NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

WASTE STORAGE FACILITY

(No.)

CODE 313

DEFINITION

A waste storage impoundment made by constructing an embankment and/or excavating a pit or dugout, or by fabricating a structure.

PURPOSE

To temporarily store wastes such as manure, wastewater, and contaminated runoff as a storage function component of an agricultural waste management system.

CONDITIONS WHERE PRACTICE APPLIES

- where the storage facility is a component of a planned agricultural waste management system
- where temporary storage is needed for organic wastes generated by agricultural production or processing
- where the storage facility can be constructed, operated and maintained without polluting air or water resources
- where site conditions are suitable for construction of the facility
- with facilities utilizing embankments with an effective height of 35 feet or less where damage resulting from failure would be limited to damage of farm buildings, agricultural land, or township and county roads (hazard classification "a")
- with fabricated structures including tanks, stacking facilities, and pond appurtenances.

CRITERIA

General Criteria Applying to All Waste Storage Facilities.

Laws and regulations. Waste storage facilities must be planned, designed, and constructed to meet all federal, state, and local laws and regulations. Rules of Georgia Department of Natural Resources, Environmental Protection Division, Chapter 391-3-6-.20 and 391-3-6-.21 contain the requirements for animal feeding operations in the state of Georgia. These rules are promulgated under the authority of the Georgia Water Quality Control Act (O.C.G.A. Section 12-5-20 et seq.).

Location. To minimize the potential for contamination of streams, waste storage facilities should be located outside of 100-year floodplains. However, if site restrictions require location within a floodplain, they shall be protected from inundation or damage from a 100-year flood event, or larger if required by laws, rules, and regulations. Waste storage facilities shall be located so the potential impacts from breach of embankment, accidental release, and liner failure are minimized; and separation distances are such that prevailing winds and landscape elements such as building arrangement, landforms, and vegetation minimize odors and protect aesthetic values.

Georgia DNR rules contain location or separation distance requirements that differ

from NRCS criteria. The more restrictive or stringent criteria should be used in the design and construction of waste storage facilities. In no case shall the separation distance be less than that required by the DNR or other state agency rules or local ordinances.

Appendix A and B contains minimum separation distances recommended by NRCS.

Site Investigation. A detailed site investigation shall be made for each waste storage facility prior to design. This investigation should include, but not be limited to, evaluation of: distance from residences, proximity to the 100-year floodplain and blue line streams; zoning jurisdiction of municipalities; utilities in the construction area; wetlands; available land for application of effluent; soils; and other environmental factors.

During the site investigation, the environmental risk of the site will be evaluated using NRCS form SCS - CPA - 52 "Environmental Effects for Conservation Plans and Areawide Conservation Plans" (latest edition). If the evaluation of the site results in the number of adverse effects exceeding the beneficial effects or if any of the special environmental concerns are adverse or positive, a Quality Assurance Plan will be developed and implemented in accordance with NRCS National Engineering Manual, Part 512, Subpart D.

Storage period. The storage period is the maximum length of time anticipated between emptying events. The storage period shall be the greater of either 30 days or the time required to provide for environmentally safe utilization of waste considering the climate, crops, soil, equipment, or as required by local, state, and federal regulations.

For greater management flexibility and to facilitate proper land application of the waste, the following storage periods are recommended. The storage period must be compatible with the nutrient management plan and the cropping rotation(s).

Facility	Storage Period (days)
Waste Storage Pond	90 -180
Stacking Facility	30 - 45
Solids Separation Basin	30 - 45
Holding Tank	90 - 180

Design storage volume. The design storage volume equal to the required storage volume, shall consist of the total of the following as appropriate:

(a) Manure, wastewater, and other wastes accumulated during the storage period

(b) Normal precipitation less evaporation on the surface area (at the design storage volume level) of the facility during the storage period

(c) Normal runoff from the facility's drainage area during the storage period

(d) 25-year, 24-hour precipitation on the surface (at the required design storage volume level) of the facility

(e) 25-year, 24-hour runoff from the facility's drainage area

(f) Residual solids after liquids have been removed. A minimum of 6 inches shall be provided for tanks

(g) Additional storage as may be required to meet management goals or regulatory requirements

Inlet. Inlets shall be of any permanent type designed to resist corrosion, plugging, freeze damage and ultraviolet ray deterioration while incorporating erosion protection as necessary.

