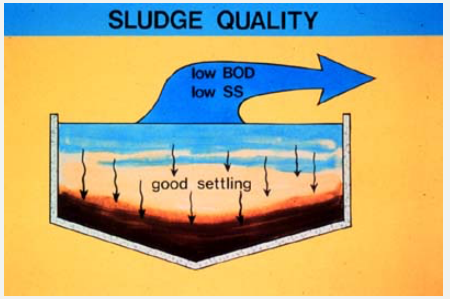

ENVE 422
TREATMENT AND DISPOSAL OF WATER AND WASTEWATER
SLUDGE

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REGULATIONS OF SEWAGE SLUDGE

TURKISH REGULATIONS RELATED TO SLUDGE

Su Kirliliği Kontrolü Yönetmeliği

Water Pollution Control Regulations: September 4, 1988 originally; revised in December 31, 2004.
Treatment methods for wastewater sludge are given & discussed.

Direct Discharges into the Receiving Water Courses:

Item number 26, **Section D** $\Rightarrow$ treatment sludges & septic tank sludges are **strictly prohibited from being discharged** into the receiving water.

Direct Discharges into the Receiving Water Courses:

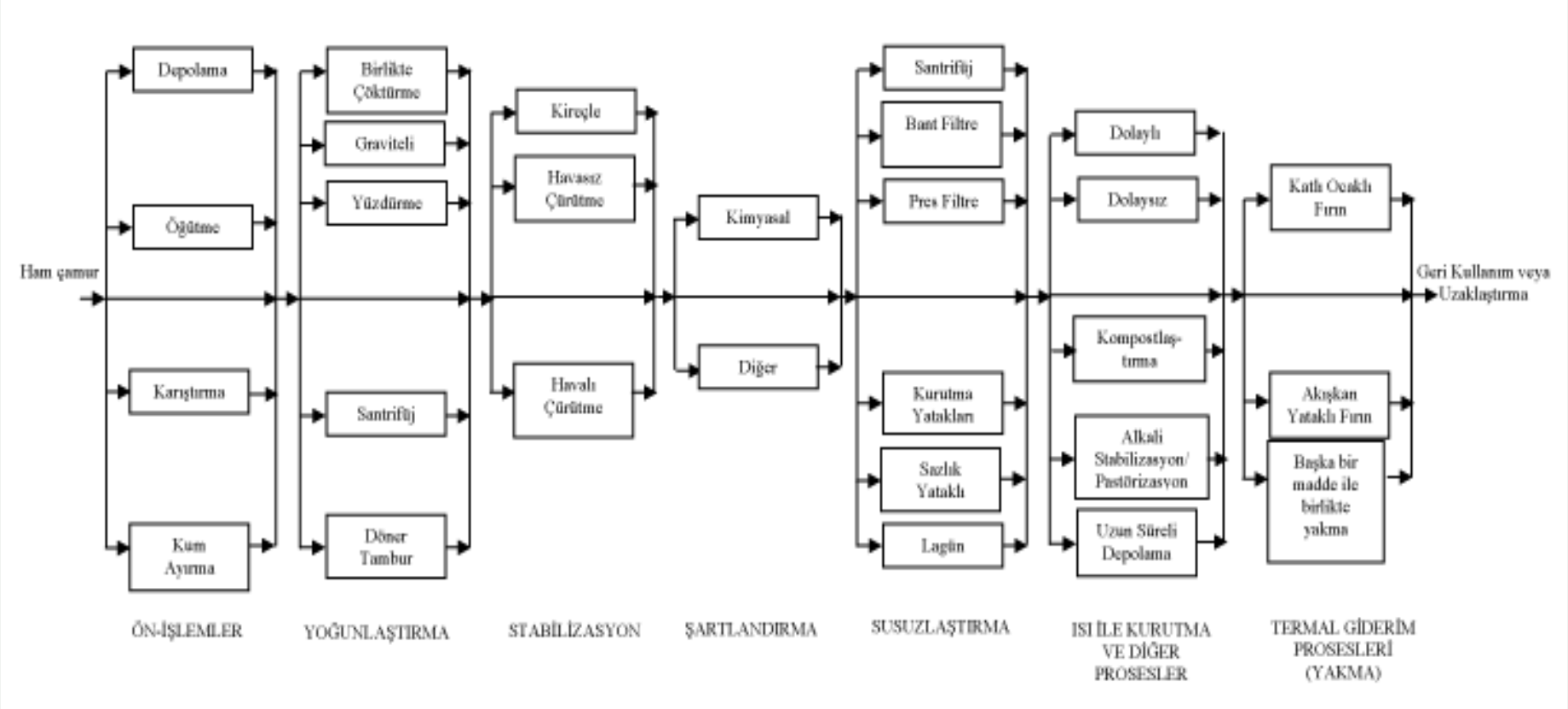
In addition:

A similar item is also present in the Urban Wastewater Treatment Regulation which was issued on January 8th, 2006. This regulation too, strictly prohibits the disposal of wastewater sludge into the receiving water courses.

