Recommendation & SWOT Form

RECOMMENDATION SUMMARY
Reduce Daily Flow Rates: Reduce the minimum absorption area design flow for individual wastewater systems from 200 gallons per day to 150 gpd/bedroom, This reflects that the current design flow requirements predate modern low-flow fixtures and water conservation practices.

INTERNAL FACTORS

STRENGTHS +	WEAKNESSES –

• Updates an outdated standard to reflect real usage
• Reduces system footprint and construction costs.
• Aligns Hawaii with most U.S. States
• Oversized systems negatively impact the effectiveness of natural, biological treatment processes
	• Reduced redundancy for high-occupancy or multi-generational households.
	  ○ Even with reduced estimated flow rates, there is already redundancy to cover these outliers.
	  ○ See Additional Information (Bullet 2)
	• Less conservative buffer for future household growth.

EXTERNAL FACTORS

OPPORTUNITIES +	THREATS –

• Reduces construction costs significantly. • Accelerates the path toward the 3,000 cesspools/year target. • Makes cesspool conversion feasible for homeowners with small lots who currently cannot meet leachfield sizing requirements. • Supports landowners with limited financial and spatial resources	• A small percentage of households may have genuinely higher water use. • Without monitoring, undersized systems could fail in high-occupancy situations.

ADDITIONAL INFORMATION

- Actual average daily household use in Honolulu from BWS and census data is 304 gpd, or 98 gpd/br assuming an average of 3.1 bedrooms per house. Applying a 1.33 surge factor like Washington State would give 131 gpd/br. Applying a 1.50 surge factor like Connecticut would give 147 gpd/br. A 1.50 surge factor would be more protective for high-occupancy households in Hawai'i where multigenerational gatherings are common.
- Hawaiʻi's 200 gpd/bedroom standard is derived from the 1967 "Manual of Septic Tank Practice" and the 1980 "Onsite Wastewater Treatment Manual," which estimated househol water use before low-flush toilets (mandated federally in 1994), low-flow showerheads, and WaterSense appliances became standard. The 1967 manual estimates 75 gpd/person for single family residences and the 1980 manual estimates 44 gpd/person. Only a single study (Cohen and Wallman) with a sample size of 8 residences showed a maximum individual residence average of 101.6 gpd/person, which represented only one household in the dataset.

TABLE 4-1

SUMMARY OF AVERAGE DAILY RESIDENTIAL WASTEWATER FLOWS

Study	No. of Residences	Duration of Study months	Wastewater Flow Study Average gpcd	Wastewater Flow Range of Individual Residence Averages gpcd
Linaweaver, et al. (1)	22	-	49	36 - 66
Anderson and Watson (2)	18	4	44	18 - 69
Watson, et al. (3)	3	2-12	53	25 - 65
Cohen and Wallman (4)	8	6	52	37.8 - 101.6
Laak (5)	5	24	41.4	26.3 - 65.4
Bennett and Linstedt (6)	5	0.5	44.5	31.8 - 82.5
Siegrist, et al. (7)	11	1	42.6	25.4 - 56.9
Otis (8)	21	12	36	8 - 71
Duffy, et al. (9)	16	12	42.3	-
		Weighted Average	44	

- In 1994, the US Energy Policy Act went into effect to improve water efficiency nationwide. The EPA 2002 "Onsite Wastewater Treatment Systems Manual (EPA/625/R-00/008)" is the mos current authoritative federal guidance. Chapter 3 addresses design flows, and recommend designing for a range of typically 50-70 gpd/person for homes built before 1994, and 40-60 gpd/person for homes built after 1994 or retrofitted with modern water-efficient fixtures. Hawai'i's current 200 gpd/br value, therefore, assumes 2+ high-use persons per bedroom under 1960s fixture assumptions. The following table shows 5 end-use water studies used to inform federal guidance.

Table 3-1. Summary of average daily residential wastewater flows[a]

Study	Number of residences	Study duration (months)	Study average (gal/pers/day)[b]	Study range (gal/pers/day)
Brown & Caldwell (1984)	210		66.2 (250.6)[b]	57.3–73.0 (216.9–276.3)[b]
Anderson & Siegrist (1989)	90	3	70.8 (268.0)	65.9–76.6 (249.4–289.9)
Anderson et al. (1993)	25	3	50.7 (191.9)	26.1–85.2 (98.9–322.5)
Mayer et al. (1999)	1188	1[c]	69.3 (262.3)	57.1–83.5 (216.1–316.1)
Weighted Average	153		68.6 (259.7)	

[a] Based on indoor water use monitoring and not wastewater flow monitoring.
[b] Liters/person/day in parentheses.
[c] Based on 2 weeks of continuous flow monitoring in each of two seasons at each home.