Emptying Component. Some type of component shall be provided for emptying storage facilities. It may be a facility such as a gate, pipe, dock, wet well, pumping platform, retaining wall, or ramp. Features to protect

against erosion, tampering, and accidental release shall be incorporated as necessary.

Accumulated solids removal. Provision shall be made for periodic removal of accumulated solids to preserve storage capacity. The anticipated method for doing this must be considered in planning, particularly in determining the configuration of ponds and type of seal, if any.

Safety. Design shall include appropriate safety features to minimize the hazards of the facility. Ramps used to empty liquids shall have a slope of 4 horizontal to 1 vertical or flatter. Those used to empty slurry, semi-solid, or solid waste shall have a slope of 10 horizontal to 1 vertical or flatter unless special traction surfaces are provided. Warning signs, fences, ladders, ropes, bars, rails, and other devices shall be provided, as appropriate, to ensure the safety of humans and livestock. Ventilation and warning signs must be provided for covered waste holding structures, as necessary, to prevent explosion, poisoning, or asphyxiation. Pipelines shall be provided with a water-sealed trap and vent, or similar device, if there is a potential, based on design configuration, for gases to enter buildings or other confined spaces. Uncovered fabricated structures for liquid or slurry waste with walls less than 5 feet above ground surface or waste storage pond shall be fenced and warning signs posted to prevent children and others from using them for other than their intended purpose.

Erosion Protection. Embankments and denuded/disturbed areas surrounding the facility shall be treated to control erosion. This includes the inside slopes of a waste storage pond as needed to protect the integrity of the liner. Permanent vegetation shall be established on all denuded/disturbed areas in compliance with NRCS Conservation Practice Standard, Critical Area Treatment, Code 342.

Additional Criteria for Waste Storage Ponds

Hazard Classification. The area downstream of the embankment shall be evaluated carefully to determine the impact from a sudden breach of the proposed embankment on both structural and environmental features. This evaluation must consider all existing improvements and those improvements that may reasonably be expected to be made during the useful life of the structure. The results of this examination provide for the proper hazard class of the embankment. Only hazard class (a) embankments are to be designed under this standard. NRCS, National Engineering Manual, Subchapter C, Subpart C - Dams, Paragraph 520.21 provides guidance for determination and documentation of hazard classification of embankments.

Soils and foundation. The specific discharge of the waste storage pond shall be less than $1X10^{-6}$ cm3/cm2/sec (0.0028 ft3/ft2/day). (Note: NRCS Agricultural Waste Management Field Handbook, Appendix 10D 'guidelines do propose recognition of sealing to the extent of one order of magnitude for soils with a clay content exceeding 5 percent for ruminant animal manures and 15 percent for monogastric animal manures.') In no case shall the permeability, seepage rate or specific discharge rate be greater than those specified in the Georgia DNR rules. The storage pond shall be located in soils with an acceptable permeability that meets all applicable rules and regulations, or the storage pond shall be lined. Information and guidance on controlling seepage from waste impoundments can be found in the NRCS, National Engineering Handbook Series, Part 651, Agricultural Waste Management Field Handbook (AWMFH), Appendix 10D.

During the soils investigation, it must be verified that no subsurface tile lines are present. On sites that are located on cropland or land that has been cropped in the past and is land with soil types that respond to subsurface drainage, an observation trench along the entire length of the embankment shall be constructed to a minimum of five feet in depth. The trench shall have a bottom width adequate to accommodate the equipment used for excavation, backfill, and compaction operations and the side slopes shall be 1:1 or flatter. If any tile lines are present in the area of the waste storage pond or embankment, they must be removed for a minimum distance

of 15 feet beyond the outside embankment toe. Tile lines that cannot be severed and plugged will be routed around the waste storage pond site. A 50 feet separation distance will be maintained between the tile line and the toe out limits of the embankment and/or excavation for the waste storage pond.

