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ACCEPTABLE METHODS BASED UPON CURRENT KNOWLEDGE FOR THE UTILIZATION OR DISPOSAL OF SLUDGES FROM PUBLICLY OWNED WASTEWATER TREATMENT PLANTS.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
AIR AND WATER PROGRAMS

SUBJECT: Policy Statement on Acceptable Methods for the Utilization or Disposal of Sludges -- ACTION MEMORANDUM
FROM: Acting Assistant Administrator for Air and Water Programs (AW-443)
TO: The Administrator
THRU: AX

*Gene Chubb
has a memo
dated 8/2/72
regarding this*

ISSUE

Approval for publication is required for a proposed "Policy Statement on Acceptable Methods for the Utilization or Disposal of Sludges" (Tab A). This policy statement will be used by Regional Administrators to review applications for EPA construction grants.

BACKGROUND

1. Statutory Basis:

Under Title II of the Federal Water Pollution Control Act Amendments of 1972 ("the Act"), the Administrator makes grants for construction of treatment works.

Under Section 203(a) of the Act, each applicant for a grant submits to the Administrator for his approval, plans, specifications, and estimates for each proposed project for the construction of treatment works for which a grant is applied.

Under Section 201(d)(4) the Administrator shall encourage waste treatment management which results in the construction of revenue producing facilities providing for the ultimate disposal of sludge that will not result in environmental hazards.

In Section 212(2)(A), the term treatment works includes site acquisition of the land that will be an integral part of the treatment process or is used for ultimate disposal of residues resulting from such works.

Thus EPA Regional Administrators, in reviewing grant applications, need policy information on methods of sludge utilization or disposal which are environmentally acceptable.

2. Previous Policy Statements:

In October, 1970 the Council on Environmental Quality sent a report to the President, entitled "Ocean Dumping - A National Policy." In that report, the following statements were made: ". . . The Council on Environmental Quality recommends the following policies relating to specific types of wastes currently being dumped in the ocean, in estuaries, and in the Great Lakes:

Ocean dumping of undigested sewage sludge should be stopped as soon as possible and no new sources allowed.

Ocean dumping of digested or other stabilized sludge should be phased out and no new sources allowed. In cases in which substantial facilities and/or significant commitments exist, continued ocean dumping may be necessary until alternatives can be developed and implemented. But continued ocean dumping should be considered an interim measure. . .".

In accordance with the CEQ recommendation, an EPA interim policy dated October 21, 1971, was issued to the Regional Administrators for their guidance in the grant making process. The interim policy prohibited the issuance of grants for new treatment facilities which would dispose of sludge to the ocean. Grants to existing facilities which practices ocean disposal of sludge could not be made unless the practice was discontinued before the completion of construction. Waivers were allowed when cessation of ocean disposal could not be reasonably accomplished within the construction time frame. Waiver requests had to be accompanied by a time schedule and plan of action for phasing out ocean sludge disposal.

On September 29, 1972, the President's Water Pollution Control Advisory Board, in its report "Ocean Disposal Practices and Effects," stated among its conclusions:

". . . the board has heard convincing evidence that the presence of toxic substances, primarily the heavy metals, in municipal sewage creates special problems in the ultimate disposal of the resulting sludge from treatment plants. These substances have an adverse effect through

their possible entry into the marine food chain when ultimate disposal of sludge is in the ocean. Similarly, adverse effects follow from discharges to the atmosphere of these substances if incineration is selected as the method of sludge disposal. Even when sludge disposal is to land, the presence of these toxic materials complicates the problem and introduces difficulties in the ultimate use of land. . .".

On October 23, 1972, the Marine Protection Research and Sanctuaries Act was enacted. It is the stated purpose of this Act ". . . to regulate the transportation of material from the United States for dumping into ocean waters . . ." "Material" is defined in the Act to include sewage sludge.

On April 5, 1973, the Environmental Protection Agency issued "Interim Regulations Governing Transportation for Dumping, and Dumping of Material into Ocean Waters". These state, in part, ". . . when Title I of the Act becomes effective on April 23, 1973, it will generally be unlawful to depart a port in the United States for the purpose of dumping material in the oceans, or dumping material in the territorial or contiguous zone of the United States, unless the person engaged in such transport or dumping has first obtained a permit from EPA. . .".

On June 11, 1973, the Environmental Protection Agency published proposed "Standards of Performance for New Stationary Sources" to restrict air pollution emissions from seven source categories. Sewage sludge incinerators were included in the coverage of these standards.

