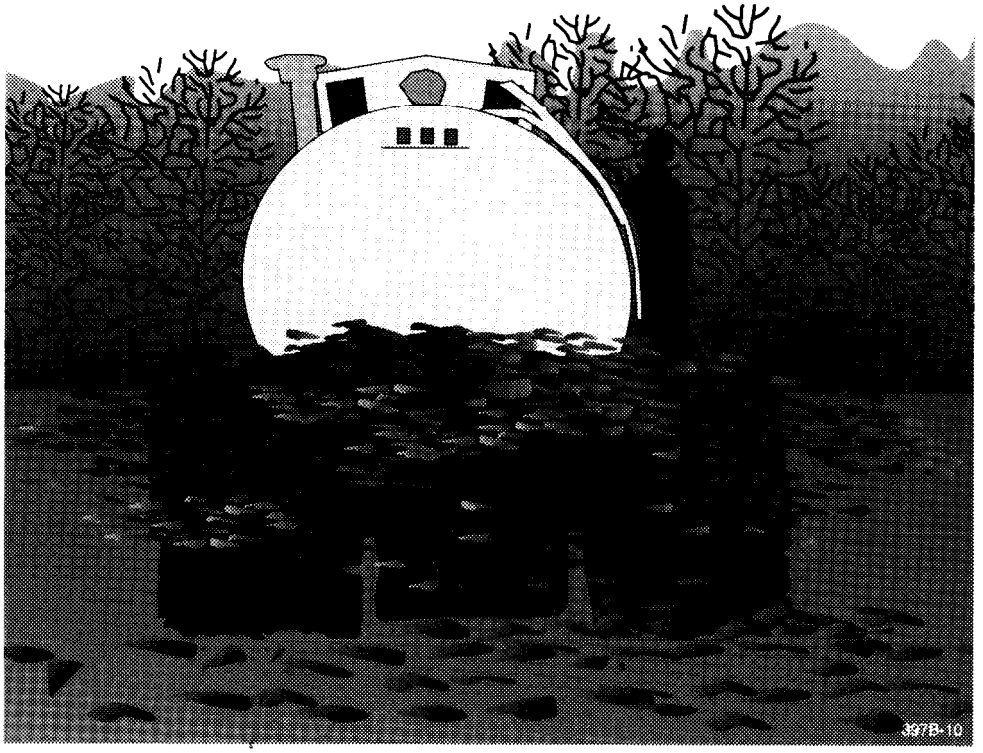
United States
Environmental
Protection Agency

**Office of Enforcement
and Compliance Assurance**
Washington, DC 20460

EPA/831-B-93-002b
December, 1994

EPA Land Application of Sewage Sludge

A Guide for Land Appliers on the Requirements of the Federal Standards for the Use or Disposal of Sewage Sludge, 40 CFR Part 503



PREFACE

Under the authority of Section 405(d) of the Clean Water Act as amended, the U.S. Environmental Protection Agency (EPA) promulgated, at 40 *Code of Federal Regulations (CFR)* Part 503, Phase I of the risk-based regulation that governs the final use or disposal of sewage sludge. The intent of this Federal program is to ensure that sewage sludge is used or disposed of in a way that protects both human health and the environment. Part 503, Standards for the Use or Disposal of Sewage Sludge, establishes the general requirements, pollutant limits, operational standards, and management practices, as well as frequency of monitoring, record-keeping, and reporting requirements, that apply to sewage sludge that is land applied, placed on a surface disposal site, or fired in a sewage sludge incinerator *(see 58 Federal Register 9248,* February 19, 1993). For further general information about the regulation and the parties affected, refer to *A Plain English Guide to the Part 503 Biosolids Rule (EPA, 1994).* **This document explains the requirements applicable to LAND APPLIERS of sewage sludge.** Separate documents explaining the responsibilities of persons who prepare sewage sludge and owners/operators of surface disposal sites are also available. The documents listed below can be obtained through the EPA regional offices listed on the back cover of this document:

- *Preparing Sewage Sludge for Land Application or Surface Disposal-A Guide for Preparers on the Monitoring, Record Keeping, and Reporting Requirements of the Federal Standards for the Use or Disposal of Sewage Sludge, 40 CFR Part 503* (EPA, *1993).*

- *Surface Disposal of Sewage Sludge-A Guide for Owners/Operators of Surface Disposal Facilities on the Monitoring, Recordkeeping, and Notification Requirements of the Federal Standards for the Use or Disposal of Sewage Sludge, 40 CFR Part 503* (EPA, 1994).

The term “sewage sludge” is used in this document because of its wide recognition, its regulatory definition, and its consistency with other EPA guidance documents pertaining to the Part 503 regulation, Standards for the Use or Disposal of Sewage Sludge. However, the new term **“biosolids”** is becoming more common as a replacement for the term “sewage sludge”

because it is thought to more accurately reflect the beneficial characteristics inherent in sewage sludge.

Part 503 is being developed in two phases. Phase I of the risk-based regulation, which this document addresses, does not cover all types of sludge, but rather addresses the following:

- Scum or solids removed from primary, secondary, or advanced wastewater treatment processes
- A material derived from sewage sludge
- Domestic septage.

The following types of sludge are not subject to Part 503 but are regulated under the designated Federal rules when land applied:

- Sludge generated during treatment of industrial process wastewater at an industrial facility (40 *CFR* Part 257, if nonhazardous)
- Sewage sludge generated at an industrial facility during the treatment of industrial wastewater combined with domestic sewage (40 *CFR* Part 257)
- Hazardous sludge, including hazardous sewage sludge (40 *CFR* Parts 261, 264, 265, 266, 267, and 268)
- Sewage sludge with polychlorinated biphenyl concentrations of 50 ppm or greater (40 *CFR* Part 761)
- Drinking water treatment sludge (40 *CFR* Part 257)
- Grit or screenings generated during the treatment of domestic sewage (40 *CFR* Part 257).

Part 503 imposes requirements on four groups of persons:

- Persons who prepare sewage sludge or a material derived from sewage sludge
- Land appliers of sewage sludge

- Owners/operators of sewage sludge surface disposal sites
- Owners/operators of sewage sludge incinerators.

In an effort to explain the many different aspects of Part 503 to the regulated community, EPA has developed a series of guidance documents. A list of these documents is provided in the reference section at the end of this document.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

APPENDICES

LIST OF EXHIBITS

1. INTRODUCTION

The U.S. Environmental Protection Agency promulgated a regulation at 40 *Code of Federal Regulations (CFR)* Part 503 to ensure that sewage sludge is used or disposed of in a way that protects human health and the environment. Part 503 imposes requirements for the land application, surface disposal, and incineration of sewage sludge. This manual focuses on land application, providing guidance to land appliers of sewage sludge.

The purpose of this document is to provide the land applier with sufficient guidance to comply fully with all applicable Part 503 requirements. The Part 503 regulation is largely self implementing, which means that anyone engaged in activities covered by the regulation must comply with the appropriate requirements on or before the compliance deadline (see Exhibit 1).

Exhibit 1. Compliance Deadlines for Part 503 Requirements

Requirement	Compliance Deadline
Frequency of monitoring and record keeping requirements	July 20, 1993
All other requirements (i.e., reporting, general requirements, pollutant limits, pathogen reduction, vector attraction reduction, and management practices)	February 19, 1994*

***If compliance requires construction of new pollution control facilities, compliance is required as expeditiously as possible but no later than February 19, 1995. A new pollution facility is any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which began after the promulgation of Part 503, and includes any building, structure, facility, or installation that replaces or substantially upgrades the process or production equipment necessary to meet a standard under Part 503. The definition of new pollution control facility does not include replacement of any building, structure, facility, or installation due to normal operational wear and tear, or installation of monitoring equipment or devices, including the purchase of computer hardware or software for monitoring purposes.**

This guidance is structured to first provide a general understanding of the Rule and its underlying principles, including definitions of sewage sludge, land application, and an explanation of who under the Rule is considered a land applier. Section 1 discusses the general factors that are taken into account in determining the land applier's responsibilities under the Rule. Section 2 summarizes the seven basic types of Part 503 requirements for land application.

The number and stringency of requirements for land appliers discussed in Chapter 2 depends upon the quality of the sewage sludge and the circumstances under which it is being applied. Section 3 simplifies the process of determining which requirements apply in different situations by presenting nine possible land application scenarios based on quality, and provides a comprehensive list of requirements for each. All the land applier must do to know which requirements apply in his or her situation is to locate the scenario that most resembles his (her) particular circumstances. Section 4 contains additional information that may be needed to enable the land applier to fully document compliance with the requirements listed in Section 3.

1.1 Definition of Land Application

Land application is defined as the spreading, spraying, injection, or incorporation of sewage sludge, including a material derived from sewage sludge (e.g., compost and pelletized sewage sludge), onto or below the surface of the land to take advantage of the soil enhancing qualities of the sewage sludge. Sewage sludge is land applied to improve the structure of the soil. It is also applied as a fertilizer to supply nutrients to crops and other vegetation grown in the soil. Sewage sludge is commonly applied to agricultural land (including pasture and range land), forests, reclamation sites, public contact sites (e.g., parks, turf farms, highway median strips, golf courses), lawns, and home gardens.

Sewage sludge is land applied in bulk form or sold or given away in a bag or similar container for application to the land. The term “bulk” implies sewage sludge that is applied generally in large quantities to large parcels of land. Bulk sewage sludge is typically used by commercial and municipal appliers for agriculture, tree and turf farms, golf courses, parks, and reclamation of construction or surface mining sites. Sewage sludge sold or given away in a bag or other container is generally used by the smaller scale user, such as a home gardener or landscaper.

In disturbed areas such as mining sites, where there is no soil substrate from which to sustain vegetation, large amounts of nitrogen and organic material may be required to re-establish basic plant cover. When sewage sludge is used in these areas to supply the adequate substrate, it is often necessary to apply quantities that exceed the agronomic rate. In such cases, sewage sludge

is generally applied once, and then the site is seeded. Because of the highly soluble nature of nitrates, which are the main nutritive component of both sewage sludge and standard fertilizer products, sewage sludge applied in this manner has the potential for nitrate contamination of ground water if not properly managed. Therefore, any time sewage sludge is going to be applied at greater than agronomic rates, the land applier must first seek approval from the permitting authority. In some instances, the permitting authority may require a specific permit for this practice.

Domestic septage also contains beneficial characteristics as a soil enhancer and can be land applied. Although domestic septage is considered sewage sludge, its physical characteristics are different from those of sewage sludge generated at a wastewater treatment plant. As such, some of the Part 503 requirements for the land application of domestic septage are different from the land application requirements found in this manual and are therefore addressed in a separate document. For further information on how to comply with Part 503 when applying domestic septage to agricultural land, forests, or reclamation sites, refer to *Domestic Septage Regulatory Guidance: A Guide to the EPA 503 Rule* (EPA, 1993). Contact the Office of Water Resources Center or the National Small Flows Clearinghouse to obtain a copy.

Surface disposal is another regulated use or disposal practice for sewage sludge that is similar to land application in that it entails the placement of sewage sludge on the land. The main difference between the two is that in the case of surface disposal, sewage sludge is placed on the land for the **purpose of final disposal,** without regard for the soil enhancing qualities of the sewage sludge.

1.2 The Land Applier and Factors for Determining His or Her Responsibilities Under Part 503

Land appliers are persons who apply sewage sludge to the land to condition the soil and/or to fertilize crops or vegetation grown in the soil. The term “land applier” includes persons applying large quantities of bulk sewage sludge to areas such as agricultural land as well as persons applying smaller quantities of sludge, usually distributed in bags, to a lawn or home garden. Thus, the definition of land applier is very broad and includes both those persons

applying sewage sludge to the land in large quantities and home owners who apply sewage sludge in small quantities.

Although the definition of "land applier" encompasses a wide range of persons, not all land appliers are required to comply with the same number and variety of Part 503 land application requirements. Which appliers will need to comply with what requirements depends upon several important factors, the most prominent of which **are sewage sludge quality,** and whether the sewage sludge is provided to the land applier **in bulk form or in a bag or other container.**

Sewage Sludge Quality

The Part 503 regulation focuses on the following three parameters as a basis for determining sewage sludge quality:

- The presence of **pollutants** (arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc)
- The presence of **pathogens (e.g.,** bacteria, viruses, parasites)
- The sewage sludge's **attractiveness to vectors** (e.g., rodents, flies, mosquitoes).

Sewage sludge quality varies from municipality to municipality with respect to these three parameters. Determining sewage sludge quality is usually the sole responsibility of the person who initially prepares the sludge, and not of the land applier. However, because sewage sludge quality plays such a significant role in determining land application requirements, a portion of this document is dedicated to the explanation of this topic.

To accommodate this variability and ensure the protection of human health and the environment, Part 503 has established several sets of sewage sludge quality requirements for each of the three parameters, with corresponding requirements to be implemented by the land applier. In this way, varying qualities of sewage sludge can be land applied while still providing protection to human health and the environment.

Sewage sludge that meets the most stringent limits **for all three** of the above sewage sludge quality parameters is referred to as **Exceptional Quality (EQ)** sewage sludge. Sewage sludge that **does not** meet the most stringent limits **for any or all three** of the sludge quality parameters is referred to as **non-EQ sewage sludge.**

EQ sludge is considered comparable to standard fertilizer products. Therefore **land appliers of EQ sewage sludge have no requirements to meet under the Rule.** For non-EQ sludges, however, Part 503 imposes a larger number and variety of requirements depending upon the degree to which the sludge quality diverges from EQ.

Sewage sludge or material derived from sewage sludge is classified as Exceptional Quality (EQ) if it meets the following requirements:

Requirements

Pollutants—Both Ceiling Concentrations (40 *CFR* 503.13(b)(1)) and Pollutant Concentrations (40 *CFR* 503.13(b)(3))

Pathogens—One of the Class A Pathogen Reduction Alternatives (40 *CFR* 503.32(a))

Attractiveness to Vectors—One of the Vector Attraction Reduction Options that are accomplished during sewage sludge processing/treatment (options 1-8) (40 *CFR* 503.33(b)(1)-(8)).

Sewage sludge or material derived from sewage sludge is classified as non-EQ if it exceeds one, two, or all three of the requirements that define EQ sewage sludge as specified above and in the Rule.

When sewage sludge is non-EQ, Part 503 imposes requirements for both the sewage sludge and the land application site to ensure the same level of protection for human health and the environment as provided by EQ sewage sludge.

Methods of Sewage Sludge Distribution to the Land Applier

The number and type of requirements associated with the land application of sewage sludge are affected not only by sludge quality (pollutant levels, level of pathogen reduction, and attractiveness to vectors), but also by the method of distribution, that is, whether the sludge is applied in bulk form or is placed in a bag or other container for application to the land.

The method of distribution is important because it is an indication of the relative quantity of sewage sludge being applied. Bulk sewage sludge is usually applied in large quantities, whereas sewage sludge sold or given away in bags or other containers is usually applied in smaller quantities. Some types of requirements can be easily implemented by large quantity land appliers, while the same requirement can be impractical and cumbersome for the small quantity appliers.

Most of the requirements for land appliers under Part 503 affect appliers of bulk, non-EQ sewage sludge. Appliers of sewage sludge sold or given away in a bag or other container need only read and adhere to instructions on the label or information sheet accompanying the sewage sludge product; they are not subject to management practices, pollutant limits, pathogen and vector attraction reduction requirements, or recordkeeping and reporting requirements.

Because the probability of close human contact is very high when sewage sludge is distributed for use by the general public in bags or other containers, only material that is EQ for all three sludge quality parameters, or that at a minimum meets EQ quality for pathogen reduction and vector attraction reduction, can be distributed in bags or other containers.

Sewage sludge that does not attain EQ quality for at least these two parameters can only be distributed and applied in bulk. This is because there are a number of site restrictions and other land application requirements that are necessary for the proper application of sewage sludge of this quality, yet would be impractical for small appliers such as homeowners to implement.

Consequences of Changing the Quality of Sewage Sludge

If the applier changes the quality of the sewage sludge prior to application, the change may influence the number of requirements with which the land applier must comply.

Generally, it is the responsibility of the person who prepares the sewage sludge to monitor and certify sewage sludge quality. In some cases, the person who prepares the sewage sludge also land applies it and is clearly responsible for meeting the requirements for sewage sludge preparation in addition to those for land application. If the land applier alters the sewage sludge quality so that the quality of the sewage sludge being applied is different from what was received from the preparer, the land applier becomes a preparer and assumes responsibility for monitoring and certifying its quality (e.g., certification of sludge quality relative to pollutant limits, level of pathogen reduction, and level of vector attraction reduction).

Mixing bulk EQ sewage sludge with other EQ sewage sludges, cornposting it, or mixing it with other non 503 regulated substances such as bulking agents, wood chips, or substances to enhance the beneficial characteristics of the sludge as a fertilizer theoretically results in a mixture that is still EQ in quality. Therefore, in these situations, the land applier would not assume responsibility for re-evaluating its quality.

However, sludge quality is considered to have been changed when bulk non-EQ sewage sludge is accepted from several sources and mixed prior to land application, when bulk non-EQ sewage sludge is mixed with other additives such as wood chips\bulking agents or substances to enhance the characteristics of sludge as a fertilizer, or when bulk EQ sewage sludge is mixed with non-EQ sludge. In these situations, the resulting quality of the mixtures must be ascertained to know how to correctly land apply. For further information regarding these requirements, please refer to the document *Preparing Sewage Sludge for Land Application or Surface Disposal-A Guide for Preparers on the Monitoring, Recordkeeping, and Reporting Requirements of the Federal Standards for the Use or Disposal of Sewage Sludge Management, 40 CFR Part 503* (EPA, 1993).

1.3 Glossary of Terms

Agricultural land- Land on which a food, feed, or fiber crop is grown. This includes range land or land used as pasture.

Agronomic rate- The whole sludge application rate designed to (1) provide the amount of nitrogen needed by a crop or vegetation grown on the land and (2) 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.

Annual pollutant loading rate (APLR)- The maximum amount of a pollutant that can be applied to a unit area of land during a 365-day period. This term describes pollutant limits for sewage sludge that is given away or sold in a bag or other container for application to the land.

Annual whole sludge application rate- The maximum amount of a sewage sludge on a dry weight basis that can be applied to a land application site during a 365-day (l-year) period.

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

Bagged sewage sludge- Sewage sludge that is sold or given away in a bag or other container (i.e., either an open or closed receptacle containing 1 metric ton or less of sewage sludge).

Class I sludge management facility- Publicly owned treatment works (POTWs), 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 pretreatment program responsibilities under 40 *CFR* 403.10(e). In addition, the Regional Administrator or, in the case of approved State programs, the Regional Administrator in conjunction with the State Director, has the discretion to designate any treatment works treating domestic sewage (TWTDS) as a Class I sludge management facility.