Water Pollution Control Regulation – Technical Aspects Bulletin (Atıksu Arıtma Tesisleri Teknik Usuller Tebliği – March 20th, 2010)

- This document defines how the sludge originating from domestic wastewater treatment plants should be treated.
- It lists possible alternative techniques of thickening, stabilization and dewatering as flow charts.
- It mentions the important parameters if the sludge is to be reused for land application.
- It gives the typical disposal methods (land application for agriculture and thermal applications) and introduces them very briefly.

Technical Aspects Bulletin



Generalized Flow Scheme of Treatment and Disposal of Municipal Sludge

Regulation on the Landfilling of Wastes, March 2010 (Atıkların Düzenli Depolanmasına Dair Yönetmelik)

Three types of landfills:

- Type 1: for hazardous waste
- Type 2: for municipal wastes
- Type 3: for inert wastes

Sludge → type 1 or type 2 depends on the analysis

Contaminant Limit Values for Type 2 Landfills
Granular non-hazardous wastes subjected to leaching test at a liquid to solid ratio (L/S) of 10 L/kg should not exceed the limits

Parametre	Birim	Sınır Değer
As (Arsenik)	mg / lt	0,2
Ba (Baryum)	mg / lt	10
Cd (Kadmiyum)	mg / lt	0,1
Cr toplam (Toplam krom)	mg / lt	1
Cu (Bakır)	mg / lt	5
Hg (Civa)	mg / lt	0,02
Mo (Molibden)	mg / lt	1
Ni (Nikel)	mg / lt	1
Pb(Kurşun)	mg / lt	1
Sb (Antimon)	mg / lt	0,07
Se(Selenyum)	mg / lt	0,05
Zn (Çinko)	mg / lt	5
Klorür	mg / lt	1500
Florür	mg / lt	15
Sülfat	mg / lt	2000
ÇOK (Çözünmüş organik karbon) (1)	mg / lt	80
TÇK (Toplam çözünen katı) (2)	mg / lt	6000

Contaminant Limit Values for Type 1 Landfills
Granular non-hazardous wastes subjected to leaching test at a liquid to solid ratio (L/S) of 10 L/kg should not exceed the limits

Parametre	Birim	Sınır değerler
As (Arsenik)	mg / lt	2,5
Ba (Baryum)	mg / lt	30
Cd (Kadmiyum)	mg / lt	0,5
Cr toplam (Toplam krom)	mg / lt	7
Cu (Bakır)	mg / lt	10
Hg (Civa)	mg / lt	0,2
Mo (Molibden)	mg / lt	3
Ni (Nikel)	mg / lt	4
Pb(Kurşun)	mg / lt	5
Sb (Antimon)	mg / lt	0,5
Se(Selenyum)	mg / lt	0,7
Zn (Çinko)	mg / lt	20
Klorür	mg / lt	2500
Florür	mg / lt	50
Sülfat	mg / lt	5000
ÇOK(Çözünmüş organik karbon) (1)	mg / lt	100
TÇK(Toplam çözünen katı) (2)	mg / lt	10000

Dissolved Organic Carbon (DOC) – the problem parameter about the landfilling of sludge

Temporary item 4: if the sludge is analyzed and found non-hazardous with respect to all other parameters measured, compliance with the DOC content will not be required until 1/1/205 provided that the sludge has 50% dry solids content and it is pretreated to reduce the odors and bring the sludge into a stable state.

The Change (26/12/2019):

if the sludge is analyzed and found non-hazardous with respect to all other parameters measured, compliance with the DOC content will not be required until 1/1/2025 provided that the sludge has 50% dry solids content and it is pretreated to reduce the odors and bring the sludge into a stable state.

Landfilling of Biodegradable Wastes

- Effective in five years from the date of issue (March 2010) of this regulation, i.e. in 2015, the biodegradable wastes will have to be reduced down to 75% of their value in 2005,

- In 8 years, i.e. in 2018, the biodegradable wastes will have to be reduced down 50% of its value in 2005, and

- In 15 years, i.e. in 2025, the biodegradable wastes will have to be reduced down to 35% of its value in 2005.