All of the reports, legislation, regulations, and standards material cited above restrict wastewater treatment authorities concerning the ultimate disposal of residues resulting from their wastewater treatment process, without providing counsel as to the disposal methods which would be environmentally sound, or at least deemed acceptable. This has created a serious situation of uncertainty and concern to those treatment authorities, and to environmentalists as a whole. If left unresolved, this problem situation can only become worse, as the PL 92-500 requirements for universal secondary treatment produce greater quantities of sewage sludge than are produced today.

WORK GROUP

An EPA work group was established to develop a positive Agency policy concerning the disposal of sludge from publicly owned wastewater treatment plants. This group ultimately included representatives from the Office of Air and Water Programs, Office of Research and Development,

Office of Solid Waste Management Programs, Office of Toxic Substances, Office of Planning and Evaluation, and Region III. In addition to the EPA representatives, Mr. Steffen Plehn of the Council on Environmental Quality participated with the work group throughout. Major assistance was also provided by Dr. Thomas Hinesly, consultant to the Office of the Under Secretary of the Army. Near the end of its work, the group also received advice from representatives of the United States Department of Agriculture and the Food and Drug Administration.

The Environmental Protection Agency draft policy statement concerning acceptable methods, based upon current knowledge, for the utilization or disposal of sludges from publicly owned wastewater treatment plants, represents a product of the work group.

Early in its deliberation, the work group decided that its effort should be two-fold: (1) The development, for immediate practical use, of a sludge disposal policy which would reflect current information concerning the environmental soundness of various sludge disposal methods. This policy would be used by Regional Administrators in the evaluation of applications for Federal assistance to construct wastewater treatment works, and (2) The development of a sludge policy which would identify optimum sludge utilization or disposal technology. This policy would result from a sound Federal research and development program specifically designed for this purpose.

The work group is now engaged in designing the R&D program for the optimum sludge method policy. It is expected that this design will be completed when the comments on the proposed statement are received. The design would, necessarily, coordinate the related activities of all participating Federal agencies. Representatives of such agencies will be included within the design group.

SUMMARY OF POLICY STATEMENT

The policy statement for immediate use, based upon current knowledge, is the subject of this memorandum (Tab A). This policy statement describes acceptable methods for the utilization or disposal of sludge from publicly owned wastewater treatment plants. It is divided into two essential parts; the first part describes methods in which the sludge is used to serve a useful purpose beyond mere disposal, and the second part describes methods which provide only for disposal. Both parts, of course, include only methods which are environmentally acceptable.

Methods which are not on the list are not acceptable, although the policy statement provides for the Environmental Protection Agency to encourage and assist in the development of new or advanced procedures.

In the policy statement, "Group I: Sludge Utilization Methods" now includes only one basic category. This category is recognized by the statement: "Stabilization and subsequent land application for agriculture, enhancement of parks, forests, and reclamation of poor or damaged terrain, is an environmentally acceptable method for the utilization of sludge". Stabilization and land application are further defined in subsequent passages to this initial statement and special precautions are stipulated for the protection of public health, ground water protection, controlling surface water runoff, the choice of crops suitable for sludge application, application rates, and monitoring.

"Group II: Sludge Disposal Methods" includes sludge landfills involving mixed sludge and solid wastes and sludge incineration and disposal of the resulting ash. Precautions are specified for protection of public health, ground water protection, and conformance to applicable air pollution requirements.

Ocean disposal of sewage sludge is considered acceptable for treatment works presently using this method when the sludge meets the criteria specified by EPA in the ocean disposal regulations. When the sludge exceeds the criteria, ocean disposal will be permitted only on an interim basis and subject to an approved implementation plan to eliminate the material.

TECHNICAL SUPPORT DOCUMENT

A Technical Support Document (Tab B) was prepared by the Work Group to take advantage of unpublished information and summarize the technical basis for the contents of the policy statement.

The document is a compilation of material extracted from U.S. Government publications, as well as material which is in the draft stage. This document will not be published separately since it is a summary and compilation of information which will be made available when the source documents are published.

COORDINATION

The policy statement has been coordinated within EPA including the Regions. Working level coordination has been accomplished with other Federal agencies having direct input, such as the U.S. Department of Agriculture and the Food and Drug Administration. Many changes have been incorporated in the statement as a result of these reviews. All substantive comments have been resolved with the exception of those received informally from the Office of Hazardous Materials Control (Tab C). Unresolved issues are discussed subsequently.

IMPACT OF THE POLICY STATEMENT

1. The impact will be most significant for land application. After examining data on sludges from 180 sources it has been determined that more than 50 percent of the sources would not qualify, including Milwaukee's millorganite and Chicago's Fulton County. For this reason, provision was made for demonstration projects under carefully defined and monitored conditions where the sludge exceeds the limits given in the policy statement.

