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WTS – 37 (Revised October 2026)

GUIDANCE DOCUMENT FOR THE DESIGN OF A LINED WASTEWATER HOLDING POND (SURFACE IMPOUNDMENT)

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Information from the items listed below shall be presented as a minimum in an application prepared by a Nevada Registered Professional Engineer (P.E.) for a lined holding pond (surface impoundment) that contains wastewater regulated and permitted by the Bureau of Water Pollution Control (BWPC). Surface impoundments storing and/or treating wastewater require a discharge permit to be issued from BWPC prior to commencement of construction and operation.

BWPC does not permit the storage of any wastewater that is classified as a hazardous waste.

Also, please note that the Nevada Division of Water Resources (NDWR), Phone: (775) 684-2800, must approve any basin with a depth greater than 20 feet or a storage capacity of more than 20 acre-feet (AF).

This document is solely intended as guidance to the regulated community. It shall not replace best professional engineering judgment in the design of a wastewater holding pond or the regulations on dam safety from the DWR.

KEY WORDS:

NAC: Nevada Administrative Code
ASTM: American Society for Testing and Materials
GSI: Geosynthetic Institute
LCRS: Leak Collection and Recovery Systems

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1. SITE CHARACTERIZATION DATA REQUIRED

A. A topographical map of the site with 5-foot contour intervals. On this map, please provide identification of the following within a one mile radius of the proposed pond:

1) Creeks and Rivers;
2) Dwelling units (e.g., residences and commercial buildings);
3) Earthquake fault lines;
4) Drinking water wells;
5) Wellhead Protection Zone Area delineation (if available).

B. The depth to the groundwater table shall be provided along with a description of the underlying strata (confining layers, soil types, etc.). The groundwater gradient and direction, depth to groundwater, and groundwater quality shall be provided.

If this information is not available from available data, the applicant may have to drill borings to the water table and have the strata categorized by a licensed professional with expertise in this discipline.

C. Watershed map of the site which depicts the 100-year flood plain and storm water drainage channels in and around the proposed pond(s) site.

D. Direction of prevailing winds shall be provided.

2. GENERAL POND CONSTRUCTION DETAILS

A. Interior embankments shall be sloped no steeper than 3:1 (horizontal to vertical).

B. Pond bottom shall be level unless a leak detection system is proposed using a leak collection media.

C. Top of the embankment shall be a minimum of 8 feet wide for non-vehicular access. If the top of the embankment is used as a service road, the top embankment width must be at least 12 feet and designed to support the load weight for all service vehicles.

D. Pond geometry should be either square or rectangular. If rectangular, the side lengths shall be no longer than 3 times the side width. Other pond geometry will be reviewed on a case by case basis.

E. A freeboard of 3-feet is required for all large ponds (greater than 1 acre of surface area). A freeboard of 2-feet may be acceptable for smaller ponds (1 acre or less of surface area) if it can be determined that wave action will not be a problem based upon a wave fetch analysis using local wind (meteorological) data.

F. The pond must withstand and contain, without release, the 25-year, 24-hour storm event.

G. Plans for protection from floodwater must be presented. The pond must be designed to

withstand the run-off generated by the 24-hour storm event with a 100-year recurrence interval. The pond should remain operational after such an event, with no structural damage.

H. The engineer shall attempt to not locate any ponds within the 100-year flood plain (NAC 445A.285).

I. A method for recording the liquid level in each pond shall be provided. This may include staff gages, sidewall depth markings, or pressure-depth sensors. If using staff gages, then the length intervals shall be marked in units of a quarter of a foot or inches and be easily readable from 30 feet away.

J. A plan for leak detection must be presented for all ponds. Examples of acceptable leak detection systems include double liner designs with leak collection sumps, and monitoring wells. Other innovative plans for leak detection will be reviewed by BWPC on a case by case basis.

K. A water balance demonstrating storage capacity of the pond within the required freeboard shall be presented. This balance shall incorporate local figures for pond surface evaporation and average precipitation rates.

L. Inlet piping must have an adequate erosion protection measure at the discharge point into the pond.

M. Seepage collars must be installed at junctions at piping penetrations to the pond embankment.

N. Ballast measures shall be considered to protect liner uplift from wind activity or high water table.

O. Odor control plans (if required). These may include providing aeration or recirculation of the flow to the pond(s) or other acceptable measures (chemical oxidants, algal control chemicals, scum removal, sludge removal, etc.).

