

4.17 Individual Lagoon

Revision: ~~July 18, 2013~~ June 5, 2014

4.17.1 Description

An individual lagoon is a pond sealed with a natural or synthetic liner into which sewage from a household or small business is discharged. Bacteria digest the solids in the presence of oxygen, and the liquid is evaporated into the atmosphere.

4.17.2 Approval Conditions

1. Lagoons are applicable only in areas of Idaho where the annual evaporation exceeds the annual precipitation.
2. The lagoon may not be placed within ~~100-200~~ feet of the owner's property line ~~and may not be placed within 300 feet from a neighboring dwelling~~ as measured from the toe of the exterior slope.
3. Bottom of the finished lagoon must not be constructed within:
 - a. 6 inches of the ~~maximum~~ seasonal high ground water.
 - b. 2 feet of the normal high ground water level.
 - c. 2 feet of bedrock.
4. Site must be located in an area of maximum exposure to the sun and wind.
5. Slope must not be greater than 12%.
6. Lagoons are restricted from use in areas where such systems may have an ice cover for more than 3 months.
7. A source of makeup water ~~with a backflow prevention system between the source and the lagoon~~ must be readily available.
8. Lot size should be at least 10 acres but in no case should be less than 5 acres. If the lot is less than 10 acres, a variance must be required.
9. ~~This design is for individual residential dwellings or small commercial businesses that only discharge domestic wastewater. Facilities discharging non-domestic wastewater do not qualify for an individual lagoon under this guidance.~~
10. ~~System designs that meet the definition of a central system (IDAPA 58.01.03.003.08) do not qualify for an individual lagoon under this guidance.~~
11. ~~The system shall be designed by a PE licensed in Idaho.~~

4.17.3 Design

1. Area of the lagoon at the 2-foot minimum depth is first determined by the net evaporation of the area. Equation 4-13 gives the calculation for horizontal area.

$$A = \frac{1.2 \times \text{yearly flow (in cubic feet)}}{\text{Annual net moisture (in feet)}}$$

Equation 4-13. Lagoon horizontal area (square feet).

where:

Yearly flow in cubic feet = (GPD x 365 days) x (7.48 gallons/ft³).

Annual net moisture as determined from a water mass balance beginning in October.

- ~~2. For commercial establishments with organic loadings higher than domestic sewage, check the area required based on biological oxygen demand (BOD) loading. This is an important check in areas with high evaporation rates and low precipitation. Equation 4-14 shows the calculation for horizontal area factoring in BODs.~~

~~$$A = \frac{(GPD)(BOD[mg / L])(8.35 \times 10^{-6})}{(20lb / acre / day)} \times (43,560 ft^2 / acre)$$~~

~~**Equation 4-14. Horizontal area factoring in BOD.**~~

~~where:~~

~~A = surface area in square feet.~~

- ~~3. Use the area calculation that gives the largest area.~~

42. Total liquid depth:

2 foot minimum depth + 2 foot freeboard + annual net moisture as determined by a water mass balance.

3. The lagoon shall be lined with material that is watertight and demonstrates at least a 20-year service life. The following requirements must be met for flexible membrane liners:
- Have properties equivalent to or greater than 30-mil PVC.
 - Have field repair instructions and materials provided to the purchaser of the liner.
 - Have factory fabricated boots for waterproof field bonding of piping to the liner.
 - Liner must be placed against smooth, regular surfaces free of sharp edges, nails, wire, splinters, or other objects that may puncture the liner. A 4-inch layer of clean sand should provide liner protection.
4. The lagoon shall be designed for a maximum leakage rate of 500 gallons per acre per day.
5. Minimum dike and embankment details:
- Inner and outer slope—3 horizontal to 1 vertical (3:1)
 - Inner slopes should not be flatter than 4 horizontal to 1 vertical (4:1)
 - Embankment width— 4 feet minimum
5. The effluent discharge inlet to the lagoon must be placed near its center with a concrete splash-pad constructed around the inlet.

6. A water depth gauge clearly visible from the edge of the lagoon should be installed at located near the concrete splash pad.
7. A cleanout must be placed on the gravity-influent lines at a point above the lagoon's maximum liquid elevation.
8. If the sewage is pumped to the lagoon, a valve must be installed in the line that will permit repairs without draining the lagoon and will prevent backflow of effluent to the pumping chamber.
9. The lagoon must be fenced to exclude children, pets, and livestock. A sign indicating Danger—Human Sewage is recommended.