2. Cost impact and energy impacts have not been included in this analysis since the only criterion considered was environmental acceptability.

SUMMARY OF MAJOR ISSUES

1. Should EPA issue a policy statement on sludge?

It is recommended that EPA issue such a statement to provide guidance to EPA Regional Administrators. However limited our current information, some municipalities are making decisions in the near future and cannot wait for ultimate or optimum solutions.

2. Should EPA include land application in the policy statement?

It is recommended that land application be included. The alternatives to including land application are either to prohibit it entirely (which would be contrary to the intent of the Act) or to leave it up to the Regional Administrators, with no guidance.

3. Should EPA fund land for application or disposal of sludge, when there is no similar funding for municipal solid waste?

It is noted that EPA funds such land in response to the Act. The fact that there is no similar program for solid wastes does not alter the construction grant eligibility of land for ultimate disposition of residues from wastewater treatment.

4. Should EPA delay issuing the policy statement until more information is available?

It is recommended that the statement not be delayed. The statement is conservative and includes provisions for control monitoring. Additional substantive information on major subjects is not likely to be available in the near term future, and is considered to be at least 5 years away, given the low levels of current research funding.

RECOMMENDATION

It is recommended that "Acceptable Methods, Based Upon Current Knowledge, for the Utilization or Disposal of Sludge from Publicly Owned Treatment Plants" be approved for publication in the Federal Register as a proposed declaration of Environmental Protection Agency policy.

Approve: _____

Disapprove: _____

Date: _____

CONCURRENCES

EG,	Kirk	Concur	_____	Nonconcur	_____	Date	_____
RD,	Grenfield	Concur	_____	Nonconcur	_____	Date	_____
PM,	Alm	Concur	_____	Nonconcur	_____	Date	_____
HM,	Elkins (Acting)	Concur	_____	Nonconcur	_____	Date	_____

Prepare: by AFWM:AW-447:sms:WAWhittington:Rm:1125:HSM-E:X69976:2-20-74

ENVIRONMENTAL PROTECTION AGENCY

Notice of Intent to Issue a Policy Statement
on Acceptable Methods for the
Utilization or Disposal of Sludges

Notice is hereby given that the Environmental Protection Agency intends to issue a policy statement on Acceptable Methods, based upon current knowledge, for the Utilization or Disposal of Sludges from Publicly Owned Wastewater Treatment Plants. The policy statement is contained in Appendix I to this notice. The purpose of the policy statement is to provide guidance to Regional Administrators of the Environmental Protection Agency in evaluating proposed sludge utilization or disposal systems included in the design of publicly owned treatment works for which construction grant applications are made.

The policy statement was developed by an Agency work group with substantial assistance provided by individuals from the Council on Environmental Quality, the U.S. Department of Agriculture, the Food and Drug Administration, and the Department of the Army.

For sludge disposal by sanitary landfill, incineration, and ocean dumping, there are extensive criteria already available in other EPA regulatory material. In general these criteria have

been referenced in the policy statement with some modifications.

For sludge in sanitary landfills, reference is made to the EPA sanitary landfill guidelines. One additional requirement is that there be a binding agreement for proper operation where the sanitary landfill operator is not the grant applicant.

For sludge incineration, reference is made to the EPA new source performance standards. Additional requirements have been included based on previous work by the EPA Sludge Incineration Task Force.

Ocean disposal is strictly regulated by EPA, and the EPA guidelines on the subject are referenced in the policy statement. In general, ocean disposal of sludge is not a desirable practice and it is included in the policy statement only because in some cases it may be acceptable on an interim basis.

The area with least existing regulatory material is land application of sludge. Accordingly, it was necessary to provide more detailed material on this subject.

The policy statement contains criteria for land application of municipal sludges. The most difficult matter to resolve, however,

was application to lands which are or could be used to grow crops in the human food chain. For such applications, the criteria in the policy statement are designed to protect public health and preserve farmland resources. To insure complete coverage, projects involving crops in the human food chain will be reviewed by the Food and Drug Administration and the U.S. Department of Agriculture.

The Agency is aware that there are research and demonstration efforts now underway to define optimum methods for utilization of municipal sludge. The present policy statement is based on current knowledge, and will be modified from time to time as additional information becomes available.

Because of the wide interest in this subject, the Environmental Protection Agency is soliciting comments on the proposed policy statement. Interested persons should submit written comments, views, or data to the Director, Municipal Construction Division, Office of Water Program Operations, Environmental Protection Agency, Washington, D.C. 20460. All such communications received prior to 60 days after publication of this notice in the Federal Register will be considered in developing the final policy statement.