- Hawai'i's 200 gpd/bedroom rate is tied for the second highest in the country. Alternative models from other states:
    - Washington State uses a 120 gpd/bedroom flat rate; The minimum design flow is based on 45 gpd/capita. WA assumes 2 people at 90 gpd per bedroom, with a 33% buffer for surge capacity, which results in 120 gpd/br. Washington's rule developmen committee issued a research report on their design considerations for residential flow rates specifically evaluating their assumptions on design flow.
    - Vermont's Chapter 1 assumes 2 people per bedroom for the first 3 bedrooms, then 1 person per bedroom after that, at 70 gpd/capita.
    - Pennsylvania's Title 25 has a minimum of 400 gpd until 3 bedrooms. The minimum flow of 400 gpd is increased by 100 gpd for each bedroom over 3.
    - Massachusetts' Title 5 uses a nutrient loading calculation to set a 110 gpd/br flow rate
- Maui County adopted a water use calculation method in 2024 to determine estimated water usage. The method assumes an Equivalent Single Dwelling (ESD) is equal to 300 gpd and represents the estimated daily water use of a typical home, based on the number of bedrooms and bathrooms. For example, a 3 bed, 2 bath home would equal 0.9 ESDs, which estimates 270 gpd. Based on current HAR 11-62 rules, the wastewater system for this home would need to be sized for 600 gpd. This demonstrates that the standard oversizes by a factor of 2x or more.
- Hawaii adopted IAPMO's Water Demand Calculator (WDC), published as UPC Appendix M, into the Hawaii Plumbing Code 2021 (Hawaii Plumbing Code §M 102.2). Hawaii was among the first ten states nationally to adopt Appendix M. The WDC replaced Hunter's Curve, an outdated pipe-sizing methodology, with an updated probability model built on data from 1,038 single-family homes. Daily flow values may be able to be extrapolated from fixture data. Its adoption shows that Hawaii has already accepted reduced residential flow rates

when sizing plumbing fixtures, and should be consistent when sizing wastewater disposal systems.

- Relevant code sections:
  - 200 gpd/br: HAR 11-62-34(a)(2)(A), HAR 11-62-34(c)(2)(A), HAR 11-62-34(d)(2)(B)
  - Maximum daily flow rate: HAR 11-62-31.1(a)(1)(D), HAR 11-62-33.1(a)(5)

Once completed, please email this form to ***doh.wwb.cesspool@doh.hawaii.gov***.

Recommendation & SWOT Form

RECOMMENDATION SUMMARY

REV 1 - Allow for disposal system sizing based solely on soil hydraulic conductivity (absorption capacity) when an aerobic treatment unit (ATU) is implemented in an IWS, rather than HAR 11-62 Appendix D (Table III). This approach is supported by the EPA Manual on Land Based Treatment Systems, specifically Soil Aquifer Treatment systems, where a limiting factor design analysis demonstrates that hydraulic conductivity is the limiting factor when nitrogen is reduced and wastewater strength is low (household wastewater).

INTERNAL FACTORS

STRENGTHS +	WEAKNESSES –
Provides more options for cesspool conversions on small or difficult properties and furthers the department's objectives of eliminating cesspools	May result in the installation of more ATUs, requiring more oversight of maintenance processes on the part of ATU owners by DOH

EXTERNAL FACTORS

OPPORTUNITIES +	THREATS –
Provides more options for cesspool conversions to owners of properties which lack land area or access for the installation of large soil absorption systems sized based on Table III Provides a lower upfront cost for cesspool conversion by reducing the cost of excavation for absorption systems sized based on Table III	Will require ongoing maintenance (pumping and servicing of mechanical equipment) and electricity costs of owners who elect to install ATUs in place of septic tanks

ADDITIONAL INFORMATION

11-62 should recognize the fact that Table III and its sizing requirements for soil absorption systems are based on broad distribution of effluent from a septic tank to allow further treatment of constituents in the soil by natural microbial action and that this is not needed when treatment occurs within an ATU, eliminating the need for such large absorption systems.

Once completed, please email this form to doh.wwb.cesspool@doh.hawaii.gov.

EPA United States Environmental Protection Agency

Process Design Manual

Land Treatment of Municipal Wastewater Effluents

EPA/625/R-06/016
September 2006

Process Design Manual

Land Treatment of Municipal Wastewater Effluents

Land Remediation and Pollution Control Division
National Risk Management Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, Ohio

Notice

Foreword

The U.S. Environmental Protection Agency (EPA) is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The National Risk Management Research Laboratory (NRMRL) is the Agency's center for investigation of technological and management approaches for preventing and reducing risks from pollution that threaten human health and the environment. The focus of the Laboratory's research program is on methods and their cost-effectiveness for prevention and control of pollution to air, land, water, and subsurface resources; protection of water quality in public water systems; remediation of contaminated sites, sediments and ground water; prevention and control of indoor air pollution; and restoration of ecosystems. NRMRL collaborates with both public and private sector partners to foster technologies that reduce the cost of compliance and to anticipate emerging problems. NRMRL's research provides solutions to environmental problems by: developing and promoting technologies that protect and improve the environment; advancing scientific and engineering information to support regulatory and policy decisions; and providing the technical support and information transfer to ensure implementation of environmental regulations and strategies at the national, state, and community levels.

This publication has been produced as part of the Laboratory's strategic long-term research plan. It is published and made available by EPA's Office of Research and Development to assist the user community and to link researchers with their clients.

Sally Gutierrez, Director
National Risk Management Research Laboratory

Abstract

The U.S. Environmental Protection Agency guidance on land treatment of municipal and industrial wastewater was updated for the first time since 1984. Significant new technological changes include phytoremediation, vadose zone monitoring, new design approaches to surface irrigation, center-pivot irrigation, drip and micro-sprinkler irrigation, and capital and operating costs. Also included in the new manual are new performance data on soil-aquifer treatment, a rational model for balancing oxygen uptake with BOD loadings, and industrial wastewater land application guidance, emphasizing treatment of food processing wastewater. Costs and energy use of land treatment technologies are updated.