A detailed soils investigation with special attention to the water table and seepage potential must be a part of each plan and design. The soils investigation must extend at least two feet below the planned bottom elevation of the waste storage pond. When poor foundation conditions are anticipated or encountered, the investigation shall extend to the depth determined by the designer.

Samples of the soil material will be taken and tested for permeability. If the samples are field classified as permeability groups III or IV as defined in Appendix 10D of the AWFMH, the designer may proceed with the design pending the laboratory test results. Should the samples be field classified as permeability group I or II as defined by Appendix 10D, the design process will be suspended until the laboratory test results are received.

The results of the laboratory testing will be used to determine the need for sealing or lining of the lagoon. All earthen liners will be designed in accordance with Appendix 10D of the AWFMH. Liners utilizing amendments or additives to enhance the sealing of the soil will be designed in accordance with the appropriate NRCS Conservation Practice Standard (e.g. Code 521B, Code 521C) and Appendix 10-D. Flexible membrane liners will be designed in accordance with NRCS Conservation Practice Standard, Code 521A, Pond Sealing and Lining, Flexible Membrane. Other types of liners may be used provided they limit or reduce the seepage rate, permeability or specific discharge to an acceptable or statutory level. Any synthetic or structural liner shall be watertight.

The waste storage pond shall have a bottom elevation that is a minimum of 2 feet above the seasonal high water table unless special design features are incorporated that address buoyant forces, storage pond seepage rates, and non-encroachment of the water table by contaminants. The water table may be lowered by use of perimeter drains to meet this requirement.

Maximum Operating Level. The maximum operating level for waste storage ponds shall be the pond level that provides for the required volume less the volume contribution of precipitation and runoff from the 25-year, 24-hour storm event plus the volume allowance for residual solids after liquids have been removed. Refer to Appendix C for a typical cross section of a waste storage pond. A permanent marker or recorder shall be installed at this maximum operating level to indicate when drawdown should begin. The marker or recorder shall be referenced and explained in the O&M plan.

Outlet. No outlet shall automatically release storage from the required design volume. Manually operated outlets shall be of permanent type designed to resist corrosion and plugging.

Embankments. The minimum elevation of the top of the settled embankment shall be 1 foot above the waste storage pond's designed maximum liquid surface. This height shall be increased by the amount needed to ensure that the top elevation will be maintained after settlement. This increase shall be not less than 5 percent. The minimum top widths are shown in Table 1. The combined side slopes of the settled embankment shall not be less than 5 horizontal to 1 vertical, and neither slope shall be steeper than 2 horizontal to 1 vertical unless provisions are made to provide stability.

Table 1 – Minimum Top Widths

Total embankment Height, ft.	Top Width, ft.
15 or less	8
15 – 20	10
20 – 25	12
25 – 30	14
30 – 35	15

Auxiliary Spillway - Embankment waste storage ponds (those having a maximum design liquid level against the embankment of 3 feet or more above natural ground surface) shall be provided with an auxiliary (emergency) spillway to protect the embankment from overtopping. The crest of the auxiliary spillway shall be at or above the top elevation of the 25-yr 24hr storm volume stored in the waste storage pond. The auxiliary spillway shall be designed to pass the peak discharge from a 25yr, 24hr storm event. There shall be a minimum of 1 foot of freeboard above the designed depth of flow in the auxiliary spillway.

The auxiliary spillway shall be placed in undisturbed soil, when possible. When the auxiliary spillway must be placed in fill material, precautions shall be taken to insure the integrity of the embankment. Where first stage/primary waste storage pond effluent empties into second waste storage pond and the liquid level is positively controlled by an adequately sized discharge pipe, no auxiliary spillway is required for the first stage/primary waste storage pond.

Excavations. Unless supported by a soil investigation, excavated side slopes shall be no steeper than 2 horizontal to 1 vertical.

Additional Criteria for Fabricated Structures

Foundation. The foundations of fabricated waste storage structures shall be proportioned to safely support all superimposed loads without excessive movement or settlement.