P. The chemical compatibility of the liner material with the stored wastewater must be evaluated with the liner manufacturer and found suitable for the proposed wastewater.

Q. A plan for measuring the depth of solids (sludge) accumulation in the pond shall be provided (e.g., Sludge Judge™, ultrasonic sounder, etc.). Additionally, a plan for solids removal from the pond shall be presented that will be protective of the liner system.

R. The ponds shall be enclosed within an acceptable fence to keep out non-authorized personnel (e.g., the public), wildlife, and livestock. Waterfowl protection (e.g., bird balls, netting, etc.) may be also required by applicable state or federal wildlife agencies.

S. The perimeter fence shall be posted at the entrance gate and on all four sides at a recommended 300 ft. spacing interval per sign. The warning signs shall indicate usage of the pond(s) as a wastewater storage facility. The entrance gate sign shall denote the facility's name and emergency contact number.

T. A safety plan (emergency egress) for getting people out of the pond shall be presented (e.g. roped life rings, textured liner, sidewall ladders, service rowboat, etc.).

3. DESIGN ITEMS FOR GEOMEMBRANE LINER SYSTEMS

A. The liner should have a coefficient of permeability of at least 1 x 10^{-11} cm/sec and minimum thicknesses of 60-mil (primary liner) and 40-mil (secondary liner), respectively. The primary or upper liner is the liner layer in contact with the wastewater.

B. Reclaimed water ponds (e.g. golf courses, effluent storage reservoirs, etc.) storing denitrified domestic effluent (i.e. < 10 mg/l of Total Nitrogen content) may utilize a PVC liner with a minimal thickness of 30-mil provided that the PVC liner is protected from UV degradation (e.g., soil or sand cover, sprayed-on concrete, etc.).

C. The liner material specifications shall meet the standards listed in the Geosynthetic Research Institute Test Method GM13 (e.g. UV Resistance, Puncture Resistance).

D. A plan for protection of the liner from ice damage, temperature extremes, wind uplift, oxidation, and sharp objects shall be presented.

E. If there is the potential for gas generation in the sub-base, a plan to remove the gases beneath the liner must be presented.

F. Supporting geotechnical data on the embankment foundation and slope stability shall be submitted.

G. Subsurface or underlayment prep for the liner installation shall be provided.

H. It is strongly recommended that the primary liner material be textured on the exposed side for personnel slip prevention.

I. A means of emergency egress shall be provided (e.g. knotted hand lines, welded in ladder rungs, etc.).

J. Provide the details on liner anchoring and all pipe penetrations. It is recommended that liner penetrations be limited to the best extent possible and reserved to areas above the pond freeboard to reduce potential for leaks.

K. The engineer-of-record for the approved design shall submit a Quality Assurance/Quality Control (QA/QC) letter and report on the liner installation when complete. This documentation shall include a summary of the results of all field tests conducted on the liner.

4. DOUBLE LINED LEAK DETECTION SYSTEMS DESIGN ITEMS

A. A double-lined pond is required when any industrial and/or process (non-domestic) wastewater is stored. Plans for a single-lined pond storing and/or treating only domestic

(sanitary) wastewater shall be prepared and submitted in accordance with WTS-5: Guidance Document for Design of Wastewater Treatment Ponds.

B. The liner materials shall be at least 60-mil (primary liner) and 40-mil (secondary liner) thick, respectively, and made of HDPE or approved equivalent material (e.g. LLDPE, PVC, Polypropylene, etc.).

C. The leak collection material between the two liners shall be designed to rapidly transmit primary liner leakage to a collection sump and prevent hydraulic head transference from the primary liner onto the secondary liner. This interstitial material should be an engineered geo-net or equivalent material.

D. The Leak Collection and Recovery System or LCRS (e.g., collection sump, pumps, collection media, etc.) shall be designed to remove the collected leakage at a rate equal to or greater than the maximum rate collected in the interstitial leak detection media and/or at a rate that prevents the overfilling of the detection sump.

E. The leak detection metering system must allow for accurate recording of the daily volume of leakage from the primary liner.

