Rationale for the Proposed Revisions

To Department of Health

Administrative Rules,

Title 11, Chapter 62

Wastewater Systems

Department of Health

Environmental Management Division

Wastewater Branch

Honolulu, Hawai`i

August 2014
(Revised November 2014)

Background:

The Department of Health (DOH) has statutory authority to adopt rules that it deems necessary for the public health and safety respecting:

(1) **Nuisances**, foul or noxious odors, gases, vapors, waters in which mosquitoes breed or may breed, **sources of filth, and causes of sickness or disease**, within the respective districts of the State, and on board any vessel;

(3) Location, air space, ventilation, **sanitation, drainage, sewage disposal, and other health conditions** of buildings, courts, construction projects, excavations, pools, watercourses, areas, and alleys;

(4) Privy vaults and **cesspools**;

Hawai`i Revised Statutes (HRS) §§321-11. DOH also has statutory rulemaking authority under HRS §342D-4, which states:

In addition to any other power or duty prescribed by law and in this chapter, the director shall prevent, control, and abate water pollution in the State and **may control all management practices for domestic sewage, sewage sludge, and recycled water, whether or not the practices cause water pollution.** In the discharge of this duty, the director may adopt rules pursuant to chapter 91 necessary for the purposes of this chapter.

Hawai`i's administrative rules for wastewater systems date back to at least December 1988. They were revised in December 2004.

Proposed Revisions:
The Department of Health (DOH) is proposing to revise Hawai`i Administrative Rules (HAR), Title 11, Chapter 62, Wastewater Systems (hereinafter referred to as HAR 11-62), with the following changes, among other things:

1. Prohibiting the installation of new cesspools in all areas of the State;

2. Requiring sewer connections or upgrades of some existing cesspools within 365 days after sale of property. The DOH is proposing to target the cesspools locations that most affect human health and water quality: those near a public drinking water well, and those within 750 feet of the shoreline, a perennial stream or a marsh. 750 feet is appropriate given the data on average groundwater time of travel and die-off of longer lived pathogens such as salmonella and fecal strep. DOH data indicate that there are approximately 2,551 cesspools in a Zone B contribution area near a public drinking water well, 6,896 within 750 feet of the shoreline, 11,536 within 750 feet of a perennial stream, and 657 within 750 feet of a marsh, for a total of 19,793 cesspools that would need to upgrade after sale. **This represents a 78% reduction from the original proposed requirement that all of the approximately 88,000 cesspools statewide must upgrade on sale**. DOH

also may exempt lots for which an upgrade is not feasible, for example due to small size, steep slope or difficult access. DOH will offer a program of zero interest loans through its state revolving loan funds for homeowners who are required to upgrade cesspools.

3. Prohibiting individual wastewater systems (IWSs) for developments with greater than 15 subdivided lots or 15 dwelling units unless the subdivision's lots average in size more than one acre per lot.

4. Changing definitions in §11-62-01 to clarify the meaning of terms used in the rules and delete terms no longer included;

5. Eliminating the "general permit" and clarifying that the Wastewater Branch of DOH issues construction approvals and approvals to use, not permits;

6. Adding a requirement that effluent testing for private wastewater treatment plants shall be performed by an independent laboratory;

