results in ppm (mg/kg).

As can be seen from this data, average concentrations of naturally occurring arsenic and nickel are greater than the maximum limit set in the sludge regulations. Other metals will have occasional naturally occurring concentrations which exceed the regulatory limit.

The logical answer here seems to be, first, raising the limits for arsenic and nickel. Also, a regulatory provision should be made for cases where naturally occurring levels of other metals exceed the maximum limit. Annual monitoring of the soil could be performed to ensure that no significant increase (<10%) over background levels occurs. A TCLP test could be ran at the time of permit renewal for that site; this is every five years.

Current Approach

It is obvious that naturally occurring (background) levels were not a factor in establishing the values for the maximum allowable soil concentrations (MASC) in the WV sludge regulations. All of the MASC values listed in the regulations, with the exception of mercury, are calculated by dividing the maximum concentration of a given metal allowed in the sludge by 7.2. The 7.2 factor apparently came from a calculation using a projected loading rate and the resulting soil concentrations. Toxicity or naturally occurring levels were apparently not considered.

If the MASC is exceeded for a given parameter, DEP is allowing the land application site to continue to be used only if the concentration of that parameter in the sludge is below the minimum detection limit in the sludge. For example, if the background soil sample is high in arsenic, the site may still be used as long as the sludge analyses show "not detected" for arsenic.

While this gives some relief, it makes little sense as a long term solution. Parkersburg, for example, may land apply as long as arsenic is not detected in the sludge. However, if the next sludge sample shows arsenic increasing from <0.1 ppm to 0.11 ppm, the city would be forced to go to a landfill and pay hundreds of thousands of dollars in landfill costs, even though continued land application would result in a total addition of less than an ounce/acre over a 100 year period at liberal application rates. No negative environmental impact would be result. (Another problem with this approach is variation between laboratories on what is considered "not detected." This problem is described in the next section.)

In addition to landfill costs, some municipalities are having trouble finding landfills to take sludge and may end with a round trip several hours long. The sludge must also be 20% solids to be landfilled. Many of the new plants are

designed with vacuum drying beds, which are typically achieving 12-15% solids. Additional handling to mix in a bulking agent would be needed. All of this will result in less sludge being wasted from the treatment plant, which will lead to poorer effluent quality. Degradation of water quality will be the final outcome, unless DEP takes steps to resolve the problem.

Land application of septage is subject to similar problems. Rather than hauling septage for 50 miles to an acceptable land application site or POTW, they are more likely to dump over the hill, in a creek, or down a manhole.

Laboratory Methods

The lower limit ("non-detectable") values reported vary from laboratory to laboratory, depending on which analytical method is used. The AA furnace method usually has the lowest detection limits. To further complicate the reporting of lower limit values, some laboratories report down to the method detection limit (MDL), while others report to the minimum quantification limit (MQL). For example, a "non-detectable" value for molybdenum is reported by one laboratory as <5 ppm (MQL), another reports <1.7 ppm, and another reports <0.64 ppm (MDL). The regulatory limit for molybdenum in soil is 2.5 ppm.

EPA guidance documents suggest analytical methods from SW-846 ("Test Methods for Evaluating Solid Waste") for sludge analysis. All samples for metals analysis must be digested by SW-846 Method 3050 and then analyzed by AA furnace, AA direct aspiration, or ICP (except mercury which is analyzed by AA cold vapor). Each metal has a different method number for each of the three analytical techniques.

This has resulted in some confusion when contract laboratories list different analytical methods on their report sheets. Some list the digestion method number, others list the method numbers for each particular metal analysis, and some labs are listing method numbers related to water analysis methods.

The DEP-OWR laboratory results listed above are from water analytical methods taken from EPA's "Methods of Chemical Analysis of Water and Wastes." The water method and SW-846 method differ in the digestion procedure. The SW-846 is a more aggressive and lengthier digestion which involves the addition of nitric acid and peroxide, refluxing with acid, and hydrochloric acid may also be added. After digestion the procedures are essentially the same. It is generally agreed among the laboratory analysts whom I talked with that the SW-846 method would be expected to yield higher results than the water digestion method. OWR plans to begin using SW-846 methods in the very near future.

Summary and Recommended Changes

1. The "high" background metal values are not due to sludge application or pesticide usage.

2. No leaching of metals was detected in the soil samples.

3. Background levels were not accounted for when deriving the soil limits in Table 3 of the sludge regulations.

4. The arsenic and nickel soil limits should be raised to account for naturally occurring levels.

5. DEP should consider a regulatory provision to allow sludge application at sites which exceed the soil limits by requiring annual monitoring with no significant increase over background levels at these sites.

6. If possible, DEP should adopt the previous two points as policy until necessary corrections are made in the regulations.

7. If these changes are not made, I believe more environmental harm will result from lack of sludge wasting from treatment facilities and improper septage disposal.

8. Permits issued by DEP should require that all metals analysis be performed in accordance with SW-846 methodology.

9. The DEP-OWR laboratory will also use SW-846 methodology.

10. Contract laboratories performing sludge and soil analyses should be notified of accepted analytical methods and necessary lower detection limits.

POTENTIAL IMPACT OF CURRENT LANGUAGE IN SLUDGE LAW

Land application of sewage sludge has been recognized by the federal government and the State of West Virginia as a viable disposal/reuse option which is environmentally sound and beneficial. The current statute includes a provision intended to limit long term accumulation of certain metals in those soils receiving sludge amendments. During the last year as municipalities have collected the information necessary to begin implementing the law, soils samples in many West Virginia counties indicate that natural levels for several metals exceed the targets established by the regulations. Those targets were not scientifically defensible, but at the time, it was determined that safeguards be developed and that target levels in soils be established for long term environmental protection.

While that concern is still valid, the current language in the law and the limits in the regulations have in effect prohibited land application in at least 28 counties in West Virginia where soils data have been collected. (See attached map) In those counties, facilities will not be allowed to land apply sludge. Municipalities will be forced to dispose of their sludge in landfills, if landfills are available to accept it. The difference in cost between land application and landfill disposal in those counties will be borne by the municipality and the citizens. Approximately 60,000 tons of sludge is generated by the municipalities in these counties. At $30 to $40 per ton it would cost them between $1.8 and $2.4 million to dispose of this sludge in landfills. Land application fees for that same sludge would cost $60,000.

Municipalities must have access to environmentally acceptable and economically achievable disposal options. Without such options, sludges may end up in streams or in areas where significant environmental harm may occur.

In order for the current sludge management activities related to land application of sewage sludge to continue effectively and with minimal impact to the environment, the statute must be amended.

Clifton

DEPARTMENT OF COMMERCE, LABOR & ENVIRONMENTAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
1356 Hansford Street
Charleston, WV 25301-1401

Gaston Caperton
Governor

John M. Ranson
Cabinet Secretary

David C. Callaghan
Director

Ann A. Spaner
Deputy Director

January 11, 1995

MEMORANDUM TO: Clifton Browning

RE: Toxicity of Arsenic and Nickel

The following is a review of information contained in EPA's "Technical Support Document for Land Application of Sewage Sludge". The risk assessment done by EPA evaluated 14 different pathways of concern for entry of pollutants into the environment and human body. Safe concentrations for each pollutant were developed for each entry pathway. Federal limits were set by using the value from the most limiting pathway.

In the case of arsenic the most limiting pathway of concern was direct ingestion of sewage sludge by a small child. The risk assessment assumed that a child between the ages of 1 and 6 would ingest sewage sludge from storage piles or soil surface for a period of five years. The rate of ingestion was 0.2 g sludge/day (equals 6 grams/month). It was assumed that the sludge is not diluted with soil when exposure occurs.

The arsenic limit arrived at by this method is 41 mg/kg, which is also listed as the State limit in sludge for land application. The next highest value for arsenic was 930 mg/kg; this is for an entry pathway of human ingestion of plants grown in a home garden that has been treated with sludge.

Note that our State soil limit for arsenic (5.7 mg/kg) is set seven times lower than the level that the EPA risk assessment concluded to be protective of children ingesting soil/sludge.

The federal limit for nickel is based on the most limiting pathway being plant uptake of nickel causing toxicity to the plant itself. Plant toxicity is indicated by slowed growth or significant reduction in crop yield, not necessarily killing the plant.

Relative to plant uptake of heavy metals, Federal limits are based on assessment of data from a variety of soil pH's. Forty percent of the studies used by EPA used soils with a pH less than 6.0, with some pH values as low as 4.5. Therefore, the EPA limits based on plant uptake are quite conservative

for application in West Virginia, as our State regulations adopted minimum soil pH requirements (pH>6.2). Maintaining a higher soil pH will significantly reduce plant uptake of heavy metals. In fact, the EPA assessment states that in these studies, "increasing the pH completely corrected phytotoxicity."

There is also research showing that some sludges which are low in metals content can actually reduce the plant uptake rate of heavy metals from the soil. This is due to the sludge "competing" with the soil for the available metals.

James P. Summers
Environmental Inspector
Environmental Enforcement

TABLE 5.4-1

AGRICULTURAL RESULTS FOR INORGANIC POLLUTANTS

Pathways

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pollutant	RPc	RPc	RSC	RPc	RSC	RPc	RSC	RPc	RPc	RPc	RPc	RPc	RPc	RPc
Arsenic	6700	930	41			1600	3100				400	66000		1200
Cadmium	610	120	39	6400	68000	140	650			53	8000	63000		unlimited
Chromium			79000				190000	3000			5000	unlimited		12000
Copper			10000			3700	2000	1500	2900			unlimited		unlimited
Lead			300			11000	1200			5000	10000	unlimited		unlimited
Mercury	180	370	17	4000	24000						10000	1100		unlimited
Molybdenum			400			18	530							
Nickel	63000	10000	820			1800	5400	420			3000	unlimited		13000
Selenium	14000	1200	100	15000	13000	790	130							
Zinc	16000	3600	16000	530000	2200000	12000	36000	2800						

Note: All results rounded down to two significant figures

RPc = reference cumulative application rate of pollutant (kg-pollutant/ha)

RSC = reference concentration of pollutant in sewage sludge (µg-pollutant/g-sewage sludge DW)

TABLE 5.2.1-1

ENVIRONMENTAL PATHWAYS OF CONCERN
IDENTIFIED FOR APPLICATION OF SEWAGE SLUDGE TO AGRICULTURAL LAND

Pathway	Description of HEI (Highly Exposed Individual)
1. Sewage Sludge→Soil→Plant→Human	Human ingesting plants grown in sewage sludge-amended soil.
2. Sewage Sludge→Soil→Plant→Human	Residential home gardener.
3. Sewage Sludge→Human	Children ingesting sewage sludge.
4. Sewage Sludge→Soil→Plant→ Animal→Human	Farm households producing a major portion of the animal products they consume. It is assumed that the animals eat plants grown in soil amended with sewage sludge.
5. Sewage Sludge→Soil→Animal→ Human	Farm households consuming livestock that ingest sewage sludge while grazing.
6. Sewage Sludge→Soil→Plant→ Animal	Livestock ingesting crops grown on sewage sludge-amended soil.
7. Sewage Sludge→Soil→Animal	Grazing livestock ingesting sewage sludge.
8. Sewage Sludge→Soil→Plant	Plants grown in sewage sludge-amended soil.
9. Sewage Sludge→Soil→Soil Organism	Soil organisms living in sewage sludge-amended soil.
10. Sewage Sludge→Soil→Soil Organsim→ Soil Organism Predator	Animals eating soil organisms living in sewage sludge-amended soil.
11. Sewage Sludge→Soil→Airborne Dust→Human	Tractor operator exposed to dust while plowing large areas of sewage sludge-amended soil.
12. Sewage Sludge→Soil→Surface Water→Human	Water Quality Criteria for the receiving water for a person who consumes 0.04 kg/day of fish and 2 liters/day of water.
13. Sewage Sludge→Soil→Air→Human	Human breathing volatile pollutants from sewage sludge.
14. Sewage Sludge→Soil→Ground Water→Human	Human drinking water from wells contaminated with pollutants leaching from sewage sludge-amended soil to ground water.