Slow-rate land treatment remains the most popular type of land treatment system. Many slow-rate systems are now designed as water reuse systems. Trends in distribution have been toward sprinkler and drip irrigation systems.

A CD which accompanies the document contains copies of earlier editions of the land treatment manual and the latest manual for water reuse.

KEYWORDS: land treatment, soil aquifer treatment, spray irrigation, groundwater monitoring, vadose zone sampling, costs

Contents

Figures

important in the more arid western portions of the United States.

Optimization of a system for wastewater treatment usually results in the selection of perennial grasses because a longer application season, higher hydraulic loadings, and greater nitrogen loadings compared to other annual agricultural crops. Site selection is important with municipal wastewater which requires greater hydraulic capacity. Annual planting and cultivation can also be avoided with perennial grasses. However, corn and other crops with higher market values are also grown on systems where treatment is a major objective. Muskegon, MI (US EPA, 1980) was a noted example with over 2020 ha (5,000 acres) of corn, alfalfa and soybeans under cultivation.

Forested systems also offer the advantage of a longer application season and higher hydraulic loadings than typical agricultural crops, but may be less efficient than perennial grasses for nitrogen removal depending on the type of tree, stage of growth and general site conditions. Early research at the Pennsylvania State University (US EPA, 1974) established the basic criteria for full-scale forested systems. Subsequent work in Georgia, Michigan, and Washington State further refined the criteria for regional and species differences (McKim, 1982). A large-scale slow rate forested system in Clayton County, GA, designed for 75,700 m^3/d (20 mgd) uses 1460 ha (3650 acres) and has been in continuous operation since 1981 (Reed and Bastian, 1991; Nutter et al., 1996). The largest operational land treatment system in the United States is the 3232-ha (8,000-acre) forested system in Dalton, GA.

1.5. Overland Flow Treatment

Overland flow (OF) is the controlled application of wastewater to relatively impermeable soils on gentle grass covered slopes. The hydraulic loading is typically several inches of liquid per week and is usually higher than for most SR systems. Vegetation (e.g., perennial grasses) in the OF system contributes to slope stability, erosion protection, and treatment.

The design flow path is essentially sheet flow down the carefully prepared vegetated surface with runoff collected in ditches or drains at the toe of each slope (Figure 1-2). Treatment occurs as the applied wastewater interacts with the soil, the vegetation, and the biological surface growths. Many of the treatment responses are similar to those occurring in trickling filters and other attached growth processes. Wastewater is typically applied from gated pipe or nozzles at the top of the slope or from sprinklers located on the slope surface. Industrial wastewaters and those with higher solids content typically use the latter approach. A small portion of the applied water may be lost to deep percolation and evapotranspiration, but the major portion is collected in the toe ditches and discharged, typically to an adjacent surface water. Because these systems discharge to surface waters, a National Pollutant Discharge Elimination System (NPDES) permit is required.

The SR and SAT concepts may include percolate recovery and discharge, but the OF process almost always includes a surface discharge and the necessary permits are required. The purpose of overland flow is cost-effective wastewater treatment. The harvest and sale of the cover crop may provide some secondary benefit and help offset operational costs, but the primary objective is treatment of the wastewater. Crop removal should be encouraged since removing the crop also removes N and P. Design procedures are presented in Chapter 9. One of the largest municipal overland flow systems in the U.S. is in Davis, CA (Crites et al., 2001) designed for 18,925 m^3/d (5 mgd) flow and covering 80 ha (200 acres).

1.6. Soil Aquifer Treatment

SAT land treatment is the controlled application of wastewater to earthen basins in permeable soils at a rate typically measured in terms of meters of liquid per week. As shown in Table 1-2, the hydraulic loading rates for SAT are usually higher than SR systems. Any surface vegetation that is present has a marginal role for treatment due to the high hydraulic loadings. In these cases, water-tolerant grasses are typically used. Treatment in the SAT process is accomplished by biological, chemical and physical interactions in the soil matrix with the near surface layers being the most active zone.