7. Clarifying when a building modification may trigger a requirement to upgrade a system;

8. Consolidating requirements for non-domestic wastewater;

9. Streamlining by allowing engineers to submit certification statements for treatment works;

10. Requiring new facilities greater than 100,000 gallons per day to dewater their sludge;

11. Restricting the use of seepage pits as soil absorption systems;

12. Adding reporting requirements for wastewater treatment works;

13. Updating graywater system rules to be consistent with State Plumbing Code;

14. Requiring that septic tank manholes be brought to grade and secured for better maintenance access;

15. Clarifying requirements for operators of aerobic treatment units;

16. Add minimum contract requirements for the maintenance of an aerobic treatment unit and its disposal system;

17. Add restrictions to prevent the direct discharge of effluent from an aerobic treatment unit to groundwater;

18. Deleting requirement that pumpers submit quarterly reports;

19. Revising provisions of field citations;

20. Revising spill reporting requirements;

21. Revising the flow per capita requirements for restaurants, barber shops and beauty salons;

22. Clarifying that the IWS setback is from the shoreline certification, not the vegetation; and

23. Revising the Molybdenum pollutant ceiling from 15 mg/kg to 25 mg/kg.

Rationale for prohibiting new cesspools and requiring upgrades of existing cesspools on sale of property in locations that most affect human health and water quality .

Sewers and septic systems treat wastewater before discharging it to the environment, but cesspools generally do not.[1] Cesspools are little more than holes in the ground that discharge raw, untreated human waste directly into the subsoil, where it can spread and contaminate ground water, drinking water sources, streams and the ocean by releasing disease-causing pathogens and other harmful substances. The effluent from cesspools generally contains much higher concentrations of nitrogen, phosphorus, and fecal coliform bacteria than that of septic system effluent subjected to soil treatment.[2] **In order to protect public health and the environment, new cesspools should be prohibited, and existing cesspools should be gradually phased out through mandatory upgrading to sewer or septic systems whenever property is sold in locations that most affect human health and water quality. Please refer to Appendix A for DOH's rationale for proposed setback zones to require point-of-sale upgrades of cesspools.**

Cesspool risks to human health and the environment.

Cesspools present risks to human health and the environment on every major island in the State of Hawai`i. There are approximately 88,000 cesspools currently in the State, with nearly 50,000 located on the Big Island, almost 14,000 on Kauai, over 12,000 on Maui, over 11,000 on Oahu and over 1,400 on Molokai. Each year an additional 800 new cesspools are approved for construction.

[1] Any treatment that cesspool effluent receives is incidental, not by design, very site specific, and not practical to include in the regulatory process.

[2] An evaluation done by the Water Resources Research Center of the University of Hawai`i concluded that the effluent from cesspools contains concentrations about 15 to 90 times higher for nitrogen, 5 to 20 times higher for phosphorus, and 77,000 times higher for fecal coliform bacteria than that of septic system effluent subjected to soil treatment ("Onsite Wastewater Treatment Survey and Assessment – Prepared for the State of Hawaii, Department of Business, Economic Development and Tourism Office of Planning, Hawaii Coastal Zone Management Program; and the Department of Health," Water Resources Research Center, University of Hawaii and Engineering Solutions, Inc., March 2008).

Hawai`i's cesspools may release up to 55 million gallons of untreated sewage into the ground each day. Untreated wastewater contains pathogens such as bacteria, protozoa and viruses that can cause gastroenteritis, Hepatitis A, conjunctivitis, leptospirosis, salmonellosis and cholera. Pharmaceuticals in wastewater, including disruptive hormones, also may adversely affect human health and aquatic organisms. Hawai`i's cesspools also release as much as 23,700 pounds of nitrogen and nearly 6,000 pounds of phosphorus into the ground each day, which can stimulate undesirable algae growth, degrade water quality, and impact coral reefs.

Studies performed for DOH designated receptors of concern as sensitive ecosystems that can potentially be adversely affected by cesspool effluent or areas where potential human contact with cesspool contaminated waters may occur.[3] These studies considered three receptors of concern: (1) drinking water sources, (2) streams and watersheds, and (3) coastal waters. Setback zones were delineated around each receptor of concern based on either a fixed distance or a groundwater time of travel to the receptor of concern. Based on these studies, it was determined that there are approximately **87,000** cesspools that pose a risk to our water resources. The purpose of these studies was to identify the cesspools and other individual wastewater treatment systems that have the potential for adverse receptor of concern impact. The presence of a cesspool within a receptor of concern's setback zone is evaluated as having the potential for a negative impact on that receptor of concern.