DIVISION OF ENVIRONMENTAL PROTECTION

Soil Sample Results

County	As	Cd	Cr	Cu	Pb	Hg	Mo	Ni	Se	Zn	Method
Grant	3.9		80		18.4	*0.1*		40	2.9		SW-846
Greenbrier	2.2		*13*	25	12.1	*0.1*	*0.25*	25	0.5	30	CFR-136
Hardy	7.6	0.4	40	25	15.9	0.3		45	1.2	115	CFR-136
Jefferson	9.9		255		23.4	*0.1*		160	8.7		SW-846
Jefferson	15		340		23.8	*0.1*		150	1.7		SW-846
Jefferson	6.1		375		23.9	0.2		175			SW-846
Lewis	16.6	0.4	60	35	30.4	*0.1*	0.8	55	4.3	110	CFR-136
Mercer	3.1		30	25	18.3	*0.1*		10	*0.5*	105	CFR-136
Mercer	5.8		*13*	15	13	*0.1*		10	2.2	60	CFR-136
Mercer	3.2		*13*	15	10.6	0.3		10	0.5	55	CFR-136
Mineral	18		290		18	*0.1*		100	1.8		SW-846
Morgan	10.7		105		17.3	*0.1*		50	1.1		SW-846
Pocahontas	7.4		60	15	17.8	*0.1*		40	*0.5*	55	CFR-136
Putnam	16.2		60	30	43.5	0.2	*0.25*	50	1.5	120	CFR-136
Putnam	6.7	0.1	55	15	20.2	*0.1*	1.4	55	*0.5*	60	CFR-136
Putnam	4.6		50	25	15.6	0.2		50	*0.5*	60	CFR-136
Wood	6.4		50	30	17	0.2		50	*0.5*	115	CFR-136
Wood	9.4	0.3	55	20	29.7	*0.1*	0.7	30	1.5	90	CFR-136
Wood	14.6	0.3	80	20	25.9	*0.1*	0.6	35	*0.5*	85	CFR-136
Wood	8.5	0.1	*13*	15	23.7	*0.1*	0.5	20	*0.5*	75	CFR-136
Wood	10.4	0.4	*13*	25	30.3	*0.1*	1.1	30	*0.5*	90	CFR-136
Wood	4.7	0.2	45	5	19.4	*0.1*	0.7	20	*0.5*	55	CFR-136
Wood	11.7	0.1	45	25	25.8	*0.1*	1.2	45	*0.5*	85	CFR-136
Wood	10.8	0.1	75	25	27.4	*0.1*	0.6	45	*0.5*	80	CFR-136
Wood	9.8	0.2	55	25	26.5	*0.1*	2.2	35	*0.5*	90	CFR-136
Wood	11.2	0.2	85	30	27.9	*0.1*	1.1	45	*0.5*	95	CFR-136
Wood	16.7	0.3	115	45	39	*0.1*	3	45	*0.5*	115	CFR-136
Wood	4.2	0.1	75	15	24.5	*0.1*	*0.25*	20	*0.5*	60	CFR-136
Wood	6.2	0.2	80		25.5	*0.1*	0.5	10	*0.5*	45	CFR-136
Wood	6.2	0.3	40	15	21.8	*0.1*	*0.25*	10	*0.5*	75	CFR-136
Wood	8.8	0.3	75	25	33.3	*0.1*	*0.25*	30	*0.5*	85	CFR-136
Average	8.923	0.235	88.39	22.71	23.22	0.126	0.824	48.23	1.23	80.4	
Maximum	18	0.4	375	45	43.5	0.3	3	175	8.7	120	
Minimum	2.2	0.1	13	5	10.6	0.1	0.25	10	0.5	30	
State Limit	5.7	1.4	140	140	35	2	2.5	28	5	350	

Blank Spaces Indicate No Sample Results Available.

When values reported from the laboratory are below the minimum detection limit, one half of the detection limit value is used for averaging purpose. These values are italicized.

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ENVIRONMENTAL ENFORCEMENT

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. _____ Sample No. #1
Facility Weston STP Basin Kanawha
Sample Point Location: Villers Farm No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge Soil
Dept./Div./Branch OEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
940901	905		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 940830-1000 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS		RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C		⊗	P31616, Fec. Coli/100 ml			(5)	P937 Tot. K, mg/KG	6.32
(2)	P400, pH, S.U.	8.0	7	P31673, Fec. Strep./100 ml			5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l	SOLIDS		5	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol., mg/l	SOLIDS		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend., mg/l	SOLIDS		(5)	P1002, Tot. As, ug/GM	16.6
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l	SOLIDS		5	P1007, Tot. Ba, ug/l	
1	P53 Flow, gpm		3	P38260, MBAS, mg/l			(5)	P1027, Tot. Cd, ug/GM	0.4
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l			(5)	P1034, Tot. Cr, ug/GM	6C
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l			(5)	P1042, Tot. Cu, ug/GM	35
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l			5	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l			(5)	P1051, Tot. Pb, ug/GM	30.4
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l			5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/KG	PHOS	287.5	(5)	P71900, Tot. Hg, ug/GM	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l	PHOS		(5)	P1067, Tot. Ni, ug/GM	55
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l	PHOS		(5)	P1147, Tot. Se, ug/GM	4.3
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET	NITROGEN	1652	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH3-N, mg/KG WET	NITROGEN	28	5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		(4)	P605, ORG. -N, mg/KG WET	NITROGEN	1624	(5)	P1092, Tot. Zn, ug/GM	110
3	P90120, BOD-carb, mg/l		3	P620, NO2-N, mg/l	NITROGEN		(5)	Mol Molybdenum mg/gm	0.8
3	P324, BOD20, mg/l		3	P615 NO3-N, mg/l	NITROGEN		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO3-NO2, mg/l	NITROGEN		(13)	% Solids	79.9
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/KG		5.40			
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/KG		6.19			

QA Review WIR Laboratory Supervisor Signature L. Villers Farm

Comments: (SKETCH ON BACK)

PT-6048

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. WV0022349 Outfall No. _____ Sample No. 3 Lab. No. _____
Facility City of Charlestown Basin Potomac
Sample Point Location: Burns Farm (Original) Lat. _____ Long. _____ # of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ (Soil) Sludge
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____
Field Values: pH(meter) P400 _____ pH(Paper/Kit) P406 _____ Cond. P94 _____ D.O.(probe) P299 _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
941202	1030		

STORET Station No: SC _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 941201-1130 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS		RESULT		ANALYSIS	RESULT
1	P10, Temp. (Water) C.		3	P500, Total, mg/l	SOLIDS		5	P929, Tot. Na, mg/l	
1	P61, Flow,cfs		3	P70300, Dissol, mg/l			(5)	P1105, Tot. Al, ug/l	
1	P58, Flow,gpm		3	P530, Suspend. mg/l			5	P1097, Tot. Sb, ug/l	
1	P301, % D.O. SAT.		3	P505, Vol. Suspend., mg/l			(5)	P1002, Tot. As, ug/l	15.0
2	P389, Lab D.O., mg/l (probe)		3	P81374, % Solids, %		81.3	5	P1007, Tot. Ba, ug/l	
(2)	P403, Lab pH,S.U.	7.2	3	P38260, MBAS, mg/l			(5)	P1027, Tot. Cd, ug/l	
3	P95, Lab Cond.,umhos/cm		4	P32730, Phenols, ug/l			(5)	P1034, Tot. Cr, ug/l	340
3	P70508, Acidity, mg/l (H)		6	P720, Cyanide, ug/l			(5)	P1042, Tot. Cu, ug/l	
3	P435, Acidity, mg/l		3	P1032, Hex. Cr, ug/l			(5)	P1045, Tot. Fe, ug/l	
3	P436, (Mineral) Acidity, mg/l		4	P550, Oil-Grease, mg/l			(5)	P1051, Tot. Pb, ug/l	23.8
3	P410, Alkalinity, mg/l		2	P950, Fluoride, mg/l			5	P1055, Tot. Mn, ug/l	
5	P900, Hardness, mg/l		(4)	P665, Total, mg/KG	PHOS	77	(5)	P71900, Tot. Hg, ug/l	<0.2
3	P945, Sulfate, mg/l		10	P666, Dis., mg/l			(5)	P1067, Tot. Ni, ug/l	150
9	P745, Sulfide, mg/l		8	P660, Ortho. PO4, mg/l			(5)	P1147, Tot. Se, ug/l	1.7
3	P80, Color PT-CO U.		(4)	P625, TKN, mg/KG WET	NITROGEN	1064	5	P1077, Tot. Ag, ug/l	
3	P70, Turbidity, NTU		(1)	P610, NH_3-N, mg/KG WET		112	5	P1012, Tot. Be, ug/l	
2	P940, Chloride, mg/l		(4)	P605, ORG. -N, mg/KG WET		952	(5)	P1092, Tot. Zn, ug/l	
3	P310, BOD_5,mg/l		3	P620, NO_3-N, mg/l			5	P1059, Tot. Tl, ug/l	
3	P80125, BOD_5carb, mg/l		3	P615 NO_2-N, mg/l			(5)	P1062, Tot. Mo, ug/l	
4	P335, COD, mg/l		4	P630, NO_2-NO_3, mg/l					
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/l			11	P300, D.O. mg/l (winkler)	
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/l					
7	P31616, Fec. Coli/100 ml		(6)	P937 Tot. K, mg/l					

QA Review _____ Laboratory Supervisor Signature _____
Comments:

(SKETCH ON BACK)

Results to:

PT-6048

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. WV0022349 Outfall No. _____ Sample No. 4 Lab. No. _____
Facility City of Charlestown Basin Potomac
Sample Point Location: Burns Farm (Woods) Lat. _____ Long. _____ # of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Soil sludge
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____
Field Values: pH(meter) P400 _____ pH(Paper/Kit)P406 _____ Cond. P94 _____ D.O.(probe)P299 _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
941202	1030		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 941201-1200 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS		RESULT		ANALYSIS	RESULT
1	P10, Temp. (Water) C.		3	P500, Total, mg/l	SOLIDS		5	P929, Tot. Na, mg/l	
1	P61, Flow,cfs		3	P70300, Dissol. mg/l			(5)	P1105, Tot. Al, ug/l	
1	P53, Flow,gpm		3	P530, Suspend. mg/l			5	P1097, Tot. Sb, ug/l	
1	P301, % D.O. SAT.		3	P505, Vol. Suspend., mg/l			(5)	P1002, Tot. As, ug/l	6.1
2	P389, Lab D.O., mg/l (probe)		3	P81374, % Solids, %		76.3	5	P1007, Tot. Ba, ug/l	
(2)	P403, Lab pH,S.U.	7.0	3	P38260, MBAS, mg/l			(5)	P1027, Tot. Cd, ug/l	
3	P95, Lab Cond.,umhos/cm		4	P32730, Phenols, ug/l			(5)	P1034, Tot. Cr, ug/l	375
3	P70508, Acidity, mg/l (H)		6	P720, Cyanide, ug/l			(5)	P1042, Tot. Cu, ug/l	
3	P435, Acidity, mg/l		3	P1032, Hex. Cr, ug/l			(5)	P1045, Tot. Fe, ug/l	
3	P436, (Mineral) Acidity, mg/l		4	P550, Oil-Grease, mg/l			(5)	P1051, Tot. Pb, ug/l	23.9
3	P410, Alkalinity, mg/l		2	P950, Fluoride, mg/l			5	P1055, Tot. Mn, ug/l	
5	P900, Hardness, mg/l		(4)	P665, Total, mg/KG	PHOS	292.5	(5)	P71900, Tot. Hg, ug/l	0.2
3	P945, Sulfate, mg/l		10	P666, Dis., mg/l			(5)	P1067, Tot. Ni, ug/l	175
9	P745, Sulfide, mg/l		8	P660, Ortho. PO4, mg/l			(5)	P1147, Tot. Se, ug/l	
3	P80, Color PT-CO U.		(4)	P625, TKN. mg/KG WET	NITROGEN	2156	5	P1077, Tot. Ag, ug/l	
3	P70, Turbidity, NTU		(2)	P610, NH_3-N, mg/KG WET		28	5	P1012, Tot. Be, ug/l	
2	P940, Chloride, mg/l		(4)	P605, ORG. -N, mg/KG WET		2128	(5)	P1092, Tot. Zn, ug/l	
3	P310, BOD_5,mg/l		3	P620, NO_2-N, mg/l			5	P1059, Tot. Tl, ug/l	
3	P80126, BOD_5carb, mg/l		3	P615 NO_3-N, mg/l			(5)	P1062, Tot. Mo, ug/l	
4	P335, COD, mg/l		4	P630, NO_2-NO_3, mg/l					
4	P680, TOC, mg/l		(5)	P916, Tot. Ca., mg/l			11	P300, D.O. mg 11 (winkler)	
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/l					
7	P31616, Fec. Coli/100 ml		(5)	P937 Tot. K, mg/l					

QA Review _____ Laboratory Supervisor Signature _____
Comments:

Results to:

(SKETCH ON BACK)

PT-6048

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. WV0022349 Outfall No. _____ Sample No. 2 Lab. No. _____
Facility City of Charlestown Basin Potomac
Sample Point Location: Burns Farm (New Fish) Lat. _____ Long. _____ # of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ (Soil) Sludge
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____
Field Values: pH(meter) P400 _____ pH(Paper/Kit)P406 _____ Cond. P94 _____ D.O.(probe)P299 _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
941202	1030		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 94/20-1115 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS		RESULT		ANALYSIS	RESULT
1	P10, Temp. (Water) C.		3	P500, Total, mg/l	SOLIDS		5	P929, Tot. Na, mg/l	
1	P61, Flow,cfs		3	P70300, Dissol. mg/l			(5)	P1105, Tot. Al, ug/l	
1	P58, Flow,gpm		3	P530, Suspend. mg/l			5	P1097, Tot. Sb, ug/l	
1	P301, % D.O. SAT.		3	P505, Vol. Suspend., mg/l			(5)	P1002, Tot. As, ug/l	9.9
2	P389, Lab D.O., mg/l (probe)		3	P81374, % Solids, %		81.0	5	P1007, Tot. Ba, ug/l	
(2)	P403, Lab pH,S.U.	7.3	3	P38260, MBAS, mg/l			(5)	P1027, Tot. Cd, ug/l	
3	P95, Lab Cond.,umhos/cm		4	P32730, Phenols, ug/l			(5)	P1034, Tot. Cr, ug/l	255
3	P70508, Acidity, mg/l (H)		6	P720, Cyanide, ug/l			(5)	P1042, Tot. Cu, ug/l	
3	P435, Acidity, mg/l		3	P1032, Hex. Cr, ug/l			(5)	P1045, Tot. Fe, ug/l	
3	P436, (Mineral) Acidity, mg/l		4	P550, Oil-Grease, mg/l			(5)	P1051, Tot. Pb, ug/l	23.4
3	P410, Alkalinity, mg/l		2	P950, Fluoride, mg/l			5	P1055, Tot. Mn, ug/l	
5	P900, Hardness, mg/l		(4)	P665, Total, mg/l as P	PHOS	83	(5)	P71900, Tot. Hg, ug/l	<0.2
3	P945, Sulfate, mg/l		10	P666, Dis., mg/l			(5)	P1067, Tot. Ni, ug/l	160
9	P745, Sulfide, mg/l		8	P660, Ortho, PO4, mg/l			(5)	P1147, Tot. Se, ug/l	8.7
3	P80, Color PT-CO U.		(4)	P625, TKN, mg/KG WET	NITROGEN	1064	5	P1077, Tot. Ag, ug/l	
3	P70, Turbidity, NTU		(4)	P610, NH3-N, mg/KG WET		28	5	P1012, Tot. Be, ug/l	
2	P940, Chloride, mg/l		(4)	P605, ORG. -N, mg/KG WET		1036	(5)	P1092, Tot. Zn, ug/l	
3	P310, BOD_5,mg/l		3	P620, NO_3-N, mg/l			5	P1059, Tot. Tl, ug/l	
3	P80126, BOD_5carb, mg/l		3	P615 NO_2-N, mg/l			(5)	P1062, Tot. Mo, ug/l	
4	P335, COD, mg/l		4	P630, NO_2-NO_3, mg/l					
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/l			11	P300, D.O. mg 11 (winkler)	
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/l					
7	P31615, Fec. Coli/100 ml		(5)	P937 Tot. K, mg/l					

QA Review _____ Laboratory Supervisor Signature _____
Comments:

(SKETCH ON BACK)

Results to:

PT-6047

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. NA Outfall No. NA Sample No. #1 Lab. No. _____
Facility Moran Farm Basin Potomac
Sample Point Location: Fountain Pasture No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge Sed
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
941203	1030		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 941201-1700 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		(X)	P31616, Fec. Coli/100 ml		(5)	P937, Tot. K, mg/l	
(2)	P400, pH, S.U.	6.8	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l SOLIDS		(5)	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/l		(5)	P1002, Tot. As, ug/l	18.0
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/l	
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/l	270
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/l	
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/l	18.0
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(1)	P665, Total, mg/KG PHOS	116	(5)	P71900, Tot. Hg, ug/l	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l		(5)	P1067, Tot. Ni, ug/l	100
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l		(5)	P1147, Tot. Se, ug/l	1.3
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET NITROGEN	1232	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH3-N, mg/KG WET	56	5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		(4)	P605, ORG. -N, mg/KG WET	1176	(5)	P1092, Tot. Zn, ug/l	
3	P80125, BOD5 carb. mg/l		3	P620, NO2-N, mg/l		(5)	Molybdenum	
3	P224, BOD5, mg/l		3	P615 NO3-N, mg/l		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO3-NO2, mg/l		(3)	% Solids	80.1
4	P680, TOC, mg/l		(5)	P915, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/l				

QA Review _____ Laboratory Supervisor Signature _____

Comments: (SKETCH ON BACK)

PT-6046

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. WV0027707 Outfall No. NA Sample No. #2 Lab. No. _____
Facility Ivacm Springs PSD Basin Potomac
Sample Point Location: [redacted] @ Harrison Farm No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. Sludge (Sent)
Dept./Div./Branch OEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
94/12/02	1030		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 941129-1030 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C		(X)	P31615, Fec. Coli/100 ml		(5)	P937 Tot. K, mg/l	
(2)	P400, pH, S.U.	7.1	7	P31672, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l — SOLIDS		(5)	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/l		(5)	P1002, Tot. As, ug/l	10.7
1	P51 Flow, cfs		3	P505, Vol. Suspend., mg/l		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/l	
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/l	105
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/l	
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/l	17.3
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/KG — PHOSPHOROUS	120	(5)	P71900, Tot. Hg, ug/l	< 0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l		(5)	P1067, Tot. Ni, ug/l	50
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l		(5)	P1147, Tot. Se, ug/l	1.1
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET — NITROGEN	1148	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH3-N, mg/KG WET	112	5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		(4)	P625, ORG. N, mg/KG WET	1036	(5)	P1092, Tot. Zn, ug/l	
3	P80128, BODcarb, mg/l		3	P620, NO2-N, mg/l		(2)	Molybdenum	
3	P324, BODu, mg/l		3	P615 NO3-N, mg/l		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO2+NO3, mg/l		(3)	% Solids	81.7
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/l				

QA Review _____ Laboratory Supervisor Signature _____

Comments: (SKETCH ON BACK)

K-5915T

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. _____ Sample No. #2 Lab. No. _____
Facility NIZO STP Basin Kenauha
Sample Point Location: Richard Winters Farm No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge S-1
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
940901	900		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTT)
(Grab): Date-Time 940829-1700 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS		RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		(1)	P31616, Fec. Coli/100 ml			(5)	P937 Tot. K, mg/KG	2.10
(2)	P400, pH, S.U.	6.8	7	P31673, Fec. Strep./100 ml			5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l	SOLIDS		5	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l	SOLIDS		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/l	SOLIDS		(5)	P1002, Tot. As, ug/GM	6.7
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l	SOLIDS		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l			(5)	P1027, Tot. Cd, ug/GM	0.1
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l			(5)	P1034, Tot. Cr, ug/GM	55
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l			(5)	P1042, Tot. Cu, ug/GM	15
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l			5	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l			(5)	P1051, Tot. Pb, ug/GM	20.2
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l			5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/KG	PHOS	16.5	(5)	P71900, Tot. Hg, ug/GM	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l	PHOS		(5)	P1067, Tot. Ni, ug/GM	5.5
3	P80, Color PT-CO U.		8	P660, Ortho, PO4, mg/l	PHOS		(5)	P1147, Tot. Se, ug/GM	<1
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET	NITROGEN	896	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH_3-N, mg/KG WET	NITROGEN	56	5	P1087, Tot. V, ug/l	
3	P310, BOD_5, mg/l		(4)	P605, ORG. -N, mg/KG WET	NITROGEN	840	(5)	P1092, Tot. Zn, ug/GM	66
3	P80126, BOD_{5corr}, mg/l		3	P620, NO_2-N, mg/l	NITROGEN		(5)	Molybdenum mg/gm EM	1.4
3	P324, BOD_{5n}, mg/l		3	P615 NO_3-N, mg/l	NITROGEN		11	P900, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO_3-HNO_3, mg/l	NITROGEN		(3)	% Solids	33.-
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/KG		0.69			
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/KG		3.09			

QA Review WIR Laboratory Supervisor Signature _____

Comments: (SKETCH ON BACK)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

RECEIVED
NOV 22 1994
ENVIRONMENTAL ENFORCEMENT

Permit No. _____ Outfall No. _____ Sample No. #1
Facility Alfred STP Basin Kaw
Sample Point Location: Brad Wikenen Farm No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. Sludge Soil
Dept./Div./Branch TEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
940901	900		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 940829-1415 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		(2)	P31616, Fec. Coli/100 ml		(5)	P927 Tot. K, mg/KG	2.85
(2)	P400, pH, S.U.	6.7	1	P31672, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l SOLIDS		5	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l SOLIDS		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend. mg/l SOLIDS		(5)	P1002, Tot. As, ug/G-M	16.2
1	P61 Flow, cfs		3	P535, Vol. Suspend., mg/l SOLIDS		5	P1007, Tot. Ba, ug/l	
1	P68 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/G-M	0.2
3	PT0508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/G-M	60
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/G-M	30
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		5	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/G-M	43.5
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/KG PHOSPHOROUS	190.0	(5)	P71900, Tot. Hg, ug/G-M	0.2
9	P745, Sulfide, mg/l		10	P666, Diss., mg/l PHOSPHOROUS		(5)	P1067, Tot. Ni, ug/G-M	50
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l PHOSPHOROUS		(5)	P1147, Tot. Se, ug/G-M	1.5
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET NITROGEN	1540	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH4-N, mg/KG WET NITROGEN	56	5	P1087, Tot. V, ug/l	
3	P310, BOC5, mg/l		(4)	P605, ORG. -N, mg/KG WET NITROGEN	1484	(5)	P1092, Tot. Zn, ug/G-M	120
3	P80126, BOC carb, mg/l		3	P630, NO2-N, mg/l NITROGEN		(5)	Molybdenum ug/gm	<0.5
3	P124, BODnn, mg/l		3	P615 NO3-N, mg/l NITROGEN		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO2+NO3, mg/l NITROGEN		(3)	% Solids	50.2
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/KG	1.85			
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/KG	4.17			