Cumulative pollutant loading rate (CPLR)- The maximum amount of an inorganic pollutant that can be applied to an area of land. This term applies to bulk sewage sludge that is land applied.

Domestic septage- Either a 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. This does not include septage resulting from treatment of wastewater with a commercial or industrial component.

Exceptional Quality sewage sludge- Sewage sludge that meets the most stringent limits for the three sludge quality parameters. In gauging sewage sludge quality, EPA determined that three main parameters of concern should be considered: (1) pollutant levels, (2) the relative presence or absence of pathogenic organisms, such as salmonella and E-Coli bacteria, enteric viruses, or viable helminth ova, and (3) the degree of attractiveness of the sewage sludge to vectors, such as flies, rats, and mosquitoes, that could potentially come in contact with pathogenic organisms and spread disease. Given these three variables, there can be a number of possible sewage

sludge qualities. The term Exceptional Quality (EQ), which does not appear in the Part 503 regulation, is used to describe sewage sludge that meets the highest quality for all three of these Sewage sludge quality parameters (i.e., ceiling concentrations and pollutant concentrations in 503.13 for metals, one of the Class A pathogen reduction alternatives, and one of the sewage sludge processing vector attraction reduction options 1 through 8).

Feed crop- Crops produced primarily for consumption by animals. These include, but are not limited to, corn and grass. For a crop to be considered a feed crop, it has to be produced for consumption by animals (e.g., grass grown to prevent erosion or to stabilize an area is not considered a feed crop).

Fiber crop- Crops, such as flax and cotton, that were included in Part 503 because products from these crops (e.g., cotton seed oil) may be consumed by humans.

Food crop- Crops consumed by humans. These include, but are not limited to, fruits, grains, vegetables, and tobacco.

Forest land- Tract of land thick with trees and underbrush.

Preparer- 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.

Land application site- An area of land on which sewage sludge is applied to condition the soil or to fertilize crops or vegetation grown in the soil.

Pasture- Land on which animals feed directly on feed crops such as legumes, grasses, or grain stubble.

Public contact site- Land with a high potential for contact by the public, including public parks, ball fields, cemeteries, nurseries, turf farms, and golf courses.

Range land- Open land with indigenous vegetation.

Reclamation site- Drastically disturbed land, such as strip mines and construction sites, that is reclaimed using sewage sludge.

Sewage sludge- The 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, and solids removed during primary, secondary, or advanced wastewater treatment processes. The definition of sewage sludge also includes a material derived from sewage sludge (i.e., sewage sludge whose quality is changed either through further treatment or through mixing with other materials).

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

Treatment works treating domestic sewage- A POTW or other sewage sludge or wastewater treatment system or device, regardless of ownership used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge.

2. SUMMARY OF PART 503 REQUIREMENTS FOR LAND APPLICATION

This section summarizes the Part 503 requirements for the land application of sewage sludge. Part 503 contains seven basic types of requirements for sewage sludge that is land applied:

- General requirements
- Pollutant limits
- Operational standards for pathogen and vector attraction reduction
- Management practices
- Frequency of monitoring
- Recordkeeping
- Reporting.

As has been previously mentioned, the number of requirements for the land applier is determined by the quality of the sewage sludge being land applied, in addition to whether the sewage sludge is land applied in bulk form or sold or given away in a bag or other container for application to the land.

2.1 General Requirements (40 *CFR* 503.12)

The general requirements, listed in Exhibit 2, establish a number of general ground rules for the land application of sewage sludge. Most requirements are for bulk non-EQ sewage sludge. The requirements for land appliers of bulk non-EQ sewage sludge address the:

- Transfer of sufficient information (referred to as Notice and Necessary Information in Part 503.12) among the preparer, land applier, landowner, and permitting authority
- Tracking of cumulative pollutant loadings from sewage sludge that is non-EQ for pollutants
- Movement of sewage sludge across State lines.

Exhibit 2. General Requirements for Land Application of Sewage Sludge

(a)	No person shall apply sewage sludge to the land except in accordance with the Part 503 land application requirements.
(b)	No person shall apply bulk sewage sludge that is non-EQ for pollutants (i.e., subject to 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, forests, areas where the potential for contact with the public is high (i.e., 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 applicable Part 503 requirements.
(e)(2)(i)	Before bulk sewage sludge that is subject to cumulative pollutant loading rates (CPLRs) 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 is being 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 CPLRs has not been applied to the site since July 20, 1993, the cumulative amount of 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 CPLRs 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 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 CPLRs 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 since that date is not known, sewage sludge subject to CPLRs may no longer be applied to the site.
(f)	A person who prepares bulk sewage sludge shall provide the person who applies the bulk sewage sludge notice and necessary information to comply with applicable Part 503 requirements.
(g)	When the person who prepares sewage sludge gives the material to another person who prepares sewage sludge, the person who provides the sewage sludge shall provide to the person who receives sewage sludge notice and necessary information to comply with the applicable Part 503 requirements.
(h)	The person who applies bulk sewage sludge to the land shall provide the owner/leaseholder of the land on which the bulk sewage sludge is applied notice and necessary information to comply with applicable Part 503 requirements
(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 must include: (1) The location by either street address or latitude/longitude, of each land application site. (2) The approximate time period in which the 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 the bulk sewage sludge to the 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 must include: (1) The location, by either street address or latitude/longitude, of each land application site. (2) The name, address, and National Pollutant Discharge Elimination System permit number (if appropriate) of the person who will apply the bulk sewage sludge.

Notice and Necessary Information

If the land applier is not the same person who prepared the sewage sludge, the person preparing the bulk non-EQ sewage sludge is responsible for giving the land applier documentation on the quality of the sewage sludge. This information must be obtained prior to applying the sludge to land. In this case, the preparer must provide the land applier with necessary information on how to comply with Part 503 (see Appendix A, Notice and Necessary Information) to ensure that the land applier is fully aware of his or her responsibilities and that the sewage sludge is properly applied. In turn, the land applier is required to obtain this information from the preparer prior to land application if the preparer does not readily offer it.

The land applier will need to obtain the following information, prior to land application, from the preparer:

- Pollutant concentrations
- Nitrogen concentrations
- Class of pathogen reduction level achieved
- Vector attraction reduction option achieved, if any.

In addition, the land applier is required to provide the landowner/leaseholder with any information necessary to comply with the land application requirements. For example, if sewage sludge that is non-EQ due to pathogens is applied, the land applier, at a minimum, must inform the landowner/leaseholder of the applicable site restrictions. The land applier may also want to provide to the landowner/leaseholder the sewage sludge quality information, including nitrogen content, with documentation that sewage sludge has been applied to the land in compliance with all relevant Part 503 requirements. Appendix A contains a sample format for providing notice and necessary information to the landowner/leaseholder.

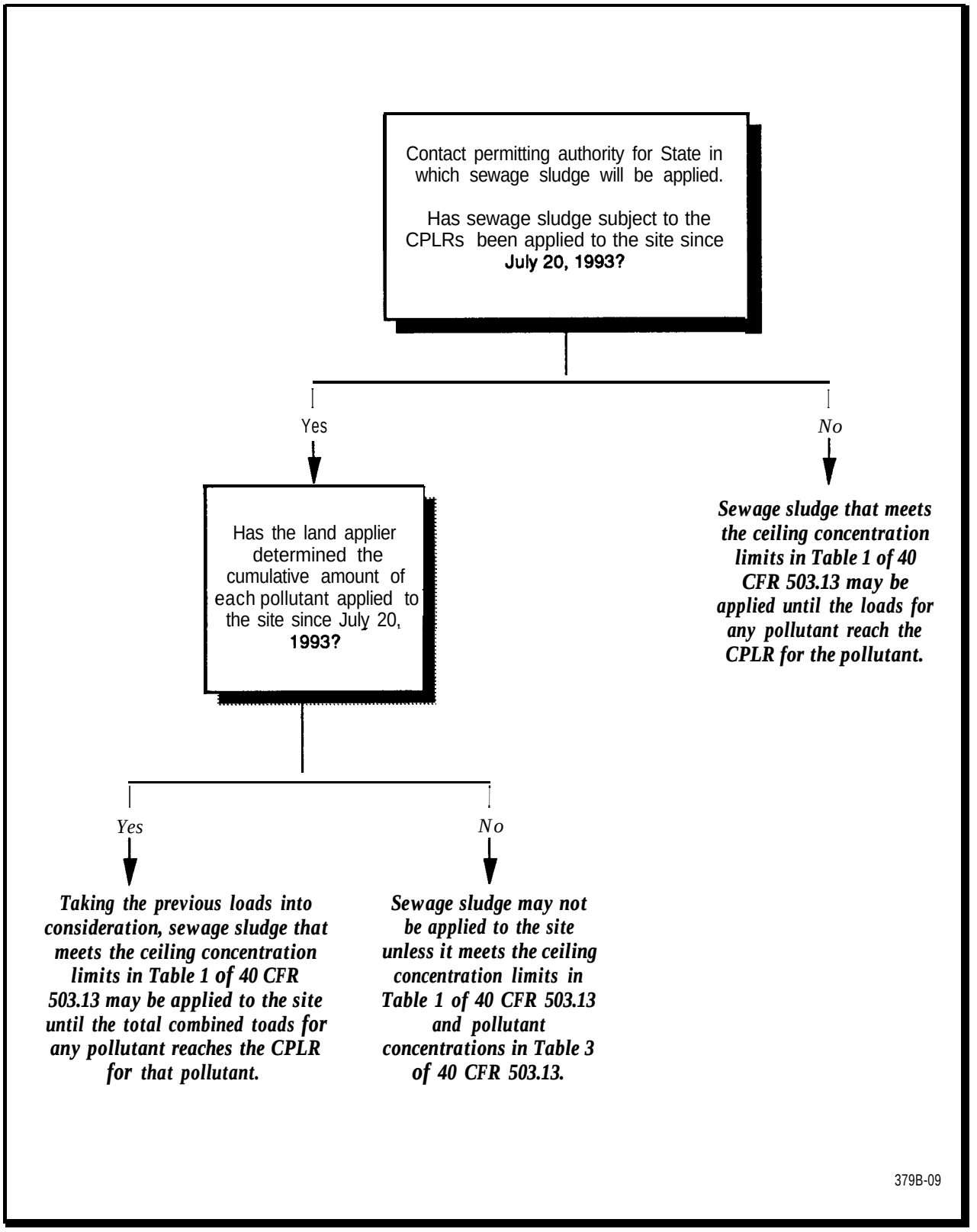
Tracking of Cumulative Pollutant Loadings Rate

If bulk sewage sludge being land applied is non-EQ due to pollutant levels, the land applier is required to comply with cumulative pollutant loading rates (CPLRs). Two general requirements apply specifically to the land application of sewage sludge subject to CPLRs. (CPLRs are described in Section 2.2.) The first general requirement facilitates tracking the amount of each pollutant applied to land application sites where sewage sludge of this quality has been applied. The second general requirement ensures that previous applications of sewage sludge subject to CPLRs are considered before additional applications.

The land applier must notify the permitting authority in the State where the sludge will be applied of his or her intent to apply sewage sludge to a particular site prior to initial land application. This notification must include the location of each land application site and the name, address, telephone number, and National Pollutant Discharge Elimination System (NPDES) permit number (if appropriate) of the land applier.

In all situations where bulk sewage sludge that is non-EQ due to pollutant levels is land applied, land appliers must consult the permitting authority, prior to initiating land application, to determine whether or not there have been past applications of sewage sludge subject to CPLRs **since July 20, 1993.** If sewage sludge of this quality was not applied to the site previously, the land applier must begin keeping records of the cumulative loadings of each of the 10 regulated pollutants. If multiple land appliers are applying sewage sludge of this quality to the same site, they must make their sewage sludge application data available to the other appliers and coordinate the tracking of cumulative loadings to ensure that the CPLRs are not exceeded. If sewage sludge of this quality was applied to the site since July 20, 1993, the land applier must find out the amount of each regulated pollutant that was applied and subtract those loadings from the allowable CPLR for each pollutant to ensure that additional applications will not exceed the CPLR for any of the pollutants regulated under Part 503. If the levels of pollutants were not documented in the previous application and the applier is unable to take these past loadings into account, no additional sewage sludge that is non-EQ due to pollutants can be applied to the site. Exhibit 3 outlines the procedures for determining whether sewage sludge subject to CPLRs can be applied to a land application site that has had previous sewage sludge applications. Land

Exhibit 3. Procedure for Determining Whether Sewage Sludge Subject to CPLRs May Be Applied to a Land Application Site



appliers are encouraged to contact the U.S. Environmental Protection Agency (EPA) Regional Water Management Division for assistance in tracking CPLR applications.

Movement of Bulk Sewage Sludge Across State Lines (see 503.12(i))

When the land applier determines that bulk non-EQ sewage sludge is to be land applied in a State other than the State in which it was generated, he or she should notify the preparer immediately. The preparer is responsible for notifying the permitting authority in the State where the material is to be applied prior to the initial application to a site. Before the initial application, the applier should contact the preparer to confirm that this notification has been submitted.

In the case of interstate land application of sewage sludge that is non-EQ due to pollutant levels (i.e., subject to CPLRs), the land applier, as well as the preparer, must send written notice to the permitting authority in the State where the sewage sludge is to be applied prior to the initial application of sewage sludge to the site.

2.2 Pollutant Limits (40 *CFR* 503.13)

The first parameter of the three that must be assessed to determine overall sludge quality is the level of pollutants (metals). Some sewage sludge contains negligible levels of pollutants while others contain higher levels. To ensure that human health and the environment are protected equally while still allowing the land application of sewage sludges of variable quality, Part 503 provides the following four sets of pollutant limits.

Ceiling Concentrations

Ceiling concentrations apply to all land applied sewage sludge (bulk sewage sludge and sewage sludge sold or given away in a bag or other container). Ceiling concentrations (milligrams per kilogram, on a dry weight basis), given in Exhibit 4, establish the maximum concentration of each pollutant that sewage sludge can contain and still be land applied. Each sample of sewage sludge analyzed must meet the ceiling concentration limits. These limits are applied as maximum, never to be exceeded values, not as averages. Sewage sludge that does not meet

Exhibit 4. Pollutant Limits for the Land Application of Sewage Sludge

Concentration Limits		
Pollutant	**Ceiling Concentrations (Table 1 of 40 *CFR* 503.13) (milligrams per kilogram, dry weight)**	**Pollutant Concentrations (Table 3 of 40 *CFR* 503.13) Monthly Average (milligrams per kilogram, dry weight)**
Arsenic	75	41
Cadmium	85	39
Chromium	3,000	1,200
Copper	4,300	1,500
Lead	840	300
Mercury	57	17
Molybdenum*	75	--
Nickel	420	420
Selenium	100	36
Zinc	7,500	2,800

Loading Rates				
	Cumulative Pollutant Loading Rates (Table 2 of 40 *CFR* 503.13)		**Annual Pollutant Loading Rates (Table 4 of 40 *CFR* 503.13)**	
Pollutant	**(kilograms per hectare, dry weight)**	**(pounds per acre, dry weight)**	**(kilograms per hectare per 365-day period, dry weight)**	**(pounds per acre per 365-day period, dry weight)**
Arsenic	41	37	2.0	1.8
Cadmium	39	35	1.9	1.7
Chromium	3,000	2,677	150	134
Copper	1,500	1,339	75	67
Lead	300	268	15	13
Mercury	17	15	0.85	0.76
Molybdenum*	--	--	--	--
Nickel	420	375	21	19
Selenium	100	89	5.0	4.5
Zinc	2,800	2,500	140	125

***The pollutant concentration limit, cumulative pollutant loading rate, and annual pollutant loading rate for molybdenum were deleted from Part 503 effective February 19, 1994. EPA will reconsider establishing these limits at a later date.**

these specified thresholds for any or all of the 10 regulated pollutants must be used of disposed of in some other way; it cannot be land applied. Once it is determined that sewage sludge meets ceiling concentrations, the preparer must determine which one of the remaining three sets of pollutant limits applies to his or her sewage sludge.

Pollutant Concentration Limits

Sewage sludge meeting pollutant concentration limits achieves one of three levels of quality necessary for EQ status. The land applier has no land application requirements relative to pollutants for sewage sludge meeting these limits. Pollutant concentration limits are monthly average values in milligrams per kilogram on a dry weight basis (see Exhibit 4).

Cumulative Pollutant Loadings

CPLRs apply to bulk sludge that meets ceiling concentration limits but does not meet pollutant concentration limits for any or all of the 10 regulated pollutants (see Exhibit 4). CPLRs establish the maximum amount (mass) of each regulated pollutant that can be applied to a site (kilogram per hectare) during the life of the site. (For purposes of determining compliance with Part 503, a "site" is considered to be a parcel of land on which sewage sludge has been or will be applied.) The greatest number of recordkeeping and reporting requirements for the land applier pertains to sewage sludge of this quality.

When applying sewage sludge that is subject to CPLRs, the land applier is required to keep records of the amounts of each regulated pollutant applied to the site over time to ensure that the maximum allowable amounts are not exceeded. This is calculated by determining the amount of each pollutant applied to the land in previous sewage sludge applications and subtracting this amount from the CPLR for each pollutant (see Appendix B). The applier then must maintain records of the amounts of each pollutant applied to the site in sewage sludge, including the amounts applied in previous applications occurring after July 20, 1993. If several land appliers are applying sewage sludge on the same site, all the land appliers are responsible for communicating with each other to ensure that the CPLRs are not exceeded.

Annual Pollutant Loading Rates

APLRs apply to sewage sludge that meets ceiling concentrations, but does not meet pollutant concentration limits (see Exhibit 4), and **is to be sold or given away in a bag or other container** for application to the land. APLRs establish the maximum amount (mass) of pollutants in sewage sludge that can be applied to a site during a 365-day period. APLRs instead of CPLRs are applied to these sludges because sewage sludge sold or given away in a bag or other container is commonly used by homeowners and it would be impractical to expect homeowners to track cumulative pollutant loadings. APLRs, therefore, have been designed so that the applier of bagged sewage sludge of this quality does not have to track cumulative pollutant loadings.

Appliers that use sewage sludge sold or given away in a bag or other container have no requirements under the Part 503 regulation except to follow the instructions provided with the sewage sludge. For non-EQ sewage sludge that is sold or given away in a bag or other container, the person who prepares the sewage sludge is required to determine the appropriate application rate based on the sludge quality and print it on a label or information sheet for the applier.