Where a non-uniform foundation cannot be avoided or applied loads may create highly variable foundation loads, settlement should be calculated from site-specific soil test data. Index tests of site soil may allow correlation with similar soils for which test data is available. If no test data is available, presumptive bearing strength values for assessing actual bearing pressures may be obtained from Table 2 or another nationally recognized building code. In using presumptive bearing values, adequate detailing and articulation shall be provided to avoid distressing movements in the structure.

Foundations consisting of bedrock with joints, fractures, or solution channels shall be treated or a separation distance provided consisting of a minimum of 1 foot of impermeable soil between the floor slab and the bedrock or an alternative that will achieve equal protection.

Table 2 - Presumptive Allowable Bearing Stress Values[1]

Foundation Description	Allowable Stress
Crystalline Bedrock	12000 psf
Sedimentary Rock	6000 psf
Sandy Gravel or Gravel	5000 psf
Sand, Silty Sand, Clayey Sand, Silty Gravel, Clayey Gravel	3000 psf
Clay, Sandy Clay, Silty Clay, Clayey Silt	2000 psf

[1] Basic Building Code, 12th Edition, 1993, Building Officials and Code Administrators, Inc. (BOCA)

Liquid tightness. Applications such as tanks that require liquid tightness shall be designed and constructed in accordance with standard engineering and industry practice appropriate for the construction materials used to achieve this objective.

Structural loadings. Waste storage structures shall be designed to withstand all anticipated loads including internal and external loads, hydrostatic uplift pressure, concentrated surface and impact loads, water pressure due to seasonal high water table, and frost or ice pressure and load combinations in compliance with this standard and applicable local building codes.

The lateral earth pressures should be calculated from soil strength values determined from the results of appropriate soil tests. Lateral earth pressures can be calculated using the procedures in NRCS Technical Release 74 (TR-74). If soil strength tests are not available, the presumptive lateral earth pressure values indicated in Table 3 shall be used.

Lateral earth pressures based upon equivalent fluid assumptions shall be assigned according to the following conditions:

- **Rigid frame or restrained wall.** Use the values shown in Table 3 under the column "Frame tanks," which gives pressures comparable to the at-rest condition.
- **Flexible or yielding walls.** Use the values shown in Table 3 under the column "Free-standing walls," which gives pressures comparable to the active condition. Walls in this category are designed on the basis of gravity for stability or are designed as a cantilever having a base wall thickness to height of backfill ratio of not more than 0.085.

Internal lateral pressure used for design shall be 65 lb/ft^2 where the stored waste is not protected from precipitation. A value of 60 lb/ft^2 may be used where the stored waste is protected from precipitation and will not become saturated. Lesser values may be used if supported by measurement of actual pressures of the waste to be stored. If heavy equipment will be operated near the wall, an additional two feet of soil surcharge shall be considered in the wall analysis.

Tank covers shall be designed to withstand both dead and live loads. The live load values for covers contained in ASAE EP378.3, Floor and Suspended Loads on Agricultural Structures Due to Use, and in ASAE EP 393.2, Manure Storages, shall be the minimum used. The actual axle load for tank wagons having more than a 2,000-gallon capacity shall be used.

If the facility is to have a roof, snow and wind loads shall be as specified in ASAE EP288.5, Agricultural Building Snow and Wind Loads. If the facility is to serve as part of a foundation or support for a building, the total load shall be considered in the structural design.

Structural design. The structural design shall consider all items that will influence the performance of the structure, including loading assumptions, material properties and construction quality. Design assumptions and construction requirements shall be indicated on standard plans.

Tanks may be designed with or without covers. Covers, beams, or braces that are integral to structural performance must be indicated on the construction drawings. The openings in covered tanks shall be designed to accommodate equipment for loading, agitating, and emptying. These openings shall be equipped with grills or secure covers for safety, and for odor and vector control.

All structures shall be underlain by free draining material or shall have a footing located below the anticipated frost depth. Fabricated structures shall be designed according to the criteria in the following references as appropriate:

- Steel: "Manual of Steel Construction", American Institute of Steel Construction.
- Timber: "National Design Specifications for Wood Construction", American Forest and Paper Association.
- Concrete: "Building Code Requirements for Reinforced Concrete, ACI 318", American Concrete Institute.
- Masonry: "Building Code Requirements for Masonry Structures, ACI 530", American Concrete Institute.