QA Review WIR Laboratory Supervisor Signature _____

Comments: (SKETCH ON BACK)

OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. 1A Sample No. #2 Lab. No. _____
Facility Foster Industries Basin Potomac
Sample Point Location: Composite of Fields #EB No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Soil
Dept./Div./Branch DEP-EE Program: NPDES Sampler T. Simmons Witness Kraft
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
940512	1200	Diane / Tommy / Enid	Enid
940513	0900	Enid	Charles Lindaugh

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 940511-1402 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		7	P31616, Fec. Coli/100 ml		(0)	P937 Tot. K, mg/KG	6.68
(2)	P400, pH, S.U.	6.5	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l — SOLIDS		(5)	P1105, Tot. Al, ug/GM	31,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol., mg/l — SOLIDS		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend., mg/l — SOLIDS		(5)	P1002, Tot. As, ug/GM	7.6
1	P61 Flow, cfs		3	P535, Vol. Suspend., mg/l — SOLIDS		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	<2.5
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	40
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	25
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/GM	26,000
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	15.9
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(1)	P665, Total, mg/KG — PHOS	737.5	(5)	P71900, Tot. Hg, ug/GM	0.3
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l — PHOS		(5)	P1067, Tot. Ni, ug/GM	45
3	P80, Color PT-CO U.		8	P660, Ortho, PO4, mg/l — PHOS		(5)	P1147, Tot. Se, ug/GM	1.2
3	P70, Turbidity, NTU		(2)	P625, TKN, mg/KG WET — NITROGEN	1876	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH_3-N, mg/KG WET — NITROGEN	<1	5	P1087, Tot. V, ug/l	
3	P310, BOD_5, mg/l		(4)	P605, ORG. -N, mg/KG WET — NITROGEN	1876	(5)	P1092, Tot. Zn, ug/GM	115
3	P80125, BOD_{5carb}, mg/l		3	P620, NO_2-N, mg/l — NITROGEN		(6)	Molybdenum	NO RESULT
3	P324, BOD_{5n}, mg/l		3	P615 NO_3-N, mg/l — NITROGEN		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO_3-NO_2, mg/l — NITROGEN		(3)	% Solids	72.6
4	P680, TOC, mg/l		(5)	P915, Tot. Ca., mg/KG	1.16			
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/KG	3.15			

QA Review IJIR Laboratory Supervisor Signature [signature]

Comments: (SKETCH ON BACK)

K-5714

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. WV0001121 Outfall No. ~~2~~ Taylor Farm Sample No. #1 Lab. No. _____
Facility Howes Leather Company Basin Kanawha
Sample Point Location: Field #1 Composit No. of Containers 2
Sample: Water ~~Effluent~~ Sedmt. _____ Influent _____ Eff. _____ ~~Stream~~ Soil
Dept./Div./Branch DEP-EB Program: _____ Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
940422	1545		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 940420-1440 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		7	P31616, Fec. Coli/100 ml		(5)	P937 Tot. K. mg/KG	2.52
(2)	P400, pH, S.U.	7.2	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l — SOLIDS		5	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol. mg/l		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend. mg/l		(5)	P1002, Tot. As, ug/GM	7.4
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	<2.5
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	60
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	15
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		5	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	17.8
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/KG — PHOS	300	(5)	P71900, Tot. Hg, ug/GM #	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l — PHOS		(5)	P1067, Tot. Ni, ug/GM	40
3	P80, Color PT-CO U.		8	P660, Ortho, PO4, mg/l — PHOS		(5)	P1147, Tot. Se, ug/GM	<1.0
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET — NITROGEN	1932	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH_3-N, mg/KG WET — NITROGEN	84	5	P1087, Tot. V, ug/l	
3	P310, BOD_5, mg/l		(4)	P605, ORG. -N, mg/KG WET — NITROGEN	1848	(5)	P1092, Tot. Zn, ug/GM	55
3	P80126, BOD_5 carb. mg/l		3	P620, NO_3-N, mg/l — NITROGEN		(5)	Molybdenum	NO RESULT
3	P324, BOD_{20}, mg/l		3	P615 NO_2-N, mg/l — NITROGEN		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO_3-NO_2, mg/l — NITROGEN				
4	P680, TOC, mg/l		(5)	P916, Tot. Ca., mg/KG	2.05		% solids	80.5
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/KG	1.67			

QA Review WIR Laboratory Supervisor Signature L. Simmons Pollyea

Comments: # exceeded holding time (SKETCH ON BACK)

O-5843-1

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. Sludge Sample No. #1 Lab. No. _____
Facility Central-Boaz Basin Ohio
Sample Point Location: Sludge Application Field composite No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. Sludge S-1
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
940715	1015	James Summers	

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 940713-1330 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		~~X~~	P31616, Fec. Coli/100 ml		~~X~~	P937 Tot. K, mg/l	
(2)	P400, pH, S.U.	6.0	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l SOLIDS		5	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/l		(5)	P1002, Tot. As, ug/GM	6.4
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	5
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	50
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	30
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		5	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	17.0
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/KG PHOS	87.0	(5)	P71900, Tot. Hg, ug/GM	0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l		(5)	P1067, Tot. Ni, ug/GM	50
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l		(5)	P1147, Tot. Se, ug/GM	<1.0
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET N	1148	(5)	P1077, Tot. Ag, ug/GM	5
2	P940, Chloride, mg/l		(4)	P610, NH_3-N, mg/KG WET I	168	5	P1087, Tot. V, ug/l	
3	P410, $CaCO_3$, mg/l		(4)	P605, ORG. -N, mg/KG WET T	980	(5)	P1092, Tot. Zn, ug/GM	115
3	P80126, BOD_{5carb}, mg/l		3	P620, NO_2-N, mg/l R		~~X~~	Molybdenum	
3	P324, BOD_{5n}, mg/l		3	P615 NO_3-N, mg/l O		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO_3-HC_3, mg/l G		(3)	% Solids	93.4
4	P680, TOC, mg/l		~~X~~	P916, Tot. Ca., mg/l E				
7	P31501, Tot. Coli/100 ml		~~X~~	P927, Tot. Mg, mg/l N				

QA Review WIR Laboratory Supervisor Signature _____

Comments: (SKETCH ON BACK)

K-5715

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. WV0023299 Outfall No. Wiseman Farm Sample No. 1 Lab. No. _____
Facility Nitro STP Basin Kanawha
Sample Point Location: New Fields No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ (X) Soil _____
Dept./Div./Branch OEP-EE Program: NPDES Sampler _____ Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
940422	(X) 1550	[signature]	

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
(Grab) Date-Time 940422-1400 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS		RESULT	✓	ANALYSIS	RESULT
(1)	P10, Temp. (Water) C.		7	P31616, Fec. Coli/100 ml			(5)	P937, Tot. K, mg/KG	2.12
(2)	P400, pH, S.U.	5.3	7	P31673, Fec. Strep./100 ml			5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l	SOLIDS		5	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l	SOLIDS		5	P1097, Tot. Sb, ug/l	
1	P301, % D.O. SAT.		3	P530, Suspend, mg/l	SOLIDS		(5)	P1002, Tot. As, ug/GM	4.6
1	P61, Flow, cfs		3	P505, Vol. Suspend., mg/l	SOLIDS		5	P1007, Tot. Ba, ug/l	
1	P58, Flow, gpm		3	P38260, MBAS, mg/l			(5)	P1027, Tot. Cd, ug/GM	<2.5
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l			(5)	P1034, Tot. Cr, ug/GM	50
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l			(5)	P1042, Tot. Cu, ug/GM	25
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l			5	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l			(5)	P1051, Tot. Pb, ug/GM	15.6
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l			5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/KG	PHOS	75.0	(5)	P71900, Tot. Hg, ug/GM	0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l	PHOS		(5)	P1067, Tot. Ni, ug/GM	50
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l	PHOS		(5)	P1147, Tot. Se, ug/GM	<1.0
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET	NITROGEN	700	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH_3-N, mg/KG WET	NITROGEN	56	5	P1087, Tot. V, ug/l	
3	P310, BOD_5, mg/l		(4)	P605, ORG. -N, mg/KG WET	NITROGEN	644	(5)	P1092, Tot. Zn, ug/GM	60
3	P80126, BOD_5 carb, mg/l		3	P620, NO_2-N, mg/l	NITROGEN		(5)	Molybdenum	NO RESULT
3	P324, BOD_{20}, mg/l		3	P615, NO_3-N, mg/l	NITROGEN		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO_2-NO_3, mg/l	NITROGEN		(3)	% Solids	84.6
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/KG		0.04			
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/KG		2.18			

QA Review LWIR Laboratory Supervisor Signature [signature]

Comments: (SKETCH ON BACK)

K-5816

LOCK-UP

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. ~~Shields~~ NA Sample No. #1 Lab. No. _____

Facility Alderson WWTP Basin Kanawha

Sample Point Location: Shields Farm No. of Containers 1

Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Soil _____

Dept./Div./Branch DEP-OWR-EE Program: NPDES Sampler T. Summers Witness _____

Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
940623	0740	[signature]	[signature]

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)

(Grab) Date-Time 940622-1200 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		7	P31616, Fec. Coli/100 ml		5	P937 Tot. K, mg/1	
(2)	P400, pH, S.U.	6.0	7	P31673, Fec. Strep., 100 ml		5	P929, Tot. Na, mg/1	
3	P95, Cond., umhos/cm		3	P500, Total, mg/1 SOLIDS		5	P1105, Tot. Al, ug/1	
2	P299, D.O., mg/1 (probe)		3	P70300, Dissol, mg/1		5	P1097, Tot. Sb, ug/1	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/1		(5)	P1002, Tot. As, ug/GM	2.2
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/1		5	P1007, Tot. Ba, ug/1	
1	P58 Flow, gpm		3	P38260, MBAS, mg/1		(5)	P1027, Tot. Cd, ug/GM	< 2.5
3	P70508, Acidity, mg/1 (H)		4	P32730, Phenols, ug/1		(5)	P1034, Tot. Cr, ug/GM	< 25
3	P435, Acidity, mg/1		6	P720, Cyanide, ug/1		(5)	P1042, Tot. Cu, ug/GM	15
3	P436, (Mineral) Acidity, mg/1		3	P1032, Hex. Cr, ug/1		5	P1045, Tot. Fe, ug/1	
3	P410, Alkalinity, mg/1		4	P550, Oil-Grease, mg/1		(5)	P1051, Tot. Pb, ug/GM	12.1
5	P900, Hardness, mg/1		2	P950, Fluoride, mg/1		5	P1055, Tot. Mn, ug/1	
3	P945, Sulfate, mg/1		(4)	P665, Total, mg/KG PHOS	78	(5)	P71900, Tot. Hg, ug/GM	< 0.2
9	P745, Sulfide, mg/1		10	P666, Dis., mg/1		(5)	P1067, Tot. Ni, ug/GM	25
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/1		(5)	P1147, Tot. Se, ug/GM	< 1.0
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET NITROGEN	1372	5	P1077, Tot. Ag, ug/1	
2	P940, Chloride, mg/1		(4)	P610, NH_3-N, mg/KG WET	672	5	P1087, Tot. V, ug/1	
3	P310, BOD_5, mg/1		(4)	P605, ORG. -N, mg/KG WET	700	(5)	P1092, Tot. Zn, ug/GM	30
3	P80126, BOD_5carb, mg/1		3	P620, NO_2-N, mg/1		(5)	Molybdenum ug/L	< 0.5
3	P324, BOD_{20}, mg/1		3	P615 NO_3-N, mg/1		11	P300, D.O., mg/1 (Winkler)	
4	P335, COD, mg/1		4	P630, NO_3-NO_2, mg/1		(2)	% Solids	86.6
4	P680, TOC, mg/1		5	P916, Tot. Ca., mg/1				
7	P31501, Tot. Coli/100 ml		5	P927, Tot. Mg, mg/1				