Russell E. Train
Administrator

Appendix I
U.S. ENVIRONMENTAL PROTECTION AGENCY POLICY

Acceptable Methods, Based Upon Current Knowledge, for the Utilization or Disposal of Sludges From Publicly Owned Wastewater Treatment Plants.

The treatment of wastewaters for pollutant removal produces not only relatively clean water for discharge, but also a significant quantity of residue material. For domestic sewage, treated in publicly owned plants, this residue is essentially organic in nature, although measurable quantities of metal, minerals, and other compounds are invariably also present. Where industrial wastewaters are treated together with domestic sewage, the potential is increased for additional foreign materials in the resulting sludge. Further, pathogenic organisms in sewage may survive the wastewater treatment process and be found in the residue.

Depending upon the constituent character of the wastewater treatment plant sludge, and the quantity involved, disposal of this residue material can exert a significantly adverse impact on the environment. It is essential for wastewater treatment installations to give effective consideration to the proper disposal of sludge produced as well as to the proper disposal of treated wastewater.

The requirements of the Federal Water Pollution Control Act Amendments of 1972 provide an immediate emphasis to the need for environmentally sound means for sludge disposal. The national requirement for secondary treatment, to cite an example, will not only produce a greater quantity of sludge than heretofore, but will also result nationwide in greater and possibly more concentrated forms of foreign materials present in the sludge.

The disposition of wastewater treatment plant sludges is a complex problem. It can involve simultaneously the air, land, and water phases of the environment, encompassing such varied considerations as public health, plant growth, and ground water protection; as well as pollution control. Regional Administrators of the Environmental Protection Agency are faced with these questions daily as they evaluate sludge disposal systems included in the design of publicly owned treatment works for which construction grant applications are made. Even in consideration of the still limited information available on the complex issue of sludge utilization and disposal, there remains a need for an Agency policy, defining a baseline of acceptable sludge utilization or disposal practice.

For the reasons cited above, a clear statement of environmentally acceptable methods for sludge utilization or disposal is presented in this document. The methods listed are based upon current knowledge. No attempt is made to state that the listed methods are optimum for sludge utilization or disposal, but rather to state that any adverse environmental impact associated with each method can be tolerated if the site conditions are suitable. A companion document is being developed to guide Federal research and demonstration efforts for the purpose of producing optimum technology for sludge utilization or disposal procedures which minimize adverse environmental effects.

The list of currently acceptable methods is divided into two distinct parts, in order of the priority of acceptance. The first part has been established to include methods in which the sludge is utilized as a resource. The second part includes those methods which are environmentally acceptable but in which the sludge is not utilized for any beneficial purpose.

Methods which appear to have great future promise, but which have not been used in existing facilities, are not included in

this list. As these methods are demonstrated in practical use, and as supporting information is obtained, they will be added to the list of acceptable methods. Because it is the policy of the Environmental Protection Agency to encourage and, where possible, assist in the development of new or advanced wastewater treatment procedures, Federal grant funds may be awarded for the construction of sludge utilization or disposal facilities not on the list, provided that information is presented by the grant applicant sufficient to allow a determination that such facilities would meet applicable statutory and regulatory requirements.

Proper operation, maintenance, and monitoring of the sludge utilization or disposal method are essential to ensure that adverse environmental effects do not result. Grant applicants must demonstrate that they will have manager, operators, and resources necessary to achieve and maintain the required performance on a continuing basis.

The criteria in this policy statement are subject to confirmation or revision based on future experience in the field. All users are encouraged to submit suggested revisions, data, and information to the Director of the Municipal Construction Division, Office of Water Program Operations, Environmental Protection Agency, Washington, D.C. 20460.

Group I: Sludge Utilization Methods

1. Stabilization and Subsequent Land Application for Agriculture, Enhancement of Parks and Forests, and Reclamation of Poor or Damaged Terrain, is an environmentally acceptable method for the utilization of sludge.

1. Stabilization. Prior to land application, sludge must be stabilized to reduce public health hazards, as well as prevent nuisance conditions such as odors and insects. To be acceptable, the stabilization method used must reduce influent volatiles by at least 40 percent, and fecal coliform reduction must exceed 97 percent. In order to ensure nuisance odor conditions do not occur, a higher degree of volatile reduction may be required (reference Figure 13, page 213, ASCE/WPCF Manual of Practice on Sewage Treatment Plant Design, 1959). Well designed and operated anaerobic digestion is an acceptable method for sludge stabilization. If anaerobic digestion is used, the sludge must be maintained in the digester at a temperature of at least 30° C, with hydraulic capacity for at least 30 days. In well designed and operated high rate digesters, the hydraulic capacity may be reduced provided the performance requirements are met. Digested

sludge can be further stabilized by various composting systems. If composting is used, temperatures above 55°C must be reached as a result of oxidative bacterial action. After proper composting the material must be cured in a stockpile for at least 30 days. It is emphasized that odor control is an extremely important requirement, and the absence of objectionable odors is highly dependent on adequate stabilization.