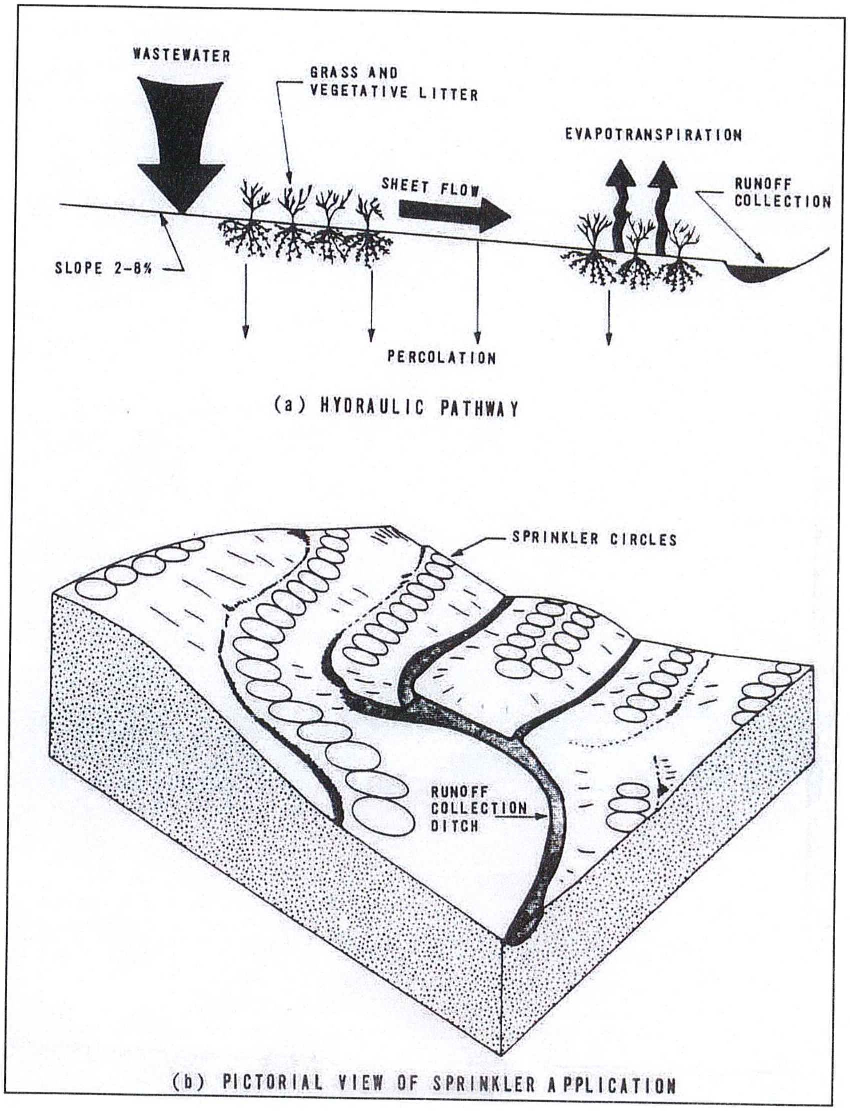

Figure 1-2. Overland Flow.

The design flow path involves surface infiltration, subsurface percolation and lateral flow away from the application site (Figure 1-3). A cyclic application, as described in Chapter 10, is typical when the operational mode includes a flooding period followed by days or weeks of drying. Continuous application of well treated wastewater can be accomplished with low application rates. This allows aerobic restoration of the infiltration surface and drainage of the applied percolate. The geohydrological aspects of the SAT site are more critical than for the other processes and a proper definition of subsurface conditions and the local groundwater system is essential for design.

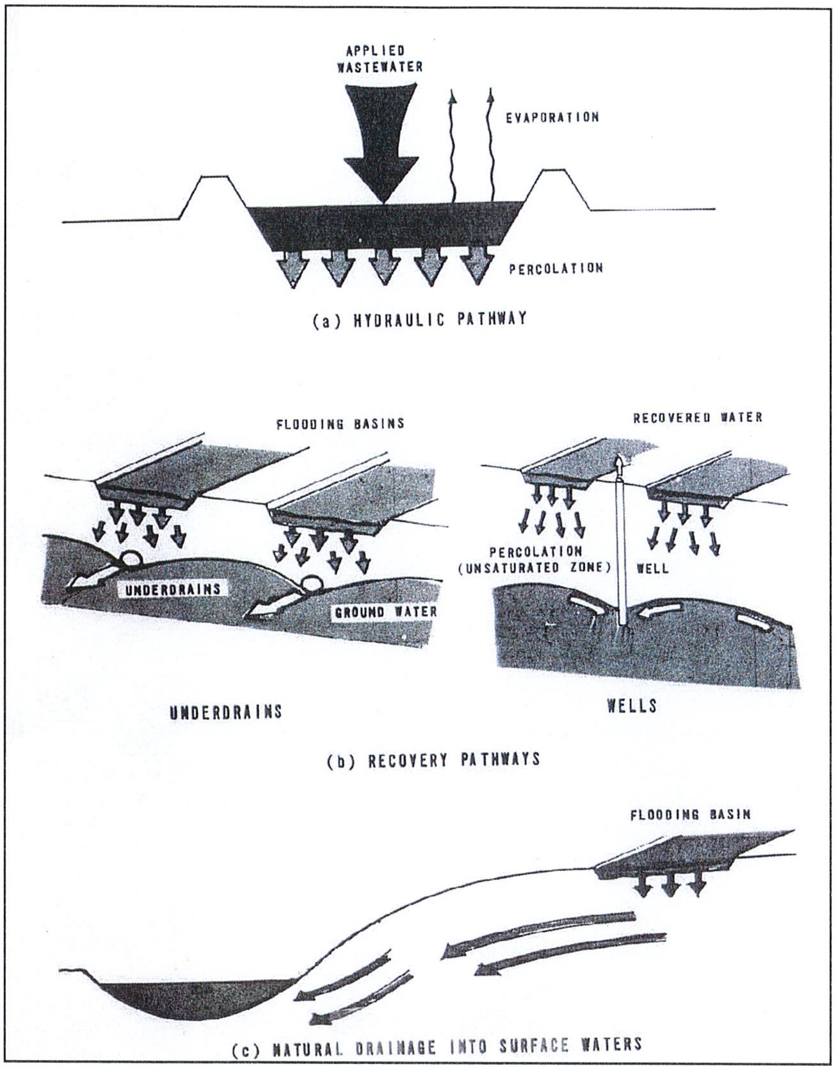

Figure 1-3. SAT Hydraulic Pathways.