Slabs on grade. Slab design shall consider the required performance and the critical applied loads along with both the subgrade material and material resistance of the concrete slab. Where applied point loads are minimal and liquid-tightness is not required, such as barnyard and feedlot slabs subject only to precipitation, and the subgrade is uniform and dense, the minimum slab thickness shall be 4 inches with a maximum joint spacing of 10 feet. Joint spacing can be increased if steel reinforcing is added based on subgrade drag theory.

For applications where liquid-tightness is required such as floor slabs of storage tanks, the minimum thickness for uniform foundations shall be 5 inches and shall contain distributed reinforcing steel. The required area of such reinforcing steel shall be based on subgrade

drag theory as discussed in industry guidelines such as American Concrete Institute, ACI 360, “Design of Slabs-on-Grade”.

When heavy equipment loads are to be resisted and/or where a non-uniform foundation cannot be avoided, an appropriate design procedure incorporating a subgrade resistance parameter(s) such as ACI 360 shall be used.

Additional Criteria - Stacking Facilities

Solids stacking implies that the manure has a consistency that does not flow, but remains in place even during the wettest time of the storage period. Facilities receiving 100 percent of the manure production, with no provision for liquid separation, shall not be designed as stacking facilities.

Stacking facilities may be open or roofed and are used for wastes, which behave primarily as a solid. The anticipated stacking angle of manure must be considered in determining the wall height.

Stacking facilities shall be constructed of durable materials such as reinforced concrete, reinforced concrete block, or treated lumber. They shall be designed with adequate safety factors to prevent failure due to internal or external pressures, including hydrostatic uplift pressure and imposed surface loads such as equipment which may be used within, on, or adjacent to the structure. Lumber shall not be used for walls that support moving stacking elevators or similar loads.

Structural design criteria for stacking facilities shall be in accordance with the criteria for the various materials listed in the section "Structural Design" of this standard.

Timber Walls. All posts and lumber in contact with wastes or exposed to moisture shall be pressure treated in accordance with Federal Specification, Wood Preservation: Treating Practices, TT-W-571i. Posts shall have a minimum size of 4 inches by 6 inches (nominal) and be placed in the ground from 3 to 6 feet deep, depending on the design analysis. Posts for "mini-composters" shall have a minimum size of 4 inches by 4 inches (nominal). Side planking shall be treated lumber with a minimum thickness of 2 inches (nominal).

Seepage. Effluent seepage in amounts that would pollute surface or ground water shall be prevented by watertight construction or collected and disposed of in a safe manner. Influent seepage in amounts that would infringe on designed storage capacity shall be prevented by watertight construction or site drainage.

Internal Drainage. Drainage of some liquids, including rainfall from the stacking area (especially those without a roof) should be considered. This can be accomplished by use of a timber wall with the boards installed vertically, leaving 3/4-inch cracks. The timber wall drainage section may be included in a concrete or masonry block wall. Design criteria shall be the same as for timber walls. Seepage shall be collected in a tank or waste storage pond, or properly treated in a lagoon or infiltration strip.

Poultry Litter Stacking Facilities

To prevent spontaneous combustion, poultry litter in the stacking facility should have less than 40 percent moisture and dry litter and moist litter should not be layered. In addition, the height of the litter stack shall not exceed 5 to 7 feet, with litter to wood contact (sidewall) limited to 3 to 5 feet.

The procedures in the Alabama Poultry Waste Management , Waste Utilization and Facility Design Workbook may be utilized to design poultry litter stacking facilities.

CONSIDERATIONS

Waste storage facilities should be located as close to the source of waste and polluted runoff as practicable.

Non-polluted runoff should be excluded from the structure to the fullest extent possible except where its storage is advantageous to the operation of the agricultural waste management system.

Freeboard for waste storage tanks should be considered.

Solid/liquid separation of runoff or wastewater entering pond facilities should be considered to minimize the frequency of accumulated solids removal and to facilitate pumping and application of the stored waste.