Aerobic stabilization, chemical stabilization [lime treatment, etc.], and heat stabilization methods may also be utilized, provided that assurance can be made, for the specific case, that the public health factors and nuisance potential are no greater than would be associated with anaerobic digestion or composting. The specific numerical values for stabilization as above may not apply to these alternative methods.

1. 2. Land Application. After stabilization, liquid digested sludge may be applied to the land by plow injection, or by ridge and furrow spreading. Dried or dewatered stabilized sludge, or composted material from digested sludge, may be spread upon the land and then incorporated into the soil by plowing, discing, or a similar method.

Spray application of digested sludge to the land is acceptable only when the transport of aerosols, beyond the boundaries of the application area, is minimized through such means as the use of low pressure sprays, or the use of spray nozzles located close to ground level and directed downward.

1. 3. Precautions.

1. 3. 1. Protection of Public Health

1. 3. 1. Pathogens. Protecting the public health must be accomplished by either controlling public access to the site, or by reduction of pathogens in the sludge. Acceptable methods for reduction of pathogens in digested sludges include pasteurization (30 minutes at 70°C), high pH treatment with lime (pH greater than 12, for 3 hours), and long term storage for liquid digested sludge (60 days at 20°C or 120 days at 4°C). Additional disinfection is not required for completely composted materials.

1.3.1. 2. Application to Agricultural Lands

Application of sludge to agricultural lands which may be used to grow crops must be carefully reviewed to ensure cropland resources are protected and harmful contaminants do not enter the human food chain.

Each project involving application of sludge to lands which may be used to grow crops must be reviewed by the U.S. Department of Agriculture. Additionally, when the crops will be in the human food chain, the project must be reviewed by the Food and Drug Administration. Regional Administrators should arrange for the project facility plan to be reviewed by these agencies. The report should provide sufficient information for the review, including information on sludge treatment, industrial users, estimated sludge characteristics, the land application system, expected crops or products, operating practices, and monitoring.

Work is underway by EPA, USDA, and FDA to define more precisely the types of sludges which can be used for land application.

In the interim, USDA has provided the following information:

Sludges not exceeding the maximum levels indicated in Table I may be applied to land which are or could be used to grow crops in the human food chain

Table 1

Interim maximum content of toxic elements for sludges to be applied to land which will ever grow crops in the human food chain.

Element	Maximum Content mg/kg dry sludge.
Cd	10
Cu	1000
Hg	10
Ni	200
Pb	700
Zn	2000

Up to 150 percent of values listed in Table 1 may be tolerated if an abatement program is concurrently offered which will have the potential to reduce the sludge contents to those listed.

No greater total amount of sludge may be applied over the life of the project than calculated by Equation 1 for the sludge and soil in question.

Equation 1: Total quantity of sludge, tons per acre, =

$$\frac{\text{CEC (meq/100g unamended soil)} \times 1.63 \times 10^4}{[1 \times \left(\frac{\text{mg Zn}}{\text{kg sludge}} - 50\right) + 2 \times \left(\frac{\text{mg Cu}}{\text{kg sludge}} - 25\right) + 8 \times \left(\frac{\text{mg Ni}}{\text{kg soil}} - 25\right)]}$$

Equation 1 is based on limiting metal additions as Zn (equivalent) to 5 percent of cation exchange capacity (CEC) of the unamended soil to allow continued growth of all crops at pH > 6.5. The modified Zn (equivalent) is used to correct for dilution of the soil by the inorganic matter of sludge.

The sludge-amended soil must be at pH > 6.5 for at least 2 years after sludge amendment.

In cases where sludge is applied to land which will not be used to grow crops in the human food chain, higher total applications may be allowed. In those cases, it will be possible to adjust the pH and soil conditions, or use specific crop species or varieties, which will limit injury from and uptake of the contaminants (consult the Agricultural Research Service, U.S. Department of Agriculture).