Regulation on the Combustion of Wastes - 2010
Atıkların Yakılmasına Dair Yönetmelik

- If the facility obtains more than 40 % of its calorific power value from wastes, than it is considered as an individual combustion facility not a co-combustion facility.
- These facilities have to obey the limit values given in Appendix 4 of the regulation.
- If a combustion facility obtains less than 40 % of its calorific power value from wastes, it is considered as co-combustion facility.
- In this case the emission limit values listed in Appendix 2 of this regulation apply. The cement factories in this categories have to obey limit values for particulate matter, HCl, HF, NO_x, heavy metals, dioxins and furans, SO_2, TOC, CO.

Wastes that can be accepted by cement factories – category: sludge

19 02 05	Fiziksel ve kimyasal işlemlerden kaynaklanan tehlikeli maddeler içeren çamurlar
19 08 05	Kentsel atık suyun arıtılmasından kaynaklanan çamurlar
19 08 11	Endüstriyel atık suyun biyolojik arıtılmasından kaynaklanan tehlikeli maddeler içeren çamurlar
19 08 12	19 08 11 dışındaki endüstriyel atık suyun biyolojik arıtılmasından kaynaklanan çamurlar
19 08 13	Endüstriyel atık suyun diğer yöntemlerle arıtılmasından kaynaklanan tehlikeli maddeler içeren çamurlar
19 08 14	19 08 13 dışındaki endüstriyel atık suyun diğer yöntemlerle arıtılmasından kaynaklanan çamurlar
19 11 05	Saha içi atıksu arıtımından kaynaklanan tehlikeli maddeler içeren çamurlar
19 11 06	19 11 05 dışındaki saha içi atıksu arıtımından kaynaklanan çamurlar

Regulation on the Use of Municipal and Urban Sludges on Land (Evsel ve Kentsel Arıtma Çamurlarının Toprakta Kullanılmasına Dair Yönetmelik) (August 3rd, 2010)

- Raw sludges that have not gone through any stabilization process can never be used on land.
- Stabilized sludge can be used on land provided that all the requirements given in Appendix 1-B, 1-C and 1-D are satisfied all together.
- The land that the stabilized sludge is to be applied should not contain heavy metals in concentrations exceeding the limit values given in Appendix 1-A.
- Stabilized sludge cannot be used on land that is used for growing fruits and vegetables that are eaten raw and that touch the ground. Stabilized sludge use on land that grows fruits trees is allowed.

Regulation on the Use of Municipal and Urban Sludges on Land (Evsel ve Kentsel Arıtma Çamurlarının Toprakta Kullanılmasına Dair Yönetmelik) (August 3rd, 2010) (continued)

- Sludge application is not allowed if the pH of the land is less than 6.
- Stabilized sludge can not be used on land with organic content higher than 5 %.
- Stabilized sludge with organic content less than 40 % can not be used on land.
- In the treatment plants with population equivalent 1 Million or above sludges are required to be dried to over 90% dry solids content. If the plant demonstrates that the use is technically and economically suitable, then 90% dry solids content requirement can be waived by the Ministry.
- There are a number of other requirements such as these listed in the regulation.

Appendix 1-A Metal Limit Values Required in Soil

Heavy Metal (Total)	6 ≤ pH < 7 mg/kg in oven dry soil	pH ≥ 7 mg/kg in oven dry soil
Lead	70	100
Cadmium	1	1.5
Chromium	60	100
Cupper	50	100
Nickel	50	70
Zinc	150	200
Mercury	0.5	1

Appendix 1-B Maximum Metal Concentrations that can be Allowed in Stabilized Sludge

Heavy Metal (Total)	**Limit Value mg/kg in dry sludge solids**
Lead	750
Cadmium	10
Chromium	1000
Cupper	1000
Nickel	300
Zinc	2500
Mercury	10

Appendix 1-C Required Limit Values for Organic Compounds in Stabilized Sludge

Organic Compounds	Limit Value mg/kg in dry sludge solids
AOX (adsorbable organic halides)	500
LAS (linear alkylbenzene sulfonates)	2600
DEHP (diftalat(2ethylhexyl))	100
NPE (sum of nonylphenol, nonylphenol mono and diethoxylates)	50
PAH (sum of polycyclic aromatic hydrocarbons)	6
PCB (sum of congeners 28, 52, 101, 118, 138, 153 and 180)	0.8
PCDD/F (polychlorinated dibenzodioksins / dibenzofurans)	100 (ng/kg)

Appendix 1-D Microbiological Quality Criteria

After the stabilization application the levels of E. Coli is required to be reduced by 2 logs (99 %).