Cesspool effluent can negatively impact drinking water wells by introducing biological and chemical contamination into the well's intake. Setbacks were delineated for public drinking water wells based on the groundwater time of travel to the well intake. A two-year time-of-travel setback for drinking water wells identifies those cesspools that have the potential to introduce chemical and biological contamination into a well. It is assumed that pathogens will not survive longer than 2 years, but chemical contamination can persist much longer. There are approximately 2,551 cesspools that are located in areas within a 2 year time of travel to the intake of a public drinking water well.

Cesspool effluent entering a stream or a wetland can introduce pathogens and increase the nutrient loads resulting in excessive plant growth. A 750 foot setback from the stream channel or delineated wetland boundary identifies those cesspools with the potential to introduce both pathogen and nutrient contamination to a water body. Perennial streams and wetlands depend on discharge of groundwater to the surface water to support stream flow during periods with no or little rainfall. Cesspools located within a perennial watershed or near a wetland can increase the nutrient load of the streams within that watershed. There are approximately 12,019 cesspools that are located within 750 feet of perennial stream channels or wetland boundaries throughout the State.

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[3]"Human and Environmental Risk Ranking of Onsite Sewage Disposal Systems on Oahu, Hawaii," Robert B. Whittier of DOH and Aly I. El-Kadi of University of Hawai`i at Manoa, December 2009.

"Human Health and Environmental Risk Ranking of On-site Sewage Disposal Systems For the Hawaiian Islands of Kauai, Maui, Molokai and Hawai`i," Robert B. Whittier of DOH and Aly I. El-Kadi of University of Hawai`i at Manoa, June 2014.

As with streams, cesspool effluent can introduce pathogens and nutrients to the coastal waters. The 750 foot coastal setback identifies those cesspools with the highest potential to introduce pathogen and nutrient contamination into the coastal waters. There are approximately 6,896 cesspools that are located within 750 feet of the shoreline . **DOH is targeting for upgrading on sale a total of approximately 19,793 cesspools statewide.**

The studies indicate that Hawai`i Island and Kauai have the most high risk areas for water quality degradation from on-site disposal systems:

- Hawai`i Island: Hilo and the Hamakua coast have elevated risk of harm to coastal waters and drinking water. Kapoho, Puako, and Waimea are also areas with elevated risk.

- Kauai: in Wailua/Kapaa there is a dense clustering of on-site systems near perennial streams and the shoreline, with higher risk of harm. The south shore from Poipu to Hanapepe, and Nawiliwili also have high risks.

- Maui has elevated risks in coastal zones in Kaanapali, Kihei to Makena, Waihee/Waiehu and the coastal area fronting the northwest slope of Haleakala.

- On Oahu, Koolauloa, Pupukea-Sunset Beach, Kahaluu, and Waialua are the areas with highest risk.

- On Molokai, there is elevated risk near the coast fronting the unsewered areas near Kaunakakai.

<u>Last in the Nation</u>

Hawai`i is the only state in the US that still allows construction of new cesspools. Hawai`i has fallen behind all other states in eliminating cesspool pollution. Even Rhode Island, which has the second largest number of cesspools in the nation (25,000), banned the construction of new cesspools ***46 years ago*** in 1968. Rhode Island's Cesspool Act of 2007 mandates replacement of cesspools that are located within 200 feet of shoreline or wells.

New Jersey, requires cesspools to be upgraded to septic systems whenever property ownership changes. Requiring cesspool upgrades when property is sold makes sense because the cost of the upgrade can be shared between the buyer and seller at a time when sellers, with proceeds from the sale, are better able to afford upgrading costs and buyers, who are usually borrowing already for their purchase, may obtain additional financing for eliminating a cesspool.

Loss of Federal funds

Federal agencies have warned that Hawai`i needs to control pollution from on-site sewage disposal systems such as cesspools in order to continue to qualify for federal financial assistance under the Coastal Nonpoint Pollution Control Program.