Note that only EQ sewage sludge or sewage sludge that is non-EQ only due to pollutant levels can be sold or given away in a bag or other container. Bagged sewage sludge must, at a minimum, meet the highest quality requirements for pathogen reduction and one of the eight vector attraction reduction options that involve treatment of the sewage sludge. Sewage sludge that does not meet the highest quality for at least these two sludge quality parameters cannot be sold or given away in a bag or other container for application to the land.

2.3 Pathogen Reduction (40 *CFR* 503.15 and 40 *CFR* 503.32)

The second parameter in determining sewage sludge quality is the presence or absence of pathogens (i.e., disease causing organisms), such as Salmonella bacteria, enteric viruses, and viable helminth ova. The preparer is responsible for monitoring and certifying the sewage

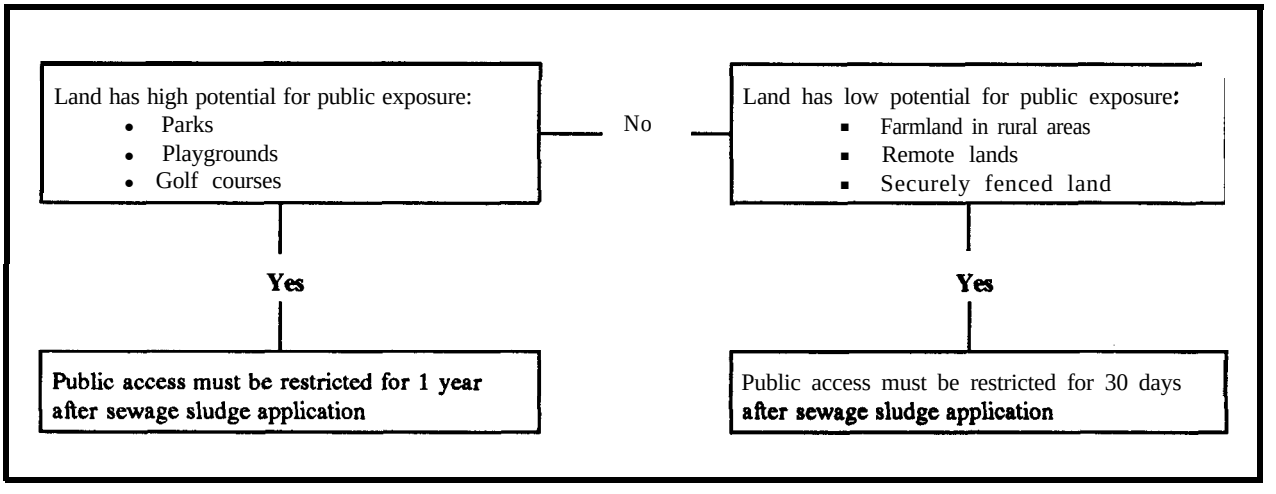
sludge for pathogen reduction. If the land applier chooses, however, he or she may at any time verify this information independently (see Appendix C, Monitoring).

The Part 503 regulation contains two classes of pathogen reduction: Class A and Class B. Class A pathogen reduction alternatives render the sewage sludge virtually pathogen free after treatment. Class B pathogen reduction alternatives significantly reduce but do not eliminate all pathogens. Land appliers who apply sewage sludge that is certified by the preparer as Class A have no requirements relative to pathogens. If the sewage sludge is Class B, site restrictions must be imposed to allow time for natural processes to further reduce pathogen levels.

Site restrictions for Class B address (1) public access to the land application site and (2) crop harvest and grazing of animals at the site. Public access must be restricted for at least 30 days on all land application sites that receive Class B sewage sludge.

If the site is frequently used by the public or the potential for public contact is high, public access must be restricted for 1 year after Class B sewage sludge is applied. Exhibit 5 illustrates the different public access waiting periods.

Exhibit 5. Public Access Restrictions for Land Application of Class B Sewage Sludge



In addition to public access control, several other site restrictions may apply, depending on the uses of the land application site. For example, if food crops are grown at the site, certain

waiting periods must be observed prior to harvest. Similarly, waiting periods must be observed for sites where feed and fiber crops, as well as turf, are grown and where animals are grazed.

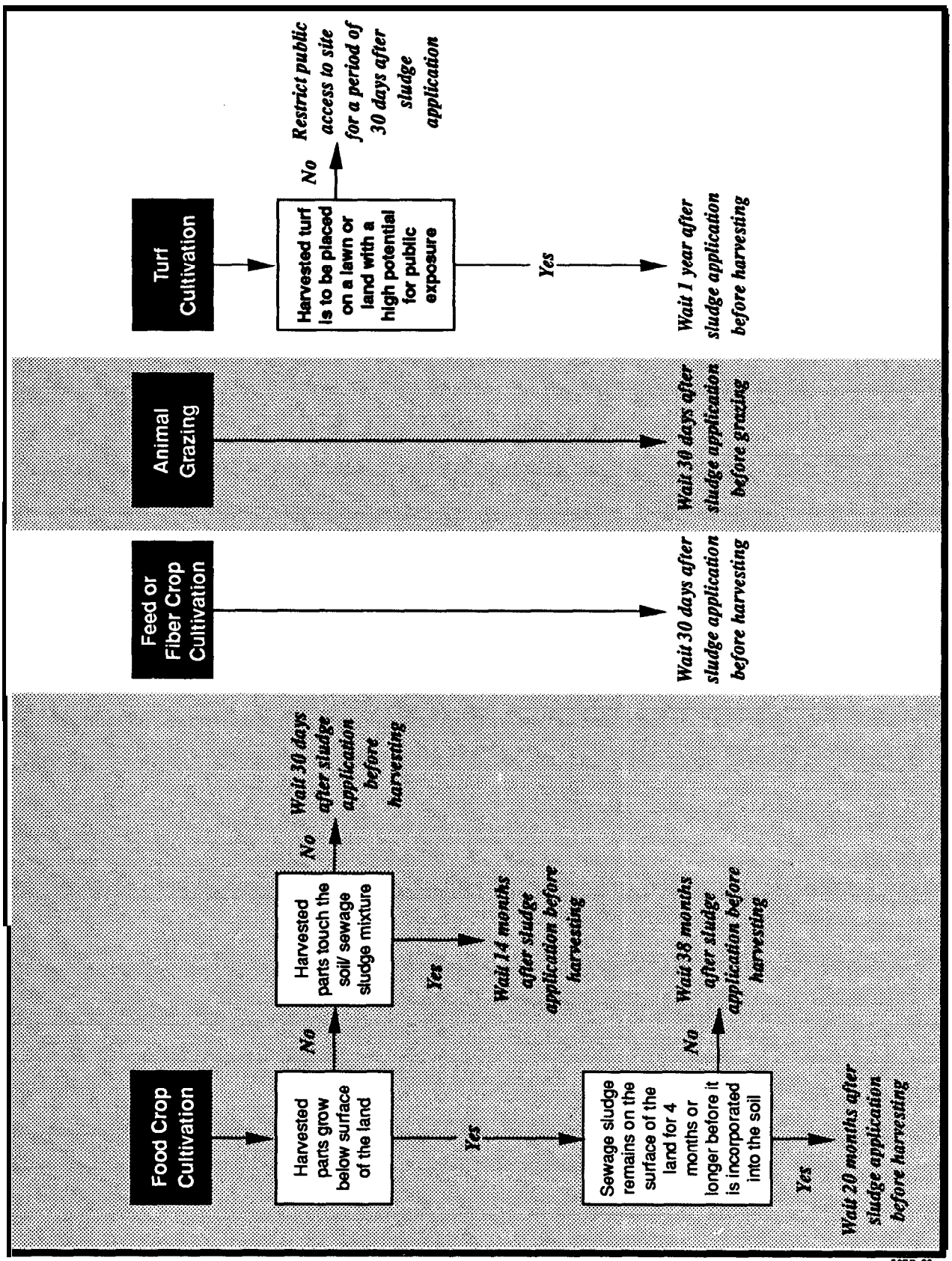
Exhibit 6 provides a flowchart linking the land use with site restrictions. When the land application site is not used for any of the activities shown in Exhibit 6, the only site restriction that applies is public access control.

The site restrictions to control public access or crop harvest and grazing animals must be implemented by either the land applier or the landowner/leaseholder. At a minimum, the land applier must provide the landowner/leaseholder with a list of these restrictions and inform him or her that these restrictions must be met for each site where Class B sewage sludge is applied. If it is agreed that the land applier will implement site restrictions, the land applier must certify that they have been met and maintain this certification in his or her records for a period of 5 years. If the land applier and the land owner agree that the land owner will implement the appropriate restrictions, the land applier must provide the land ***owner*** with a list of the restrictions and certify that the land owner was appropriately informed. (Refer to Appendix A, Notice and Necessary Information, for an example notification format.)

In summary, the following site restrictions associated with the application of Class B sewage sludge are necessary to provide the same level of protection to public health and the environment as is provided by Class A sewage sludge:

- Public access to land with a high potential for public exposure shall be restricted for 1 year after sewage sludge application.
- Public access to land with a low potential for public exposure shall be restricted for 30 days after sewage sludge application.
- Food crops, feed crops, or fiber crops shall not be harvested for 30 days after sewage sludge is applied.
- Food crops with harvested parts that touch the sewage sludge/soil mixture and are totally above the land surface (e.g., melons, cucumbers, squash) shall not be harvested for 14 months after application of sewage sludge.

Exhibit 6. Crop and Grazing Restrictions for Class B Sewage Sludge



- Food crops with harvested parts below the surface of the land (e.g., root crops, such as potatoes, carrots, radishes) shall not be harvested for 20 months after application when the sewage sludge is not incorporated into the soil or remains on the soil surface for 4 or more months prior to incorporation into the soil.

- Food crops with harvested parts below the surface (e.g., root crops, such as potatoes, carrots, radishes) shall not be harvested for 38 months if the sewage sludge is incorporated into the soil within 4 months after sewage sludge application.

- Animals shall not be grazed on a site for 30 days after sewage sludge application.

- Turf shall not be harvested for 1 year after sewage sludge application if the turf is placed on land with a high potential for public exposure or on a lawn, unless otherwise specified by the permitting authority.

2.4 Vector Attraction Reduction (40 *CFR* 503.15 and 40 *CFR* 503.33)

The degree of attractiveness of sewage sludge to vectors is the third parameter of sewage sludge quality. Vectors are animals and insects (e.g., rodents, flies, birds) that might be attracted to sewage sludge and, therefore, could transmit pathogenic organisms (if any are present) to humans. One of the 10 options provided in the regulation to reduce vector attractiveness must be met if sewage sludge is to be applied to the land. The 10 vector attraction reduction options fall into two categories-treatment options (options 1 through 8) and barrier options (options 9 and 10). Treatment options are undertaken by the sewage sludge preparer. If any one of the treatment options is performed by the preparer, the land applier has no requirements relative to vector attraction reduction. If one of the treatment options is not performed by the preparer, the land applier is responsible for implementing and certifying compliance with either one of the following barrier options (which use soil as a barrier between the sewage sludge and any vectors that might be present):

- Vector Attraction Reduction Option 9 (40 *CFR* 503.33)

  - Sewage sludge shall be injected below the surface of the land.
  - No significant amount of the sewage sludge shall be present on the land surface within 1 hour after the sewage sludge is injected.
  - When sewage sludge that is injected below the surface of the land is Class A for pathogens, the sewage sludge shall be injected below the land surface within 8

hours after being discharged from the pathogen treatment process (to prevent regrowth of Salmonella bacteria).

- Vector Attraction Reduction Option 10 (40 *CFR* 503.33)

  - Sewage sludge applied to the land shall be incorporated into the soil within 6 hours after application to the land.
  - When sewage sludge that is incorporated into the soil is Class A for pathogens, the sewage sludge shall be applied to the land within 8 hours after being discharged from the pathogen treatment process.

2.5 Management Practices (40 *CFR* 503.14)

Management practices also help ensure that sewage sludge is applied in a manner that is protective of human health and environment. Most management practices govern the way in which bulk non-EQ sewage sludge is applied to the land and, in some cases, may prevent the application from occurring on a specific parcel. Management practices are applicable to the land application of bulk non-EQ sewage sludge in the following areas:

- Threatened or Endangered species
- Flooded, frozen, or snow-covered land
- Distance to waters of the United States
- Agronomic rates.

Only one management practice applies to sewage sludge sold or given away in a bag or other container. A label or information sheet must be provided with the sludge indicating the appropriate application rate for the quality of the sludge. The applier is required to read and follow correctly these instructions.

Threatened or Endangered Species

Part 503 prohibits the application of bulk non-EQ sewage sludge to the land if it is likely to adversely affect threatened or endangered species or their designated critical habitat. Any direct or indirect action that reduces the likelihood of survival and recovery of an threatened or endangered species is considered an “adverse effect. ” Critical habitat is any place where an

threatened or endangered species lives and grows during any stage in its life cycle. The U.S. Department of Interior, Fish and Wildlife Service (FWS) publishes a list of threatened or endangered species at 50 *CFR* 17.11 and 17.12.

Application of sewage sludge to land that is subjected to normal tillage, cropping, and grazing practices, mining, forestry and other activities that, by their nature, turn the soil and impact vegetation is not likely to cause any increase in negative impact on endangered species and in fact may be beneficial because of the nutritive and soil building properties of sewage sludge. However, it is the responsibility of the land applier to determine whether the application of sludge might cause an adverse effect on threatened or endangered species or their critical habitats. The Part 503 rule requires the land applier to certify that the applicable management practices have been met, including the requirement concerning threatened or endangered species, and that records be kept indicating how the applicable management practices have been met.

To comply with this management practice, the land applier should consult with FWS to determine whether any threatened or endangered species or designated critical habitats are present at the site. The land applier should retain all documentation to demonstrate that the site was evaluated for potential effects on threatened or endangered species and/or their habitat and that necessary protective measures were identified and implemented. The telephone number of the appropriate local FWS field office can be obtained from the FWS regional offices, listed in Appendix D.

Flooded. Frozen. or Snow-Covered Land

Part 503 does not prohibit the application of bulk non-EQ sewage sludge to flooded, frozen, or snow-covered lands. The regulation does, however, state that bulk sewage sludge applied to these lands may not enter wetlands or other waters of the United States, unless specifically authorized by a permit issued under Sections 402 or 404 of the Clean Water Act. EPA Regional Sludge Coordinators can be contacted for further information.

Prior to applying sewage sludge to flooded, frozen, or snow-covered lands, the land applier should ensure that proper runoff control measures are in place to prevent sewage sludge from

entering waters of the United States. Some common runoff controls include slope restrictions, buffer zones/filter strips, tillage to create a roughened soil surface, crop residue or vegetation requirements, berms, dikes, silt fences, diversions, sediment basins and terraces.

Distance to Waters of the United States

Part 503 prohibits the application of bulk non-EQ sewage sludge on agricultural land, forest, or a reclamation site that is within 10 meters (approximately 33 feet) of any waters of the United States (i.e., intermittent flowing streams as well as creeks, rivers, wetlands, or lakes) unless otherwise specified by the permitting authority. This lo-meter buffer zone serves as a barrier against sewage sludge entering water bodies. A permitting authority may give approval prior to application of sewage sludge to land that is less than 10 meters from waters of the United States if the application is expected to enhance the local environment. For example, the application of bulk sewage sludge to revegetate a stream bank suffering from severe erosion may be approved by the permitting authority if the risk from not stabilizing the bank with sewage sludge is greater than the risk of sewage sludge reaching the stream.

Many land appliers employ additional management practices to minimize runoff and ponding of sewage sludge. Common management practices include conservation tillage, infiltration trenches, diversions, filter strips, terraces, grassed waterways, sediment basins, and detention ponds.

Agronomic Rate

Part 503 requires that bulk non-EQ sewage sludge be applied to a site at a rate that is equal to or less than the agronomic rate for the site. The agronomic rate is the whole sewage sludge application rate (on a dry weight basis) that is designed to provide the amount of nitrogen needed by the crop or vegetation and yet minimize the amount of nitrogen that passes below the root zone of the crop or vegetation to the ground water. A sewage sludge application rate exceeding the agronomic rate could result in nitrate contamination of the ground water. Sewage sludge should be applied as close to the time of maximum nutrient uptake by crops as feasible.

Although the preparer is required to supply the land applier with the nitrogen content of the sewage sludge, the land applier will be responsible for ensuring that the sewage sludge is applied at less than or equal to the agronomic rate for the site. Appendix E contains worksheets to help calculate the annual whole sewage sludge application rate consistent with the agronomic rate for the vegetation being grown. **These worksheets provide only one approach for calculating the agronomic rate; other approaches can be used.** Many State sludge management programs and/or local agricultural extension agents have developed their own methods for calculating the agronomic rate. Assistance in calculating the agronomic rate should be available from a knowledgeable person such as the local extension agent or soil testing department at the land grant university in each State.

In some cases, the permitting authority may specifically authorize the application of sewage sludge to a reclamation site at a rate that exceeds the agronomic rate. Such cases may include but are not limited to, reclamation sites where there is no potential for nitrate to leach down to the ground water or where the ground water is not capable of being used as a potable water supply (assuming that the State has no antidegradation policy that would apply to these waters). Typically, sewage sludge will be applied at a rate that exceeds the agronomic rate only once, to improve the physical properties of the soil and supply nitrogen and other nutrients. Once a vegetative cover has been established, future applications of sewage sludge should be limited to the agronomic rate of the vegetation grown.

2.6 Monitoring (40 *CFR* 503.16)

The person who prepares sewage sludge must monitor sludge quality. As mentioned in the section on general requirements, the land applier must obtain information from the preparer on the pollutant concentrations in bulk non-EQ sewage sludge. The applier of bulk sewage sludge may want to independently verify sewage sludge quality through additional testing, although **this is not required.** By independently testing the sewage sludge using EPA-approved procedures, the applier can check the reliability of the information from the preparer. Appendix C contains guidance for monitoring the quality of sewage sludge.

To meet the requirement of providing the land applier with the pollutant concentration information, the preparer may negotiate with the land applier and designate the land applier as the party responsible for sampling and/or testing the preparer's sewage sludge. The land applier will need to keep records documenting results. However, the preparer is still responsible for documenting the. sewage sludge quality.

2.7 Recordkeeping (40 *CFR* 503.17)

Recordkeeping requirements for the land application of sewage sludge are divided into responsibilities for the sewage sludge preparer and those for the land applier. All preparers are required to keep records on sludge quality regardless of whether the sewage sludge is EQ or non-EQ. Land appliers are only required to keep records for sludge quality if they change the original quality of the sludge and therefore meet the definition of a preparer. Otherwise, land appliers are only required to keep records when applying bulk sewage sludge that is non-EQ for one, two, or all three of the sludge quality parameters.