Permit applications for land use of sludge is evaluated by a commission formed by the members from the related institutions and permits are granted for three years. People who are in charge of the **treatment works** that sludge originate from, are **responsible** for **analyzing the soil** that the sludge application is done regularly **every 12 months period**. Same people are also **responsible** for analyzing their sludge at every six or twelve months periods depending on their sludge production rate. In addition, the producers of sludge are in charge of **preparing and giving guidance** about the use of treated sludge on land to the users.

SLUDGE REGULATIONS IN UNITED STATES

The use & disposal of sewage sludge, including domestic septage are regulated under **40 CFR Part 503**. This regulation came into effect on **February 19, 1993**. Before this date sludge was regulated by 40 CFR Part 257, and today too, **industrial sludges or municipal sludge mixed with industrial sludge** are handled still by 40 CFR Part 257 (this was in effect since 1979).

The 503 regulations establishes standards for the **final use or disposal of sewage sludge** when the sewage sludge is applied to **agricultural or non-agricultural land** (distributed & marketed sludge), placed in or on surface disposal sites or incinerated.

Things which are not covered: sludge codisposal with MSW, sludge that is **co-incinerated with large amounts of MSW** (>~ 30% by weight), sludge which is of industrial origin, and sludge that is already classified as hazardous.

The final rule establishes requirements for **pathogenic organisms or indicator organism**, such as fecal coliform. The rule also includes requirements for destroying or reducing those characteristics of sewage sludge **that attact birds, insects, rats & other animals (so-called vectors).** Vectors can transfer pathogens to humans. So sludge regulations will require **measures for reducing the attraction of vectors to sewage sludge** (for ex. destruction of odor causing properties of sludge which can attract insects & animals).

The final rule also establishes **specific numerical limits** for pollutants when sewage sludge is used or disposed by one or more methods. Not every pollutant is regulated under each practice.

The rule also requires **monitoring, record-keeping & reporting** for the sludge used or disposed by a treatment works; on a regular basis.

Standards specify the purpose and applicability, compliance period, necessary permits and direct enforcability, exclusion, requirements for a person who prepares sewage sludge, sampling and analysis; general definitions, etc. All of these are given in Subpart A.

What's in 503?

Five sub-parts

Subpart A – General Provisions

Subpart B - Land Application

Subpart C – Surface Disposal

Subpart D – Pathogen and Vector Attraction Reduction

Subpart E - Incineration

Subpart B- Land Application

a) Sewage Sludge

1. Bulk sewage sludge or sewage sludge **sold or given away** in a bag or other container shall not be applied to the land if the concentration of any pollutant in the sewage sludge exceeds the ceiling concentrations for the pollutant in Table 7.

Table 7. Ceiling Concentrations

Pollutant	Ceiling Concentration (mg/kg, dry weight basis)
Arsenic	75
Cadmium	85
Chromium	3000
Copper	4300
Lead	840
Mercury	57
Molybdenum	75
Nickel	128
Selenium	100
Zinc	7500

2. If bulk sewage is applied to **agricultural land, forest or public contact site or a reclamation site**, either
   a) the **cumulative loading rate** for each pollutant shall not exceed the cumulative pollutant loading rate for the pollutants listed in Table 8, or
   b) the **concentration of each pollutant** in the sewage sludge shall not exceed the concentration for the pollutant in Table 9.

3. If bulk sludge is applied to **a lawn or a home garden** the concentration of each pollutant in the sewage sludge shall **not exceed the concentration for the pollutant** in Table 9.

Table 8. Cumulative Pollutant Loading Rates

Pollutant	Cumulative Pollutant Rate (kg/hectare)
Arsenic	41
Cadmium	39
Chromium	3000
Copper	1500
Lead	300
Mercury	17
Molybdenum	18
Nickel	128
Selenium	100
Zinc	2000

Table 9. Pollutant Concentrations

Pollutant	Monthly Average Concentrations (mg/kg, dry weigth basis)
Arsenic	11
Cadmium	39
Chromium	1200
Copper	1500
Lead	300
Mercury	17
Molybdenum	18
Nickel	420
Selenium	36
Zinc	2000

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

a) The concentration of each contaminant in the sewage sludge shall **not exceed the concentration for the pollutant** in Table 9, or

b) The product of concentration of each pollutant in the sewage sludge and the annual whole sludge application rate for the sewage sludge shall not cause the annual pollutant loading rate in Table 10 to be exceeded. The procedure to determine the annual whole sludge application rate is given in Appendix A.