Alternative to cesspools

When connection to a sewer system is not practical, a septic system should be installed to contain and treat wastewater before disposal. A septic system allows solids to settle in a tank where anaerobic organisms slowly digest organic solids and allow liquids to flow into a shallow absorption bed. A proper soil bed has a biologically active area in the first three feet of the soil layer where oxygen can support microorganism activity that neutralizes pathogens. The studies indicate that soil treatment is very effective in removing bacteria (fecal coliform was only 13 colony forming units (cfu) per 100 milliliters (mL) in leachate after soil treatment versus 1,000,000 cfu/mL for cesspools.) Septic systems with soil treatment also greatly reduce the amount of nitrogen and phosphorus compared to cesspools. An evaluation using the data from the Whittier and El-Kadi studies indicates that replacing cesspools with septic systems with soil treatment would reduce nitrogen discharges by more than 90% and phosphorus by more than 80%.

In contrast, when waste is delivered directly into subsoil that is too coarse or lacks oxygen, as usually happens with cesspools, biological activity to treat wastewater cannot be supported. Coarse, porous soil conditions and fractured lava or lava tubes are a problem particularly on the island of Hawai`i (Big Island), where the majority of the cesspools in the State are located. Porous rock cannot effectively filter wastewater but instead allows easy flow within tubes and caves, as documented by the Hawai`i Chapter of the National Speleological Society. As described above, there is elevated risk of contamination of drinking water sources, streams and watersheds, and coastal waters from cesspools.

Conclusion

There are approximately **87,000** cesspools in Hawai`i that pose a potential risk to our water resources. Cesspools discharge untreated waste into the ground, causing risks to human health through drinking water sources, streams and near-shore waters. These risks will increase with the growing population if Hawai`i does not stop allowing the installation of new cesspools, and will continue if Hawai`i does not phase out cesspools. **The Department of Health seeks to protect public health and preserve our natural resources by proposing in these rules that no new cesspools be permitted and approximately 19,793 existing cesspools be upgraded to sewers or septic systems upon the sale of a property in locations that most affect human health and water quality.**

Rationale for other changes

The table below lists other changes proposed by DOH with the rationales for those changes:

Sections proposed for change	Rationales for proposed changes for HAR, Chapter 11-62
§11-62-01	Amend the preamble to reflect the present goals and objectives for the treatment and disposal of wastewater in the State of Hawai`i. Amendment explains a major new initiative, to prohibit the construction of new cesspools in the State. This proposed initiative will help protect our groundwater, drinking water and surface waters.
§11-62-02(c)	Change would clarify the relationship between the chapter 11-62 rules and the provisions in county codes, rules or ordinances.
§11-62-03	To make the definition of "Bedroom" easier to understand. Current definition is difficult to interpret. "Construction" is referenced in the rules but is not defined; a definition of the term would lead to greater consistency in program implementation. Deleting the definition of "CWDA maps" would be appropriate if new cesspools are prohibited because the maps then would not be needed. The definition of "General Permit" is no longer needed. The General Permit Program was terminated because the Wastewater Branch has decided not to seek delegation for the Wastewater Sludge Program with EPA. The General Permit was required as a condition of seeking delegation. Propose to revise the definition of "Graywater" to be consistent with HRS section 342D-1. Change the term defined from "Individual wastewater system" to "Individual wastewater systems". Clarify the definition by listing the common types of systems. Would add the definition of "Large capacity cesspool" for information purposes and make it consistent with the definition used by EPA, which regulates large capacity cesspools. Would delete the definition of "Notice of Intent". This definition applies to the General Permit Program that has been terminated by the Wastewater Branch. Would add the definition of "Public water systems" because it is referenced in the appendices and to ensure consistency with program implementation. Would update the rules' reference to the "Reuse Guidelines" to the latest version of the document. Would clarify the definition of "Seepage pit" to make it easier to understand. The current definition is unclear. Revised definition based on public comment. Would add the definition of "Septic system" to clarify the meaning; the term is used in various areas of the chapter but not defined.