Some recordkeeping requirements for land appliers vary depending on the sewage sludge quality. However, all appliers of **bulk non-EQ** sewage sludge are responsible for documenting implementation of the applicable management practices. When bulk sewage sludge is non-EQ for pollutants, the land applier also must keep records tracking the cumulative pollutant loadings. The land applier must also keep records describing the procedures used and the results of the investigations of previous applications of sewage sludge subject to CPLRs. When the site has reached 90 percent of its CPLR, the land applier should notify the preparer annually until the site has reached 100 percent. At that point, no additional sewage sludge that is non-EQ for pollutants can be applied. When bulk sewage sludge is non-EQ for pathogens, the land applier must keep records on the implementation of Class B site restrictions. When bulk sewage sludge is non-EQ for vector attraction reduction, the land applier must keep records documenting implementation of one of the vector attraction reduction options (i.e., option 9 or 10).

In addition, the land applier must sign a certification as to whether he or she is in compliance with site restrictions, vector attraction reduction options, and/or management practices whenever

these requirements are applicable. Most records must be kept and made readily available to inspectors for a period of **5 years.** Where sewage sludge that is non-EQ for pollutants is being applied, the land applier must maintain records documenting the cumulative pollutant loadings for each application site **indefinitely.**

2.8 Reporting (40 *CFR* 503.18)

The reporting requirements under Part 503 apply to major municipal NPDES permittees and Class I Sludge Management Facilities. Major municipal NPDES permittees are publicly owned treatment works (POTWs) with a design flow rate equal to or greater than 1 million gallons per day and POTWs with a service population of 10,000 people or more. Class I sludge management facilities are usually POTWs that are 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 pretreatment program responsibilities under 40 *CFR* 403.10(e). In addition, the EPA Regional Administrator may use his or her discretion to designate other treatment works treating domestic sewage (TWTDS) as Class I sludge management facilities. Land appliers are not TWTDS unless designated as such by the EPA Regional Administrator. In order to have reporting requirements under Part 503, a land applier must be designated both a TWTDS and a Class I sludge management facility.

If the land applier is designated as a Class I sludge management facility, the permitting authority will probably issue a permit to the land applier that describes the reporting requirements. Persons required to report must do so by February 19 of each year. Each report should cover the previous calendar year (i.e., January 1 through December 31). Reports should be submitted

otherwise. The address for each Branch Chief is provided on the inside of the back cover of this document.
located.

information if he or she is a major municipal NPDES permittee or a Class I sludge management

facility. Any land applier who is also a preparer should consult the manual entitled *Preparing Sewage Sludge for Land Application or Surface Disposal-A Guide for Preparers of Sewage Sludge on the Monitoring, Recordkeeping, and Reporting Requirements of the Federal Standards for the Use or Disposal of Sewage Sludge, 40 503* (EPA, 1993), to determine the information to include in the preparer's portion of the report.

Additional Reporting at Times Required of Land Appliers

Although it is unlikely that the land applier will have to report compliance information to the permitting authority, the applier will need to report compliance information to the preparer of the sewage sludge. Section 503.7 of the regulation states that the preparer is ultimately responsible for making sure land application requirements are complied with, whether the preparer performs the actual land application or not. Therefore, the preparer will need to exercise some control over the activities of the applier and will need certain information to keep records of those activities.

The transfer of land application information from the land applier to the preparer is not required by Part 503. Therefore, to ensure the requisite flow of information, the exchange of this information, and any other agreements, should be accomplished through a written agreement between the two parties.

Liability

When a violation of land application requirements has occurred, the permitting authority, at its discretion, may take an enforcement action against either or both parties, depending on the nature and circumstances surrounding the violation.

3. SEWAGE SLUDGE SCENARIOS AND LAND APPLIER RESPONSIBILITIES

Nine scenarios have been given in Section 3 to help land appliers determine their responsibilities under 40 *CFR* Part 503.

Each scenario represents a different combination of sewage sludge quality and methods of distribution. In addition, each scenario includes a comprehensive list of all appropriate requirements. The attempt has been made to provide scenarios that match many of the actual land application situations that normally occur and provide guidance to the land applier on his or her responsibilities.

Each scenario is presented in a separate section, which includes a brief description followed by a list of the Part 503 requirements for the sewage sludge preparer and a list for the land applier. The preparer's requirements are given so that the land applier will know what information to expect and/or request from the preparer. The scenarios are presented according to the number of applicable requirements, from the fewest to the greatest. Specific requirements that are subject to Part 503 recordkeeping requirements are identified with an asterisk. The section numbers of the applicable recordkeeping requirements are also given. Exhibit 7 provides a matrix to help the land applier identify his or her scenario. The exhibit also gives the section and page number for the discussion of each scenario.

3.1 Scenario l-Land Application of Exceptional Quality Sewage Sludge (either bulk sewage sludge or sewage sludge sold or given away in a bag or other container)

EQ sewage sludge is considered to be comparable to other common fertilizer products. EQ sewage sludge can be distributed and applied in bulk or sold or given away in a bag or other container for application to agricultural land, forest, public contact sites, reclamation sites, lawns, and home gardens. EQ sewage sludge can be applied to sites where the potential for contact with the public is high, such as on urban parkland or golf courses, without any restrictions. It can even be applied to sites where sewage sludge that is non-EQ for pollutants

Exhibit 7. Matrix for Identifying Land Application Scenario*

Scenario	Method of Distribution	EQ	Non-EQ for Pollutant Levels	Non-EQ for Pathogen Reduction	Non-EQ for Vector Attraction Reduction	Section Page Number
1	EQ Bulk or Bag/Container	●				3.1/31
2	Bag/Container		●			3.2/33
3	Bulk		●			3.3/35
4	Bulk			●		3.4/38
5	Bulk				●	3.5/40
6	Bulk		●	●		3.6/42
7	Bulk		●		●	3.7/46
8	Bulk			●	●	3.8/49
9	Bulk		●	●	●	3.9/52

Note: If there is not a dot in the box under one of the parameters, the sewage sludge is EQ for that particular parameter.

***To determine your scenario using this matrix, locate the appropriate method of distribution and the parameter(s) that make the sludge non-EQ. For example, if you are applying bagged sewage sludge that is EQ for all parameters, the appropriate scenario is Scenario 1, which is discussed in Section 3.1. If you are applying bulk sewage sludge that is non-EQ for both pollutant levels and vectors, the appropriate scenario is Scenario 7, which is discussed in Section 3.7.**

has been applied (even if the site has reached its maximum cumulative pollutant loading rate [CPLR]) without having to document compliance with any management practices. EQ sewage sludge can be transported to and applied in States other than where it was prepared without any notification requirements.

Sewage sludge that is classified as EQ meets the following sewage sludge quality criteria:

- Pollutants-Both ceiling concentration limits (Table 1 of 40 *CFR* 503.13) and pollutant concentration limits (Table 3 of 40 *CFR* 503.13) (see Exhibit 4 of this document).
- Pathogens-One of the Class A pathogen reduction alternatives, (performed by the preparer).
- Attractiveness to Vectors-One of the sewage sludge vector attraction reduction options 1 through 8, (performed by the preparer).

Requirements for the Preparer Under Scenario 1

The preparer is required to document the attainment of EQ sewage sludge quality and maintain these data in his or her records. The preparer is not required to provide the land applier with this documentation, and the land applier is not required to request it. Even though the general requirement for notice and necessary information does not apply to EQ sewage sludge, the preparer should be willing to provide documentation to ensure the land applier that the sewage sludge meets EQ criteria. Data on sewage sludge quality are not confidential.

Requirements for the Land Applier Under Scenario 1

The land applier has no requirements when applying EQ sewage sludge as long as the land applier does not mix it with non-EQ sewage sludge before application. If the land applier further processes EQ sewage sludge by mixing it with other sewage sludge that is **non-EQ,** he or she meets the Part 503 definition of a preparer by virtue of the fact that non-EQ sludge is a part of the mixture. The individual is then responsible for monitoring and documenting sewage sludge quality.

3.2 Scenario 2-Land Application of Sewage Sludge That Is Non-EQ Due to Pollutant Levels and Is Sold or Given Away in a Bag or Other Container (i.e., subject to annual pollutant loading rates)

Scenario 2 addresses sewage sludge that is non-EQ due to pollutant levels (sewage sludge that meets the ceiling concentration limits but not the pollutant concentration limits) and is sold or given away in a bag or other container (i.e., 1 metric ton or less). Sewage sludge in this scenario meets the following criteria:

- Pollutants-Ceiling concentration limits (Table 1 of 40 *CFR* 503.13) **and annual pollutant loading rates (APLRs),** (Table 4 of 40 *CFR* 503.13) (see Exhibit 4 of this document).
- Pathogens-One of the Class A pathogen reduction alternatives, (performed by the preparer).
- Attractiveness to Vectors-One of the vector attraction reduction options 1 through 8, (performed by the preparer).

Sewage sludge sold or given away in bags or other containers is frequently used by homeowners for gardens or lawns. Because the potential for human contact with this material is high, sewage sludge that is non-EQ for pollutants is the only type of non-EQ sewage sludge that may be sold or given away in a bag or other container. Sewage sludge or material derived from sewage sludge must always meet the EQ pathogen and vector attraction reduction requirements to be sold or given away in a bag or other container. Sewage sludge that is non-EQ due to pathogens and/or vector attraction reduction must be land applied in bulk.

Requirements for the Preparer Under Scenario 2

The preparer of sewage sludge that is non-EQ for pollutants and is sold or given away in a bag or other container for application to the land is required to:

1. Document compliance with ceiling concentration limits
2. Document compliance with Class A pathogen reduction requirements
3. Document compliance with one of the sewage sludge vector attraction reduction options 1 through 8.
4. Certify compliance status with pathogen and vector attraction reduction.
5. Determine the appropriate annual whole sludge application rate (using the procedure in Appendix A of Part 503) based on the pollutant content of the sewage sludge.
6. Provide the information to the land applier (e.g., homeowner) by either affixing a label to the bag or other container or providing an information sheet when the material is sold or given away.

Requirements for the Land Applier Under Scenario 2

The land applier of sewage sludge that is non-EQ for pollutants and sold or given away in a bag or other container is required to read and follow the instructions given on the label or information sheet.

3.3 Scenario 3-Land Application of Bulk Sewage Sludge That Is Non-EQ Due to Pollutant Levels (i.e., subject to cumulative pollutant loading rates)

Scenario 3 consists of bulk sewage sludge that is non-EQ due to pollutant levels but meets EQ criteria for pathogens and vector attractiveness. Sewage sludge that is non-EQ for pollutants meets the following criteria:

- Pollutants-Ceiling concentration limits (Table 1 of 40 *CFR* 503.13) **and land application is subject to cumulative pollutant loading rates (CPLRs)** (Table 2 of 40 CFR 503.13) (see Exhibit 4 of this document).
- Pathogens-One of the Class A pathogen reduction alternatives, (performed by the preparer).
- Attractiveness to Vectors-One of the vector attraction reduction options 1 through 8, (performed by the preparer).

Requirements for the Preparer Under Scenario 3

The preparer of bulk sewage sludge that is non-EQ due to pollutant levels is required to:

1. Provide the land applier with notice and necessary information, which must include:

   - Documentation of pollutant levels, on a dry weight basis, in the bulk sewage sludge.
   - Documentation of the concentrations of total nitrogen, as N, on a dry weight basis, in the sewage sludge. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen).
   - Certification statement documenting that one of the Class A pathogen reduction alternatives was achieved.
   - Certification statement documenting that one of the vector attraction reduction options 1 through 8 was achieved.

2. When sludge is applied in a State different from the one in which the sewage sludge was prepared, provide written notice to the permitting authority (i.e., the appropriate EPA Regional Office or State [if it has an approved sewage sludge program]) in which the bulk sewage sludge subject to CPLRs will be applied, prior to the initial application to the site. The notice must include:

   - The location by either street address or latitude/longitude of each land application site

- The approximate time period in which the bulk sewage sludge will be applied to the site
- The name, address, telephone number, and National Pollutant Discharge Elimination System (NPDES) permit number (if appropriate) of the preparer
- The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

Requirements for the Land Applier Under Scenario 3

The land applier of bulk sewage sludge that is non-EQ for pollutants should address several requirements.

1. The applier should obtain notice and necessary information (see Appendix A) from the preparer, which includes:

   - Documentation of pollutant levels on a dry weight basis in the bulk sewage sludge.
   - Documentation of the concentrations of total nitrogen, as N, on a dry weight basis, in the sewage sludge. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen .)
   - Certification statement documenting that one of the Class A pathogen reduction alternatives was achieved (see Appendix F).
   - Certification statement documenting that one of the vector attraction reduction options 1 through 8 was achieved (see Appendix F).

2. If planning to apply non-EQ sewage sludge in a State other than the State in which the sewage sludge was prepared, the applier **should, but is not required to,** give the preparer the following information to assist the preparer in meeting the out-of-State notification requirement:

   - The location by either street address or latitude/longitude of each land application site
   - The approximate time period in which the bulk sewage sludge will be applied to the site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

3. The applier should provide written notice to the permitting authority (i.e., the appropriate EPA Regional Office or the State [if it has an approved sewage sludge program]) in which the bulk sewage sludge subject to CPLRs is being applied prior to the initial application of the bulk sewage sludge to the land. The notice must include:

- The location by either street address or latitude/longitude of each land application site
- The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

* 4. The applier should contact the permitting authority (i.e., the appropriate EPA Regional Office or State [if it has an approved sewage sludge program] in which the sewage sludge will be applied) to determine whether bulk sewage sludge subject to CPLRs has been applied to the site since July 20, 1993. (See Section 4.1.)

- If bulk sewage sludge that is non-EQ for pollutants **has not been applied to the** site since July 20, 1993, the cumulative amount of each pollutant listed in Exhibit 4 of this document (Table 2 of 40 *CFR* Part 503.13) may be applied to the site in accordance with those limits.
- If bulk sewage sludge that is non-EQ for pollutants **has been applied** to the site since July 20, 1993, **and the cumulative amount of each pollutant applied to the site since that date** is **known,** this amount should be subtracted from the cumulative amounts shown on Exhibit 4 to determine the remaining amount of each pollutant that may be applied to the site in accordance with CPLR limits.
- If bulk sewage that is non-EQ for pollutants **has been applied** to the site since July 20, 1993, and the **cumulative amount of each pollutant applied to the site since that date** is **not known,** no additional sewage sludge that is non-EQ for pollutants may be applied to the site. Any additional sewage sludge applied must meet the pollutant concentration limits.

* 5. The applier should describe the investigation of previous applications of bulk sewage sludge that is non-EQ for pollutants. Certify that the requirement to obtain information on previous applications. of bulk sewage sludge that is non-EQ for pollutants has been met. (See Section 4.1 and Appendix F.)

* 6. The applier should develop and **maintain indefinitely** records documenting compliance with CPLRs. Records must be readily accessible to State and EPA inspectors. This information is not confidential and may not be withheld from other land appliers or the public. (See Section 4.1 and Appendix B.)

* 7. The applier should report to the preparer when a site(s) has reached 90 percent of the CPLR for any one or all of the regulated pollutants. Continue to report annually until the site has reached 100 percent of the CPLR for the pollutant(s) in question. Once the 100 percent level is reached, no additional sewage sludge that is non-EQ due to pollutants may be applied to the site. (See Section 4.1.)

* 8. The applier should implement management practices. Develop records documenting compliance with the management practices. Certify that the management practices were met. Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.4 and Appendix F.)

9. The applier should provide notice and necessary information to the land owner/lease holder.

[* - denotes recordkeeping requirements]

3.4 Scenario 4-Land Application of Bulk Sewage Sludge That Is Non-EQ Due to Pathogen Reduction

Scenario 4 consists of bulk sewage sludge that meets all the requirements for EQ sewage sludge except that it has attained Class B pathogen reduction levels instead of Class A. Sewage sludge in Scenario 4 meets the following sewage sludge quality requirements:

- Pollutants-Both ceiling concentration limits (Table 1 of 40 *CFR* 503.13) and pollutant concentration limits (Table 3 of 40 *CFR* 503.13) (see Exhibit 4 of this document)
- **Pathogens-One of the Class B pathogen reduction alternatives**
- Attractiveness to Vectors-One of the vector attraction reduction options 1 through 8, (performed by the preparer).

Requirements for the Preparers Under Scenario 4

The preparer of bulk sewage sludge that is non-EQ due to pathogen reduction is required to:

1. Provide the land applier with notice and necessary information, which must include:

   - Documentation of pollutant levels, on a dry weight basis, in the bulk sewage sludge.
   - Documentation of the concentration of total nitrogen, as N, on a dry weight basis in the sewage sludge. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen.)
   - Certification statement documenting that one of the Class B pathogen reduction alternatives was achieved.
   - Notification that Class B site restrictions must be performed.
   - Certification statement documenting that one of the vector attraction reduction options 1 through 8 was achieved.

2. When applied in a State different from the one in which the sewage sludge was prepared, provide written notice to the permitting authority (i.e., the appropriate EPA Regional Office or State [if it has an approved sewage sludge program]) in which the bulk sewage sludge will be applied, prior to the initial application. The notice must include:

- The location by either street address or latitude/longitude of each land application site
- The approximate time period in which the bulk sewage sludge will be applied to the site
- The name, address, telephone number, and NPDES permit number (if appropriate) of the preparer
- The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

Requirements for Land Applier Under Scenario 4

The land applier of bulk sewage sludge that is non-EQ due to pathogen reduction should address several requirements.

1. The applier should obtain notice and necessary information (see Appendix A) from the preparer, which includes:

   - Documentation of pollutant levels, on a dry weight basis, in the bulk sewage sludge.
   - Documentation of the concentration of total nitrogen, as N, on a dry weight basis, in the sewage sludge. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen.)
   - Certification statement documenting that one of the Class B pathogen reduction alternatives was achieved (see Appendix F).
   - Notification that Class B site restrictions must be performed.
   - Certification statement documenting that one of the vector attraction reduction options 1 through 8 was achieved (see Appendix F).

2. If planning to apply non-EQ sewage sludge in a State other than the State in which the sewage sludge was prepared, the applier **should but is not required to** give the preparer the following information to assist the preparer in meeting the out-of-State notification requirement:

   - The location by either street address or latitude/longitude of each land application site
   - The approximate time period in which the bulk sewage sludge will be applied to the site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

* 3. **The applier should implement Class B site restrictions and/or provide a list of applicable site restrictions to the landowner/leaseholder on a copy of the notice and necessary information.** Maintain records and sign a certification statement documenting implementation of site restrictions (even if implementation consisted solely of notifying the landowner). Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.2 and Appendix F.)

* 4. The applier should implement management practices. Maintain records and sign a certification statement documenting compliance with management practices. Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.4 and Appendix F.)