Table 10. Annual Pollutant Loading Rates

Pollutant	Annual pollutant Loading Rate (kg/hectare/365 day period)
Arsenic	2.0
Cadmium	1.9
Chromium	150
Copper	75
Lead	15
Mercury	0.85
Molybdenum	0.90
Nickel	21
Selenium	5.0
Zinc	140

Management Practices:

Bulk sewage sludge shall **not be applied to land** if:

a) It is likely to adversely affect a threatened or endangered species listed.

b) The field is flooded, frozen or snow-covered so that the bulk sewage sludge enters a wetland or other waters of the US.

c) The application site is within 10 meters from waters of US.

Bulk sewage shall be applied to land at an application rate that is equal to or less than agronomic rate for the bulk sewage sludge.

A label will be affixed to the bag or container containing the sewage sludge that is **sold or given away for land application**, or an information sheet will be provided to the person who receives the sewage sludge sold or given away. The label or information sheet will contain the following information:

- The **name & address** of the person who prepared the sewage sludge,
- A statement that application of the sewage sludge to the land is **prohibited** except in accordance with the instructions on the label or information sheet,
- The annual whole **sludge application rate**.

Operational Standards: Pathogen & vector attraction reduction

A. Pathogens- Sewage Sludge:

1) Class A pathogen requirements or Class B pathogen requirements and site restrictions shall be met when bulk sewage sludge is applied to agricultural land, forest, a public contact site or a reclamation site.
2) Class A pathogen requirements shall be met when bulk sewage sludge is applied to a lawn or a home garden.
3) Class A pathogen requirements shall be met when sewage sludge is sold or given away in a bag or other container for application to the land.

B. Vector Attraction Reductions- Sewage Sludge

One of the vector attraction reduction requirements shall be met when bulk sewage sludge is applied to

* agricultural land, forest, a public contact site or reclamation site;
* lawn or home garden &
* is sold or given away in a bag or container.

Frequency of Monitoring: will be as given in Table 11.

Table 11. Frequency of Monitoring

Amount of Sewage Sludge (metric tons/365 day period)	**Frequency**
Greater than zero but less than 290	Once per year
Equal to or greater than 290 but less than 1500	Once per quarter (4 times a year)
Equal to or greater than 1500 but less than 15,000	Once per 60 days (6 times a year)
Equal to or greater than 15,000	Once per month (12 times a year)

Recordkeeping

The person who prepares sewage sludge will develop information about:

- The concentration of each pollutant in sludge,
- A certification statament about the sludge meeting the Class A pathogen requirements,
- A description of how Class A pathogen requirements are met,
- A description of how one of the vector attraction reduction requirements is met.

Also the people who derives a material from sewage sludge + who applies the bulk sludge, etc. will prepare such records & keep these records for 5 years.

SUBPART D Pathogen and Vector Attraction Reduction

CLASS A REQUIREMENTS

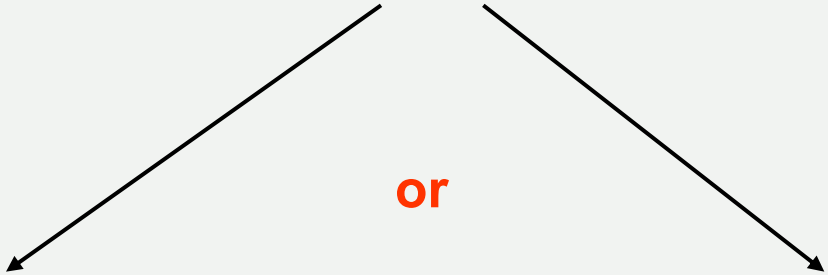
Alternative 1 (Thermal Treatment of Sludge)

or

Fecal Coliforms
< 1000 MPN/g TS (dry) OR
Salmonella sp.
< 3MPN/4 g TS (dry)

Maintain the sewage sludge temperature at a specific value
For ex. If sludge solids ≥ 7 %
$T \geq 50\ ^0C$, $t \geq 20$ min OR
When sludge solids < 7 %
$T \geq 50\ ^0C$, $t \geq 30$ min (due to insufficient info).

Alternative 2 (pH Treatment Combined with Thermal Treatment)

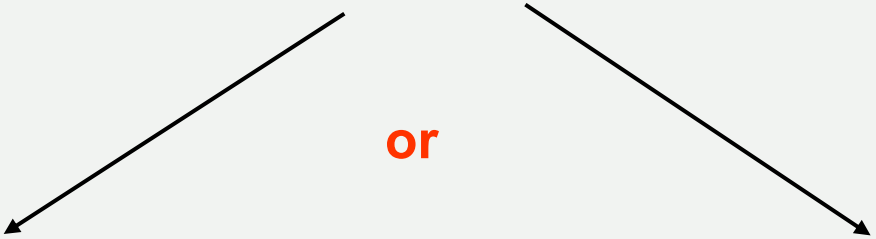


or

Fecal Coliforms
< 1000 MPN/g TS (dry) OR
Salmonella sp.
< 3MPN/4 g TS (dry)

Raise the pH to above 12 & maintain it there for 72 hrs, OR
The temperature of sewage sludge ≥ 52 ^{0}C for 12 hrs. or longer during the period that the pH ≥ 12
At the end of the 72 hrs, sewage sludge shall be air dried to achieve a > 50 % solids in sludge.

