

LAGOON AND HOLDING POND HYDRAULICS AND MAINTENANCE

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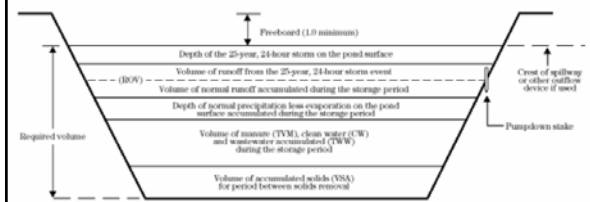
TCEQ Rules Update (July 15, 2004)

- ✓ Revised to be consistent with new EPA rule
- ✓ Retains the 25-year, 24-hour design storm for dairies and feedlots
- ✓ Adopts the 100-year, 24-hour design storm for poultry, swine and veal CAFOs

TCEQ Rules Update (July 15, 2004)

- ✓ New Voluntary Alternative Performance Standards (VAPS) provision
- ✓ Additional requirements for dairies in Major Sole-Source Impairment Zone - 30 TAC §321.42

Figure 1 Cross section of waste storage pond with watershed.



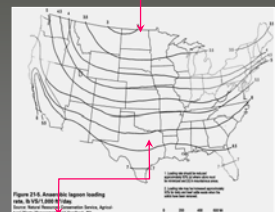
Treatment Volume

- Lagoons perform dual functions of storing and treating manure
- Minimum permanent treatment volume required for dilution and bacterial digestion of manure solids
- Bacteria activity increases with temperature
- Treatment volume based on volatile solids (VS) loading rate (lb VS/1,000 ft³/day)

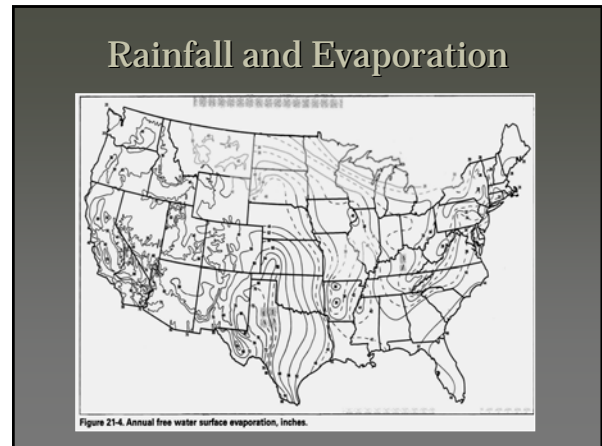
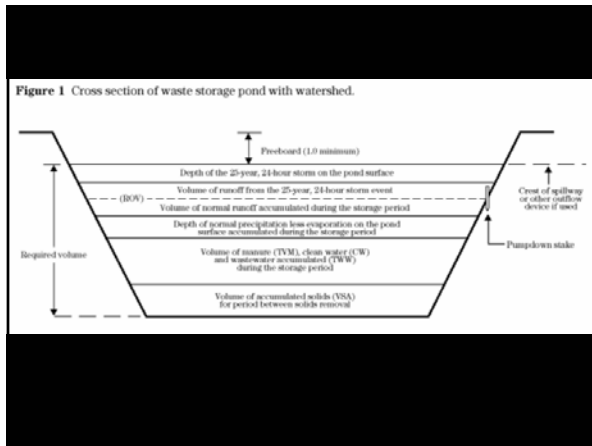
Minimum Treatment Volume

- ◆ Treatment volume designed for a certain VS loading rate
- ◆ VS loading rate is selected according to climate

3.5 lb VS/day-1,000 ft³ in central South Dakota



6-7 lb VS/day-1,000 ft³ in East Texas



25 - Year, 24 - Hour Storm

- Depth of 25-yr, 24-hr storm is based on long-term rainfall data at a given location

Figure 21-6. 25-yr, 24-hr rainfall, inches.

TCEQ's "Chronic or Catastrophic Rainfall" Definition

30 TAC §321.32 (10)

A series of rainfall events that:

- Does not provide opportunity for dewatering a retention control structure; *and*
- Is equivalent to or greater than
 - the design rainfall event; or
 - any single rainfall event that is equivalent to or greater than the design rainfall event (e. g., a 36-hour storm whose cumulative rainfall depth exceeds the nominal depth of the 25-yr/24-hr event)

"Water Balance" Requirement

- Average monthly precipitation (direct + runoff)
- Monthly consumptive use of the cropping system
- Wastewater irrigation shall not induce uncontrolled discharge
- 21-day storage of waste and process-generated wastewater

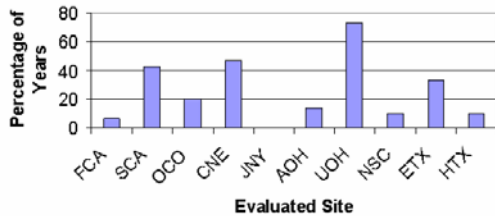
"Imminent Overflow" Provision

30 TAC §321.39

If an RCS is in danger of imminent overflow from chronic or catastrophic rainfall or catastrophic conditions, then the CAFO operator shall take reasonable steps to irrigate wastewater to land management units (LMUs) only to the extent necessary to prevent overflow from the RCS

Modeling by Moffitt et al. (2003)

Figure 2 Frequency of pumping during critical storage period to maintain storm volume - AWM Design



Conclusions by Moffitt et al. (2003)

- Occasionally pond levels will need to be lowered in less than ideal conditions
- Dairy operators need both:
 - A *strategic* nutrient management plan AND
 - *Tactical* management options and procedures for wastewater application during what would normally be non-application periods

Conclusions by Moffitt et al. (2003)

- Pond management is *critical*
 - Where the ponds are pumped down at the end of the critical storage period and kept lowered, there was little danger of overflow from design storms or chronic events
 - Where chronic rainfall events are more common, a combination of increased dewatering capability and lower maximum temporary storage level would prevent spills