5. The applier should provide notice and necessary information to the land owner/lease holder.

[* - denotes recordkeeping requirements]

3.5 Scenario 5-Land Application of Bulk Sewage Sludge That Is Non-EQ Due to Vector Attraction Reduction

Scenario 5 consists of bulk sewage sludge that meets all the criteria for EQ sewage sludge except vector attraction reduction options 1 through 8. To be eligible for land application, **all** sewage

performed by the preparer, or option 9 or 10, which are performed by the land applier. Sewage sludge that is classified as non-EQ due to the level of vector attraction reduction meets the following sewage sludge quality requirements:

- Pollutants-Roth ceiling concentration limits (Table 1 of 40 *CFR* 503.13) and pollutant concentration limits (Table 3 of 40 *CFR* 503.13) (see Exhibit 4 of this document)
- Pathogens-One of the Class A pathogen reduction alternatives, (performed by the preparer).
- **Attractiveness to Vectors-Either sewage sludge vector attraction reduction option 9 or 10, (performed by the land applier).**

Requirements for the Preparer Under Scenario 5

The preparer of bulk sewage sludge that is non-EQ for vector attraction reduction is required to:

1. Provide the notice and necessary information, which must include:

   - Documentation of pollutant levels, on a dry weight basis, in the bulk sewage sludge.
   - Documentation of the concentration of total nitrogen as N, on a dry weight basis, in the sewage sludge. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen .)
   - Documentation that one of the Class A pathogen reduction alternatives was achieved.
   - Documentation that one of the vector attraction reduction options 1 through 8 was not performed.
   - Notification that either vector attraction option 9 or 10 must be performed.

2. When applied in a State different from the one in which the sewage sludge was prepared, provide written notice to the permitting authority (i.e., the appropriate EPA Regional Office or State [if it has an approved sewage sludge program]) in which the bulk sewage sludge will be applied, prior to the initial application. The notice must include:

   - The location by either street address or latitude/longitude of each land application site
   - The approximate time period in which the bulk sewage sludge will be applied to the site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the preparer
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

Requirements for the Land Applier Under Scenario 5

The land applier of sewage sludge that is non-EQ for vector attraction reduction should address several requirements.

1. The applier should obtain notice and necessary information (see Appendix A) from the preparer, which includes:

- Documentation of pollutant levels, on a dry weight basis, in the bulk sewage sludge.
- Documentation of the concentration of total nitrogen as N, on a dry weight basis, in the sewage sludge. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen.)
- Documentation that one of the Class A pathogen reduction alternatives was achieved (see Appendix F).
- Documentation that one of the vector attraction reduction options 1 through 8 was not performed (see Appendix F).
- Notification that either vector attraction option 9 or 10 must be performed.

2. If planning to apply non-EQ sewage sludge in a State other than the State in which the sewage sludge was prepared, the applier **should but is not required to** give the preparer the following information to assist the preparer in meeting the out-of-State notification requirement:

   - The location by either street address or latitude/longitude of each land application site
   - The approximate time period in which the bulk sewage sludge will be applied to the site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

* 3. **The applier should perform vector attraction reduction option 9 or 10.** Maintain records and sign a certification statement documenting compliance with vector attraction reduction option 9 or 10. Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.3 and Appendix F.)

* 4. The applier should implement management practices. Maintain records and sign a certification statement documenting compliance with the management practices. Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.4 and Appendix F.)

[* - denotes recordkeeping requirements]

3.6 Scenario 6-Land Application of Bulk Sewage Sludge That Is Non-EQ Due to Pollutant Levels and Pathogen Reduction

Scenario 6 comprises bulk sewage sludge that is non-EQ quality for pollutants and pathogen reduction. Sewage sludge classified as non-EQ due to levels of pollutants and pathogen reduction meets the following sewage sludge quality requirements:

- Pollutants-Ceiling concentration limits (Table 1 of 40 *CFR* 503.13) **and cumulative pollutant loading rate (CPLRs)** (Table 2 of 40 *CFR* 503.13) (see Exhibit 4 of this document)

- **Pathogens-One of the Class B pathogen reduction alternatives**

- Attractiveness to Vectors-One of the sewage sludge vector attraction reduction options 1 through 8, to be (performed by the preparer).

Requirements for the Preparer Under Scenario 6

The preparer of bulk sewage sludge that is non-EQ due to pollutants and pathogen reduction is required to:

1. Provide the notice and necessary information, which must include:

   - Documentation of pollutant concentrations on a dry weight basis.
   - Documentation of the concentration of total nitrogen, as N, on a dry weight basis in the sewage sludge. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen.)
   - Documentation that one of the Class B pathogen reduction alternatives was achieved.
   - Notification that Class B site restrictions must be performed.
   - Documentation that one of the process vector attraction reduction options 1 through 8 was performed.

2. When applied in a State different from the one in which the sewage sludge was prepared, provide written notice to the permitting authority (i.e., the appropriate EPA Regional Office or State [if it has an approved sewage sludge program]) in which the bulk sewage sludge subject to CPLRs will be applied, prior to the initial application. The notice must include:

   - The location by either street address or latitude/longitude of each land application site
   - The approximate time period in which the bulk sewage sludge will be applied to the site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the preparer
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the applier.

Requirements for the Land Applier Under Scenario 6

The land applier of bulk sewage sludge that is non-EQ due to pollutants and pathogen reduction should address several requirements.

1. The applier should obtain notice and necessary information (see Appendix A) from the preparer, including:

   - Documentation of pollutant concentrations on a dry weight basis.
   - Documentation of total nitrogen concentrations on a dry weight basis. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen.)
   - Documentation that one of the Class B pathogen reduction alternatives was achieved (see Appendix F).
   - Notification that Class B site restrictions must be performed.
   - Documentation that one of the process vector attraction reduction options 1 through 8 was performed (see Appendix F).

2. If planning to apply non-EQ sewage sludge in a State other than the State in which the sewage sludge was prepared, the applier **should but is not required to** give the preparer the following information to assist the preparer in meeting the out-of-State notification requirement:

   - The location by either street address or latitude/longitude of each land application site
   - The approximate time period in which the bulk sewage sludge will be applied to the site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

3. The applier should provide written notice to the permitting authority (i.e., the appropriate EPA Regional Office or State [if it has an approved sewage sludge program]) in which the bulk sewage sludge subject to CPLRs will be applied, prior to the initial application. The notice must include:

   - The location by either street address or latitude/longitude of each land application site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

* 4. The applier should contact the permitting authority for the State in which the bulk sewage sludge is being applied to determine whether sewage sludge subject to CPLR limits has been applied to the site since July 20, 1993. (See Section 4.1.)

- If bulk sewage sludge subject to CPLRs has **not been applied** to the site since July 20, 1993, the cumulative amount of each pollutant listed in Exhibit 4 of this document (Table 2 of 40 *CFR* 503.13) may be applied to the site in accordance with those limits.
- If bulk sewage sludge subject to CPLRs **has been applied** to the site since July 20, 1993, **and the cumulative amount of each pollutant applied to the site since that date** is **known, the** previous cumulative amount of each pollutant applied to the site must be used to determine the remaining amount of each pollutant that may be applied to the site in accordance with CPLR limits.
- If bulk sewage sludge subject to CPLRs **has been applied** to the site since July 20, 1993, and the **cumulative amount of each pollutant applied to the site since that date** is **not known,** no additional CPLR sewage sludge may be applied to the site. Any future applications of sewage sludge must meet pollutant concentration limits (Table 3 of 503.13).

* 5. The applier should describe the investigation of previous applications of bulk sewage sludge that is non-EQ for pollutants (subject to CPLRs). Certify that the requirement to obtain information on previous applications of bulk sewage sludge that is non-EQ for pollutants has been met. (See Section 4.1 and Appendix F.)

* 6. The applier should develop and **maintain indefinitely** records documenting compliance with CPLRs. Records must be readily accessible to State and EPA inspectors. This information is not confidential and may not be withheld from other land appliers or the public. (See Section 4.1 and Appendix B.)

7. The applier should report to the preparer when a site has reached 90 percent of the CPLR for any or all of the regulated pollutants. Continue to report annually until the site has reached 100 percent of the CPLR for the pollutant(s) in question. Once the 100 percent level is reached, no additional sewage sludge that is non-EQ for pollutants may be applied to the site. (See Section 4.1.)

* **8. The applier should implement Class B site restrictions and/or provide a list of applicable site restrictions to the landowner/leaseholder on a copy of the notice and necessary information.** Maintain records and sign a certification statement documenting implementation of site restrictions (even if implementation consisted solely of notifying the landowner). Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.2 and Appendix F.)

* 9. The applier should implement the management practices. Maintain records and sign a certification statement documenting compliance with management practices. Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.4 and Appendix F.)

10. The applier should provide notice and necessary information to the land owner/lease holder.

[* - denotes recordkeeping requirement]

3.7 Scenario 7-Land Application of Bulk Sewage Sludge That Is Non-EQ Due to Pollutant Levels and Vector Attraction Reduction

Scenario 7 consists of bulk sewage sludge that is non-EQ for pollutants and vector attraction reduction. Sewage sludge in this scenario meets the following sewage sludge quality requirements:

- Pollutants-Ceiling concentration limits (Table 1 of 40 *CFR* 503.13) **and land application is subject to cumulative pollutant loading rates (CPLRs)** (Table 2 of 40 *CFR* 503.13) (see Exhibit 4 of this document)
- Pathogens-One of the Class A pathogen reduction alternatives, (performed by the preparer).
- **Attractiveness to Vectors-Either vector attraction reduction option 9 or 10, (performed by the land applier).**

Requirements for the Preparer Under Scenario 7

The preparer of bulk sewage sludge that is non-EQ due to pollutants and vector attraction reduction is required to:

1. Provide the notice and necessary information, which includes:
   - Documentation of pollutant concentrations, on a dry weight basis, in milligrams per kilogram.
   - Documentation of total nitrogen concentrations, as N, on a dry weight basis. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen.)
   - Documentation that one of the Class A pathogen reduction alternatives was achieved.
   - Documentation that one of the vector attraction reduction options 1 through 8 was not performed.
   - Notification that either vector attraction reduction option 9 or 10 must be performed.

2. When applied in a State different from the one in which the sewage sludge was prepared, provide written notice to the permitting authority (i.e., the appropriate EPA Regional Office or State [if it has an approved sewage sludge program]) prior to the initial application. The notice must include:

   - The location by either street address or latitude/longitude of each land application site
   - The approximate time period in which the bulk sewage sludge will be applied to the site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the preparer.
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the applier.

Requirements for the Land Applier Under Scenario 7

The land applier of bulk sewage sludge that is non-EQ due to pollutants and vector attraction reduction should address several requirements.

1. The applier should obtain notice and necessary information (see Appendix A) from the preparer, including:

   - Documentation of pollutant concentrations, on a dry weight basis, in milligrams per kilogram.
   - Documentation of total nitrogen concentrations on a dry weight basis. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen.)
   - Documentation that one of the Class A pathogen reduction alternatives was achieved (see Appendix F).
   - Documentation that one of the process vector attraction reduction options 1 through 8 was not performed (see Appendix F).
   - Notification that either vector attraction option 9 or 10 must be performed.

2. If planning to apply non-EQ sewage sludge in a State other than the State in which the sewage sludge was prepared, the applier **should but is not required to** give the preparer the following information to assist the preparer in meeting the out-of-State notification requirement:

   - The location by either street address or latitude/longitude of each land application site
   - The approximate time period in which the bulk sewage sludge will be applied to the site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

3. The applier should provide written notice to the permitting authority (i.e., the appropriate EPA Region for the State [if it has an approved sludge program]) in which the bulk sewage sludge subject to CPLRs will be applied, prior to the initial application. The notice must include:

   - The location by either street address or latitude/longitude of each land application site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

* 4. The applier should contact the permitting authority (i.e., the appropriate EPA Regional Office or State [if it has an approved sewage sludge program]) in which the bulk sewage sludge subject to CPLRs will be applied, prior to application to determine whether sewage sludge meeting CPLR limits has been applied to the site since July 20, 1993. (See Section 4.1.)

   - If bulk sewage sludge subject to CPLRs has **not been applied** to the site since July 20, 1993, the cumulative amount of each pollutant listed in Exhibit 4 of this document (Table 2 of 40 *CFR* 503.13) may be applied to the site in accordance with those limits.
   - If bulk sewage sludge subject to CPLRs **has been applied** to the site since July 20, 1993, **and the cumulative amount of each pollutant applied to the site since that date** is **known,** the previous cumulative amount of each pollutant applied to the site must be used to determine the remaining amount of each pollutant that can be applied to the site in accordance with CPLR limits.
   - If bulk sewage sludge subject to CPLRs **has been applied** to the site since July 20, 1993, and the **cumulative amount of each pollutant applied to the site since that date is not known,** no additional CPLR sewage sludge may be applied to the site. Any future applications of sewage sludge must meet the pollutant concentration limits.

* 5. The applier should describe the investigation of previous applications of bulk sewage sludge that is non-EQ for pollutants. Certify that the requirement to obtain information on previous applications of bulk sewage sludge that is non-EQ for pollutants was met. (See Section 4.1 and Appendix F.)

* 6. The applier should develop and **maintain indefinitely,** records documenting compliance with CPLRs. Records must be readily accessible to State and EPA inspectors. This information is not confidential and may not be withheld from other land appliers or the public. (See Section 4.1 and Appendix B.)

7. The applier should report to the preparer when a site has reached 90 percent of the CPLR for any one of the regulated pollutants. Continue to notify the preparer annually until the site has reached 100 percent of the CPLR for the pollutant(s) in question. Once the 100 percent level is reached, no additional sewage sludge that is non-EQ due to pollutants may be applied to the site. (See Section 4.1.)

* 8. **The applier should perform vector attraction reduction option 9 or 10.** Maintain records, and sign a certification statement documenting compliance with vector attraction reduction option 9 or 10. Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.3 and Appendix F.)

* 9. The applier should implement the management practices. Maintain records and sign a certification statement documenting compliance with management practices. Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.4 and Appendix F.)

10. The applier should provide notice and necessary information to the land owner/lease holder.

[* - denotes recordkeeping requirement]

3.8 Scenario 8-Land Application of Bulk Sewage Sludge That Is Non-EQ Due to Pathogen Reduction and Vector Attraction Reduction

Scenario 8 addresses bulk sewage sludge that meets pollutant concentration limits but does not meet the EQ requirements for pathogen reduction or vector attraction reduction. Sewage sludge classified as non-EQ due to pathogen and vector attractiveness meets the following requirements:

- Pollutants-Ceiling concentration limits (Table 1 of 40 *CFR* 503.13) and pollutant concentration limits (Table 3 of 40 *CFR* 503.13) (see Exhibit 4 of this document)
- **Pathogens-One of the Class B pathogen reduction alternatives**
- **Attractiveness to Vectors-Either sewage sludge vector attraction reduction option 9 or 10, (to be performed by the land applier).**

Requirements for the Preparer Under Scenario 8

The preparer of bulk sewage sludge that is non-EQ due to pathogen reduction and vector attraction reduction is required to:

1. Provide the notice and necessary information, which must include:
   - Documentation of pollutant levels, on a dry weight basis, in the bulk sewage sludge

- Documentation of total nitrogen concentrations, as N, on a dry weight basis. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen.)
- Documentation that one of the Class B pathogen reduction alternatives was achieved.
- Notification that the Class B site restrictions must be performed.
- Documentation that one of the vector attraction reduction options 1 through 8 was not performed
- Notification that either vector attraction reduction option 9 or 10 must be performed.

2. When applied in a State different from the one in which the sewage sludge was prepared, provide written notice to the permitting authority (i.e., the appropriate EPA Regional Office or State [if it has an approved sewage sludge program]) in which the bulk sewage sludge will be applied, prior to the initial application.

   The notice must include:

   - The location by either street address or latitude/longitude of each land application site
   - The approximate time period in which the bulk sewage sludge will be applied to the site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the preparer.
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

Requirements for the Land Applier Under Scenario 8

The land applier of bulk sewage sludge that is non-EQ due to pathogen reduction and vector attraction reduction should address several requirements:

1. The applier should obtain notice and necessary information (see Appendix A) from the preparer, which includes:

   - Documentation of pollutant levels, on a dry weight basis, in the bulk sewage sludge
   - Documentation of the concentration of total nitrogen, as N, on a dry weight basis, in the sewage sludge. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen .)
   - Documentation that one of the Class B pathogen reduction alternatives was achieved (see Appendix F)
   - Notification that the Class B site restrictions must be performed.

- Documentation that one of the vector attraction reduction options 1 through 8 was not performed (see Appendix F)
- Notification that either vector attraction option 9 or 10 must be performed.

2. If planning to apply non-EQ sewage sludge in a State other than the State in which the sewage sludge was prepared, the applier **should but is not required to** give the preparer the following information to assist the preparer in meeting the out-of-State notification requirement:

- The location by either street address or latitude/longitude of each land application site
- The approximate time period in which the bulk sewage sludge will be applied to the site
- The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

* **3. The applier should implement Class B site restrictions and/or provide to the landowner/leaseholder a list of applicable site restrictions on a copy of the notice and necessary information.** Maintain records and sign a certification statement documenting implementation of the site restrictions (even if implementation consisted solely of notifying the landowner). Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.2 and Appendix F.)

* 4. **The applier should perform vector attraction reduction option 9 or 10.** Maintain records and sign a certification statement documenting compliance with vector attraction reduction option 9 or 10. Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.3 and Appendix F.)

* 5. The applier should implement management practices. Maintain records and sign a certification statement documenting compliance with management practices. Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.4 and Appendix F.)

6. The applier should provide notice and necessary information to the land owner/lease holder.

[* - denotes recordkeeping requirement]

3.9 Scenario 9-Land Application of Bulk Sewage Sludge That Is Non-EQ Due to Pollutant Levels, Pathogen Reduction, and Vector Attraction Reduction

Scenario 9 comprises bulk sewage sludge that is non-EQ for all three sewage sludge quality parameters-pollutants, pathogens, and vector attraction. This sewage sludge meets the following requirements:

- Pollutants-Ceiling concentration limits (Table 1 of 40 *CFR* 503.13) **and land application is subject to cumulative pollutant loading rates (CPLRs)** (Table 2 of 40 *CFR* Part 503.13) (see Exhibit 4 of this document)
- **Pathogens-One of the Class B pathogen reduction alternatives**
- **Attractiveness to Vectors-Either sewage sludge vector attraction reduction option 9 or 10, (to be performed by the land applier).**

Requirements for the Preparer Under Scenario 9

The preparer of bulk sewage sludge that is non-EQ due to pollutants, pathogen reduction, and vector attraction reduction is required to:

1. Provide the notice and necessary information, which must include:
   - Documentation of pollutant concentrations on a dry weight basis.
   - Documentation of total nitrogen concentrations, as N, on a dry weight basis. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen.)
   - Documentation that one of the Class B pathogen reduction alternatives was achieved.
   - Notification that Class B site restrictions must be performed.
   - Documentation that one of the process vector attraction reduction options 1 through **8** was not performed.
   - Notification that either vector attraction option 9 or 10 must be performed.
2. When applied in a State different from the one in which the sewage sludge was prepared, provide written notice to the-permitting authority (i.e., the appropriate EPA Regional Office or State [if it has an approved sewage sludge program]) in which the bulk sewage sludge subject to CPLRs will be applied, prior to the initial application.