Alternative 3
Virus & parasite guidelines for sludge treatment processes other than temperature & pH

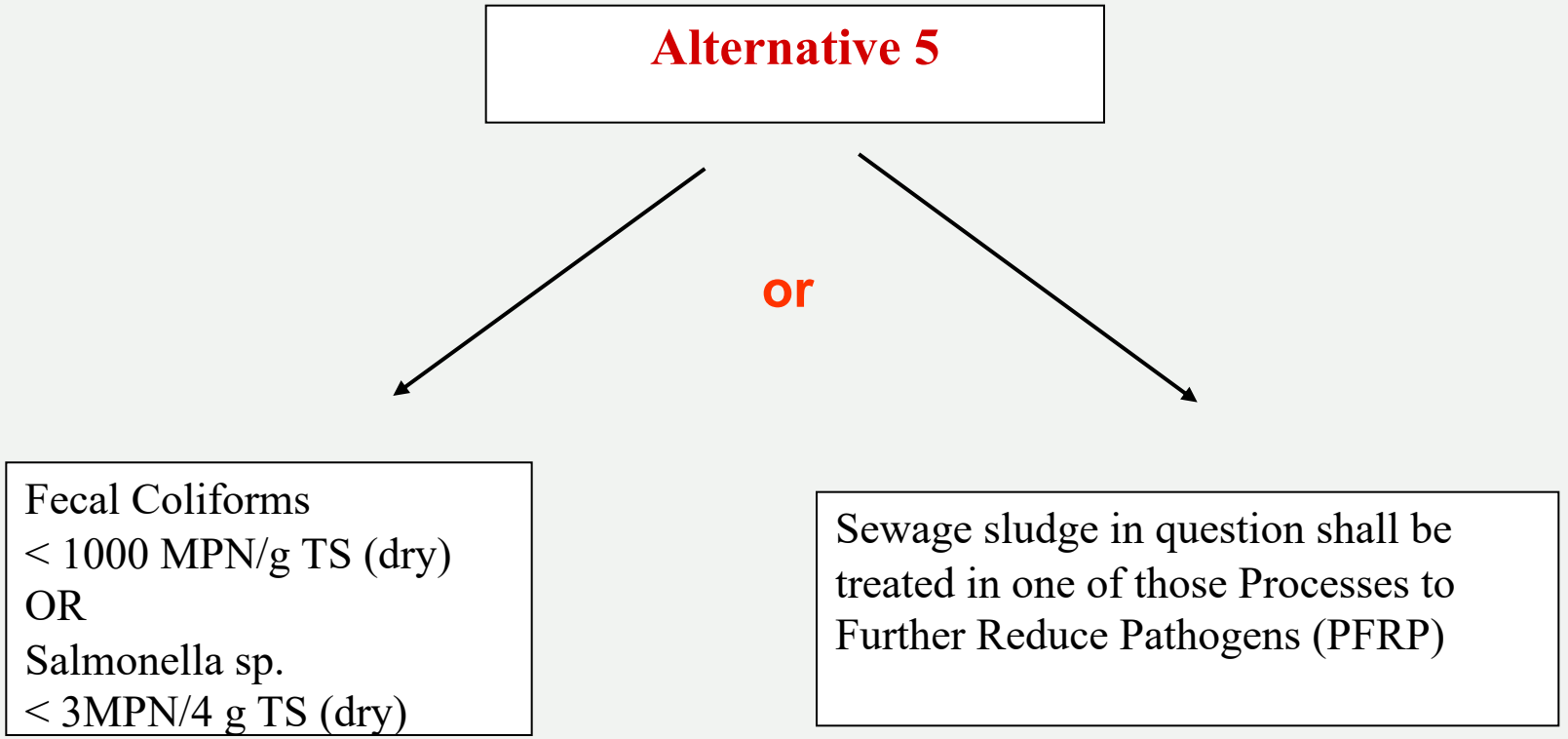


Fecal Coliforms
< 1000 MPN/g TS (dry) OR
Salmonella sp.
< 3MPN/4 g TS (dry)

First before treatment determine:
If sludge contains any enteric viruses.
If sludge has < 1 PFU/4 g solids ⇒ sludge Class A.
If sludge has ≥ 1 PFU/4 g TS ⇒ Class A if after sludge treatment sludge has < 1 PFU 4 g TS.
Same limits are applicable for helmith ova.