QA Review LJR Laboratory Supervisor Signature [signature]

Comments: (SKETCH ON BACK)

PT-6045

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. WV0021792 Outfall No. _____ Sample No. #1 Lab. No. _____
Facility Petersburg STP Basin Potomac
Sample Point Location: Rev. Hyer Farm No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge (Sol.)
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
941202	1030		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 941128-1100 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		(X)	P31616, Fec. Coli/100 ml		(5)	P937 Tot. K, mg/l	
(2)	P400, pH, S.U.	7.2	7	P31672, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l SOLIDS		(5)	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/l		(5)	P1002, Tot. As, ug/l	3.9
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/l	
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/l	80
3	P405, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/l	
3	P435, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/l	18.4
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/KG P	185	(5)	P71900, Tot. Hg, ug/l	< 0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l PHOS		(5)	P1067, Tot. Ni, ug/l	40
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l		(5)	P1147, Tot. Se, ug/l	2.9
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET N	☆ 952	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH3-N, mg/KG WET I	☆ 56.0	5	P1067, Tot. Y, ug/l	
3	P310, BOD_5, mg/l		(4)	P605, ORG. -N, mg/KG WET B	☆ 896	(5)	P1092, Tot. Zn, ug/l	
3	P80126, BOD_5-carb, mg/l		3	P620, NO2+3-N, mg/l O		(5)	Molybdenum	
3	P324, BOD_{20}, mg/l		3	P615 NO2-N, mg/l E		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO3-NO2, mg/l N		(3)	% Solids	84.6
4	P680, TOC, mg/l		(5)	P916, Tot. Ca., mg/l				
7	P31501, Tot. Coli/100 ml		(3)	P927, Tot. Mg, mg/l				

QA Review _____ Laboratory Supervisor Signature _____

Comments: ☆ exceeded holding time

(SKETCH ON BACK)

0-5969
(1)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. N/A Sample No. #1 Lab. No. _____
Facility Parkersburg Sanitary Board Basin Ohio
Sample Point Location: Middle of #2 Effluent composite No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge (S.)
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 94/004-0930 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		⊗	P31616, Fec. Coli/100 ml		⊗	P937 Tot. K. mg/l	
(2)	P400, pH, S.U.	5.9	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na. mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l SOLIDS		(5)	P1105, Tot. Al. ug/G/M	26,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol. mg/l		5	P1097, Tot. Sb. ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend. mg/l		(5)	P1002, Tot. As. ug/G/M	9.4
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l		5	P1007, Tot. Ba. ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd. ug/G/M	0.3
3	P71508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr. ug/G/M	55
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu. ug/G/M	20
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr. ug/l		(5)	P1045, Tot. Fe. ug/G/M	25,000
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb. ug/G/M	29.7
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn. ug/l	
3	P945, Sulfate, mg/l		⊗	P665, Total, mg/l PHOS		(5)	P71900, Tot. Hg. ug/G/M	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l		(5)	P1067, Tot. Ni. ug/G/M	30
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l		(5)	P1147, Tot. Se. ug/G/M	1.5
3	P70, Turbidity, JTU		⊗	P625, TKN, mg/l NITROGEN		5	P1077, Tot. Ag. ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH3-N, mg/l		5	P1087, Tot. V. ug/l	
3	P310, BOD5, mg/l		⊗	P605, ORG. N, mg/l		(5)	P1092, Tot. Zn. ug/G/M	90
3	P80126, BOD5carb, mg/l		3	P620, NO2-N, mg/l		(5)	Molybdenum ug/gm	0.7
3	P124, BODnn, mg/l		3	P615 NO3-N, mg/l		11	P900, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO3+NO2, mg/l		⊗	% Solids	78.0
4	P680, TOC, mg/l		⊗	P916, Tot. Ca., mg/l				
7	P31501, Tot. Coli/100 ml		⊗	P927, Tot. Mg, mg/l				

QA Review WIR Laboratory Supervisor Signature Wilma Rose

Comments: (SKETCH ON BACK)

0-5969
(2)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. N/A Sample No. #2 Lab. No. _____
Facility Parkersburg Sanitary Board Basin _____
Sample Point Location: Upper N. Wood Ext. No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge (S-1)
Dept./Div./Branch DEP-EE Program: NPDES Sampler: J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT
(Grab): Date-Time 941004-1015 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		(X)	P31616, Fec. Coli/100 ml		(5)	P937 Tot. K, mg/l	
(2)	P400, pH, S.U.	5.6	7	P31672, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l	SOLIDS	(5)	P1105, Tot. Al, ug/GM	23,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l	SOLIDS	5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/l	SOLIDS	(5)	P1002, Tot. As, ug/GM	14.6
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l	SOLIDS	5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	0.3
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	80
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	20
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/GM	31,000
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	25.9
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(3)	P665, Total, mg/l	PHOS	(5)	P71900, Tot. Hg, ug/GM	<0.2
9	P745, Sulfide, mg/l		10	P556, Ots., mg/l	PHOS	(5)	P1067, Tot. Ni, ug/GM	35
3	P80, Color PT-CO U.		8	P660, Ortho, PO4, mg/l	PHOS	(5)	P1147, Tot. Se, ug/GM	<1
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/l	NITROGEN	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH3-N, mg/l	NITROGEN	5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		(4)	P605, ORG. -N, mg/l	NITROGEN	(5)	P1092, Tot. Zn, ug/GM	85
3	P80120, BOD-carb, mg/l		3	P630, NO2-N, mg/l	NITROGEN	(5)	Molybdenum ug/gm	0.6
3	P334, BOD-nit, mg/l		3	P615 NO3-N, mg/l	NITROGEN	11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P620, NO2-NO3, mg/l	NITROGEN	(X)	% Solids	81.1
4	P680, TOC, mg/l		(6)	P916, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		(3)	P927, Tot. Mg, mg/l				

QA Review WIR Laboratory Supervisor Signature Wilma Reip

Comments: (SKETCH ON BACK)

O-5969
(3)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. [illegible] Outfall No. NA Sample No. #3 Lab. No. _____
Facility Tarrytown Sanitary Board Basin _____
Sample Point Location: Effluent from chlorine contact No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge (S)
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
(Grab): Date-Time 941004-1300 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C		(X)	P31615, Fec. Coli/100 ml		(X)	P937 Tot. K, mg/l	
(2)	P400, pH, S.U.	6.6	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l SOLIDS		(5)	P1105, Tot. Al, ug/GM	23,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol., mg/l SOLIDS		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend., mg/l SOLIDS		(5)	P1002, Tot. As, ug/GM	8.5
1	P61 Flow, cfs		3	P535, Vol. Suspend., mg/l SOLIDS		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	0.1
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	<25
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	15
3	P436, (Mineral) Acidity, mg/l		3	P1002, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/GM	21,000
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	23.7
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(X)	P665, Total, mg/l PHOS		(5)	P71900, Tot. Hg, ug/GM	<0.2
9	P745, Sulfide, mg/l		10	P666, Ots., mg/l PHOS		(5)	P1067, Tot. Ni, ug/GM	20
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l PHOS		(5)	P1147, Tot. Se, ug/GM	<1
3	P70, Turbidity, NTU		(X)	P625, TKN, mg/l NITROGEN		5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(X)	P610, NH3-N, mg/l NITROGEN		5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		(X)	P605, ORG. -N, mg/l NITROGEN		(5)	P1092, Tot. Zn, ug/GM	70
3	P80128, BOD acetb., mg/l		3	P620, NO3-N, mg/l NITROGEN		(5)	Aldrin mg/kg dry wt	0.5
3	P324, BOD3, mg/l		3	P615 NO2-N, mg/l NITROGEN		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO3+NO2, mg/l NITROGEN		(X)	% Solids	85.4
4	P680, TOC, mg/l		(X)	P916, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		(X)	P927, Tot. Mg, mg/l				

QA Review WIR Laboratory Supervisor Signature [signature]

Comments: (SKETCH ON BACK)

O-5969
(4)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. N/A Sample No. #1 Lab. No. _____
Facility Parkersburg Sanitary Board Basin Ohio
Sample Point Location: Effluent from Clay Silo No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge (Sl.)
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
(Grab): Date-Time 941004-1301 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		(X)	P31615, Fec. Coli/100 ml		(5)	P937, Tot. K, mg/l	
(2)	P400, pH, S.U.	6.5	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l — SOLIDS		(5)	P1105, Tot. Al, ug/GM	27,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l — SOLIDS		5	P1097, Tot. Sb, ug/l	
1	P301, % D.O. SAT.		3	P530, Suspend, mg/l — SOLIDS		(5)	P1002, Tot. As, ug/GM	10.4
1	P61, Flow, cfs		3	P535, Vol. Suspend., mg/l — SOLIDS		5	P1007, Tot. Ba, ug/l	
1	P58, Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	0.4
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	<25
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	25
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/GM	26,000
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	30.3
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/l — PHOS		(5)	P71900, Tot. Hg, ug/GM	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l — PHOS		(5)	P1067, Tot. Ni, ug/GM	30
3	P80, Color PT-CO U.		8	P680, Ortho. PO4, mg/l — PHOS		(5)	P1147, Tot. Se, ug/GM	<1
3	P70, Turbidity, NTU		(X)	P625, TKN, mg/l — NITROGEN		5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(X)	P610, NH3-N, mg/l — NITROGEN		5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		(X)	P605, ORG. -N, mg/l — NITROGEN		(5)	P1092, Tot. Zn, ug/GM	90
3	P80126, BOD-scarb., mg/l		3	P630, NO2-N, mg/l — NITROGEN		(5)	Molybdenum ug/gm	1.1
3	P324, BOD20, mg/l		3	P615, NO3-N, mg/l — NITROGEN		11	P900, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P620, NO3-NO2, mg/l — NITROGEN		(X)	% Solids	84.0
4	P680, TOC, mg/l		(3)	P916, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/l				

QA Review WJR Laboratory Supervisor Signature Wilma J Reip

Comments: (SKETCH ON BACK)