FDA has provided the following information:

Regulations exist to control the level of persistent organic chemicals, such as pesticides and polychlorinated biphenyls, in certain components of the food chain. However, similar guidelines have not at present been

established for all trace elements in foods. When standards are implemented, those sludge applications involving crops in the human food chain will have to be adjusted to conform. Cd and Pb are of particular concern and Hg, As, Se as well as persistent organics, such as pesticides and PCB's could also be of concern in municipal sludge and in some crops grown in sludge-treated soil.

Even though pathogen reduction methods are used, additional precautions should be undertaken when sludge is used for agricultural purposes. Under certain conditions, specific organisms may survive in the soil for extended periods. Consequently, application of sludge for crops which may be eaten raw by humans is not acceptable. Sludge applied to crops which are cooked or processed before consumption, to pastures, or crops used for forage should be negative for pathogens by normally applied analytical procedures. Forage and pasture crops should not be consumed by animals while such crops are physically contaminated by sludge as this could result in direct ingestion by animals. Grazing animals should not be permitted on pastures before thorough removal of sludge by rain or similar method.

Where sludges are to be applied to the land, industrial users of municipal wastewater treatment works should be required to pretreat their wastewaters so as to minimize heavy metals and other chemical contaminants from industrial sources (see Federal Guidelines: Pre-treatment of Pollutants Introduced into Publicly Owned Treatment Works).

Note, however, that quantities of these materials may also be present in wastewaters usually considered of non-industrial origin. In developing pretreatment programs, special attention must be given to the disposal of sludges created or materials removed during the pretreatment process. Disposal of these materials must be in an environmentally sound manner.

The criteria in this section are based on limited information and admittedly EPA is conservative in defining a sludge acceptable for land application. Other sludges may also be acceptable as demonstration projects, including some sludges which do not in every respect fall within the above limits. However they can only be accepted under certain carefully defined and controlled conditions.

The specific nature of the program to control non-conforming types of land application of sludges will vary, but usually will include monitoring, abatement procedures and periodic reporting. An abatement program must be capable of accomplishing its objective within a reasonable time, but in no case more than 5 years from the start.

Regional Administrators should work closely with grant applicants desiring to utilize such sludge in land application projects. Technical assistance to resolve specific questions is available at EPA Headquarters, the EPA NERC's, especially the Advanced Waste Treatment Research Laboratory, and the USDA Agricultural Research Service.

1. 3. 2. Ground Water Protection

The land application system shall be so designed that the permanent ground waters (ground water which is not removed from the ground by an underdrain system or other mechanical means) which are in the zone of saturation (where the water is not held in the ground by capillary tension) that result from the application of sludge will not exceed the chemical quality or pesticides levels for raw or untreated drinking water supply sources in the EPA Manual for Evaluating Public Drinking Water Supplies as below (except as noted in Paragraph 1: 3. 2. 4.):

1. 3. 2. 1. Chemical Quality:

	<u>Units of Measurements</u>	<u>Maximum Allowable Limits</u>
Arsenic	mg/l	0.1
Barium	mg/l	1
Cadmium		
Chloride	mg/l	250
Chromium	mg/l	0.05
Copper	mg/l	1
Cyanide		
Fluoride	mg/l	1.1
Foaming Agents as Methylene Blue Active Substances	mg/l	0.5
Iron	mg/l	0.3
Lead	mg/l	0.05
Manganese	mg/l	0.05
Mercury		
Nitrate Nitrogen	mg/l	10
Carbon Absorbable Organics-Carbon; Chloroform Extractable (CCE)	mg/l	0.3

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Effluent standards for the following toxic pollutants have been proposed pursuant to s 307(a) of the Act. These proposed standards are being considered at public hearings, and will be promulgated at the conclusion of the hearings. Any effluent standards promulgated for these pollutants under s 307(a) will be taken into account when the standards proposed herein are promulgated or revised:

Cadmium

Cyanide

Mercury

Aldrin and Dieldrin

DDT

Endrin

Toxaphene

Handwritten notes:
- 2000-2001
- 2002-2003
- 2004-2005

	<u>Units of Measurements</u>	<u>Maximum Allowable Limits</u>
Carbon Absorbable Organics -	mg/l	1.5
Carbon: Alcohol Extractable (CAE)	mg/l	0.01
Selenium	mg/l	0.05
Silver	mg/l	270
Sodium	mg/l	250
Sulfate	mg/l	5
Zinc	mg/l	

1. 3. 2. 2.

Pesticides:

	<u>Units of Measurements</u>	<u>Maximum Allowable Concentration</u>
Chlordane	mg/l	0.01
Heptachlor	mg/l	0.02
Heptachlor epoxide	mg/l	0.02
Heptachlor and Heptachlor epoxide	mg/l	0.02
Lindane	mg/l	0.1
Methoxychlor	mg/l	0.5
Organophosphate and carbamate insecticides ^a	mg/l	0.1
2,4-D	mg/l	1
2,4,5-F	mg/l	0.005
2,4,5-TP	mg/l	0.2

^aExpressed in terms of parathion equivalent cholinesterase inhibition.

