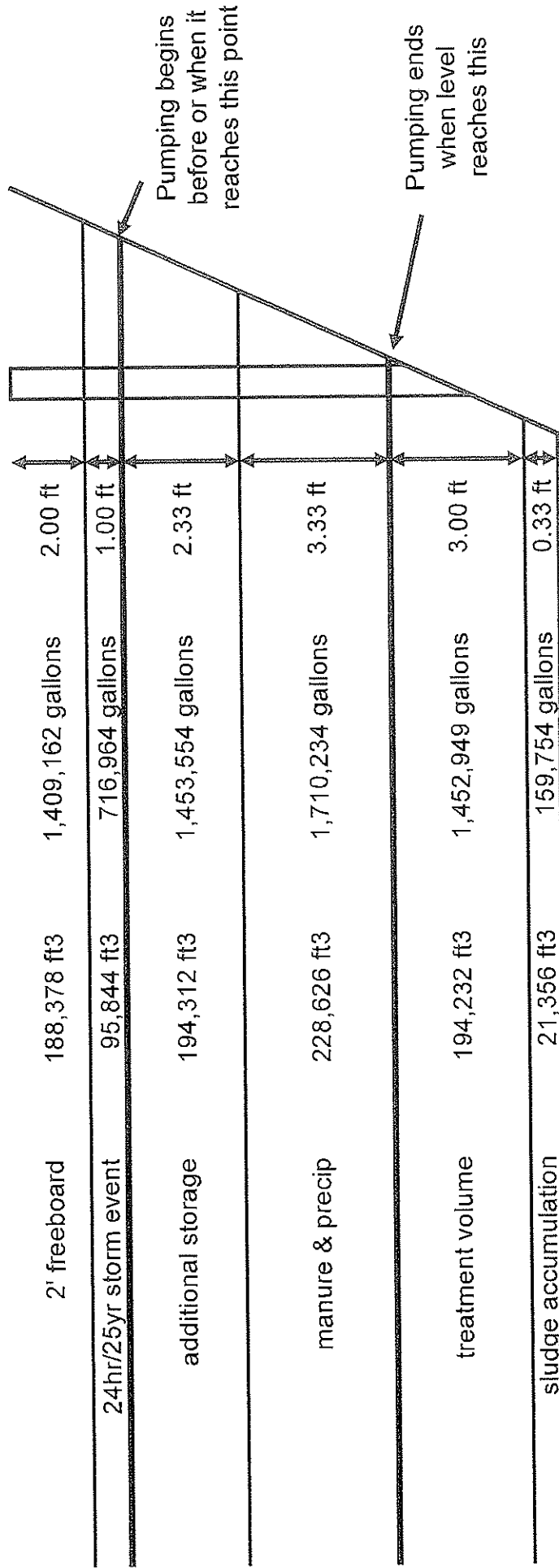


# Westridge Dairy Lagoon Pumpdown Marker



# Westridge Dairy -- Manure Storage Analysis

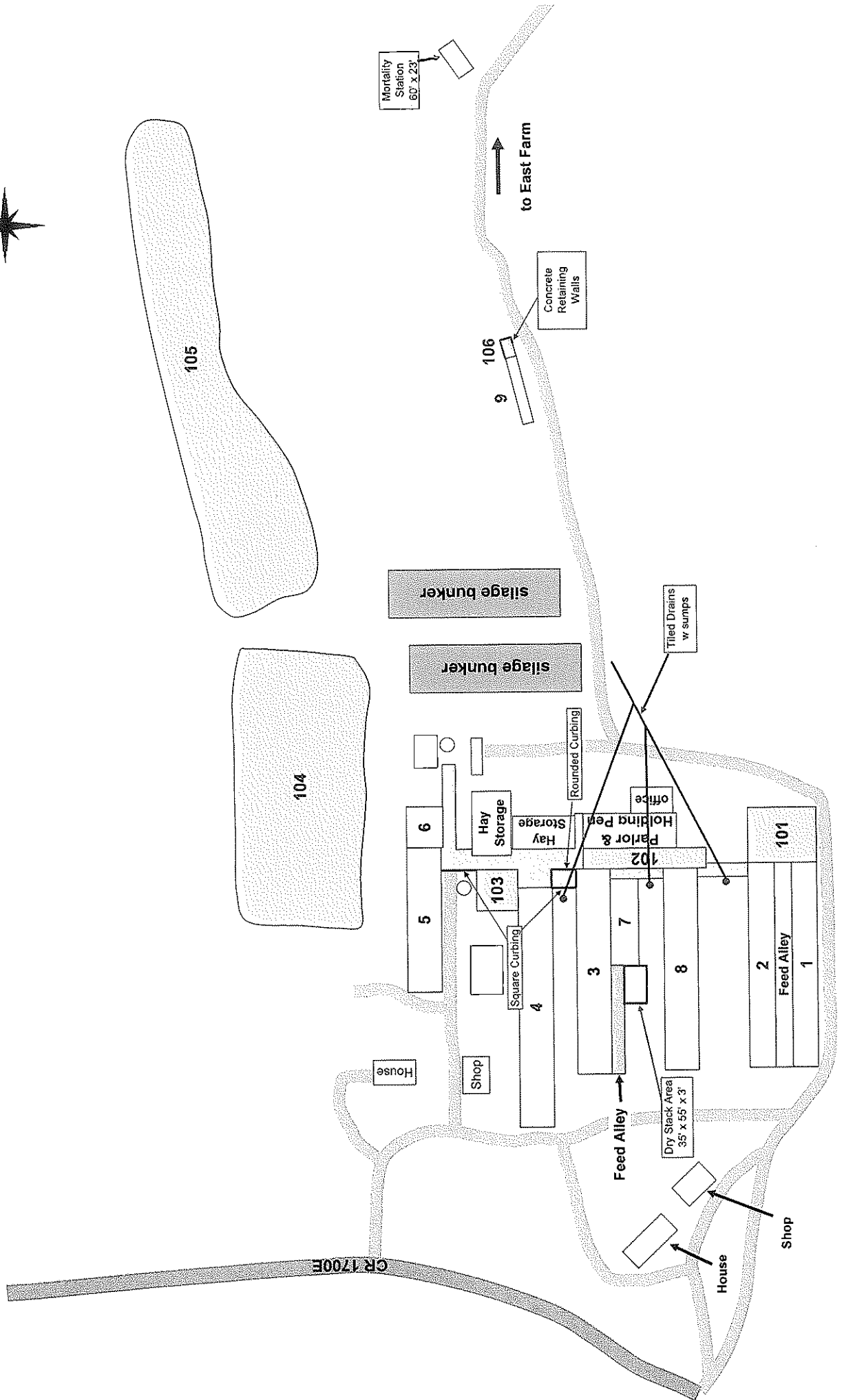
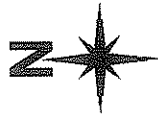
| Location               | Daily Manure Cubic Feet | Storage Needs - Cubic Feet |          |            | Facility Size |       |        | Storage Excess (Deficit) |          | Storage Capacity Days |          |
|------------------------|-------------------------|----------------------------|----------|------------|---------------|-------|--------|--------------------------|----------|-----------------------|----------|
|                        |                         | 180 days                   | 365 days | Cubic Feet | Length        | Width | Depth  | Cubic Feet               | 180 days |                       | 365 days |
|                        |                         | <b>Solid Dairy Manure</b>  |          |            |               |       |        |                          |          |                       |          |
| Barn 1                 | 268.73                  | 48,371                     | 98,086   | 300        | 50            | 0.25  | 3,750  | (44,621)                 | (94,336) | 14                    |          |
| Barn 2                 | 268.73                  | 48,371                     | 98,086   | 300        | 50            | 0.25  | 3,750  | (44,621)                 | (94,336) | 14                    |          |
| Barn 3                 | 268.73                  | 48,371                     | 98,086   | 300        | 50            | 0.25  | 3,750  | (44,621)                 | (94,336) | 14                    |          |
| Barn 4                 | 268.73                  | 48,371                     | 98,086   | 350        | 50            | 0.25  | 4,375  | (43,996)                 | (93,711) | 16                    |          |
| Barn 5                 | 223.94                  | 40,309                     | 81,738   | 210        | 50            | 0.25  | 2,625  | (37,684)                 | (79,113) | 12                    |          |