Due consideration should be given to environmental concerns, economics, the overall waste management system plan, and safety and health factors.

Considerations for minimizing the potential for and impacts of sudden breach of embankment or accidental release from the required volume.

Features, safeguards, and/or management measures to minimize the risk of failure or accidental release, or to minimize or mitigate impact of this type of failure should be considered when any of the categories listed in Table 4 might be significantly affected.

The following should be considered either singly or in combination to minimize the potential of or the consequences of sudden breach of embankments when one or more of the potential impact categories listed in Table 4 may be significantly affected:

1. An auxiliary (emergency) spillway
2. Additional freeboard
3. Storage for wet year rather than normal year precipitation
4. Reinforced embankment -- such as, additional top width, flattened and/or armored downstream side slopes
5. Secondary containment

Table 4 - Potential Impact Categories from Breach of Embankment or Accidental Release

1. Surface water bodies -- perennial streams, lakes, wetlands, and estuaries
2. Critical habitat for threatened and endangered species
3. Riparian areas
4. Farmstead, or other areas of habitation
5. Off-farm property
6. Historical and/or archaeological sites or structures that meet the eligibility criteria for listing in the National Register of Historical Places

The following options should be considered to minimize the potential for accidental release from the required volume through gravity outlets when one or more of the potential impact categories listed in Table 4 may be significantly affected:

1. Outlet gate locks or locked gate housing
2. Secondary containment
3. Alarm system
4. Another means of emptying the required volume

Considerations for minimizing the potential of waste storage pond liner failure.

Sites with categories listed in Table 5 should be avoided unless no reasonable alternative exists. Under those circumstances, consideration should be given to providing an additional measure of safety from pond seepage when any of the potential impact categories listed in Table 5 may be significantly affected.

Table 5 - Potential Impact Categories for Liner Failure

1. Any underlying aquifer is at a shallow depth and not confined
2. The vadose zone is rock
3. The aquifer is a domestic water supply or ecologically vital water supply
4. The site is located in an area of solutionized bedrock such as limestone or gypsum

Should any of the potential impact categories listed in Table 5 be affected, consideration should be given to the following:

1. A clay liner designed in accordance with procedures of AWMFH Appendix 10D with a thickness and coefficient of permeability so that specific discharge is less than 1 x 10^{-6} cm/sec
2. A flexible membrane liner over a clay liner
3. A geosynthetic clay liner (GCL) flexible membrane liner
4. A concrete liner designed in accordance with slabs on grade criteria for fabricated structures requiring water tightness

Considerations for minimizing the impact of odors.

An anaerobic lagoon instead of a waste storage pond should be considered for sites located in rural areas where odors are a concern. This should be especially considered where odors would affect neighboring farms having enterprises that do not cause odors and/or neighbors who earn a living off-farm. The recommended loading rate for anaerobic lagoons at sites where odors must be minimized is one-half the value given in AWMFH Figure 10-22.

For sites located near urban areas practices such as the following should be considered to reduce odor emissions:

1. Covering the storage facility with a suitable cover.
2. Using naturally aerated or mechanically aerated lagoons.
3. Using composting in conjunction with a solid waste system rather than a liquid or slurry system.
4. Using a methane digester and capture system.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed that is consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for its design.

The plan shall contain the operational requirements for emptying the storage facility. This shall include the requirement that waste shall be removed from storage and utilized at locations, times, rates, and volume in accordance with the overall waste management system plan and the Nutrient Management Plan (NRCS Conservation Practice Standard, Code 590) developed for the facility. In addition, for ponds, the plan shall include an explanation of the permanent marker or recorder installed to indicate the maximum operating level. The plan shall include a strategy for removal and disposition of waste with least the environmental damage during the normal storage period to the extent necessary to insure the pond's safe operation. This strategy is for the removal of the contribution of unusual storm events that may cause the pond to fill to capacity prematurely with subsequent design inflow and usual precipitation prior to the end of the normal storage period. Development of an emergency action plan should be considered for waste storage facilities where there is a potential for significant impact from breach or accidental release. The plan shall include site-specific provisions for emergency actions that will minimize these impacts.

REFERENCES:

NRCS, National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook.