1. 3. 2. 3. Any public drinking water standards hereafter issued by EPA which prescribe maximum allowable limits or permissible concentrations of chemicals, radioactive materials, or pesticides shall apply in lieu of those in Paragraphs 1. 3. 2. 1 and 1. 3. 2. 2.

1. 3. 2. 4. If the presently existing concentration of any parameter is higher in the ground water than the levels allowed above, then the use of a land application technique should not result in an increase in the concentration of that parameter.

1. 3. 2. 5. The soil depth to fissured rock, highly permeable gravels, or ground water shall be sufficient to prevent ground water degradation. Because minimum vertical distances are so dependant upon "in situ" soil conditions, a thorough investigation of soil and hydrogeologic conditions [by a qualified geohydrologist] is required for each site where sludge is to be applied to the land. To prevent solubilization and migration of metal ions, the pH of the combined soil and sludge should be above 6.5 at all times.

1. 3. 3. Controlling Surface Water Runoff

Surface water runoff must be controlled to prevent contravention of water quality standards which might be produced by the migration of sludge material into receiving bodies of water. Containment

and controlled release of runoff from sludge application areas, or effective erosion control methods, must be practiced as necessary. Technical advice on erosion control is available from the Soil Conservation Service, U.S. Department of Agriculture.

I. 3. 4. Crops Suitable for Sludge Application.

- I. 3. 4. 1. Crops vary widely in their reaction to sludge enriched soils. The particular crop species may be adversely affected by trace elements in the sludge. Additionally, the crop may take up and concentrate certain of these trace elements, thereby inhibiting future use of the harvested materials (particularly in the human food chain). The reaction of a specific crop to sludge application is extremely site dependent. Factors such as soil type, pH, moisture content, climate, and crop species are important. For advice concerning crops which can be satisfactorily grown in sludge enriched soils, the local representatives of the U.S. Department of Agriculture should be consulted.
- I. 3. 4. 2. To date the practice of sludge spreading in forests has been limited. However, forests offer opportunities for beneficial use of sludge to improve soil fertility and increase tree

growth. With most tree species nutrient uptake is small compared to that of cultivated crops, however in the case of some species, intensive culture operations for the production of wood fibre is possible. High application rates (in excess, of about 15 tons of dry solids per year per acre) might require nitrogen removal to prevent nitrate pollution of groundwater.

I. 3. 5. Application Rates.

I. 3. 5. 1. The sludge application rate per unit of acre must be managed to ensure that environmental requirements are met.

It is not possible to give a rate, or even an upper limit, which would be universally applicable, since the limit varies widely and must be determined for each site.

I. 3. 5. 2. Nitrogenous substances usually limit annual application rates. The following factors must be estimated.

a. Total nitrogen balance, including nitrogen applied, plant uptake, loss through volatilization or denitrification, recycling from decaying plant matter, and potential for nitrate migration to the ground water.

b. Quantity and persistence of ammonia compounds since excess amounts are toxic to some seeds. Two weeks cessation of application before seeding has been adequate.

It is possible that the presence in the sludge of certain salts, phosphorous compounds, metals, radionuclides and other materials may also limit application rates in specific instances. Each prospective land application should be assessed on a case-by-case basis with consideration given to both local sludge and soil characteristics.

1. 3. 5. 3. Sludge is generated relatively constantly throughout the year. The application rate must be harmonized with the crop growing season. A mass balance is necessary to determine the amount of sludge storage required, including an allowance for climate conditions or other unusual conditions, during intervals when the sludge is not applied to the land.

1. 3. 6. Monitoring

A plan must be developed and implemented to provide for adequate monitoring of each land application site. Where application rates will not exceed 5 dry tons/acre/year for liquid digested sludge, or 50 dry tons/acre/year over a three year period for

dried or dewatered sludge, the site monitoring requirements may be reduced, considering the size of the site, and the potential for problems or adverse long term effects. This plan must be specifically designed for applicable local conditions, and is to include (but is not limited to):

a. Ground water observation wells, surface water, sludge, and soils: monitor for heavy metals, persistent organics, pathogens, and nitrates.

b. Human food chain products grown in sludge aided soil: heavy metals, persistent organics, and pathogens.

Group II: Sludge Disposal Methods

2. Sanitary Landfill of sludge containing no free moisture, either separately or along with mixed municipal solid waste is an environmentally acceptable method for the disposal of sludge.