| Barn 6                 | 134.36                  | 24,186                     | 49,043   | 60         | 60            | 0.25  | 900    | (23,286)                 | (48,143) | 7                     |          |
| Barn 7                 | 68.06                   | 12,252                     | 24,844   | 130        | 40            | 0.25  | 1,300  | (10,952)                 | (23,544) | 19                    |          |
| Barn 8                 | 201.39                  | 36,250                     | 73,508   | 300        | 50            | 0.25  | 3,750  | (32,500)                 | (69,758) | 19                    |          |
| Manure Basin 101       |                         |                            |          | 100        | 100           | 8.00  | 80,000 | 80,000                   | 80,000   |                       |          |
| Manure Basin 102       |                         |                            |          | 180        | 30            | 4.00  | 21,600 | 21,600                   | 21,600   |                       |          |
| Manure Basin 103       |                         |                            |          | 60         | 60            | 6.00  | 21,600 | 21,600                   | 21,600   |                       |          |
| Total                  | 1,702.68                |                            |          |            |               |       |        |                          |          |                       |          |
| Manure retain as solid | 40%                     |                            |          |            |               |       |        |                          |          |                       |          |
| Total Solid Manure     | 681.07                  |                            |          |            |               |       |        |                          |          |                       |          |
|                        |                         |                            |          |            |               |       | Total  | 147,400                  |          | 216                   |          |