F. The maximum allowable leakage rate for the primary liner is 500 gallons/acre-day. The action leakage rates for the primary liner should be as follows (note: a more restrictive action leakage rate schedule may be required in the discharge permit on a case-by-case basis):

    i. When the leakage rate exceeds 125 gallons/acre-day, the facility shall develop a plan to identify the source of the leakage. This plan shall be submitted to the BWPC for its review and approval within one months' time upon discovery of the leakage.

    ii. When the leakage rate exceeds 250 gallons/acre-day, the approved plan shall be initiated.

    iii. When the leakage rate exceeds 500 gallons/acre-day, the permittee shall notify the BWPC in writing within five (5) business days, shall cease discharge to the identified leaking pond(s), and shall implement all necessary corrective action measures to mitigate the liner leakage.

    iv. Leak-detection monitoring wells may be required to assess impacts to environment.

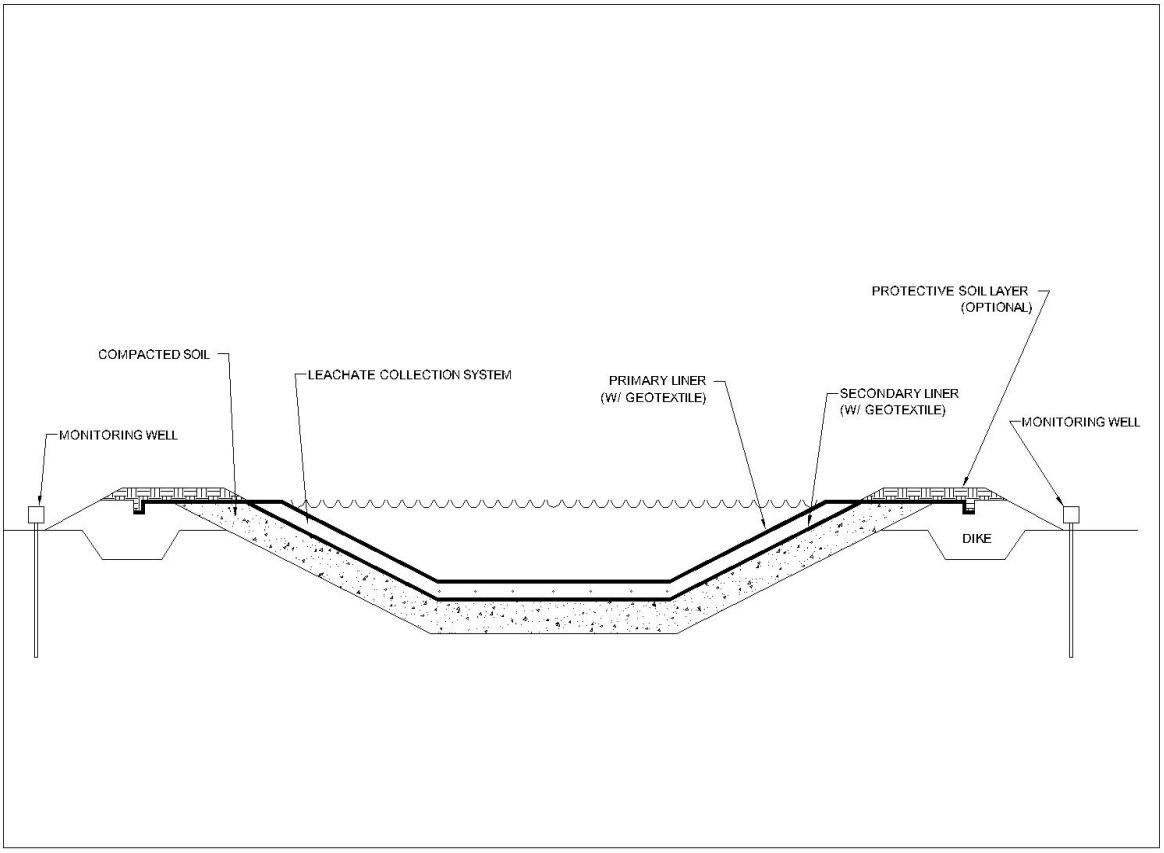


Figure 1 - Example of a Surface Impoundment

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3. U.S. EPA, *Introduction to Land Disposal Units (40 CFR Parts 264/265, Subparts K, L, M, N)*, https://www.epa.gov/sites/default/files/2015-07/documents/ldu05.pdf