O-5969
(5)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. N/A Sample No. _____ Lab. No. _____
Facility Parker Brand Sanitary Board Basin Ohio
Sample Point Location: Elsinore - Fed. Supply St. No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge (5)
Dept./Div./Branch DEP - EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
(Grab): Date-Time 940604-1230 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C		(6)	P31616, Fec. Coli/100 ml		(5)	P937 Tot. K, mg/l	
(2)	P400, pH, S.U.	6.5	7	P31672, Fec. Strep./100 ml		(5)	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l	SOLIDS	(5)	P1105, Tot. Al, ug/GM	16,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l	SOLIDS	5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/l	SOLIDS	(5)	P1002, Tot. As, ug/GM	4.7
1	P61 Flow, cfs		3	P535, Vol. Suspend., mg/l	SOLIDS	5	P1007, Tot. Ba, ug/l	
1	P68 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	0.2
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	45
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	<10
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/GM	13,000
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	19.4
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(8)	P665, Total, mg/l	PHOS	(5)	P71900, Tot. Hg, ug/GM	<0.2
9	P745, Sulfide, mg/l		4-0	P666, Ortho, mg/l	PHOS	(5)	P1067, Tot. Ni, ug/GM	20
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l	PHOS	(5)	P1147, Tot. Se, ug/l	<1
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/l	NITROGEN	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH3-N, mg/l	NITROGEN	5	P1087, Tot. V, ug/l	
3	P410, BCO_3, mg/l		(4)	P605, ORG. -N, mg/l	NITROGEN	(5)	P1092, Tot. Zn, ug/GM	55
3	P90120, BCO-carb, mg/l		3	P620, NO2-N, mg/l	NITROGEN	(5)	Molybdenum ug/gm	0.7
3	P124, BCO_{3eq}, mg/l		3	P615 NO3-N, mg/l	NITROGEN	11	P900, D.O., mg/l (Winkler)	
4	P935, CCO, mg/l		4	P630, HCO3-HCO3, mg/l	NITROGEN	(8)	% Solids	86.1
4	P680, TOC, mg/l		(3)	P916, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		(3)	P927, Tot. Mg, mg/l				

QA Review NIR Laboratory Supervisor Signature Wilma Reip

Comments: (SKETCH ON BACK)

O-59-69
(6)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. Woods #2 Sample No. #6 Lab. No _____
Facility Pat Kirshner - Sanitary Basin - 1 Basin Upper
Sample Point Location: @ Woods Pond Fish Hatchery Farm No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge (5.1)
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 941004-1310 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS		RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		X	P31616, Fec. Coli/100 ml			(5)	P937 Tot. K, mg/l	
(2)	P400, pH, S.U.	6.6	7	P31673, Fec. Strep./100 ml			5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l	SOLIDS		(5)	P1105, Tot. Al, ug/l GM	26,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol. mg/l			5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend. mg/l			(5)	P1002, Tot. As, ug/l GM	11.7
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l			5	P1007, Tot. Ba, ug/l	
1	P53 Flow, gpm		3	P38260, MBAS, mg/l			(5)	P1027, Tot. Cd, ug/l GM	0.1
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l			(5)	P1034, Tot. Cr, ug/l GM	45
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l			(5)	P1042, Tot. Cu, ug/l GM	25
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l			(5)	P1045, Tot. Fe, ug/l GM	38,000
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l			(5)	P1051, Tot. Pb, ug/l GM	25.8
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l			5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(5)	P665, Total, mg/l	PHOS		(5)	P71900, Tot. Hg, ug/l GM	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l			(5)	P1067, Tot. Ni, ug/l GM	45
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l			(5)	P1147, Tot. Se, ug/l	< 1
3	P70, Turbidity, NTU		X	P625, TKN, mg/l	NITROGEN		5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		X	P610, NH3-N, mg/l			5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		X	P605, ORG. -N, mg/l			(5)	P1092, Tot. Zn, ug/l GM	85
3	P80128, BOD-carb. mg/l		3	P620, NO3-N, mg/l			(5)	Molybdenum ug/gm	1.2
3	P324, BODnn, mg/l		3	P615 NO2-N, mg/l			11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO-NO3, mg/l			X	% Solids	85.9
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/l					
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/l					

QA Review WIR Laboratory Supervisor Signature Wilma Reip

Comments: (SKETCH ON BACK)

O-5969
(7)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. NA Sample No. #7 Lab. No. _____
Facility Parkersburg South, Kanawha Basin Ohio
Sample Point Location: U Channel Bypass Eq. pit - No Sludge No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)

STORET Station No: SC. _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 941004-1430 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		(6)	P31616, Fec. Coli/100 ml		(3)	P927 Tot. K, mg/l	
(2)	P400, pH, S.U.	6.6	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l SOLIDS		(4)	P1105, Tot. Al, ug/G-M	23,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/l		(5)	P1002, Tot. As, ug/G-M	10.8
1	P61 Flow, cfs		3	P535, Vol. Suspend., mg/l		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(1)	P1027, Tot. Cd, ug/G-M	0.1
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(3)	P1034, Tot. Cr, ug/G-M	75
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(9)	P1042, Tot. Cu, ug/G-M	25
3	P436, (Mineral) Acidity, mg/l		3	P1033, Hex. Cr. ug/l		(8)	P1045, Tot. Fe, ug/G-M	27,000
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/G-M	27.4
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/l PHOS		(5)	P71900, Tot. Hg, ug/G-M	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l		(5)	P1067, Tot. Ni, ug/G-M	45
3	P80, Color PT-CO u.		8	P660, Ortho, PO4, mg/l		(5)	P1147, Tot. Se, ug/G-M	<1
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/l NITROGEN		5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH3-N, mg/l		5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		(4)	P605, ORG. -N, mg/l		(5)	P1092, Tot. Zn, ug/G-M	80
3	P80126, BOD5 carb, mg/l		(3)	P620, NO2-N, mg/l		(2)	Molybdenum, ug/G-M	0.6
3	P224, BOD5n, mg/l		3	P615 NO3-N, mg/l		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO3-NO2, mg/l		(1)	% Solids	83.6
4	P680, TOC, mg/l		(2)	P915, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		(4)	P927, Tot. Mg, mg/l				

QA Review WIR Laboratory Supervisor Signature Wilma Reip

Comments: (SKETCH ON BACK)

O-5969
(8)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. D _____ Outfall No. _____ Sample No. #13 Lab. No. _____
Facility Parkersburg Sanitary Board Basin OHIO
Sample Point Location: N. Charles St. - Sludge No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge Soil
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT
Grab: Date-Time 940411-1400 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		(9)	P31616, Fec. Coli/100 ml		(5)	P937 Tot. K, mg/l	
(2)	P400, pH, S.U.	6.2	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l	SOLIDS	(5)	P1105, Tot. Al, ug/G-M	22,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l	SOLIDS	5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend. mg/l	SOLIDS	(5)	P1002, Tot. As, ug/G-M	9.8
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l	SOLIDS	5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/G-M	0.2
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/G-M	55
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/G-M	25
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/G-M	25,000
3	P410, Alkalinity, mg/l		4	P550, Oil&Grease, mg/l		(5)	P1051, Tot. Pb, ug/G-M	26.5
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/l	PHOS	(5)	P71900, Tot. Hg, ug/G-M	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l	PHOS	(5)	P1067, Tot. Ni, ug/G-M	35
3	P80, Color PT-CO U.		8	P660, Ortho, PO4, mg/l	PHOS	(5)	P1147, Tot. Se, ug/G-M	<1
3	P70, Turbidity, NTU		(6)	P625, TKN, mg/l	NITROGEN	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH3-N, mg/l	NITROGEN	5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		(5)	P605, ORG. -N, mg/l	NITROGEN	(5)	P1092, Tot. Zn, ug/G-M	90
3	P80128, BOD-carb, mg/l		3	P620, NO2-N, mg/l	NITROGEN	(5)	Molybdenum, ug/gm	2.2
3	P324, BODm, mg/l		3	P615 NO3-N, mg/l	NITROGEN	11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO3-HCO3, mg/l	NITROGEN	(2)	% Solids	84.5
4	P680, TOC, mg/l		(9)	P916, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		(8)	P927, Tot. Mg, mg/l				

QA Review IWIR Laboratory Supervisor Signature Wilma Reip

Comments: (SKETCH ON BACK)

0-596 (9)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. ______ Outfall No. ______ Sample No. #07 Lab. No. ______
Facility ~~[illegible]~~ Pocahontas Sanitary Board Basin Ohio
Sample Point Location: Lowland Boyd Farm Composite No. of Containers 1
Sample: Water ______ Sedmt. ______ Influent ______ Eff. ______ Sludge / Soil
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness ______
Field Meter No.: pH ______ Cond. ______ D.O. ______ Flow ______

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)

STORET Station No: SC, ______ Depth: D ______ (Date-Time as YYMMDDTTTT)
(Grab): Date-Time 941004-1515 Comp. (2) ______

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		~~(7)~~	P31616, Fec. Coli/100 ml		~~(5)~~	P937 Tot. K, mg/l	
(2)	P400, pH, S.U.	5.8	7	P31673, Fec. Strep/100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l (SOLIDS)		(5)	P1105, Tot. Al, ug/l G-M	33,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol. mg/l (SOLIDS)		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend. mg/l (SOLIDS)		(5)	P1002, Tot. As, ug/l G-M	11.2
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l (SOLIDS)		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/l G-M	0.2
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/l G-M	85
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/l G-M	30
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/l G-M	28,000
3	P410, Alkalinity, mg/l		4	P552, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/l G-M	27.9
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		~~(8)~~	P665, Total, mg/l (PHOS)		(5)	P71900, Tot. Hg, ug/l G-M	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l (PHOS)		(5)	P1067, Tot. Ni, ug/l G-M	45
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l (PHOS)		(5)	P1147, Tot. Se, ug/l G-M	<1
3	P70, Turbidity, NTU		~~(3)~~	P625, TKN, mg/l (NITROGEN)		5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		~~(3)~~	P610, NH_3-N, mg/l (NITROGEN)		5	P1087, Tot. V, ug/l	
3	P310, BOD_5, mg/l		~~(3)~~	P605, ORG. -N, mg/l (NITROGEN)		(5)	P1092, Tot. Zn, ug/l G-M	95
3	P80125, BOD_5 carb, mg/l		3	P630, NO_2-N, mg/l (NITROGEN)		(5)	Molybdenum ug/gm	1.1
3	P324, BOD_{20}, mg/l		3	P615, NO_3-N, mg/l (NITROGEN)		~~1~~	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO_2+NO_3, mg/l (NITROGEN)		~~(8)~~	% Solids	84.9
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		(3)	P927, Tot. Mg, mg/l				

QA Review WJR Laboratory Supervisor Signature Wilma J. Reip

Comments: (SKETCH ON BACK)

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DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. _____ Sample No. 41 Lab. No. _____
Facility W. Warwick STP Basin Ob
Sample Point Location: McElfresh Farm Composite No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge (Sc. 1)
Dept./Div./Branch OER-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
941005	0900		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 941005-1100 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		(X)	P31616, Fec. Coli/100 ml		(X)	P937, Tot. K, mg/l	
(2)	P400, pH, S.U.	5.3	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l — SOLIDS		(5)	P1105, Tot. Al, ug/GM	18,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol., mg/l — SOLIDS		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend., mg/l — SOLIDS		(5)	P1002, Tot. As, ug/GM	4.2
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l — SOLIDS		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	0.1
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	75
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	15
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/GM	15,000
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	24.5
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(X)	P665, Total, mg/l — PHOS		(5)	P71900, Tot. Hg, ug/GM	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l — PHOS		(5)	P1067, Tot. Ni, ug/GM	20
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l — PHOS		(5)	P1147, Tot. Se, ug/GM	<1
3	P70, Turbidity, NTU		(X)	P625, TKN, mg/l — NITROGEN		5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH3-N, mg/l — NITROGEN		5	P1087, Tot. V, ug/l	
3	P310, BOD_5, mg/l		(X)	P605, ORG. -N, mg/l — NITROGEN		(5)	P1092, Tot. Zn, ug/GM	60
3	P80126, BOD-carb, mg/l		3	P620, NO_2-N, mg/l — NITROGEN		(5)	Molybdenum, ug/GM	<0.5
3	P324, BOD_{20}, mg/l		3	P615 NO_3-N, mg/l — NITROGEN		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO_3-NO_2, mg/l — NITROGEN		(3)	% Solids	81.3
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/l				