The purpose of a soil aquifer treatment system is to provide a receiver aquifer capable of accepting liquid intended to recharge shallow groundwater. System design and operating criteria are developed to achieve that goal. However, there are several alternatives with respect to the utilization or final fate of the treated water:

- Groundwater recharge.
- Recovery of treated water for subsequent reuse or discharge.
- Recharge of adjacent surface streams.
- Seasonal storage of treated water beneath the site with seasonal recovery for agriculture.

The recovery and reuse of the treated SAT effluent is particularly attractive in dry areas in arid regions and studies in Arizona, California, and Israel (Idelovich, 1981) have demonstrated that the recovery of the treated water may be suitable for unrestricted irrigation on any type of crop. Groundwater recharge may also be attractive, but special attention is required for nitrogen if drinking water aquifers are involved. Unless special measures (described in Chapter 10) are employed, it is unlikely that drinking water levels for nitrate nitrogen (10 mg/L as N) can be routinely attained immediately beneath the application zone with typical municipal wastewaters. If special measures are not employed, there must then be sufficient mixing and dispersion with the native groundwater prior to the downgradient extraction points. In the more humid regions neither recovery nor reuse are typically considered. Examples of SAT include the Lake George, NY, system operating since 1939, the Calumet, MI, site operating since 1888, and the Hollister, CA, system operating since 1946 (US EPA., 1978).

1.7. Limiting Design Parameter Concept

The design of all land treatment systems, wetlands, and similar processes is based on the *Limiting Design Parameter* (LDP) concept (Crites et al., 2000). The LDP is the factor or the parameter, which controls the design and establishes the required size and loadings for a particular system. If a system is designed for the LDP it will then function successfully for all other less-limiting parameters of concern. Detailed discussions on the interactions in land treatment systems with the major wastewater constituents can be found in Chapter 2. Experience has shown that the LDP for systems that depend on significant infiltration, such as SR and SAT, is either the hydraulic capacity of the soil or the ability to remove nitrogen to the specified level, when typical municipal wastewaters are applied. Whichever of these two parameters requires the largest treatment area controls design as the LDP, and the system should then satisfy all other performance requirements. Overland flow, as a discharging system, will have an LDP which depends on the site-specific discharge limits, and the parameter which requires the largest treatment area controls the design.

1.8. Guide to Intended Use of Manual

The first chapter introduces the processes and the concept of limiting design parameter. In Chapter 2 all of the wastewater constituents of concern are discussed along with their fate in land treatment systems and the removal mechanisms. In Chapter 3 the movement of water through soil and groundwater is discussed including equations and physical test methods and procedures. In Chapter 4 the vegetation used in land treatment, the nutrient uptake and sensitivity to wastewater constituents, and management are described.

Planning guidance is provided in Chapter 5 including site selection procedures. Preapplication treatment and storage guidance is presented in Chapter 6 and wastewater distribution systems are introduced in Chapter 7. The process design chapters are 8, 9, and 10 covering slow rate, overland flow, and soil aquifer treatment, respectively. Equations and procedures are presented along with a brief case study of each process.

Much design and research activity in recent years has focused on industrial wastewater. In Chapter 11, the unique aspects of treating high-strength wastewater from food processors and other sources are discussed. Guidance on land application of biosolids can be found in Crites and Tchobanoglous (1998) and US EPA (1995).

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Recommendation & SWOT Form

RECOMMENDATION SUMMARY

Allow Gravel Backfill as Substitute for a Structural Lining When Converting a Cesspool to Seepage Pit

Where an existing cesspool proposed for conversion does not have a structural lining that meets the requirements for a seepage pit, clean aggregate backfill may be used in lieu of a structural lining, provided that the resulting effective storage/void volume exceeds the effective volume of a new absorption bed designed for the same design flow under subchapter 3.

For a gravel filled seepage pit, backfill the entire pit with aggregate. The applicant shall ensure that each pit has a breather conductor pipe that consists of a perforated pipe at least 4 inches in diameter, placed vertically within the backfill of the pit. The pipe shall extend from the bottom of the pit to within 12 inches below ground level.

INTERNAL FACTORS

STRENGTHS +	WEAKNESSES –
• Reduces collapse/safety risk by eliminating unlined void space with aggregate backfill • Will lower conversion costs and increase upgrade participation. • Supports difficult sites where new absorption beds are impractical due to small lots, rock, slopes, or access limits. • Uses precedent from Arizona's gravel-filled seepage pit rule. • Aggregate may provide additional treatment	• "No reports of failure" depends on complaint/reporting history, which may be incomplete • Gravel filled pits may be harder to inspect than newly constructed disposal systems.