Alternative 4

Similar to alternative 3, same things apply. The only difference is that alternative 4 is applicable to sludges treated with unknown processes.



Alternative 6

Same as alternative 5 except for the 2nd option process is not a PFRP but a process equivalent to PFRP as determined by the permitting authority

CLASS B REQUIREMENTS (Sewage Sludge)

Alternative 1. Seven samples of sewage sludge will be collected at the time of disposal. The geometric mean of the density of fecal coliforms < 2,000,000 MPN/g is (dry) or <2,000,000 CFU/g.

Alternative 2. Sewage sludge in the question shall be treated in one of the Processes to Significantly Reduce Pathogens (PSRP).

Alternative 3. Sewage sludge in question shall be treated in a process accepted equivalent to a PSRP by the permitting authority.

In all cases of Class B Site Restrictions apply.

Vector Attraction Reduction

- When sewage sludge is applied to agricultural land, forest, a public contact site or a reclamation site;
- When bulk sewage sludge is applied to a lawn or home garden,
- When sewage sludge is sold or given away in a bag or other container for application to land,
- When domestic septage is applied to agricultural land, forest, a public contact site or a reclamation site.

One of the following vector attraction reduction requirements must be made;

1. The mass of volatile solids (VS) in the sewage sludge shall be reduced by a minimum of 38 %.

2. When **38 % VS reduction** cannot be met in an **anaerobically digested sludge**, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sludge anaerobically in the lab in a bench-scale unit for **40 additional days** at a **temperature between 30 & 37 ^{0}C**. When at the end of 40 days, the volatile solids in the sewage **sludge is reduced by 17 %,** vector attraction reduction is achieved.

3. When the **38 % VS reduction cannot be achieved for aerobically digested sewage sludge**, vector attraction reduction can be demonstrated by digesting a portion of previously digested sewage sludge that has a percent solids of 2 % or less aerobically in the laboratory for **30 additional days** at **20°C**. When at the end of 30 days, the VS in the sewage sludge is **reduced by 15 %**, vector attraction reduction is achieved.

4. The specific oxygen uptake rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than **1.5 mg O_2/hr.g.TS at 20°C**.

5. Sewage sludge shall be treated in an aerobic process for **14 days or longer**, during which **temperature >45^{o}C**.

6. The pH of sewage sludge shall be raised to **12 or higher** by alkali addition & without the addition of more alkali, shall remain at 12 or higher for an additional 22 hours.

Like this there are 6 more vector attraction reduction methods. One of these should be applicable for sludge to be placed on land as well as surface disposal.

SUBPART C: SURFACE DISPOSAL

(a) An active sewage sludge unit without a liner & leachate collection system:

1) The concentration of each pollutant in sewage sludge shall not exceed the values in Table 12.

2) When pollutant exist in sewage sludge to be applied on a active sludge unit whose boundary is less than 150 meters from the property line shall not exceed the concentrations given in Table 13.

Table 12. pollutant Concentrations –Active Sewage Sludge Unit w/o a Liner & Leachate Collection

Pollutant	Concentration (mg/kg, dry weight basis)
Arsenic	73
Chromium	600
Nickel	420

Table 13. Pollutant Concentrations- Active Sewage Sludge Unit w/o a Liner and Leachate Collection system that has a Unit Boundary to the Line Distance Less Than 150 m

Unit Boundary to Property Line Distance (m)	Pollutant concentration		
	Arsenic (mg/kg)	Chromium (mg/kg)	Nickel (mg/kg)
0 to less than 25	30	200	210
25 to less than 50	34	220	240
50to less than 75	39	260	270
75 to less than 100	46	300	320
100 to less than 125	53	360	390
125 to less than 150	62	450	420

Management Practices:

- Sewage sludge shall not be placed on an active sewage sludge unit if it is likely to adversely affect a threatened or endangered species,
- An active sewage sludge unit shall not restrict the flow of a base flood,
- When a surface disposal site is located in a seismic impact zone, an active sewage sludge unit will be designed to with sand the maximum recorded horizontal ground level acceleration,
- An active sludge unit cannot be located in an unstable area,

- An active sludge unit cannot be located in a wetland area,
- Runoff from this type of site shall be collected & shall be disposed property,
- When the unit has a liner & leachate collection system, these systems will be operated when the unit is functional & for 3 years after the unit closes.

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. more management practices

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Operational Standards:

Pathogens: Either Class A or Class B requirements shall be met if sludge is placed on an active sludge unit.