The notice must include:

- The location by either street address or latitude/longitude of each land application site
- The approximate time period in which the bulk sewage sludge will be applied to the site
- The name, address, telephone number, and NPDES permit number (if appropriate) of the preparer.
- The name, address, telephone number, and NPDES permit number (if appropriate) of the applier.

Requirements for the Land Applier Under Scenario 9

The land applier of bulk sewage sludge that is non-EQ due to pollutants, pathogen reduction, and vector attraction reduction should address several requirements.

1. The applier should obtain notice and necessary information (see Appendix A) from the preparer, which includes:

   - Documentation of pollutant concentrations on a dry weight basis.
   - Documentation of total nitrogen concentrations on a dry weight basis. (To enable the land applier to calculate the agronomic rate, this should be provided in terms of ammonium nitrogen, nitrate nitrogen, and total Kjeldahl nitrogen.)
   - Documentation that one of the Class B pathogen reduction alternatives was achieved (see Appendix F).
   - Documentation that Class B site restrictions must be performed.
   - Documentation that one of the process vector attraction reduction options 1 through 8 was not performed (see Appendix F).
   - Notification that either vector attraction reduction option 9 or 10 must be performed.

2. If planning to apply non-EQ sewage sludge in a State other than the State in which the sewage sludge was prepared, the applier **should but is not required to** give the preparer the following information to assist the preparer in meeting the out-of-State notification requirement:

   - The location by either street address or latitude/longitude of each land application site
   - The approximate time period in which the bulk sewage sludge will be applied to the site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

3. The applier should provide written notice to the permitting authority (i.e., the appropriate EPA Regional Office or State in which the bulk sewage sludge subject to CPLRs will be applied, if it has an approved sewage sludge program) prior to the initial application. The notice must include:

   - The location by either street address or latitude/longitude of each land application site
   - The name, address, telephone number, and NPDES permit number (if appropriate) of the land applier.

* 4. The applier should contact the permitting authority (i.e., the appropriate EPA Regional Office or State [if it has an approved sewage sludge program]) in which the bulk sewage sludge subject to CPLRs will be applied to determine whether sewage sludge meeting CPLR limits has been applied to the site since July 20, 1993. (See Section 4.1.)

   - If bulk sewage sludge subject to CPLRs has **not been applied** to the site since July 20, 1993, the cumulative amount of each pollutant listed in Exhibit 4 of this document (Table 2 of 40 *CFR* 503.13) may be applied to the site in accordance with those limits.
   - If bulk sewage sludge subject to CPLRs **has been applied** to the site since July 20, 1993, **and the cumulative amount of each pollutant applied to the site since that date is known,** the previous cumulative amount of each pollutant applied to the site must be used to determine the remaining amount of each pollutant that can be applied to the site in accordance with CPLR limits.
   - If bulk sewage sludge subject to CPLRs **has been applied** to the site since July 20, 1993, and **the cumulative amount of each pollutant applied to the site since that date** is **not known,** no additional CPLR sewage sludge may be applied to the site. Any future applications of sewage sludge must meet the pollutant concentration limits.

5. The applier should describe investigation of previous applications of bulk sewage Certify that the requirement to obtain information on previous applications of bulk sewage sludge that is non-EQ for pollutants has been met. (See Section 4.1 and Appendix F.)

* 6. The applier should develop and **maintain indefinitely** records documenting compliance with CPLRs. Records must be readily accessible to State and EPA inspectors. This information is not confidential and may not be withheld from other land appliers or the public. (See Section 4.1 and Appendix B.)

7. The applier should report to the preparer when a site has reached 90 percent of the CPLR for any one of the regulated pollutants. Continue to report annually until the site has reached 100 percent of the CPLR for the pollutant(s) in question. Once the 100 percent level is reached, no additional sewage sludge that is non-EQ for pollutants may be applied to the site. (See Section 4.1.)

* 8. **The applier should implement Class B site restrictions and/or provide a list of applicable site restrictions to the landowner/leaseholder on a copy of the notice and necessary information.** Maintain records and sign a certification statement documenting implementation of site restrictions (even if implementation consists solely of notifying the landowner). Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.2 and Appendix F.)

* 9. **The applier should perform vector attraction reduction option 9 or 10.** Maintain records and sign a certification statement documenting compliance with vector attraction reduction option 9 or 10. Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.3 and Appendix F.)

* 10. The applier should implement management practices. Maintain records and sign a certification statement documenting compliance with management practices. Information documenting that each application complies with the requirements must be kept for 5 years. Records must be readily accessible to State and EPA inspectors. (See Section 4.4 and Appendix F.)

11. The applier should provide notice and necessary information to the land owner/lease holder.

[* - denotes recordkeeping requirement]

4. RECORDKEEPING REQUIREMENTS

Section 4 provides the land applier with additional guidance on the recordkeeping requirements in **40 *Code of Federal Regulations (CFR)*** Part 503. In particular, this section gives suggestions on the type of information that may assist the land applier in documenting compliance with the following requirements:

- Cumulative pollutant loading rates (CPLRs)
- Class B site restrictions
- Vector attraction reduction option 9 or 10
- Management practices.

4.1 Records of Cumulative Pollutant Loading Rates (Scenarios 3, 6, 7, and 9)

Any time bulk sewage sludge that is non-EQ for pollutants is land applied, the land applier must keep records. Bulk sewage sludge that is land applied and subject to the CPLRs has extensive recordkeeping requirements relative to pollutants. The land applier must track the cumulative amount of pollutants in bulk sewage sludge applied to the site and must keep records that demonstrate compliance with CPLR limits. Appendix B contains worksheets to help track CPLRs.

The land applier must keep the following records indefinitely:

- The location of each site (exact street address or latitude and longitude for the geographic center) on which the bulk sewage sludge is applied
- The number of hectares in each site
- The date and time that the sewage sludge is applied to each site
- The amount of sewage sludge (in dry metric tons) that is applied to each site

- The cumulative amount of each pollutant in the sewage sludge (in kilograms per hectare) applied to each site, including any amounts of pollutants from the previous application of sewage sludge.

- A signed certification statement (see Appendix F) that the land applier has performed the required inquiries in 503.12 (e)(2) prior to the application of bulk sewage sludge that is non-EQ for pollutants to determine whether any sewage sludge of this quality has been previously applied to the site

- Notice to permitting authority providing location of land application site and name, address, telephone number, and NPDES permit number (if appropriate) of the land applier

- A description of how the requirements to obtain information in 503.12 (e)(2) were or were not met, including correspondence between the permitting authority and other land appliers regarding previous applications of sewage sludge.

These records should include correspondence between the land applier and permitting authority identifying the land applier and location of the site and inquiring about past applications of sewage sludge subject to CPLRs. Records should also contain correspondence between the land applier and any other land appliers who used the site after July 20, 1993, for application of sewage sludge subject to CPLRs. Correspondence must include documentation of the cumulative pollutant loadings from previous applications of bulk sewage sludge that was non-EQ for pollutants.

4.2 Records of Class B Site Restrictions (Scenarios 4, 6, 8, and 9)

Any time bulk sewage sludge that is non-EQ for pathogens is land applied, the land applier must keep records. Because Class B sewage sludge usually has higher levels of pathogens than Class A sewage sludge, site restrictions are used to prevent public exposure and to control crop harvesting and grazing. To fulfill recordkeeping requirements for site restrictions, the land applier, at a minimum, should provide the landowner/leaseholder with a notification statement identifying all applicable site restrictions and certify that the notification was given. A notification similar to the example in Appendix A can be used to inform the landowner of the applicable site restrictions. If the land applier implements the site restrictions, then he or she

should keep records describing the site restrictions used. The Part 503 regulation requires these records to be kept for 5 years.

As described in Section 2, there are two categories of Class B site restrictions: (1) public access restriction and (2) crop harvest and animal grazing. All sites are subject to public access restriction. If the land applier is implementing site restrictions to control public access for Class B sewage sludge, he or she must keep the following records for 5 years:

- A description of site uses (e.g., cultivation of feed crops, growing turf, grazing animals, public park, or private forest)
- A description of the particular procedure(s) used to restrict public access to the site (e.g., fences if the potential for public contact is high, signs indicating the duration of the site restrictions)
- Certification that the land applier informed the landowner of the appropriate site restrictions or complied with the site restrictions.

If the land applier is implementing site restrictions for crop harvesting and animal grazing for Class B sewage sludge, he or she must keep the following records for 5 years:

- A description of activities performed at the site (e.g., cultivating feed crops, growing turf, grazing animals)
- Dates of land application, incorporation into the soil (if appropriate), and harvesting or grazing
- Certification that the land applier has informed the landowner of the appropriate site restrictions or complied with the site restrictions.

4.3 Records of Vector Attraction Reduction Option 9 or 10 (Scenarios 5, 7, 8, and 9)

The land application of sewage sludge that is non-EQ for vector attraction reduction requires the land applier to develop additional records. Whenever vector attraction reduction option 9 or 10 is used, the land applier must document the method for meeting this requirement, in addition to completing a certification of compliance status. These records must be kept for 5 years. One

method to fulfill this responsibility is to use a bound field notebook to record visual observations and other information to document compliance each time the sewage sludge is land applied. At a minimum, the following information should be recorded:

- Location of the field on which bulk sewage sludge is applied (street address or latitude and longitude of the center of the site)
- Date of application
- Pathogen reduction class
- Time elapsed between Class A pathogen reduction and sewage sludge incorporation or injection
- Whether visible amounts of sewage sludge are present on land surface after 1 hour of injection.

In addition, the land applier must certify whether the vector attraction reduction requirements have been met. Appendix F provides an example certification statement.

4.4 Records of Management Practices (Scenarios 3 through 9)

The land applier of bulk sewage sludge that is non-EQ for either one, two, or all three parameters (i.e., pollutants, pathogens, vectors) must maintain records that include a description of how the management practices were met at the site. The land applier must develop and keep records for each land application site for 5 years. In addition, the land applier must certify each time bulk sewage sludge is land applied whether or not management practices have been met (see Appendix F). The following sections briefly describe the types of documentation that should be recorded to demonstrate compliance with the four management practices that apply to land application of bulk sewage sludge.

Threatened or Endangered Species

The land applier must keep the following documentation to demonstrate that the site has been evaluated for potential effects on threatened or endangered species or their designated critical habitats and that necessary protective measures were identified and implemented, if necessary:

- A list of threatened or endangered species in the area or documentation from the Fish and Wildlife Service (FWS) that none exist.
- The land applier should retain all documentation to demonstrate that the site was evaluated for potential effects to threatened or endangered species and/or their habitat, and that necessary protective measures were identified and implemented. The telephone number of the appropriate local FWS field office can be obtained from the FWS regional offices, listed in Appendix D.

Flooded. Frozen. or Snow-Covered Land

To fulfill the recordkeeping requirements applicable to management practices for flooded, frozen, or snow-covered land, the land applier must develop and keep information to show that (1) the sewage sludge was not applied to the land when the land was flooded, frozen, or covered with snow, (2) the sewage sludge applied under these conditions did not enter any waters of the United States, or (3) protection of nearby wetlands or other waters of the United States was already appropriately covered by a permit. The types of records that could be used to document this information include:

- Records obtained prior to use of the site that are updated periodically
  - A copy of any permit issued pursuant to either Section 402 or 404 of the Clean Water Act
  - The average uninterrupted slope of the land application site and the distance of nearby waters of the United States from the boundary of the application site
  - A description of the runoff controls used at the site to prevent any sewage sludge from entering waters of the United States
  - Floodplain information for the application site (e.g., Soil Conservation Service soil survey information, flood insurance floodplain maps, or local records on the period or extent of flooding events) and a description of how land application of sewage sludge is managed to avoid surface water contamination during periods of flooding.

- Field notebook entries recorded each time sewage sludge is applied to the site

  - The location and size of the land application site
  - The date of each application and time, if applicable
  - The application method used (surface spreading, incorporation, injection)
  - The amount of bulk sewage sludge applied to the site and its percent solids content
  - The existing crop or crop to be grown (e.g., soy beans in June through August, sorghum in August through October)
  - A general description of the weather and soil conditions preceding and during each application (e.g., soil is dry; rain is not forecasted in the next 5 to 7 days)

Distance to Waters of the United States

To document the existence of the lo-meter setback distance from waters of the United States to prevent sewage sludge from entering waters of the United States, the land applier must maintain appropriate records, including the following:

- Records obtained prior to use of the site that are updated periodically

  - A site map indicating the location of waters of the United States and the buffer zone or a field book entry for each application site describing its size, location, slope, distance between the boundary of the land application site and nearest waters of the United States; the approximate length of each water body frontage; the width, length, and slope of the protective buffer zone provided for that water body; and a description of the vegetative cover, if any, of the buffer zone
  - A description of how the buffer zone is marked in the field (e.g., flags, fences, vegetation)
  - A copy of advance approval from the permitting authority allowing a buffer zone that is less than 10 meters
  - An overall management plan describing runoff controls for the land application site, including buffer zones and tillage practices
  - If an overall management plan is not available, a field book entry for each application site describing any other runoff controls used at the site to minimize or prevent the sewage sludge from being washed off into adjacent waters of the United States.

- Field notebook entries recorded each time bulk sewage sludge is applied to the site

  - Each time bulk sewage sludge is applied to a site with a buffer zone, a field book entry documenting the condition of the buffer zone, including its width and any vegetative cover. Part 503 does not require buffer strips to be vegetated; however, this is strongly recommended.

Agronomic Rate

To demonstrate compliance with requirements for the agronomic rate, the land applier should keep the following documentation on file:

- The type of crop or vegetation to be grown on the land and the annual nitrogen requirement for the crop or vegetation or the annual whole sewage sludge application rate recommended by the Cooperative Extension Service

- The amount of supplemental fertilizer to be applied to the land and the nitrogen content of the fertilizer **(optional)**

- The original calculations used to design the agronomic rate, including all assumptions and sources of background information, and data for the variables used in the calculation

  - Amount of nitrogen required by the crop or vegetation (available from the County Cooperative Extension Service Agent, Land Grant University and U.S. Department of Agriculture)
  - Values for the nitrogen content of the sewage sludge, usually determined from an analysis of sewage sludge for nitrate-nitrogen, ammonium-nitrogen, and total Kjeldahl nitrogen
  - Values for nitrogen content of supplemental fertilizers, if applicable/known **(optional)**
  - Results of soil sampling for residual nitrogen or estimates of nitrogen available from crop residue and previous applications of sewage sludge or manure, if applicable. Also estimates of available nitrogen from previous applications of manure. **(optional)**
  - The actual amount of bulk sewage sludge (dry weight basis) applied to the land application site.

APPENDIX A

SAMPLE FORMAT PROVIDING NOTICE AND NECESSARY INFORMATION

SAMPLE FORMAT FOR PROVIDING NOTICE AND NECESSARY INFORMATION

This form is to assist compliance with the bulk sewage sludge notification requirements (503.12(f). If the sewage sludge meets the Exceptional Quality requirements, however, then the notification requirements do not apply.

Part I - To Be Completed by PREPARERS of Sewage sludge

A. Please provide pollutant concentrations

Pollutant	Concentration (mg/kg) Measured Dry Weight (Indicate monthly average or instantaneous value)	Pollutant Concentrations (mg/kg) (Table 3 40 *CFR* 503.13) (monthly average)	Ceiling Concentrations* (Table 1 in 40 *CFR* 503.13) (instantaneous maximum)
Arsenic		41	75
Cadmium		39	85
Chromium		1,200	3,000
Copper		1,500	4,300
Lead		300	840
Mercury		17	57
Molybdenum		N/A	75
Nickel		420	420
Selenium		36	100
Zinc		2,800	7,500
TKN		N/A	N/A
NH_4^+-N		N/A	N/A
NO_3-N		N/A	N/A

*Sewage sludge may not be land applied if any pollutant concentrations in any sample exceed these values.

B. Pathogen Reduction (40 *CFR* 503.32)-Please indicate the level achieved

❑ Class A ❑ Class B

C. Vector Attraction Reduction (40 *CFR* 503.33)-Please indicate the option performed

❑ Option 1 ❑ Option 2 ❑ Option 3 ❑ Option 4

❑ Option 5 ❑ Option 6 ❑ Option 7 ❑ Option 8

❑ No vector attraction reduction options were performed

D. CERTIFICATION

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or the persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. Name and Official Title ***(type or** print)*	B. Area Code and Telephone Number
C. Signature	D. Date Signed

Part II - To Be Completed by LAND APPLIERS of Sewage sludge

Land appliers using non-EQ sludge should provide the following information, when applicable to the landowner/leaseholder.

A. If the pollutant levels in the sewage sludge do not meet the **pollutant concentration** limits in Table 3 of 40 *CFR* Part 503, then the land applier should provide the landowner with the following information:

1. Location of land application site _____

2. Number of hectares where the bulk sewage sludge was applied _____

3. Date and time bulk sewage sludge was applied _____

4. Amount of bulk sewage sludge applied in metric tons, dry weight _____

5. Record the amount of each metal and nitrogen applied and appropriate units (i.e., **kilograms per hectare, pounds per acre):**

Units	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc	Available Nitrogen

B. If a Class B pathogen reduction alternative was used (see Part I), then the following site restrictions must be met. Please check the boxes for the site restrictions met if any.

A. Food crops that may touch the sewage sludge/soil mixture cannot be harvested before the end of the following waiting period:

- ❑ 1. If harvested parts are totally **above** the land wait to harvest for **14 months** after the application of sewage sludge.
- ❑ 2. If harvested parts are **below** the land surface and the sewage sludge remains on top of the soil for 4 months or longer before the field was plowed, wait to harvest for **20 months** after the initial application of sewage sludge.
- ❑ 3. If harvested parts are below the land surface, and the sewage sludge was incorporated into the soil within 4 months of being applied, wait to harvest for **38 months** after the initial application.

B. ❑ Food crops that do not touch the sewage sludge/soil mixture, feed crops, and fiber crops cannot be harvested for 30 days after sewage sludge application.

C. ❑ Animals cannot be grazed on the land for 30 days after application of the sewage sludge.

D. ❑ If harvested turf is used for a lawn or other purpose where there is a high potential for public exposure, then the turf cannot be harvested for 1 year after the application of the sewage sludge to the land.