EXTERNAL FACTORS

OPPORTUNITIES +	THREATS –
• Accelerates cesspool upgrades by creating a lower-cost compliance option. • Helps low- and moderate-income homeowners where full replacement is unaffordable. • Gives DOH a practical tool for dense, rocky, coastal, or constrained lots.	• May change the hydraulics of the existing cesspool and affect infiltration performance • Seepage pits are more likely to affect groundwater quality than leach fields

ADDITIONAL INFORMATION

Arizona Administrative Code
https://apps.azsos.gov/public_services/title_18/18-09.pdf

"For a gravel filled seepage pit, backfill the entire pit with aggregate. The applicant shall ensure that each pit has a breather conductor pipe that consists of a perforated pipe at least 4 inches in diameter, placed vertically within the backfill of the pit. The pipe shall extend from the bottom of the pit to within 12 inches below ground level;

Notes:
[1] If unequal trench lengths are used, proportional distribution of wastewater is required.
[2] For more than 24 inches, Standard Dimensional Ratio 35 or equivalent strength pipe is required.
[3] The effective depth is the distance between the bottom of the disposal pipe and the bottom of the trench bed.

d. The applicant may substitute clean, durable, crushed, and washed recycled concrete for aggregate if noted in design documents and the trench absorption area calculation excludes the trench bottom.

3. Beds. An applicant shall:
   a. If a bed is installed, use the soil absorption rate specified in R18-9-A312(D) for "SAR, Bed. The applicant may, in computing the bed bottom absorption area, include the bed bottom and the perimeter sidewall area not more than 36 inches below the disposal pipe;
   b. Comply with the following design criteria for beds:

Gravity Beds	Minimum	Maximum
1. Number of disposal pipes	2	No Maximum
2. Length of bed	No Minimum	100 feet
3. Distance between disposal pipes	4 feet	6 feet
4. Spacing of beds measured between nearest sidewalls	2 times effective depth[1] or 5 feet, whichever is greater	No Maximum
5. Width of bed	10 feet	12 feet
6. Distance from disposal pipe to sidewall	3 feet	3 feet
7. Depth of cover over disposal pipe	9 inches	14 inches
8. Thickness of aggregate material under disposal pipe	12 inches	No Maximum
9. Thickness of aggregate material over disposal pipe	2 inches	2 inches
10. Slope of disposal pipe	Level	Level
11. Disposal pipe diameter	3 inches	4 inches

Note:
[1] The effective depth is the distance between the bottom of the disposal pipe and the bottom of the bed.

4. Chamber technology. An applicant shall:
   a. Calculate an effective chamber absorption area to size the disposal works area and determine the number of chambers needed. The effective absorption area of each chamber is calculated as follows:
      $A = (1.8 \times B \times L) + (2 \times V \times L)$
      i. "A" is the effective absorption area of each chamber,
      ii. "B" is the exterior width of the bottom of the chamber,
      iii. "V" is the vertical height of the louvered sidewall of the chamber, and
      iv. "L" is the length of the chamber;
   b. Calculate the disposal works size and number of chambers from the effective absorption area of each chamber and the soil absorption rates specified in R18-9-A312(D);
   c. Ensure that the sidewall of the chamber provides at least 35 percent open area for sidewall credit and that the design and construction minimizes the movement of fines into the chamber area. The applicant shall not use filter fabric or geotextile against the sidewall openings.

5. Seepage pits. If allowed by R18-9-A311(B)(1), the applicant shall:
   a. Design a seepage pit to comply with R18-9-A312(E)(1) for minimum vertical separation distance;
   b. Ensure that multiple seepage pit installations are served through a distribution box approved by the Department or connected in series with a watertight connection laid on undisturbed or compacted soil. The applicant shall ensure that the outlet from the pit has a sanitary tee with the vertical leg extending at least 12 inches below the inlet;
   c. Ensure that each seepage pit is circular and has an excavated diameter of 4 to 6 feet. If multiple seepage pits are installed, ensure that the minimum spacing between seepage pit sidewalls is 12 feet or three times the diameter of the seepage pit, whichever is greater. The applicant may use the alternative design procedure specified in R18-9-A312(G) for a proposed seepage pit more than 6 feet in diameter;
   d. For a gravel filled seepage pit, backfill the entire pit with aggregate. The applicant shall ensure that each pit has a breather conductor pipe that consists of a perforated pipe at least 4 inches in diameter, placed vertically within the backfill of the pit. The pipe shall extend from the bottom of the pit to within 12 inches below ground level;
   e. For a lined, hollow seepage pit, lay a concrete liner or a liner of a different protective material in the pit on a firm foundation and fill excavation voids behind the liner with at least 9 inches of aggregate;
   f. For the cover of a lined seepage pit, use an approved one or two piece reinforced concrete slab with a minimum compressive strength of 2500 pounds per square inch. The applicant shall ensure that the cover:
      i. Is at least 5 inches thick and designed to support an earth load of at least 400 pounds per square foot;
      ii. Has a 12-inch square or diameter minimum access hole with a plug or cap that is coated on the underside with an protective bituminous seal, constructed of concrete with 15 percent to 18 percent fly ash content, or made of other nonpermeable protective material; and
      iii. Has a 4 inch or larger inspection pipe placed vertically not more than 6 inches below ground level;
   g. Ensure that the top of the seepage pit cover is 4 to 18 inches below the surface of the ground;

Recommendation & SWOT Form

RECOMMENDATION SUMMARY

Allow Reduction in Leachfield Area when Greywater is Diverted and Otherwise Disposed

When greywater is otherwise disposed in accordance with this chapter or the 2002 Guidelines for the Reuse of Gray Water, the sizing of the remaining blackwater disposal system may be reduced in accordance with Table I.