| Location                                | Daily Manure Cubic Feet | Storage Needs - Cubic Feet                    |          |            | Facility Size |         |         | Storage Excess (Deficit) |           | Storage Capacity Days |          |
|---|-------------------------|---|----------|------------|---------------|---------|---------|--------------------------|-----------|-----------------------|----------|
|   |                         | 270 days                                      | 365 days | Cubic Feet | Length        | Width   | Depth   | Cubic Feet               | 270 days  |                       | 365 days |
|   |                         | <b>Slurry Dairy Manure - Holding Pond 104</b> |          |            |               |         |         |                          |           |                       |          |
| Manure retained in HP 104               | 50%                     |   |          |            |               |         |         |                          |           |                       |          |
| Manure retained in HP 104               | 851.34                  | 229,861                                       | 310,738  |            |               |         |         | (229,861)                | (310,738) |                       |          |
| Holding Pond 104                        |                         |   |          | 400        | 200           | 10.00   | 534,512 | 534,512                  | 534,512   |                       |          |
| Total Slurry Manure                     | 851.34                  |   |          |            |               |         | Total   | 534,512                  |           | 628                   |          |
| <b>Slurry Dairy Manure - Lagoon 105</b> |                         |   |          |            |               |         |         |                          |           |                       |          |
| Manure retained in Lagoon 105           | 10%                     |   |          |            |               |         |         |                          |           |                       |          |
| Manure retained in Lagoon 105           | 170.27                  | 45,972  | 62,148   |            |               |         |         | (45,972)                 | (62,148)  |                       |          |
| Milk Parlor Waste Water                 | 199.18                  | 53,780  | 72,702   |            |               |         |         | (53,780)                 | (72,702)  |                       |          |
| Precipitation Gain                      | 705.04                  | 190,362                                       | 125,325  |            |               |         |         | (190,362)                | (125,325) |                       |          |
| Lagoon 105                              |                         | 105 usable storage capacity                   | 775      | 125        | 12.00         | 422,938 | 422,938 | 422,938                  | 422,938   |                       |          |
| Total Slurry Manure                     | 1,074.50                |   |          |            |               |         | Total   | 422,938                  |           | 394                   |          |