E. ❑ Public access to land with a high potential for public exposure (e.g., parks, playgrounds, golf courses) will be restricted for 1 year after the application of the sewage sludge.

F. ❑ Public access to land with a **low potential** for public exposure (e.g., private property, remote or restricted public lands) will be restricted for 30 days after the application of the sewage sludge.

C. If the preparer did not perform any of the vector attraction reduction Options 1-8 (see Part I), then either Option 9 or 10 must be performed by the land applier. Please indicate if Option 9 or 10 was performed. Check appropriate box.

❑ Option 9-Subsurface Injection ❑ Option 10-Incorporated (plowed) Into the Soil ❑ N/A

D. CERTIFICATION

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or the persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. Name and Official Title *(type or print)*	B. Area Code and Telephone Number
C. Signature	D. Date Signed

APPENDIX B

WORKSHEET FOR TRACKING CUMULATIVE POLLUTANT LOADING RATES

TRACKING CUMULATIVE POLLUTANT LOADING RATES ON LAND APPLICATION SITES

1. Site Name and Location (street address or latitude/longitude)	[1]	3. Date of Application of Sewage Sludge

Pollutant	Cumulative Pollutant Loading Rates (CPLRs) (kg/ha)		Calculation for Determining Cumulative Loading								
	100 %	90 %	Concentration in Sewage Sludge (mg/kg) (dry weight)	x	Sewage Sludge Application Rates (M.T./ha) (from Item 2)	x	0.001 (conversion factor)	+	Amount of Pollutant Applied Since July 20, 1993 (kg/ha)[2]	=	Total Amount of Pollutant Applied to Date (kg/ha)
Arsenic	41	37	_____	x	_____	x	0.001	+	_____	=	_____
Cadmium	39	35	_____	x	_____	x	0.001	+	_____	=	_____
Chromium	3,000	2,700	_____	x	_____	x	0.001	+	_____	=	_____
Copper	1,500	1,350	_____	x	_____	x	0.001	+	_____	=	_____
Lead	**300**	**270**	_____	x	_____	x	0.001	+	_____	=	_____
Mercury	**17**	**15**	_____	x	_____	x	0.001	+	_____	=	_____
Nickel	**420**	**378**	_____	x	_____	x	0.001	+	_____	=	_____
Selenium	**100**	**90**	_____	x	_____	x	0.001	+	_____	=	_____
Zinc	2,800	2,520	_____	x	_____	x	0.001	+	_____	=	_____

[1]Use the following equations to convert from English system units (i.e., tons per acre) to metric system units (i.e., metric tons per hectare):

- To convert from tons per acre to metric tons per hectare, multiply tons per acre by 2.2421
- To convert from acres to hectares, multiply the number of acres by 0.4047
- To convert from tons to metric tons, multiply the number of tons by 0.9072.

*Land appliers are prohibited from applying CPLR sewage sludge to a site if CPLR sewage sludge was previously applied to the site after July 20, 1993, and the amounts of the pollutants regulated under Part 503 in the previously applied sewage sludge are unknown.

APPENDIX C

GUIDANCE FOR OPTIONAL SEWAGE SLUDGE QUALITY MONITORING

Monitoring

The preparer is required to monitor sewage sludge quality to ensure compliance with the Part 503 requirements. The land applier may want to periodically verify the sewage sludge quality as well. This section is designed to instruct land appliers on how to verify whether the sewage sludge they are land applying meets the requirements for Part 503. The following materials contain detailed guidance on the collection and analysis of sewage sludge samples:

- *POTW Sewage Sludge Sampling and Analysis Guidance Document* (EPA, 1989, and updates).
- *Standard Methods for the Examination of Water and Wastewater, 18th edition* (APHA, 1992)
- *Test Methods for Evaluating Solid Waste, Physical/chemical Methods,* EPA Publication SW-846 (EPA, 1986)
- *Environmental Regulations and Technology: Control of Pathogens and Vector Attraction in Sewage Sludge* (EPA, 1992)
- *Sewage Sludge Sampling Techniques* (demonstration video) (EPA, 1993).

Regulated Parameters (what to monitor)

The land applier may want to periodically monitor the parameters that Part 503 requires preparers to monitor. Regulated parameters include inorganic pollutants (i.e., metals), pathogens or non-pathogenic indicator organisms, and vector attraction reduction characteristics. Specifically, all sewage sludge that is land applied must be monitored for nitrogen and the following 10 metals: arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc. In addition to the metals, preparers are required to monitor bulk sewage sludge for nitrogen, pathogens (or organisms that would indicate the presence of pathogens), and vector attraction characteristics when called for by the pathogen reduction alternative or vector attraction reduction option. The specific pathogen and vector attraction reduction parameters vary depending on which methods of reduction for each are are used.

Indicator Organism—An indicator organism (e.g., fecal coliform) is a non-pathogenic organism whose presence implies the presence of pathogenic organisms. Indicator organisms are selected to be conservative estimates of the potential for pathogenicity.

Vector Attraction—Characteristics (e.g., odor) that attract birds, insects, and other animals that are capable of transmitting infectious agents.

Laboratory results for sewage sludge are typically reported in one of two forms-wet weight (i.e., mg/L) or dry weight (i.e., mg/kg). The concentration limits for pollutants and pathogens in the regulation are expressed as dry weight concentrations. Therefore, if laboratory results are reported as wet weight, the percent solids content of the sewage sludge must be determined to verify compliance with sewage sludge requirements. The percent solids value is used to convert analytical results expressed as a wet weight basis to a dry weight basis, as demonstrated in Exhibit C-l.

Exhibit C-l. Expressing Wet Weight Pollutant Concentrations on Dry Weight Basis

If you assume that the specific gravity of the solids is equivalent to the specific gravity of water, a simplified equation can be used to express the concentration of a pollutant on a dry weight basis:

$$A \frac{mg}{L} \div \text{Percent Solids} = B \frac{mg}{kg}$$

where: A is the concentration of the pollutant in the sewage sludge on a wet basis in mg/L

B is the concentration of the pollutant in the sewage sludge on a dry weight basis, in mg/kg.

For example, if the concentration of zinc in the sewage sludge is reported as 200 mg/L and the percent solids content of the sewage sludge is 24%, the concentration can be converted to a dry weight basis using the equation given above:

$$200 \frac{mg}{L} \div 0.24 = 833 \frac{mg}{kg.}$$

Procedures for Sampling and Analysis (how to monitor)

This section describes three factors critical for the development and implementation of a sewage sludge quality monitoring program that will produce precise and reliable analytical results and allow the land applier to verify the accuracy with which the preparer has determined sewage sludge quality:

- Collection of representative samples of the sewage sludge
- Use of appropriate analytical techniques
- Adherence to quality assurance/quality control (QA/QC) procedures for sampling and analysis.

Representative Samples

To obtain a representative sample of sewage sludge, the sample must be taken from the correct locations, represent the entire amount of sewage sludge, and be handled properly from the time of collection through analysis. Sewage sludge sampling techniques are described in the following references, which are available through the EPA Regional Sewage Sludge Coordinator or the EPA Office of Water Resource Center:

- *POTW Sewage Sludge Sampling and Analysis Guidance Document* (EPA, 1989, and updates)
- *Environmental Regulations and Technology: Control of Pathogens and Vectors in Sewage Sludge* ***(EPA, 1992)***
- *Sewage Sludge Sampling Techniques* (demonstration video) (EPA, 1993).

Appropriate sample containers must be used. For some parameters, such as volatile organics, glass containers are essential. Either plastic or glass containers can be used to collect samples for analysis of metals, indicator organisms, and pathogens. The containers must be acid cleaned and contaminant free. Sterile containers must be used for indicator organisms and pathogens.

In addition, sufficient sample volumes must be collected to perform the analyses. The sample volumes needed for each analysis vary depending on the percent total solids of the sewage sludge and the detection level of the analytical method used. Check with your laboratory to make sure you collect more than enough sewage sludge for analysis. A conservative rule of thumb is to collect 1 L or a volume containing 1 gram dry weight for metals analysis and 1 L for pathogens and indicator organisms.

Appropriate preservation techniques ensure that samples remain representative during the holding time prior to analysis. At a minimum, all sewage sludge samples should be preserved by cooling to 4°C with dry ice or an ice water bath. The holding time also influences the validity of analytical results. It is important to know and respect sample holding times for each parameter being analyzed. With the exception of mercury, the metals do not degrade easily and can be held up to 6 months. Mercury can be held for 13 days in a plastic container and 28 days in a glass container. Fecal coliform and *salmonella* have a very short holding time; if the samples cannot be delivered to the lab within 1 hour, they should be chilled promptly (using an ice and water bath) to 4°C and delivered to the lab within 24 hours. Samples for viable helminth ova can be held for up to 1 month if chilled to 4°C. Samples for viruses can be frozen for up to ***2*** weeks.

Appropriate Analytical Techniques

To ensure that sewage sludge quality data are good, the land applier must use the analytical methods specified in Part 503. Methods for analyzing inorganic pollutants are described in the EPA document entitled, *Test Methods for Evaluating Solid Waste* (EPA, 1986). Exhibit C-2 lists the methods for the analysis of metals. The following documents contain methods for pathogen analysis; specific oxygen uptake rate; and total, fixed, and volatile solids:

- **Enteric Viruses:** ASTM Designation: D 4994-89, *Standard Practice for Recovery of viruses From Wastewater Sludge* (ASTM, 1992)
- **Fecal Coliform:** Part 9221 E or Part 9222 D, *Standard Methods for the Examination of Water and Wastewater* (APHA, 1992)

- **Helminth Ova:** *Occurrence of Pathogens in Distribution and Marketing Municipal Sludge* (Yanko, 1987)

- ***Salmonella* Sp. bacteria:** Part 9260 D, *Standard Methods for the Examination of Water and Wastewater* (APHA, 1992) or "Detection and Enumeration of *Salmonella* and *Pseudomonas aerugirwsa"* (Kenner and Clark, 1974)

- **Specific Oxygen Uptake Rate:** Part 2710 B. *Standard Methods for the Examination of Water and Wastewater* (APHA, 1992)

- **Total, Fixed, and Volatile Solids:** Part 2540 ***G.*** *Standard Methods for the Examination of Water and Wastewater* (APHA, 1992)

- **Calculation of 38% Reduction of Volatile Solids:** Chapter 6, p. 27, and Appendix ***C,*** *Environmental Regulations and Technology: Control of Pathogens and Vectors in Domestic Sewage Sludge* (EPA, 1992).

Exhibit C-2. Methods for Analysis of Metals in Sewage Sludge

Pollutants	Sample Preparation and Analytical Methodologies SW-846*
Arsenic	EPA Methods 3050/3051 + 6010/7060/7061
Cadmium	EPA Methods 3050/3051 + 6010/7130/7131
Chromium	EPA Methods 3050/3051 + 6010/7190/7191
Copper	EPA Methods 3050/3051 + 6010/7210
Lead	EPA Methods 3050/3051 + 6010/7420/7421
Mercury	EPA Method 7470/7471
Molybdenum	EPA Methods 3050/3051 + 6010/7480/7481
Nickel	EPA Methods 3050/3051 + 6010/7520
Selenium	EPA Methods 3050/3051 + 6010/7740/7741
Zinc	EPA Methods 3050/3051 + 6010/7950

**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) and Update I (July 1992). Second Edition and Updates I and II (PB-87-120-291) are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. Third Edition and Revision I and Update I (Document number 955 00l-00000-1) are available from the Superintendent of Documents, Government Printing Office, 941 North Capitol Street, NE, Washington, DC 20002. Future updates will be noticed in the *Federal Register.*

Quality Assurance/Quality Control Procedures

The land applier may want to establish a QA program to ensure quality in sample collection, laboratory analysis, and data validation. QA programs should address the following major areas:

- Proper sample collection procedures, equipment, preservation methods, and chain-of-custody procedures to ensure representative samples
- Proper sample preparation procedures, instruments, equipment, and methodologies used for the analyses of samples
- Proper procedures and schedules for the calibration and maintenance of equipment and instruments associated with the collection and analyses of samples.

QC, which is part of the QA program, relates to the routine use of established procedures and policies during sample collection and analysis. The objective of QC procedures is to ultimately control both the accuracy and the precision of all analytical measurements made. QC for sample collection includes the use of duplicate and spiked samples, as well as sample blanks. QC for sample analysis includes the use of spiked and split samples, proper calibration protocols, and appropriate analytical methods, detection limits, and procedures. Guidance on QA/QC for sample collection and analysis is contained in Chapter 1 of ***Test Methods for Analysis of Solid Wastes*** (EPA, 1986). Each analytical method describes additional QC procedures.

APPENDIX D

TELEPHONE NUMBERS FOR THE
FISH AND WILDLIFE SERVICE REGIONAL OFFICES

TELEPHONE NUMBERS FOR THE
FISH AND WILDLIFE SERVICE REGIONAL OFFICES

• Region 1 (Portland) CA, HI, ID, NV, OR, WA	503/231-6131 or 6151
• Region 2 (Albuquerque) AZ, NM, OK, TX	505/766-3972
• Region 3 (Twin Cities) IL, IN, IA, MI, MN, MO, OH, WI	612/725-3276
• Region 4 (Atlanta) AL, AR, FL, GA, KY, LA, MS, NC, PR, SC, TN, VI	404/331-3580
• Region 5 (Boston) CT, DE, ME, MD, MA, NH, NJ, NY, PA, RI, VT, VA, WV	413/253-8627
• Region 6 (Denver) CO, KS, MT, MS, NE, ND, SD, UT, WY	303/236-7398
• Region 7 (Anchorage) AK	907/786-3505

APPENDIX E

WORKSHEET FOR CALCULATING THE AGRONOMIC RATE

AGRONOMIC RATE FOR NITROGEN

Nitrogen exists in the soils and sewage sludge in three basic forms:

- Organic (C-NH2)-Carbon-based compounds such as proteins and amino acids. This form is not available to plants and must be converted to inorganic nitrogen by soil microorganisms. Mineralization is the conversion of organic N to inorganic N in the form of ammonium. Mineralization rates vary for different types of sewage sludge, but most of the organic nitrogen is mineralized to inorganic N in the first year. The rate of mineralization is assumed to be low at the end of the third year after application. Thus, after the third year, the amount mineralized is not considered in the calculation of the agronomic rate. See examples on page E-8.

- Inorganic (ammonium NH_4^+, nitrite $N0_2^-$, nitrate NO_3^-)-Plants use the nitrate and ammonium ions. The soil microbes and plants compete for this inorganic N. Rapidly growing soil microbes can immobilize or "tie up" the ammonium and nitrate in the soil by converting it to the organic form, and may temporarily deplete the available N in the soil for plant uptake. The positively charged ammonium ions are adsorbed by clay and organic matter so that little of this form is leached. Nitrification is the process whereby soil microbes convert ammonium to nitrate. Nitrate is very mobile and readily leached. Nitrite is usually not present in significant concentrations.

- Gases (nitrogen, N_2, ammonia NH_3)-Nitrogen gas is present in the soil atmosphere (air) and a source of nitrogen for legumes that can convert this to ammonium (NH_4^+), which is then used by the plant. In anaerobic conditions, microorganisms can convert nitrate to nitrogen gas and nitrous oxide (N_2O); this process is called denitrification. Under alkaline conditions, ammonium ions lose a hydrogen ion and become ammonia, which readily volatilizes (producing ammonia gas NH_3^+).

Plants can use only a portion of the total nitrogen in the sewage sludge. Some of the nitrate and ammonium is lost to the atmosphere by denitrification and volatilization, and some of the organic nitrogen becomes available over time as the mineralization process converts the organic forms to ammonium and nitrate. Some of the nitrate is lost through leaching. The goal when designing the agronomic rate for an application site is to supply the necessary amount of nitrogen needed for the crops or vegetation to produce the desired harvest yield with no leaching of the nitrogen below the root zone. The rates of mineralization, plant uptake, volatilization, and denitrification are dependent on many factors and will vary from site to site and at the same site.

Factors Affecting Nitrogen Availability

Predicting how much sewage sludge is needed to provide the nitrogen sufficient to meet crop yield goals and minimize leaching of nitrogen below the root zone requires consideration of numerous factors. The following are some factors that influence the amount of sewage sludge that can be applied:

- Total nitrogen content in sewage sludge and the concentrations (or percentage of the total nitrogen) of the various nitrogen forms in the sewage sludge are influenced by the types of processing operations. Anaerobic digestion (30 days or longer) produces sludge with high levels of ammonium but little nitrate (oxygen is required to proceed from ammonia to nitrate) and converts most of the readily available organic nitrogen to ammonium nitrogen. Aerobically digested sewage sludge has higher levels of nitrate than anaerobically digested sewage sludge. Dewatering reduces the levels of both nitrate and ammonium nitrogen.

- The mineralization rate at the application site is affected by how well the sewage sludge was stabilized in the digester. Poor stabilization results in more organic nitrogen for mineralization. Good stabilization converts most of the organic nitrogen into readily available inorganic N, leaving only that which is relatively inert and resistant to further mineralization (this sewage sludge may have a low mineralization rate).

- The mineralization rate is also influenced by soil temperature. Temperature affects the metabolic rate of microorganisms, thus mineralization rates are typically higher in the summer months than in the winter months.

- The amount of ammonium lost through volatilization to the atmosphere is affected by pH, application method, application rate, and soil moisture.

  Soil/sewage sludge pH-Alkaline sewage sludges have greater volatilization losses than more acidic sewage sludge. The high concentration of hydrogen ions in an acid sewage sludge increases the level of ammonium ions in the liquid phase of the sewage sludge and consequently diminishes losses of ammonia.
  Application method-The more thoroughly sewage sludge is mixed with soil after application, the lower the volatilization loss. Increasing the interaction of the ammonium ion with the cation exchange complex of the soil reduces the amount subject to volatilization. Volatilization loss is minimal with subsurface injection of sewage sludge. If sewage sludge is left on the soil surface, volatilization occurs rapidly with the greatest loss occurring within the first week. Incorporation of surface applied sewage sludge immediately after application can greatly reduce the loss.

- Application rate-Greater amounts of sewage sludge applied increase the percentage of ammonium ions lost by volatilization, possibly because of the decrease in the number of ammonium ions in direct contact with the soil.
- Soil moisture-If the soil is saturated before surface application of liquid sewage sludge, the volatilization rate will be greater because of the decrease in the rate of infiltration. Slowing or impeding infiltration increases the length of time the aqueous ammonium ion solution is exposed to drying conditions on the soil surface, thus increasing the volatilization losses from surface applied alkaline sewage sludge.