Sewage sources entering the graywater reuse system or combined reuse system	Potential percent reduction to the blackwater disposal system
Clothes-washing machine only	20
Showers, bathtubs, hand-washing lavatories, and sinks that are not used for the disposal of hazardous or toxic ingredients	30
Clothes-washing machines, showers, bathtubs, hand-washing lavatories, and sinks that are not used for the disposal of hazardous or toxic ingredients	50

Unless further treatment is otherwise required under this chapter, all blackwater shall receive primary treatment or equivalent prior to discharge to the blackwater disposal system. For purposes of this subsection, "primary treatment or equivalent" may include treatment, separation, or diversion of solids prior to discharge. Such a system shall be approved under §11-62-35 having undergone performance testing under comparable conditions and demonstrating a five-day biochemical oxygen demand (BOD_5) effluent concentration not greater than 140 mg/L or a five-day BOD_5 removal efficiency greater than 80 percent.

The reduced blackwater disposal system is not sized to accommodate graywater. Therefore, there shall not be any physical connection between the graywater system and any part of the OSDS without authorization from the HDOH Wastewater Branch.

INTERNAL FACTORS

STRENGTHS +	WEAKNESSES –
• Greywater disposal/reuse is less restricted than blackwater, opening up other disposal pathways • Will halve the size of evapotranspiration systems used to protect groundwater tables from blackwater • Will reduce the cost of cesspool upgrades. • Accelerates the path toward the 3,000 cesspools/year target.	• Requires replumbing homes • Only possible on homes that can source separate

EXTERNAL FACTORS

OPPORTUNITIES +	THREATS –
• Reduces construction costs • Makes cesspool conversion feasible for homeowners with small lots who currently cannot meet leachfield sizing requirements. • Supports landowners with limited financial and spatial resources	• Less redundancy for party style loading events

ADDITIONAL INFORMATION

TCEQ Texas Regulations (Attached Below)

- https://texas-sos.appianportalsgov.com/rules-and-meetings?$locale=en_US&interface=VIEW_TAC_SUMMARY&queryAsDate=05%2F03%2F2026&recordId=181771
- Kept: Reduces design flows by 50% when all graywater is diverted
- Revise: Require blackwater to be treated to 140mg/L BOD.
    - Changed to: Require blackwater to be treated to 140mg/L BOD or 80% BOD removal.
    - Added percent removal to account for more concentrated flows
        - Even with mixed wastewater septic tanks don't always achieve 140 mg/L.
    - Effluent leaving a conventional septic tank (one not equipped with an effluent filter) typically has concentration of 150 to 250 mg/L for BOD5, 40 to 140 mg/L for TSS and 20-50 mg/L for FOG (Crites and Tchobanoglous, 1998). Septic tank effluent from a tank with an effluent filter has different characteristics from unfiltered effluent. Typical effluent concentrations from septic tanks equipped with effluent filters range from 100 to 140 mg/L for BOD5, 20 to 55 mg/L for TSS, and 10 to 20 mg/L for FOG (Crites and Tchobanoglous, 1998; Stuth, 2004). https://doh.wa.gov/sites/default/files/legacy/Documents/Pubs//337-105.pdf
    - Hawaii survey showed septic effluent 118 - 189 mg/L (Cummings and Babcock, 2012)
- Removed: Requires a 3-day storage tank for greywater
    - Hawaii greywater guidelines prohibit greywater storage

Texas TCEQ On-Site Sewage Facility Rules Compilation

§285.81. Requirements and Conditions for Potentially Reducing the Size of an OSSF Disposal System for a Single Family Residence with a Graywater Reuse System or a Combined Reuse System.

(a) Graywater reuse systems and combined reuse systems are authorized in Chapter 210, Subchapter F of this title (relating to Use of Graywater and Alternative Onsite Water) without a permit, without the submission of planning materials, and without meeting the requirements and conditions of this section. However, a homeowner requesting an on-site sewage facility (OSSF) disposal system smaller than required in §285.33 of this title (relating to Criteria for Effluent Disposal Systems) must obtain a permit and meet the requirements and conditions of this section. Additionally, the potential reduction of the OSSF disposal system in this section only applies to single family residence with a graywater reuse or a combined reuse system. OSSF disposal systems for non-single family residences with a graywater reuse or a combined reuse system shall not have an OSSF disposal system reduction.

(b) Effluent disposal system sizing. If the graywater reuse system or combined reuse system serving the single family residence is in compliance with Chapter 210, Subchapter F of this title, the effluent disposal system required in §285.33 of this title may be reduced in accordance with Table I in Figure: 30 TAC §285.81(b) of this section.

Table I. Potential Percent Reduction

Sewage sources entering the graywater reuse system or combined reuse system	Potential percent reduction to the effluent disposal system required in §285.33 of this title
Clothes-washing machine only	20
Showers, bathtubs, hand-washing lavatories, and sinks that are not used for the disposal of hazardous or toxic ingredients	30
Clothes-washing machines, showers, bathtubs, hand-washing lavatories, and sinks that are not used for the disposal of hazardous or toxic ingredients	50

(c) Verification of plumbing entering the OSSF. A licensed master plumber shall evaluate and document, after the plumbing is installed, which sewage sources will be entering the OSSF. The documentation must be provided to the OSSF permitting authority.