# Westridge Dairy -- Manure Storage Analysis

| Location           | Daily Manure<br>Cubic Feet | Storage Needs - Cubic Feet |          |     | Facility Size |       |        | Storage Excess (Deficit)<br>Cubic Feet |          | Storage Capacity<br>Days |
|--------------------|----------------------------|----------------------------|----------|-----|---------------|-------|--------|--|----------|--------------------------|
|                    |                            | 180 days                   | 365 days |     | Length        | Width | Depth  | 180 days                               | 365 days |                          |
|                    |                            | Solid Dairy Manure         |          |     |               |       |        |  |          |                          |
| Barn 9             | 9.68                       | 1,742                      | 3,532    | 100 | 20            | 0.5   | 1,000  | (742)                                  | (2,532)  | 103                      |
| Barn 10            | 28.23                      | 5,081                      | 10,302   | 200 | 12            | 1.5   | 3,600  | (1,481)                                | (6,702)  | 128                      |
| Barn 11            | 28.23                      | 5,081                      | 10,302   | 200 | 12            | 1.5   | 3,600  | (1,481)                                | (6,702)  | 128                      |
| Barn 12            | 7.74                       | 1,394                      | 2,826    | 100 | 20            | 0.5   | 1,000  | (394)                                  | (1,826)  | 129                      |
| Barn 13            | 52.15                      | 9,387                      | 19,035   | 40  | 130           | 1.5   | 7,800  | (1,587)                                | (11,235) | 150                      |
| Dry Stack 106      |                            |                            |          | 20  | 30            | 3     | 1,800  | 1,800                                  | 1,800    |                          |
| Dry Stack 107      |                            |                            |          | 25  | 25            | 3     | 1,875  | 1,875                                  | 1,875    |                          |
| Total Solid Manure | 126.02                     |                            |          |     | Total         |       | 20,675 |  |          | 164                      |

# Westridge Dairy Proposed Facilities - Main Farm



## Mortality Management Station Calculations Westridge Dairy

**Weight of carcasses to be composted:**

|                                 |       |                        |
|---------------------------------|-------|------------------------|
| Calves per Year                 | 810   | 810 cows x 1calf /year |
| Average Weight                  | 100   |                        |
| Mortality Percentage            | 7.50% | 92.5% Survival rate    |
| Death Loss Lbs per Year         | 6,075 |                        |
| Lbs / Day of Carcass to Compost | 16.64 |                        |

|                                 |        |                        |
|---------------------------------|--------|------------------------|
| Cow Inventory                   | 810    |                        |
| Average Weight                  | 1400   |                        |
| Mortality Percentage            | 2.00%  | 2% Death Loss per year |
| Death Loss Lbs per Year         | 22,680 |                        |
| Lbs / Day of Carcass to Compost | 62.14  |                        |

**Primary and Secondary Bin Volume:**

|                                 |               |                            |
|---------------------------------|---------------|----------------------------|
|                                 | Primary Bin   |                            |
| Lbs / Day of Carcass to Compost | 78.78         |                            |
| X 20                            | 1,576         | Cu Ft Primary Bin Volume   |
|                                 | Secondary Bin |                            |
| Lbs / Day of Carcass to Compost | 78.78         |                            |
| X 20                            | 1,576         | Cu Ft Secondary Bin Volume |

**Bin Area Calculation:**

|                          |               |
|--------------------------|---------------|
|                          | Primary Bin   |
| Cu Ft Primary Bin Volume | 1,576         |
| Depth, Ft                | 4             |
| Sq Ft Primary Bin        | 394           |
|                          | Secondary Bin |
| Cu Ft Primary Bin Volume | 1,576         |
| Depth, Ft                | 4             |
| Sq Ft Primary Bin        | 394           |

**Calculation of Number of Bins: (Minimum 3 Bins Required)**

|                         |               |
|-------------------------|---------------|
|                         | Primary Bin   |
| Sq Ft Primary Bin       | 394           |
| Sq Ft / Bin             | 130           |
| Primary Bins Required   | 3             |
|                         | Secondary Bin |
| Sq Ft Secondary Bin     | 394           |
| Sq Ft / Bin             | 130           |
| Secondary Bins Required | 3             |

**Calculate Bin Dimensions:**

|                |     |
|----------------|-----|
| Bin Area sq ft | 130 |
| Bin Depth ft   | 4   |
| Bin Width ft   | 10  |
| Bin Length ft  | 13  |