- The amount of nitrate (actual N gas) that is lost to the atmosphere by denitrification is affected by factors that contribute to anaerobic conditions and by the metabolic rate of the denitrifying microorganisms. The factors are the following:

  - Soil moisture-Saturated soils have fewer pore spaces occupied by oxygen, thus creating anaerobic conditions that favor the growth of denitrifying microorganisms.
  - Soil type-The texture of soil, coarse (sandy) to fine (clay), affects porosity and capacity to store water and oxygen, thus influencing the prevalence of anaerobic conditions even when soil is not saturated.
  - Carbon source-An abundant source of readily oxidizable carbon will increase the denitrification rate.
  - Nitrate levels-Denitrification will occur rapidly where nitrate levels provide a sufficient source of nitrogen for the microorganisms.

Procedures for Designing the Agronomic Rate

The site-specific variability of the above factors means that designing the agronomic rate should be done on a site-specific basis. Many State sewage sludge management programs have developed procedures based on the knowledge and experience gained in regulating sewage sludge land application. These procedures account for the local conditions that affect the agronomic rate. If you are unfamiliar with the specific procedures to use in calculating the agronomic rate, you should contact the State sewage sludge management authority. You can also obtain assistance from the Cooperative Extension Service, the Soil Conservation Service, or independent agronomists specializing in soil evaluation and nutrient management. These agencies and individuals can provide information on crop nitrogen needs, soil nitrogen testing, mineralization rates, and volatilization and denitrification losses.

This appendix provides a worksheet illustrating one approach for designing the agronomic rate. This worksheet is an example and is not intended to replace the procedures currently being used

by regulatory authorities or agricultural extension services. Many of the factors included in this example are common to most procedures for designing agronomic rate. Some of the less common factors are noted as optional on the worksheet.

At a minimum, all of these procedures consider the nitrogen requirement of the crop, and the nitrogen content of the sewage sludge. Most procedures address residual nitrogen either through site-specific soil nitrogen data (from soil monitoring) or estimates of the amount of residual nitrogen from previous sewage sludge applications. If appropriate, nitrogen losses and nitrogen available from sources other than the sewage sludge can be factored into the procedure for deriving the whole sludge application rate.

The nitrogen requirements for specific crops also differ by region and can be obtained from the Cooperative Extension Service's fertilizer recommendations and guides available from the County's Cooperative Extension Service Agent, Land Grant University, and U.S. Department of Agriculture. Note that nitrogen fertilizer recommendations are not typically given for legumes because they fix their own nitrogen. Example nitrogen requirements for selected crops are provided in Exhibit E-l, but the land applier should get local information by contacting the local extension agent. A list of the addresses and telephone numbers of local extension agents can be obtained from a publication entitled County ***Agents,*** available from Century Communications, Inc., 6201 Howard St., Niles, IL 60648, 708-647-1200.

Exhibit E-l. Examples of Crop Nitrogen Requirements*

Crop	Expected Yield (bushel/acre/year)	Nitrogen Requirement (lb N/acre/year)*
Corn	100	100
Oats	90	60
Barley	70	60
Grass and Hay	4 tons/acre	200
Sorghum	60	60
Peanuts	40	30
Wheat	70	105
Wheat	150	250
Soybeans	40	30
Cotton	1 bale/acre	50
Cotton	1.5 bales/acre	90

***These figures are very general and are provided only for illustration purposes.** They should not be used to determine your actual application rate. Crop fertilization requirements vary greatly with soil type, expected yields, and climatic conditions. To get more specific information on crop fertilization needs specific to your location, contact local agricultural extension agents. (Source: Domestic *Septage Regulatory Guidance: A Guide to the EPA 503 Rule, p. 28* [EPA, 1993].)

EXAMPLE DESIGN WORKSHEET l-FOR THE AGRONOMIC RATE

Key to Symbols and Abbreviations

NH4+ - N	=	Ammonium nitrogen content of the sewage sludge obtained from analytical testing of the sewage sludge, kg/mt (dry weight basis).
Kv	=	Volatilization factor estimating ammonium nitrogen remaining after atmospheric losses.
Org-N	=	Organic nitrogen content of the sewage sludge obtained from analytical testing or determined by subtracting NH_4-N from TKN, kg/mt (dry weight basis).
NO_3-N	=	Nitrate nitrogen content of the sewage sludge obtained from analytical testing, kg/mt (dry weight basis)
F_{0-1}	=	Mineralization rate for the sewage sludge during the first year of application, in percent of organic nitrogen expressed as a fraction (e.g., 20% = 0.2).

Helpful Conversions

mg/kg	= lb/ton x 500
kg/ha	= lbs/acre x 1.12
kg/ha	= tons/acre x 2242
mt/ha	= tons/acre x 2.24

1. Total available nitrogen from sewage sludge.
   a. Ammonium nitrogen. _____ kg/mt
      Calculated with the following fomula: analytical result for NH_4^+ - N (kg/mt) x Kv (Kv obtained from Exhibit E-2)
   b. Mineralized organic nitrogen for first year of application. _____ kg/mt
      Calculated with the following formula: Org-N x F_{0-1} (F_{0-1} obtained from Exhibit E-3)
   C. Nitrate nitrogen. _____ kglmt
      Use analytical result for NO_3-N
   d. Total _____ kg/mt
2. Available nitrogen in the soil. _____ kg/ha
   (Use whichever is greater a or b)
   a. Soil test results of background nitrogen in soil
   b. Estimate of available nitrogen from previous sewage sludge *applications (From Worksheet 2)*
3. Nitrogen supplied from other sources **(optional, but recommended):**
   a. Nitrogen from supplemental fertilizers **(if appropriate)** _____ kg/ha
   b. Nitrogen from irrigation water **(if appropriate)** _____ kg/ha
   C. Nitrogen from previous crop (unless #2 is based on soil testing) _____ kg/ha
   d. Other (if appropriate) (specify): _____ _____ kg/ha
   e. Total (add a, b, c, d, if available). _____ kg/ha
4. Total nitrogen available from existing sources. _____ kg/ha
   Add 2 and 3e
5. Available nitrogen loss to denitrification **(optional)** ***(check with regulatory*** *authority before using this site-specific factor)* _____ kg/ha
6. Adjusted nitrogen available _____ kg/ha
   Subtract 5 from 4
7. Total nitrogen requirement of crop *(obtain information from agricultural extension agents or other agronomy professionals)* _____ kg/ha
8. Supplemental nitrogen needed from sewage sludge. _____ kg/ha
   Subtract 4 or 6 from 7
9. Agronomic loading rate. _____ mt/ha
   Divide 8 by 1

Exhibit E-2. Example Volatilization Factors (Kv)

If Sewage Sludge Is:	Factor Kv Is:
Liquid and surface applied	.50
Liquid and injected into the soil	1.0
Dewatered and applied in any manner	.50*

*Use value obtained from State regulatory agencies if available.

Exhibit E-3. Example Mineralization Rates*

Time After Sewage Sludge Application (Year)	Fraction of Org-N Mineralized From Stabilized Primary and Waste Activated Sewage Sludge	Fraction of Org-N Mineralized From Aerobically Digested Sewage Sludge	Fraction of Org-N Mineralized From Anaerobically Digested Sewage Sludge	Fraction of Org-N Mineralized From Composted Sewage Sludge
0-1	.40	.30	.20	.10
1-2	.20	.15	.10	.05
2-3	.10	.08	.05	.03

*Fraction of Org-N present mineralized during the time interval shown.

Note: The volatilization factors and mineralization rate were obtained from the Process *Design Manual for the Land Application of Sewage Sludge* (EPA, 1983). Many States have developed different values for volatilization and mineralization based on local research. Check with the State authority or local agricultural extension agent for additional guidance.

WORKSHEET 2
EXAMPLE CALCULATION FOR AVAILABLE MINERALIZED ORGANIC NITROGEN

The organic nitrogen in sewage sludge continues to decompose and release mineral nitrogen through the mineralization process for several years following its initial application. This residual nitrogen from the previously applied sewage sludge must be accounted for as part of the overall nutrient budget when determining the agronomic rate for sewage sludge. Residual nitrogen can be determined through soil analysis or calculated using the following procedure. These calculations must be done for each yearly sewage sludge application unless soil analysis is performed prior to land application (see example calculations).

Instructions: Complete a separate table for each year sewage sludge was land applied. Note that most do not calculate beyond the third year because the values become negligible. Sum the values of mineralized Org-N (Column d) from each table for the particular calendar year you're trying to determine Org-N available. (See example below .)

a. Year[1]	b. Starting Org-N[2] (kg/ha)	c. [illegible] (Exhibit E-3)	d. Mineralized Org-N[4] (kg/ha)	e. Org-N Remaining[5] (kg/ha)
0-1 (year sewage sludge was applied)				
1-2 (1st year after)				
2-3 (2nd year after)				

[1]Begin with year sewage sludge is applied, and continue for 2 more years.
[2]In the first year, this equals the amount of Org-N initially applied. In subsequent years, it represents the amount of org-N remaining from the previous year (i.e., column e).
[3]The org-N content of the initially applied sewage sludge continues to be mineralized, at decreasing rates, for years after initial application. See Exhibit E-3 for mineralization values.
[4]Multiply column b and column c.
[5]Subtract column d from column b.

Example

Assume that anaerobically digested sewage sludge with a 3% org-N content (dry weight basis) was applied to the site at a rate of 5 mt/ha in 1986. The following year, 1987, 3 mt/ha of sewage sludge (same org-N content as in 1986) was applied to the same site. It is now 1988, and you want to calculate the available nitrogen from previous sewage sludge applications.

In 1986, the org-N in the sewage sludge applied = (0.03) (5 mt/ha) (1,000 kg/mt) = 150 kg/ha.
In 1987, the org-N in the sewage sludge applied = (0.03) (3 mt/ha) (1,000 kg/mt = 90 kg/ha.

Calculate the available nitrogen from 1986 and 1987 in the following manner (assume anaerobically digested sewage sludge).

a. Year*	b. Starting Org-N (kg/ha)	c.Mineralization Rate (Exhibit W-2)	d. Mineralized Org-N (kg/ha)	e. Org-N Remaining (kg/ha)
1986 Sewage Sludge				
0-1 (first application-1986)	**150**	**0.2**	**30**	**120**
1-2 (1987)	120	0.1	12	108
2-3 (1988)	108	0.05	5.40	102.60
1987 Sewage Sludge				
0-l (first application-1987)	90	0.2	18	72
1-2 (1988)	72	0.1	7.2	64.80
2-3 (1989)	64.8	0.05	3.24	61.56

To determine the total mineral&d organic nitrogen available in 1988 from the sewage sludge applied in 1986 and 1987, add the mineralized Org-N value in the 1988 row of column d of the table for the 1986 sewage sludge to the mineralized Org-N value in the 1988 row of column d of the table for the 1987 sewage sludge (i.e., 5.40 + 7.2 = 12.6 kg/ha).
Total mineralized Org-N available in 1988 from previous sewage sludge 12.6 kg/ha.

APPENDIX F

CERTIFICATION STATEMENTS

Example Certification Statement to Determine the Past Site History Regarding the Application of Sewage Sludge That Is Non-EQ For Pollutants, i.e., Subject to CPLRs

I certify, under penalty of law, that the requirements to obtain information in §503.12(e)(2) *[insert either* have been met *or* have not 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.

Name Date Telephone #

Example Certification Statement for the Implementation of Site Restrictions Where Sewage Sludge That Is Class B For Pathogens Is Being Applied

I certify, under penalty of law, that the site restrictions in §503.32(b)(5) *[insert either* have been met *or* have not 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.

Name Date Telephone #

or

I certify, under penalty of law, that the *[insert either* landowner *or* leaseholder] has been provided with notice and necessary information regarding the requirement to implement the site restrictions in §503.32(b)(5). This notification 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 for notification of applicable site restrictions have been met. I am aware that there are significant penalties for false certification including fine and imprisonment.

Name Date Telephone #

Example Certification Statement for
Vector Attraction Reduction

I certify, under penalty of law, that the vector attraction reduction requirement in ***[insert either*** §503.33(b)(9) ***or*** §503.33(b)(10)] *[insert either* has been met *or* has not 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 fine and imprisonment.

Name **Date** Telephone #

Example Certification Statement for Management Practices

I certify, under penalty of law, that the management practices in §503.14 *[insert either* have been met *or* have not 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.

Name Date Telephone #

REFERENCES

REFERENCES

U.S. Environmental Protection Agency. 1994. *A Plain English Guide to the EPA Part 503 Biosolids Rule.* Washington, DC: EPA/832-R-93-003.

U.S. Environmental Protection Agency. 1994. *Biosolids Recycling: Beneficial Technology for a Better Environment.* Washington, DC: EPA 832-93-009.

U.S. Environmental Protection Agency. 1994. *A Guide to the Biosolids Risk Assessment Methodology for the Part 503 Rule for Use or Disposal of Biosolids.* Washington, DC: EPA/832-B-93-005.

U. S. Environmental Protection Agency, 1994. *Biosolids Recycling: Beneficial Technologies for a Better Environment.* Office of Wastewater Enforcement and Compliance. Washington, DC: EPA/832-93-009.

U.S. Environmental Protection Agency. 1994. *Odor Control Handbook.* Washington, DC.

U.S. Environmental Protection Agency. 1994. *Surface Disposal of Sewage Sludge-A Guide for Owners/Operators of Surface Disposal Facilities on the Monitoring, Recordkeeping, and Reporting Requirements of the Federal Standards for the Use or Disposal of Sewage Sludge, 40 CFR Part 503.* Washington, DC.

U.S. Environmental Protection Agency. 1993. *Preparing Sewage Sludge for Land Application or Surface Disposal-A Guide for Preparers of Sewage Sludge on the Monitoring, Recordkeeping, and Reporting Requirements of the Federal Standards for the Use and Disposal of Sewage Sludge, 40 CFR Part 503.* Washington, DC: EPA/831B-93-002a.

U.S. Environmental Protection Agency. 1993. *Domestic Septage Regulatory Guidance: A Guide to the EPA 503 Rule.* Washington, DC: EPA 832-B-92-005.

U.S. Environmental Protection Agency. 1993. *Sewage Sludge Sampling Techniques.* Video.

U.S. Environmental Protection Agency. 1993. *Guidance for Writing Permits for the Use or Disposal of Sewage Sludge (Draft).* Office of Wastewater Enforcement and Compliance. Washington, DC.

ASTM. 1992. *Standard Practice for Recovery of Viruses From Wastewater Sludge.* Annual Book of ASTM Standards: Section 11, Water and Environmental Technology. Philadelphia, PA.

American Public Health Association (APHA). 1992. *Standard Methods for the Examination of Water and Wastewater,* 18th ed. Washington, DC.

REFERENCES (Continued)

U.S. Environmental Protection Agency. 1992. *Environmental Regulations and Technology: Control of Pathogens* and *Vectors in Sewage Sludge.* Office of Research and Development. Cincinnati, OH: EPA/625/R-92/013

Huddleston, J.H., and M.P. Ronayne. 1990. *A Guide to Soil Suitability and Site Selection for Beneficial Use of Sewage Sludge, Manual 8.* Corvallis, OR: Oregon State University Extension Service, (503) 737-2513.

U.S. Environmental Protection Agency. 1989. *POTW Sewage Sludge Sampling and Analysis Guidance Document.* Office of Water. Washington, DC: Only available through NTIS PB-93-227-957

U.S. Environmental Protection Agency. 1989. *Sampling Procedures and Protocols for the National Sewage Sludge Survey.* Office of Water. Washington, DC.

Yanko, W.A. 1987. *Occurrence of Pathogens in Distribution and Marketing Municipal Sludge.* EPA 600/1-87-014. Available from NTIS in Springfield, VA-NTIS PB 88-154273/AS.

U.S. Environmental Protection Agency. 1986. *Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods (SW-846).* Office of Solid Waste. Washington, DC.

U.S. Environmental Protection Agency. 1983. *Methods for the Chemical Analysis of Water and Wastes.* Washington, DC: EPA-600/4-79-020. Available from NTIS in Springfield, Virginia.

U.S. Environmental Protection Agency. 1983. *Process Design Manual for the Land Application of Municipal Sewage Sludge and Domestic Septage.* Cincinnati, OH: EPA-62511-83-016.

Stevenson, F.J., Editor. 1982. *Nitrogen in Agricultural Soils.* No. 22 in Agronomy Series. Madison, WI: American Society of Agronomy, Inc.

Kenner, B.A. and H.A. Clark. 1974. Detection and Enumeration of *Salmonella* and *Pseudomonas aeruginosa. Journal of Water Pollution Control Fe&ration* 46(9): 2163-2171.

Please Note:

The Office of Water publications are available from the Office of Water Resources Center (202) 260-7786, the National Small Flows Clearinghouse (800) 624-8301, or the National Technical Information Service (800) 553-6847.

Center for Environmental Research Information (CERI)/Office of Research and Development publications are available from CERI Publications Office (513) 569-7562.

REGIONAL OFFICE ADDRESSES

Mail compliance reports required under the Standards for the Use or Disposal of Sewage Sludge to the Water Compliance Branch Chief in your EPA Region at the following address:

REGION 1
Water Compliance Branch Chief
(WCC)
Water Management Division
U.S. EPA Region 1
JFK Federal Building
Boston, MA 02203-2211

REGION 2
Water Compliance Branch Chief
Water Management Division
Room 845
U.S. EPA Region 2
26 Federal Plaza
New York, NY 10278

REGION 3
Water Compliance Branch Chief
(3-WM50)
Water Management Division
U.S. EPA Region 3
841 Chestnut Street
Philadelphia, PA 19107

REGION 4
Water Compliance Branch Chief
(WPEB-1)
Water Management Division
U.S. EPA Region 4
345 Courtland Street, N.E.
Atlanta, GA 30365

REGION 5
Water Compliance Branch Chief
(WCC- 15J)
Water Management Division
U.S. EPA Region 5
77 West Jackson Boulevard
Chicago, IL 60604-3590

REGION 6
Water Compliance Branch Chief
(6W-EA)
Water Management Division
U.S. EPA Region 6
1445 Ross Avenue
Dallas, TX 75202-2733

REGION 7
Water Compliance Branch Chief
(WACM)
Water Management Division
U.S. EPA Region 7
726 Minnesota Street
Kansas City, KS 66101

REGION 8
Water Compliance Branch Chief
(8WM-C)
Water Management Division
U.S. EPA Region 8
999 18th Street, Suite 500
Denver, CO 80202-2466

REGION 9
Pretreatment Section
(W-5-3)
Water Management Division
U.S. EPA Region 9
75 Hawthorne Street
San Francisco, CA 94105-3901

REGION 10
Water Compliance Branch Chief
Water Management Division
U.S. EPA Region 10
1200 6th Avenue
Seattle, WA 98101-3188