(d) Increased wastewater strength. When graywater is removed from the total sewage stream, the remaining sewage stream entering the OSSF will have a higher organic strength. The resulting increase in sewage strength shall be determined in accordance with Table II in Figure: 30 TAC §285.81(d) of this section.

Table II. Adjusted Organic Strength

Sewage sources entering a graywater reuse system or a combined reuse system	Five-day Biochemical Oxygen Demand (BOD_5) design strength for sewage entering on-site sewage facilities milligrams per liter (mg/l)
Clothes-washing machine only	375
Showers, bathtubs, hand-washing lavatories, and sinks that are not used for the disposal of hazardous or toxic ingredients	430
Clothes-washing machines,	

Sewage sources entering a graywater reuse system or a combined reuse system	Five-day Biochemical Oxygen Demand (BOD_5) design strength for sewage entering on-site sewage facilities milligrams per liter (mg/l)
showers, bathtubs, hand-washing lavatories, and sinks that are not used for the disposal of hazardous or toxic ingredients	600

(e) If the effluent disposal system does not require secondary treatment, either a professional sanitarian or a professional engineer shall demonstrate with effective treatment design and supporting calculations that the proposed treatment system will reduce the effluent quality down to 140 milligrams per liter five-day biochemical oxygen demand (mg/l BOD_5) prior to entering the effluent disposal system.

(f) If the effluent disposal system requires secondary treatment, then a professional engineer shall demonstrate with effective treatment design and supporting calculations that the effluent quality meets the levels outlined in §285.32(e) of this title (relating to Criteria for Sewage Treatment Systems).

(g) If the effluent disposal system is reduced based on the presence of a graywater reuse system or a combined reuse system, a reserve area equivalent to the reduced area shall be shown to be available for future construction of a disposal field should the graywater reuse system or combined reuse system be abandoned at a later date. The reserve area shall meet the setbacks required by §285.91(10) of this title (relating to Tables) and shall not be used for any surface improvements.

(h) Graywater or alternative onsite water, as defined in Chapter 210, Subchapter F of this title, shall not be applied to the surface of a reduced effluent disposal system.

(i) The reduced effluent disposal system is not sized to accommodate graywater. Therefore, there shall not be any physical connection between the graywater reuse system or the combined reuse system and any part of the OSSF without authorization from the OSSF permitting authority.

(j) In addition to the requirements outlined in Chapter 210, Subchapter F of this title, a graywater reuse system or a combined reuse system, used in association with a reduced effluent disposal system under this section, must have a storage tank capable of storing a volume of three days of graywater. The storage is necessary to prevent application of graywater during periods when the landscape is saturated.

(k) Before a license to operate is issued for a reduced effluent disposal system allowed under this section, an affidavit shall be properly filed and recorded in the deed records of the county. The affidavit must include the owner's full name, the legal description of the property, a statement that the permit for the OSSF is transferred to the new owner upon transfer of the property, a statement that the effluent disposal system is reduced due to the presence of a graywater reuse system or a combined reuse system, a statement that the specified reserve area shall not contain surface improvements, and a statement that the graywater reuse system or combined reuse system cannot be connected to the OSSF without obtaining a permit from the OSSF permitting authority.

(l) If the property owner of a graywater reuse system or a combined reuse system on a property served by a reduced effluent disposal system is convicted under or found in violation of any statute related to graywater or public health nuisance, and the system is not properly repaired in a timely manner, the OSSF permitting authority may require the graywater to be connected to the OSSF. If the OSSF permitting authority requires the graywater to be connected to the OSSF, the effluent disposal system must be expanded to accommodate all the flow required in §285.91(3) of this title, and the expansion must be permitted by the OSSF permitting authority. Adopted December 7, 2016 Effective December 29, 2016

Once completed, please email this form to ***doh.wwb.cesspool@doh.hawaii.gov***.

Recommendation & SWOT Form

RECOMMENDATION SUMMARY

Allow Cesspool in High Groundwater to be Converted to a Seepage Pit for Greywater Only

A cesspool that (1) has a structural lining, (2) passes an injection test, and (3) meets setback requirements, but (4) makes contact with the groundwater table, may be converted to a seepage pit for graywater disposal only, provided that blackwater is separately treated and disposed of through a system meeting the requirements of this chapter.

INTERNAL FACTORS

STRENGTHS +	WEAKNESSES –
• Greywater adds little to no bacteria and nitrogen loading to the groundwater table • If it overflows during a storm event, it's still just greywater. • Greywater represents 50-70% of the wastewater stream • Reduces footprint by 50% to make more cesspool conversions possible • Accelerates the path toward the 3,000 cesspools/year target.	• Requires replumbing homes • Only possible on homes that can source separate • Requires more complicated injection test in cesspool with standing water

EXTERNAL FACTORS

OPPORTUNITIES +	THREATS –
• Reduces construction costs • Makes cesspool conversion feasible for homeowners with small lots who currently cannot meet leachfield sizing requirements. • Supports landowners with limited financial and spatial resources • Reduces flow and BOD loading on cesspool, potentially improving infiltration	• Homeowners could redirect blackwater flows back to cesspool to reduce treatment costs or as a result of a failing leach field. • Greywater backups possible during high water events

ADDITIONAL INFORMATION

Once completed, please email this form to ***doh.wwb.cesspool@doh.hawaii.gov****.*