**Mortality Station Bin Requirements:**

6 Bins -- Total  
 3 - Primary Bins -- 10' X 13' X 4'  
 3 - Secondary Bins -- 10' X 13' X 4'

**Proposed Compost Overall Dimensions**

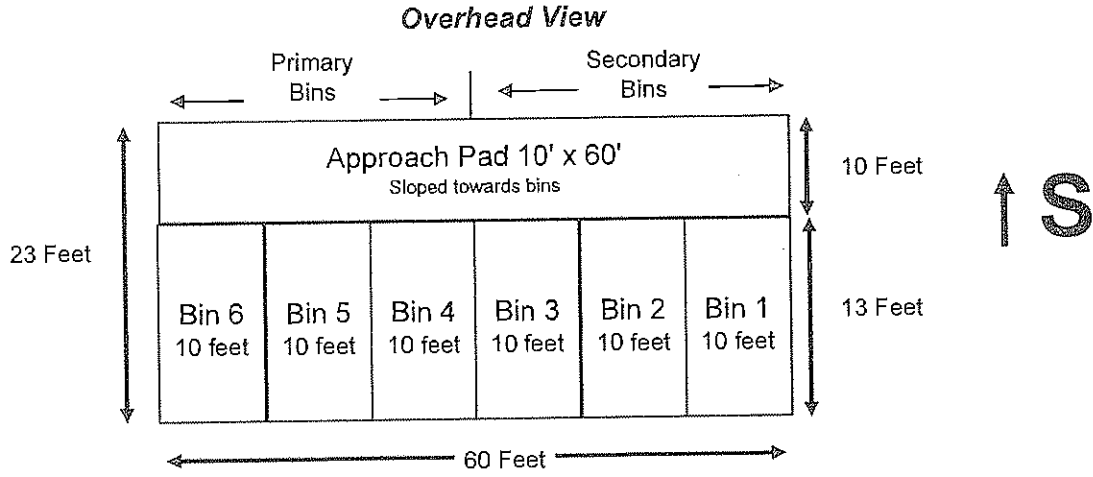
|        |     |
|--------|-----|
| Length | 60' |
| Depth  | 23' |
| Height | 4'  |

**Annual Sawdust Requirements:**

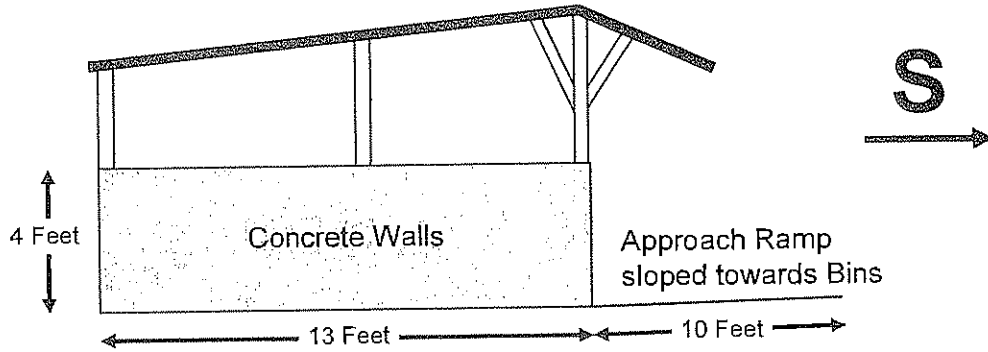
|                         |        |                                 |
|-------------------------|--------|---------------------------------|
| Death Loss Lbs per Year | 28,755 |                                 |
| X 0.0037                | 106    | Cubic Yards of Sawdust per Year |

# Westridge Dairy Proposed Mortality Station

The proposed mortality station will be placed just East of Barn 9. It will consist of 3 primary and 3 secondary compost bins each holding 390 cubic feet.



## Side View



**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**WASTE TREATMENT LAGOON**

(No.)

**CODE 359**

**DEFINITION**

A waste treatment impoundment made by constructing an embankment and/or excavating a pit or dugout.

**PURPOSE**

To biologically treat waste, such as manure and wastewater, and thereby reduce pollution potential by serving as a treatment component of a waste management system.