NRCS, National Engineering Handbook, Part 650, Engineering Field Handbook

NRCS, National Engineering Manual, Part 520

ACI 318, 360, 530

ASTM D-653, D-698

ASAE Specifications EP378.3, EP393.2, EP288.5, S288

Basic Building Code, Current Edition

Federal Specification, Wood Preservation: Treating Practices, TT-W-571ii

"Manual of Steel Construction", American Institute of Steel Construction

"National Design Specifications for Wood Construction", American Forest and Paper Association

NRCS Conservation Practice Standards:

Critical Area Planting ---------- Code 342
Pond ---------- Code 378
Pond Sealing or Lining ---------- Code 521
Nutrient Management ---------- Code 590
Waste Utilization ---------- Code 633
Manure Transfer ---------- Code 634
Closure of Waste Impoundments -- Code 360
Fence ---------- Code 342
Use Exclusion ---------- Code 472

NRCS Technical Release - 74

Alabama Poultry Waste Management, Waste Utilization and Facilities Design Workbook

Rules of Georgia Department of Natural Resources, Environmental Protection Division, Rules and Regulations for Water Quality Control, Chapter 391-3-6, Section 391-3-6-.20 and Section 391-3-6-.21

Georgia Water Quality Act (O.C.G. A.. Section 12-5-20 et. seq.)

TABLE 3 - LATERAL EARTH PRESSURE VALUES[1]

Soil		Equivalent fluid pressure (lb/ft^2/ft of depth)			
		Above seasonal high water table[2]		Below seasonal high water table[3]	
Description[4]	Unified Classification[4]	Free-standing walls	Frame tanks	Free-standing walls	Frame tanks
Clean gravel, sand or sand-gravel mixtures (maximum 5% fines)[5]	GP, GW, SP, SW	30	50	80	90
Gravel, sand, silt and clay mixtures (less than 50% fines) Coarse sands with silt and and/or clay (less than 50% fines)	All gravel sand dual symbol classifications and GM, GC, SC, SM, SC-SM	35	60	80	100
Low-plasticity silts and clays with some sand and/or gravel (50% or more fines) Fine sands with silt and/or clay (less than 50% fines)	CL, ML, CL-ML SC, SM, SC-SM	45	75	90	105
Low to medium plasticity silts and clays with little sand and/or gravel (50% or more fines)	CL, ML, CL-ML	65	85	95	110
High plasticity silts and clays (liquid limit more than 50)[6]	CH, MH	-	-	-	-

[1] For lightly compacted soils (85% to 90% maximum standard density.) Includes compaction by use of typical farm equipment.
[2] Also below seasonal high water table if adequate drainage is provided.
[3] Includes hydrostatic pressure.
[4] All definitions and procedures in accordance with ASTM D 2488 and D 653.
[5] Generally, only washed materials are in this category
[6] Not recommended. Requires special design if used.

Appendix A -- Separation Distances for Waste Storage Pond and other Components of a liquid manure system

Public or Private Use Facilities	Recommended Minimum distance from Waste Storage Pond (Feet)
Any public use area, church, picnic area, playground, etc.	700
Residence or place of habitation other than owner or tenant	700
Potable well, Private	300
Potable well, Public	500
Non-Potable wells	200
Drainage Ditches	100
Dirt - County Roads	100
Paved - County Roads	200
State Numbered Roads	300
Federal Numbered or Interstate Roads	400
Area specified by state or local ordinance	Distance established by state or local rules

Appendix B -- Separation Distances for Waste Storage Structures and other components of a dry manure system

Public or Private Use Facilities	Recommended Minimum distance from Waste Storage Structures (Feet)
Any public use area, church, picnic area, playground, etc.	500
Residence or place of habitation other than owner or tenant	500
Potable well, Private	200
Potable well, Public	300
Non-Potable wells	100
Drainage Ditches	100
Dirt - County Roads	100
Paved - County Roads	150
State Numbered Roads	200
Federal Numbered or Interstate Roads	300
Area specified by state or local ordinance	Distance established by state or local rules

Appendix C -- Typical Cross Section of Waste Storage Pond