2. 1. Stabilization

The sludge must be stabilized as described for land application in order to prevent nuisance and reduce hazards to those working in the area.

2. 2. Landfill Procedures

2. 2. 1. A sanitary landfill accepting sludge must be designed and operated in accordance with EPA Guidelines for Land Disposal of Solid

Wastes (40 CFR 241). While it is recognized that the Guidelines were developed for solid waste at Federal facilities, a sanitary landfill accepting sludge must comply with all the requirements and recommendations contained in the Guidelines.

2. 2. 2. If a sanitary landfill accepting sludge is not operated by the waste water treatment authority, a written contract or binding agreement is required between the wastewater treatment authority and the operator of the sanitary landfill. Such binding agreement shall include necessary assurances of compliance with the requirements and recommendations of the EPA Guidelines (40 CFR 241).

2. 3. Precautions

2. 3. 1. Protection of Public Health

Sludge stabilization and the daily soil cover are generally adequate protection from direct health hazards.

2. 3. 2. Ground Water Protection

The ground water underlying the sanitary landfill accepting sludge must be protected against degradation, and the sanitary

landfill must meet the ground water protection requirements .

2. 3. 3. Monitoring

A plan must be developed and implemented to provide for adequate monitoring of each sanitary landfill accepting sludge. This plan must be specifically designed for applicable local conditions, and is to include:

a. Ground water observation wells tested for heavy metals, persistent organics, pathogens, and nitrates.

b. Surface water monitoring tested for COD and total dissolved solids. Additional testing may be necessary if it is determined that leachate is entering surface waters.

3. Sludge Incineration and Disposal of the Resulting Ash is an environmentally acceptable method for the disposal of sludge. Incineration alone is a volume reduction method rather than ultimate disposal. After incineration there remains ash, either dry or in scrubber water, to be disposed of in a properly operated sanitary landfill.

3. 1. Industrial wastewaters introduced into a municipal wastewater treatment works, which practices sludge incineration, must be pretreated to reduce to a minimum the amounts of heavy metals

radioactive materials and persistent organics such as pesticides and polychlorinated biphenyls. In developing pretreatment programs, special attention must be made to the disposal of sludges created or materials removed during the pretreatment process. Disposal of these materials must be in an environmentally sound manner.

3. 2. The emissions from the sludge incinerator must meet the EPA Air pollution emission standards of performance contained in the New Source Performance Standards for Sludge Incinerators (40 CFR 60). These emission limits are based on a venturi scrubber, but any similar equipment which meets the standard is acceptable. Sludge incineration is known to vaporize any mercury present in the incoming sludge. EPA is now investigating the need for a mercury standard for sludge incineration. If such regulations are promulgated, sludge incineration will be acceptable only if assurance can be made that mercury emission limitations will be met, for the specific case. In the interim, pretreatment requirements should be imposed to eliminate mercury in municipal wastewaters from industrial or institutional sources.

3. 3. The incinerator must be so designed as to produce an operational temperature of 1600° F and minimum residence time at that temperature of 2 seconds or an equivalent combustion condition which accomplishes the purpose of destroying organic compounds, such as polychlorinated biphenols, for all combustion gases generated during the combustion process.

3. 4. A plan must be developed and implemented to provide for adequate monitoring of each sludge incinerator. The stack gas emissions from sludge incinerators must be monitored to ensure compliance with 40 CFR 60. Additionally mercury in stack gas emissions must be monitored and waste water from industrial users must be monitored if it is determined that such users will be a significant source of mercury in the municipal sludge.

4. Ocean Disposal of sewage sludge is considered acceptable for treatment works presently using this method when the sludge meets the criteria specified in 40 CFR 227. When the sludge exceeds the criteria, ocean disposal will be permitted only on an interim basis and subject to an approved implementation plan to eliminate the materials harmful to the marine environment.

1. 1. The Federal Water Pollution Control Act Amendment of 1972 (PL 92-500) and the Marine Protection, Research and Sanctuaries Act of 1972

(PL 92-532) have established a Federal program of marine pollution abatement and control. EPA has issued regulations and criteria (40 CFR 220-227) to govern the disposal of wastes to the marine environment. EPA controls such disposal by a system of permits for the discharge, transportation, and dumping of all waste materials into the marine environment (except for dredged material, which is controlled by the Corps of Engineers).

4. 2. Ocean disposal of sewage sludge is strictly controlled by EPA. Currently EPA will approve only existing dumping sites presently in use of the disposal of particular kinds of waste, unless there is extremely strong evidence in favor of approval of a new location.