4.17.4 Construction

- ~~1. The effluent discharge inlet to the lagoon must be placed near its center.~~
- ~~2. A concrete splash pad must be constructed around the inlet.~~
- ~~3. A water depth gauge clearly visible from the edge of the lagoon should be installed at the concrete splash pad.~~
- ~~4. A cleanout must be placed on the gravity-influent lines at a point above the lagoon's maximum liquid elevation.~~
- ~~5. If the sewage is pumped to the lagoon, a valve must be installed in the line that will permit repairs without draining the lagoon and will prevent backflow of effluent to the pumping chamber.~~
6. Excavation must provide the following dike and embankment details:
 - a. Inner slope 3:1
 - b. Outer slope 2:1 or flatter
 - c. Embankment width 4 feet minimum
7. All fill must be compacted to at least 95% Standard Proctor Density.
8. All soil used in constructing the pond bottom and dike cores shall be relatively impervious, incompressible and tight, and compacted to at least 95% Standard Proctor Density.
9. Lagoons shall be sealed such that the seepage loss through the seal is no more than 0.125 inches (1/8 inch) per day.
- ~~8. The lagoon must be fenced to exclude children, pets, and livestock. A sign indicating Danger—Human Sewage is recommended.~~

4.17.5 Inspections

1. A preconstruction conference should be held between the health district, installer, and responsible charge engineer.
2. The site must be inspected when the cells are excavated and compaction test results for all fill material, dikes, and the lagoon bottom shall be provided at this time.

3. The site must be inspected ~~at~~ after the ~~time the~~ impervious liner is placed and prior to filling the lagoon.
- ~~2. Inspections may be required during embankment construction to ensure adequacy of fill compaction and after completion.~~
34. Individual lagoons ~~will~~ shall be seepage tested by a PE licensed in Idaho, an Idaho licensed professional geologist, or by individuals under their supervision. ~~using the appropriate pond/lagoon seepage test procedure.~~
 - a. Seepage testing procedures, to demonstrate seepage rate compliance, must be submitted to DEQ for review and approval prior to conducting required seepage testing (see <http://www.deq.idaho.gov/water-quality/wastewater/lagoon-seepage-testing.aspx> for more information).
 - b. This is a one-time seepage test that must be performed prior to the lagoon being placed into service.
 - b. The leakage rate for the lagoon shall be no more than 0.125 inches per day.
5. The responsible charge engineer should conduct as many inspections as necessary for verification of system and component compliance with the engineered plans.
6. The responsible charge engineer shall provide the health district a written statement that the system was constructed and function in compliance with the approved plans and specifications. Additionally, the responsible charge engineer shall provide as-built plans to the health district if any construction deviations occur from the permitted construction plans. (IDAPA 58.01.03.005.15)

4.17.6 Operation and Maintenance

1. The lagoon design engineer shall provide a copy of the system's operation, maintenance, and monitoring procedures to the health district as part of the permit application and prior to subsurface sewage disposal permit issuance (IDAPA 58.01.03.005.04.k).
2. The lagoon must be kept filled with at least 2 feet of liquid.
23. ~~A supply of makeup water shall be available~~ Annual maintenance and testing of the backflow prevention device installed on the makeup water supply line shall be performed and be done according to the manufacturer's recommendations.
- ~~3. If the water comes from a well or domestic water supply, an approved backflow prevention device must be installed between the water source and the discharge to the lagoon.~~
4. Embankments must be stable and maintained to avoid breach, overflow, aesthetic nuisance, or disturbance to the lagoon operation.
5. Permanent vegetation shall be maintained on the top and outer slopes of the embankment except where a foot or vehicle path is in use. ~~Grasses should be mowed.~~
6. Woody vegetation should be removed from the embankments, grasses should be mowed, and other vegetation should be maintained regularly.
67. Weeds and other vegetation must not be allowed to grow in the lagoon.

78. ~~Duckweed or other floating aquatic weeds must be physically removed when the vegetation obscures the surface of the liquid on a regular basis.~~
89. The fence and all gates must be maintained to exclude animals, children, and other unwanted intrusion.
10. Directions for repair of the impervious liner should be included.
11. Directions on how to address potential odor issues from the lagoon should be described.