Vector Attraction Reduction: One of the vector attraction reduction requirements shall be met when sewage sludge is placed on an active sludge unit.

Frequency of Monitoring: Frequency of monitoring for the metal pollution given in previous Table 14 and pathogen concentration & vector attraction reduction requirements will be done with a frequency given in Table 8 below (sludge already place):

Table 14. Frequency of Monitoring – Surface Disposal

Amount of Sewage Sludge (metric tons/365 days)	**Frequency**
Greater than zero but less than 290	Once per year
Equal to or greater than 290 but less than 1500	Once per quarter (4 times/year)
Equal to or greater than 1500 but less than 15,000	Once per 60 days (6 times/year)
Equal to or greater than 15,000	Once per month (12 times/year)

Also air is monitored continuously for methane gas during the operation period of the unit + for another 3 years after the unit closes.

Recordkeeping: Similar recordkeeping procedures are required to land operation.

Reporting: These information will be submitted to the permitting authority each year.

SUBPART E: INCINERATION

Pollutant Limits

a) Firing of sewage sludge in a sewage sludge incinerator shall **not violate the requirements** in the National Emission Standard for Beryllium & Mercury.

b) Pollutant limit of **lead**: An equation is given & daily concentration of lead in sewage sludge fed to sewage sludge incinerator shall not exceed the concentration calculated by this formula.

When the **stack height** is **65 meters or less**, the actual stack height of the incinerator shall be used in air dispersion models.

When the **stack height** is **over 65 meters**, the creditable stack height is calculated by the authorities & it is used in air dispersion models.

c) Pollutant limit-arsenic, cadmium, chromium, and nickel.

Daily amounts of these metals in sludge fed to an incinerator can not exceed the concentration calculated by the use of specific formula given in regulations.

For air pollution models, the stack height to be used is determined as in the case of lead.

Operational Standards for Total Hydrocarbons:

The **total hydrocarbons concentration** in the exit gas from a sewage sludge incinerator shall be corrected for zero percent moisture by the use of an equation given by the regulations.

The total hydrocarbons concentration in the exit gas from a sewage sludge incinerator shall be corrected to **7 % oxygen** by multiplying the measured hydrocarbon concentration by a correction factor given in regulations.

The **monthly average concentration** of total hydrocarbons in the exit gas from a sewage sludge incinerator stack corrected for **0 % moisture & 7 % oxygen** shall not exceed 100 parts per million volumetrically.

Management Practices:

- An instrument that **measures & records** the total hydrocarbons concentration in the sewage sludge incinerator continuously will be installed. This instrument will employ a flame ionization detector, will be maintain at **150 ^{0}C or higher** and shall be calibrated at least once **every 24 hr**.
- An instrument that measures & records the **oxygen** concentration at stack exit gas.
- An instrument that measures & records the information used to determine the **moisture content** at the stack exit gas.
- An instrument that measures the combustion **temperatures** constantly.
- Sewage sludge shall not be fired in an incinerator if it is likely to adversely affect a **threatened or endangered species** listed.

Frequency of Monitoring:

- The frequency of monitoring for **beryllium** and **mercury** will be specified by the permitting authority.
- The frequency of monitoring for **arsenic**, **cadmium**, **chromium**, **lead** and **nickel** in sewage sludge fed to an incinerator shall be the frequency given in Table 15.
- **Total hydrocarbons**, **oxygen concentration** & information to determine moisture content & the combustion temperatures shall be monitored continuously.
- Air pollution control device operating parameters shall be **monitored at a frequency** determined by the permitting authority.

Table 15. Frequency of Monitoring – Incineration

Amount of Sewage Sludge (metric tons per 365 days)	**Frequency**
Greater than zero but less than 290	Once per year
Equal to or greater than 290 but less than 1500	Once per quarter (4 times/year)
Equal to or greater than 1500 but less than 15,000	Once per 60 days (6 times/year)
Equal to or greater than 15,000	Once per month (12 times/year)

Recordkeeping:

The following information will be retained by the person who fires sewage sludge for 5 years:

- The concentration of Pb, As, Cd, Cr & Ni in sewage sludge fed,
- The total HC concentration in the exit gas from the stack,
- The concentration of beryllium & mercury in sludge,
- The combustion temperatures,
- Air pollution control device operating parameters,
- The oxygen concentration & the information to determine moisture content,
- The sewage sludge feed rate,
- The stack height,
- The dispersion factor for the site.

Reporting: The formation listed above will be reported to the permitting authority once every year.


That's 'coz we'll miss you lots n lots !
ADIEU
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