**CONDITIONS WHERE PRACTICE APPLIES**

- Where the lagoon is a component of a planned agricultural waste management system.
- Where treatment is needed for organic wastes generated by agricultural production or processing.
- On any site where the lagoon can be constructed, operated and maintained without polluting air or water resources.
- To lagoons 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 country roads.

**CRITERIA**

**General Criteria for All Lagoons**

**Laws and Regulations.** Waste treatment lagoons must be planned, designed, and constructed to meet all federal, state, and local laws and regulations, including the

Illinois Livestock Management Facilities Act (LMFAct) and provisions of Title 35E, State of Illinois Rules and Regulations.

**Utilities and Permits.** The landowner shall be responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

The landowner shall obtain all necessary permissions from regulatory agencies, including the Illinois Department of Agriculture, US Army Corps of Engineers, US Environmental Protection Agency, Illinois Environmental Protection Agency and Illinois Department of Natural Resources – Office of Water Resources, or document that no permits are required. Lagoons that have berms higher than 25 feet and more than 15 acre-ft of storage volume typically require a dam safety permit from IDNR-OWR.

**Location.** To minimize the potential for contamination of streams, lagoons should be located outside of floodplains. However, if site restrictions require location within a floodplain, they shall be protected from inundation or damage from a 25-year flood event, or larger if required by laws, rules, and regulations. Lagoons 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.

Lagoons should be located so they have as little drainage area as possible. If a lagoon has a drainage area, the volume of normal runoff during the treatment period and 25-

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service State Office or visit the electronic Field Office Technical Guide.

NRCS, Illinois

May 2008

year, 24-hour storm event runoff shall be included in the required volume of the lagoon.

Setback distances for lagoons shall be as per the Livestock Management Facilities Act 900.602 (LMF Act).

**Soils and Foundation.** A site investigation shall be performed as per requirements in the LMF Act. If the results of that investigation indicate the need for a liner, a liner shall be installed as per requirements in Section 506.205 of the Rules and Regulations for the LMF Act.

The lagoon 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, lagoon 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.

**Flexible Membranes.** Flexible membrane liners shall meet or exceed the requirements of flexible membrane linings specified in NRCS Practice Standard Pond Sealing or Lining - Flexible Membrane (code 521A).

**Required Volume.** The lagoon shall have the capability of storing the following volumes:

- Volume of accumulated sludge for the period between sludge removal events;
- Minimum treatment volume (anaerobic lagoons only);
- Volume of manure, wastewater, and other wastes accumulated during the treatment period;
- Depth of normal precipitation less evaporation on the surface area (at the required volume level) of the lagoon during the treatment period;
- Depth of the 25-year, 24-hour storm precipitation on the surface area (at the required volume level) of the lagoon.
- Runoff volume for the 25-year, 24 hour storm from watershed areas not diverted away from the lagoon.

**Treatment Period.** The treatment period is the detention time between drawdown events. Treatment period shall be the greater of either 60 days; or the time required to provide the storage that allows environmentally safe utilization of waste considering the climate, crops, soil, and equipment requirements; or as required by local, state, and Federal regulations.

**Waste Loading.** Daily waste loading shall be based on the maximum daily loading considering all waste sources that will be treated by the lagoon. Reliable local information or laboratory test data should be used if available. If local information is not available Chapter 4 of the AVMFH may be used for estimating waste loading.

**Embankments.** The minimum elevation of the top of the settled embankment shall be 1 foot above the lagoon's required volume. 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             |

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

**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. Inlets 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.

**Outlet.** Outlets from the required volume shall be designed to resist corrosion and plugging. No outlet shall automatically discharge from the required volume of the lagoon.

**Facility for Drawdown.** Measures that facilitate safe drawdown of the liquid level in the lagoon shall be provided. Access areas and ramps used to withdraw waste shall have slopes that facilitate a safe operating environment. Docks, wells, pumping platforms, retaining walls, etc. shall permit drawdown without causing erosion or damage to liners.

**Sludge Removal.** Provision shall be made for periodic removal of accumulated sludge to preserve the treatment capacity of the lagoon.