QA Review WIR Laboratory Supervisor Signature William Reip

Comments: (SKETCH ON BACK)

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DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. _____ Sample No. #2 Lab. No. _____
Facility W. Hanover STP Basin Ohio
Sample Point Location: DeVaron Woods Complex No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge (Sp. 1)
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
941006	0900		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 941005-1230 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.			P31616, Fec. Coli/100 ml		(4)	P937, Tot. K, mg/l	
(2)	P400, pH, S.U.	4.5	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l SOLIDS		(5)	P1105, Tot. Al, ug/G-M	14,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend., mg/l		(5)	P1002, Tot. As, ug/G-M	6.2
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/G-M	0.2
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/G-M	80
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/G-M	<10
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/G-M	9700
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/G-M	25.5
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(9)	P665, Total, mg/l PHOS		(5)	P71900, Tot. Hg, ug/G-M	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l		(5)	P1067, Tot. Ni, ug/G-M	<20
3	P80, Color PT-CO U.		8	P660, Ortho, PO4, mg/l		(5)	P1147, Tot. Se, ug/G-M	<1
3	P70, Turbidity, NTU		(1)	P625, TKN, mg/l		5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(2)	P610, NH3-N, mg/l		5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		(4)	P605, ORG. -N, mg/l		(5)	P1092, Tot. Zn, ug/G-M	45
3	P80128, BODcarb, mg/l		3	P620, NO2-N, mg/l		(5)	Molybdenite ug/gm	0.5
3	P324, BODsg, mg/l		3	P615 NO3-N, mg/l		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO3-NO2, mg/l		(3)	% Solids	89.5
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		(3)	P927, Tot. Mg, mg/l				

QA Review WIR Laboratory Supervisor Signature Wilma Reid

Comments: (SKETCH ON BACK)

0-5970
(3)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. ________ Outfall No. ________ Sample No. #3 Lab. No. ________

Facility W. Hopkinsville STP Basin Ohio

Sample Point Location: DeVaughn Farm Composite No. of Containers 1

Sample: Water ________ Sedmt. ________ Influent ________ Eff. ________ Sludge (Soil)

Dept./Div./Branch DEP-ES Program: NPDES Sampler J. Summers Witness ________

Field Meter No.: pH ________ Cond. ________ D.O. ________ Flow ________

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
941006	0900		

STORET Station No: SC, ________ Depth: D ________ (Date-Time as YYMMDDTTTT)

(Grab): Date-Time 941005-1345 Comp. (2) ________

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C		3 (crossed out)	P31616, Fec. Coli/100 ml		(3)	P937, Tot. K, mg/l	
(2)	P400, pH, S.U.	5.3	7	P31673, Fec. Strep/100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l (SOLIDS)		(5)	P1105, Tot. Al, ug/G-M	22,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol. mg/l		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend. mg/l		(5)	P1002, Tot. As, ug/G-M	6.2
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/G-M	0.3
3	P70503, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/G-M	40
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/G-M	15
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/G-M	20,000
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/G-M	21.8
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		3 (crossed out)	P665, Total, mg/l (PHOS)		(5)	P71900, Tot. Hg, ug/G-M	<0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l		(5)	P1067, Tot. Ni, ug/G-M	<20
3	P80, Color PT-CO U.		8	P660, Ortho, PO4, mg/l		(5)	P1147, Tot. Se, ug/G-M	<1
3	P70, Turbidity, NTU		4 (crossed out)	P625, TKN, mg/l (NITROGEN)		5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		4 (crossed out)	P610, NH3-N, mg/l		5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		4 (crossed out)	P605, ORG. -N, mg/l		(5)	P1092, Tot. Zn, ug/G-M	75
3	P80120, BOD5 carb, mg/l		3	P620, NO3-N, mg/l		(5)	Molybdenum ug/gm. dr.	<0.5
3	P324, BOD, mg/l		3	P615 NO2-N, mg/l		11	P300, D.O. mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO2-NO3, mg/l		(3)	% Solids	84.1
4	P680, TOC, mg/l		5 (crossed out)	P916, Tot. Ca, mg/l				
7	P31501, Tot. Coli/100 ml		5 (crossed out)	P927, Tot. Mg, mg/l				

QA Review WIR Laboratory Supervisor Signature William Reip

Comments:

(SKETCH ON BACK)

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(4)

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. _____ Outfall No. _____ Sample No. #4 Lab. No. _____
Facility W. Hanover STP Basin Ohio
Sample Point Location: Dewa Farm No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge (Solid)
Dept./Div./Branch DEP - EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
941006	0900		

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 941005 - 1430 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C		(X)	P31616, Fec. Coli/100 ml		(X)	P937 Tot. K, mg/l	
(2)	P400, pH, S.U.	6.6	7	P31672, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l — SOLIDS		(5)	P1105, Tot. Al, ug/GM	25,000
2	P299, D.O., mg/l (probe)		3	P70300, Dissol. mg/l		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend. mg/l		(5)	P1002, Tot. As, ug/GM	8.8
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	0.3
3	P70503, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	75
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	25
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		(5)	P1045, Tot. Fe, ug/GM	25,000
3	P410, Alkalinity, mg/l		4	P556, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	33.3
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(X)	P665, Total, mg/l — PHOS		(5)	P71900, Tot. Hg, ug/GM	<0.2
9	P745, Sulfide, mg/l		10	P666, Diss., mg/l		(5)	P1067, Tot. Ni, ug/GM	30
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l		(5)	P1147, Tot. Se, ug/GM	<1
3	P70, Turbidity, NTU		(X)	P625, TKN, mg/l — NITROGEN		5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(X)	P610, NH3-N, mg/l		5	P1087, Tot. V, ug/l	
3	P310, BOD5, mg/l		(X)	P605, ORG. -N, mg/l		(5)	P1092, Tot. Zn, ug/GM	85
3	P80128, BOD-carb, mg/l		3	P620, NO2-N, mg/l		(5)	Molybdenum ug/gm	<0.5
3	P224, BOD5, mg/l		3	P615 NO3-N, mg/l		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO3+NO2, mg/l		(3)	% Solids	83.3
4	P680, TOC, mg/l		(X)	P915, Tot. Ca., mg/l				
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/l				

QA Review WIR Laboratory Supervisor Signature _____

Comments: (SKETCH ON BACK)

K-5728-3

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. NA Outfall No. _____ Sample No. 3 Lab. No. _____
Facility Fink Farm Basin Kanawha
Sample Point Location: Old Fields Composite No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge Soil
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
940429	1300	James Summers	Wilma Pelfrey

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 940427-[illegible] 1130 Comp. (2) _____ _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		[illegible]	P31616, Fec. Coli/100 ml		(5)	P937 Tot. K, mg/KG	1.54
(2)	P400, pH, S.U.	7.0	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l — SOLIDS		5	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l — SOLIDS		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/l — SOLIDS		(5)	P1002, Tot. As, ug/GM	3.2
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l — SOLIDS		5	P1007, Tot. Ba, ug/l	
1	P68 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	<2.5
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	<25
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	15
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		5	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P552, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	10.6
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/KG — PHOS	470.0	(5)	P71900, Tot. Hg, ug/GM	0.3
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l — PHOS		(5)	P1067, Tot. Ni, ug/GM	<20
3	P80, Color PT-CO U.		8	P660, Ortho, PO4, mg/l — PHOS		(5)	P1147, Tot. Se, ug/GM	<1.0
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET — NITROGEN	1876	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH_3-N, mg/KG WET — NITROGEN	56	5	P1087, Tot. V, ug/l	
3	P310, BOD_5, mg/l		(4)	P605, ORG. -N, mg/KG WET — NITROGEN	1820	(5)	P1092, Tot. Zn, ug/GM	55
3	P80128, BOD-carb, mg/l		3	P620, NO_2-N, mg/l — NITROGEN		(5)	Molybdenum	NO RESULT
3	P324, BOD_{20}, mg/l		3	P615 NO_3-N, mg/l — NITROGEN		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO_2-NO_3, mg/l — NITROGEN		(13)	% Solids	87.8
4	P680, TOC, mg/l		(5)	P916, Tot. Ca., mg/KG	3.18			
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/KG	0.96			

QA Review WIR Laboratory Supervisor Signature Wilma Pelfrey

Comments: (SKETCH ON BACK)

R-5128-2

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. NA Outfall No. _____ Sample No. 2 Lab. No. _____
Facility Fink Farm Basin _____
Sample Point Location: Beamer Amick Property No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge Soil
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
940428	1300	[signature]	Wilma Rollyson

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 940427-1030 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.			P31616, Fec. Coli/100 ml		(6)	P937 Tot. K, mg/KG	4.94
(2)	P400, pH, S.U.	5.4	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l SOLIDS		5	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/l		(5)	P1002, Tot. As, ug/GM	5.8
1	P61 Flow, cfs		3	P535, Vol. Suspend., mg/l		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	<2.5
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	<25
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	15
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		5	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	13.0
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/KG P	50.0	(5)	P71900, Tot. Hg, ug/GM	0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l HOS		(5)	P1067, Tot. Ni, ug/GM	<20
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l		(5)	P1147, Tot. Se, ug/GM	2.2
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET N	1428	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH_3-N, mg/KG WET I	28	5	P1087, Tot. V, ug/l	
3	P310, BOD_5, mg/l		(4)	P605, ORG. -N, mg/KG WET T	1400	(5)	P1092, Tot. Zn, ug/GM	60
3	P80125, BOD_5carb, mg/l		3	P620, NO_2-N, mg/l ROG		(6)	Molybdenum	NO RESULT
3	P324, BOD_{20}, mg/l		3	P615 NO_3-N, mg/l EN		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO_3-NO_2, mg/l		(3)	% Solids	80.4
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/KG	0.10			
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/KG	2.16			

QA Review WIR Laboratory Supervisor Signature Wilma Rollyson

Comments: (SKETCH ON BACK)

K-5728-

DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
Analysis Request and Result Form

Permit No. NA Outfall No. Soil Sample No. 1 Lab. No. _____
Facility ~~Elkins~~ Fink Farm Basin Kanawha
Sample Point Location: Main Fink Farm Composite No. of Containers 1
Sample: Water _____ Sedmt. _____ Influent _____ Eff. _____ Sludge Soil
Dept./Div./Branch DEP-EE Program: NPDES Sampler J. Summers Witness _____
Field Meter No.: pH _____ Cond. _____ D.O. _____ Flow _____

CHAIN OF CUSTODY

Date	Time	From (Name)	To (Name)
940428	1300	James Summers	Wilma Rollyson

STORET Station No: SC, _____ Depth: D _____ (Date-Time as YYMMDDTTTT)
Grab: Date-Time 940427-1020 Comp. (2) _____

The sampler should note the analysis requested by circling the appropriate code box.

✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
1	P10, Temp. (Water) C.		~~1~~	P31616, Fec. Coli/100 ml		(5)	P937 Tot. K, mg/KG	3.29
(2)	P400, pH, S.U.	6.4	7	P31673, Fec. Strep./100 ml		5	P929, Tot. Na, mg/l	
3	P95, Cond., umhos/cm		3	P500, Total, mg/l (SOLIDS)		5	P1105, Tot. Al, ug/l	
2	P299, D.O., mg/l (probe)		3	P70300, Dissol, mg/l (SOLIDS)		5	P1097, Tot. Sb, ug/l	
1	P301 % D.O. SAT.		3	P530, Suspend, mg/l (SOLIDS)		(5)	P1002, Tot. As, ug/GM	3.1
1	P61 Flow, cfs		3	P505, Vol. Suspend., mg/l (SOLIDS)		5	P1007, Tot. Ba, ug/l	
1	P58 Flow, gpm		3	P38260, MBAS, mg/l		(5)	P1027, Tot. Cd, ug/GM	<2.5
3	P70508, Acidity, mg/l (H)		4	P32730, Phenols, ug/l		(5)	P1034, Tot. Cr, ug/GM	30
3	P435, Acidity, mg/l		6	P720, Cyanide, ug/l		(5)	P1042, Tot. Cu, ug/GM	25
3	P436, (Mineral) Acidity, mg/l		3	P1032, Hex. Cr, ug/l		5	P1045, Tot. Fe, ug/l	
3	P410, Alkalinity, mg/l		4	P550, Oil-Grease, mg/l		(5)	P1051, Tot. Pb, ug/GM	18.3
5	P900, Hardness, mg/l		2	P950, Fluoride, mg/l		5	P1055, Tot. Mn, ug/l	
3	P945, Sulfate, mg/l		(4)	P665, Total, mg/KG (PHOS)	55.0	(5)	P71900, Tot. Hg, ug/GM	0.2
9	P745, Sulfide, mg/l		10	P666, Dis., mg/l (PHOS)		(5)	P1067, Tot. Ni, ug/GM	<20
3	P80, Color PT-CO U.		8	P660, Ortho. PO4, mg/l (PHOS)		(5)	P1147, Tot. Se, ug/GM	<1.0
3	P70, Turbidity, NTU		(4)	P625, TKN, mg/KG WET (NITROGEN)	2044	5	P1077, Tot. Ag, ug/l	
2	P940, Chloride, mg/l		(4)	P610, NH_3-N, mg/KG WET (NITROGEN)	28	5	P1087, Tot. V, ug/l	
3	P310, BOD_5, mg/l		(2)	P605, ORG. N, mg/KG WET (NITROGEN)	2016	(5)	P1092, Tot. Zn, ug/GM	105
3	P80126, BOD_5carb, mg/l		3	P620, NO_2-N, mg/l (NITROGEN)		(5)	Molybdenum	NO RESULT
3	P324, BOD_{20}, mg/l		3	P615 NO_3-N, mg/l (NITROGEN)		11	P300, D.O., mg/l (Winkler)	
4	P335, COD, mg/l		4	P630, NO_2-NO_3, mg/l (NITROGEN)		(3)	% Solids	79.2
4	P680, TOC, mg/l		(5)	P916, Tot. Ca, mg/KG	2.71			
7	P31501, Tot. Coli/100 ml		(5)	P927, Tot. Mg, mg/KG	1.75			

QA Review LWIR Laboratory Supervisor Signature Wilma Rollyson

Comments: (SKETCH ON BACK)

West Virginia Department of Environmental Protection
Job #: 1094-29353

REIC SAMPLE #	29353-1		REGULATORY
WVDEP SAMPLE #	# 1 Windland	MQL	LEVEL
	---mg/l---		
TCLP METALS			
arsenic	ND	0.020	5.0
Initial pH	6.60		
Final pH	4.66		
Extraction fluid # 1	2000 ml		
% Solids	100%		

REIC SAMPLE #	29353-2		REGULATORY
WVDEP SAMPLE #	# 2 Elshlager	MQL	LEVEL
	---mg/l---		
TCLP METALS			
arsenic	ND	0.020	5.0
cadmium	ND	0.025	1.0
Initial pH	8.57		
Final pH	4.77		
Extraction fluid # 1	2000 ml		
% Solids	100%		

REIC SAMPLE #	29353-3		REGULATORY
WVDEP SAMPLE #	# 3 C. Boyce	MQL	LEVEL
	---mg/l---		
TCLP METALS			
arsenic	ND	0.020	5.0
cadmium	ND	0.025	1.0
chromium	ND	0.25	5.0
selenium	ND	0.020	1.0
Initial pH	7.83		
Final pH	4.83		
Extraction fluid # 1	2000 ml		
% Solids	100%		

West Virginia Department of Environmental Protection
Job #: 1094-29353

REIC SAMPLE #	29353-4		REGULATORY
WVDEP SAMPLE #	# 4 L. Boyce	MQL	LEVEL
	---mg/l---		
TCLP METALS			
arsenic	ND	0.020	5.0
Initial pH	6.72		
Final pH	4.76		
Extraction fluid # 1	2000 ml		
% Solids	100%		

ND - None Detected at MQL
MQL - Minimum Quantifying Level
Note: The TCLP list was derived from the Federal Register, Volume 55, Number 61, Page 11804.

DATE: 10-18-94 APPROVED: Ivan W Lee
for Claude Scott

DIVISION OF ENVIRONMENTAL PROTECTION

Soil Sample Results

County	As	Cd	Cr	Cu	Pb	Hg	Mo	Ni	Se	Zn	Method
Grant	3.9		80		18.4	*0.1*		40	2.9		SW-846
Greenbrier	2.2		*13*	25	12.1	*0.1*	*0.25*	25	0.5	30	CFR-136
Hardy	7.6	0.4	40	25	15.9	0.3		45	1.2	115	CFR-136
Jefferson	9.9		255		23.4	*0.1*		160	8.7		SW-846
Jefferson	15		340		23.8	*0.1*		150	1.7		SW-846
Jefferson	6.1		375		23.9	0.2		175			SW-846
Lewis	16.6	0.4	60	35	30.4	*0.1*	0.8	55	4.3	110	CFR-136
Mercer	3.1		30	25	18.3	*0.1*		10	*0.5*	105	CFR-136
Mercer	5.8		*13*	15	13	*0.1*		10	2.2	60	CFR-136
Mercer	3.2		*13*	15	10.6	0.3		10	0.5	55	CFR-136
Mineral	18		290		18	*0.1*		100	1.8		SW-846
Morgan	10.7		105		17.3	*0.1*		50	1.1		SW-846
Pocahontas	7.4		60	15	17.8	*0.1*		40	*0.5*	55	CFR-136
Putnam	16.2		60	30	43.5	0.2	*0.25*	50	1.5	120	CFR-136
Putnam	6.7	0.1	55	15	20.2	*0.1*	1.4	55	*0.5*	60	CFR-136
Putnam	4.6		50	25	15.6	0.2		50	*0.5*	60	CFR-136
Wood	6.4		50	30	17	0.2		50	*0.5*	115	CFR-136
Wood	9.4	0.3	55	20	29.7	*0.1*	0.7	30	1.5	90	CFR-136
Wood	14.6	0.3	80	20	25.9	*0.1*	0.6	35	*0.5*	85	CFR-136
Wood	8.5	0.1	*13*	15	23.7	*0.1*	0.5	20	*0.5*	75	CFR-136
Wood	10.4	0.4	*13*	25	30.3	*0.1*	1.1	30	*0.5*	90	CFR-136
Wood	4.7	0.2	45	5	19.4	*0.1*	0.7	20	*0.5*	55	CFR-136
Wood	11.7	0.1	45	25	25.8	*0.1*	1.2	45	*0.5*	85	CFR-136
Wood	10.8	0.1	75	25	27.4	*0.1*	0.6	45	*0.5*	80	CFR-136
Wood	9.8	0.2	55	25	26.5	*0.1*	2.2	35	*0.5*	90	CFR-136
Wood	11.2	0.2	85	30	27.9	*0.1*	1.1	45	*0.5*	95	CFR-136
Wood	16.7	0.3	115	45	39	*0.1*	3	45	*0.5*	115	CFR-136
Wood	4.2	0.1	75	15	24.5	*0.1*	*0.25*	20	*0.5*	60	CFR-136
Wood	6.2	0.2	80		25.5	*0.1*	0.5	10	*0.5*	45	CFR-136
Wood	6.2	0.3	40	15	21.8	*0.1*	*0.25*	10	*0.5*	75	CFR-136
Wood	8.8	0.3	75	25	33.3	*0.1*	*0.25*	30	*0.5*	85	CFR-136
Average	8.923	0.235	88.39	22.71	23.22	0.126	0.824	48.23	1.23	80.4	
Maximum	18	0.4	375	45	43.5	0.3	3	175	8.7	120	
Minimum	2.2	0.1	13	5	10.6	0.1	0.25	10	0.5	30	
State Limit	5.7	1.4	140	140	35	2	2.5	28	5	350	

Blank Spaces Indicate No Sample Results Available.

When values reported from the laboratory are below the minimum detection limit.
one half of the detection limit value is used for averaging purpose, These values are italicized.

Committee votes for tougher sludge rules

By Ken Ward Jr.
STAFF WRITER

Environmentalists won their first battle of the new session Wednesday when a legislative panel approved tougher regulations on sewage sludge dumping.

The proposed rules include more stringent limits on the heavy metal content of sludge than regulations originally proposed by the state Division of Environmental Protection.

They also include a new fee on sewage sludge dumping that drew immediate criticism from the state Municipal League.

The proposed rules must clear several other legislative hurdles before they become law.

State Sen. Don Macnaughton, D-Wetzel and a chemist, estimated the changes he suggested would raise the average West Virginian's sewage bill by only 20 cents a month.

DEP Director David C. Callaghan told members of the Legislative Rule-Making Review Committee his agency could live with the stronger regulations.

But Callaghan also said he didn't think the new sludge management program — a project proposed and praised by Gov. Gaston Caperton last year — was necessary.

"We think, frankly, that there's been considerable overkill on the issue of sewage sludge," Callaghan testified. "We think that the threat to the public health and environment is virtually non-existent with regard to this sewage sludge."

Lawmakers approved the sludge control law last year after public outcry over landfill operator Pasquale Mascaro's plan to dump New York sewage sludge in Wetzel and Brooke counties.

Mascaro has since challenged the constitutionality of the law in federal court in Wheeling.

Members of the joint House-Senate rule-making review committee had twice delayed action on the sludge regulations because of complaints from environmentalists and municipalities.

Municipal League members said the DEP's original fee of $2 per ton of wet, land-applied sludge would hurt small towns that dispose of their own sludge.

Lobbyists from the West Virginia Environmental Council said the DEP's recommended pollution limits on sludge were less than surrounding states and would allow the most dirty sludge to pour into the state.

Macnaughton said the new rules should satisfy both groups.

Under the proposal, the state would receive a fee of either $10 or $20 per dry ton of sludge. Sludge with a higher content of certain heavy metals would pay the higher fee.

The proposal caps total statewide sludge fee collections at $500,000 a year, the amount Callaghan says DEP needs to run the sludge management program.

The new rules would also keep dirtier sludge from being dumped in West Virginia because it toughens limits on mercury, lead and cadmium to those used in New York, Macnaughton said.

Norm Steenstra, chief lobbyist for the environmental council, said his group was happy with the new regulations.

Nelson Robinson, a lobbyist for the Municipal League, said the rules are still too harsh.