**Erosion Protection.** Embankments and disturbed areas surrounding the lagoon shall be treated to control erosion. This includes the inside slopes of the lagoon as needed to protect the integrity of the liner.

**Safety.** Design shall include appropriate safety features to minimize the hazards of the lagoon. The lagoon shall be fenced a minimum of 5 feet above ground around the perimeter and warning signs posted to prevent children and others from using the lagoon for other than its intended purpose.

#### **Additional Criteria for Anaerobic Lagoons**

**Loading Rate.** Anaerobic lagoons shall be designed to have a minimum treatment volume based on Volatile Solids (VS) loading per unit of volume. The maximum loading rate shall be as indicated in AWMFH Figure 10-22 or according to state regulatory requirements, whichever is more stringent.

**Operating Levels.** The maximum operating level shall be the lagoon level that provides the required volume less the 25-year, 24-hour storm event precipitation on the surface of the lagoon. The maximum drawdown level shall be the lagoon level that provides volume for the required minimum treatment volume plus the volume of accumulated

sludge between sludge removal events. Permanent markers shall be installed at these elevations. The proper operating range of the lagoon is above the maximum drawdown level and below the maximum operating level. These markers shall be referenced and described in the O&M plan.

**Depth Requirements.** The minimum depth at maximum drawdown shall be 6 feet. If subsurface conditions prevent practicable construction to accommodate the minimum depth at maximum drawdown, a lesser depth may be used, if the volume requirements are met.

#### **Additional Criteria for Naturally Aerobic Lagoons**

**Loading Rate.** Naturally aerobic lagoons shall be designed to have a minimum treatment surface area as determined on the basis of daily BOD<sub>5</sub> loading per unit of lagoon surface. The required minimum treatment surface area shall be the surface area at maximum drawdown. The maximum loading rate shall be as indicated by AWMFH Figure 10-25 or according to state regulatory requirements, whichever is more stringent.

**Operating Levels.** The maximum operating level shall be the lagoon level that provides the required volume less the 25-year, 24-hour storm event on the lagoon surface. The maximum drawdown level shall be the lagoon level that provides volume for the volume of manure, wastewater, and clean water accumulated during the treatment period plus the volume of accumulated sludge between sludge removal events. Permanent markers shall be installed at these elevations. The proper operating range of the lagoon is above the maximum drawdown level and below the maximum operating level. These markers shall be referenced and described in the O&M plan.

**Depth Requirements.** The minimum depth at maximum drawdown shall be 2 feet. The maximum liquid level shall be 5 feet.

**Additional Criteria for Mechanically Aerated Lagoons**

**Loading Rate.** Mechanically aerated waste treatment lagoons' treatment function shall be designed on the basis of daily BOD<sub>5</sub> loading and aeration equipment manufacturer's performance data for oxygen transfer and mixing. Aeration equipment shall provide a minimum of 1 pound of oxygen for each pound of daily BOD<sub>5</sub> loading.

**Operating Levels.** The maximum operating level shall be the lagoon level that provides the required lagoon volume less the 25-year, 24-hour storm event precipitation and shall not exceed the site and aeration equipment limitations. A permanent marker or recorder shall be installed at this elevation. The proper operating range of the lagoon is below this elevation and above the minimum treatment elevation established by the manufacturer of the aeration equipment. This marker shall be referenced and described in the O&M plan.

**CONSIDERATIONS**

**General**

Lagoons should be located as close to the source of waste as possible.

Solid/liquid separation treatment should be considered between the waste source and the lagoon to reduce loading.

The configuration of the lagoon should be based on the method of sludge removal and method of sealing.

Due consideration should be given to 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 embankment 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 2 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 2 may be significantly affected:

- An auxiliary (emergency) spillway
- Additional freeboard
- Storage volume for the wet year rather than normal year precipitation
- Reinforced embankment -- such as, additional top width, flattened and/or armored downstream side slopes
- Secondary containment
- Water level indicators or recorders

**Table 2- Potential Impact Categories from Breach of Embankment or Accidental Release**

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

The following 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 2 may be significantly affected:

- Outlet gate locks or locked gate housing
- Secondary containment
- Alarm system
- Another means of emptying the required volume