Sections proposed for change	Rationales for proposed changes for HAR, Chapter 11-62
	Would clarify the definition of "Septic tank" to make it easier to understand. Current definition is difficult to interpret. Would update the definition of "Standard methods" to reference the latest edition of the publication. Would clarify the definition of "Subsurface disposal system" to make it easier to understand, read and apply. Removed injection well from the definition of a subsurface disposal system.
§11-62-05(a) and (b)	Would clarify that all areas of the State are critical wastewater disposal areas (CWDA) and are not appropriate for construction of new cesspools.
§11-62-06(a and b)	Would correct grammar.
§11-62-06(d)	Would relocate §11-62-06(d) to consolidate requirements for non-domestic wastewater under new §11-62-07.
§11-62-06(e)	Would renumber as Section 11-62-06(d), delete reference to permit and add "Department approval to use." The general permit program was terminated. The Department issues approvals to use and not general permits. Would add requirement that effluent testing shall be performed by an independent lab for quality assurance and quality control purposes.
§11-62-06(n)	Would renumber as Section 11-62-06(m). Would revise this section to clarify when a wastewater system should be upgraded. These changes are being proposed to protect groundwater and surface waters from the discharge of wastewater from failing systems. Would clarify that an owner has to satisfactorily address all of the deficiencies. The current language could potentially allow an owner to address one of many deficiencies.
§11-62-06(q)	Would renumber as Section 11-62-06(p), delete reference to permit, and add "Department approval to use". The general permit program was terminated. The Department issues approvals to use and not general permits.
§11-62-06(s)	Would add a new section (§11-62-06(r)) requiring upgrade of existing cesspools in locations that most affect human health and water quality upon the sale of home to protect groundwater and surface water from cesspool pollution. As explained in the more detailed rationale regarding cesspools, sale is a good time financially for buyers and sellers to afford upgrade costs.
§11-62-07	Renumbered §11-62-07.1 to §11-62-07. Relocated §11-62-06(c) under this section to consolidate the requirements for non-domestic wastewater.
§11-62-08(d)(1)	Would clarify fencing requirement to prevent the public from gaining access to wastewater systems for safety and liability reasons.
§11-62-23.1(f)	Would require the owner's engineer instead of the owner to submit the one year certification statement based on the results and actual sampling of the treatment works. This will make it easier for the owners to allow their engineers to submit this information directly to the Department. This helps to streamline the process.

Sections proposed for change	Rationales for proposed changes for HAR, Chapter 11-62
§11-62-24(b)(1)	Would add a new section to require new facilities > 100,000 gpd to have solids dewatering systems because facilities of this size should be capable of dewatering their sludge for disposal to a landfill, not rely on the Counties to process their wastewater sludge.
§11-62-25(b)	Would restrict the use of seepage pits as soil absorption systems. Seepage pits should not be a way to avoid the injection well permitting process.
§11-62-25(d)	Included injection wells in this section there was a change made to the definition of "Surface Disposal System" as a result of a public comment.
§11-62-26	Would add reporting requirements applicable to treatment works. This will assist the program with evaluating the performance of the wastewater treatment works. These requirements were provided in DOH's general permits; however, the permit program has since been terminated. Would exclude the requirement for the composite sampling of wastewater ponds. Effluent flows from ponds are not continuous, making it difficult to obtain a representative composite sample. Would delete the requirement of using the design flows and replace it with average daily flows throughout this section when performing effluent sampling. New plants often take time to achieve operation at design flow. Effluent testing should be based on average daily flows. Would clarify the need to maintain a log book at the wastewater treatment works, to help ensure that proper operation and maintenance is being performed at the facility.
§11-62-26(c)(2)(ii)	Would delete requirement to monitor the control of chlorine dosage. DOH determined that this information was not necessary when evaluating the performance of the chlorination system.
§11-62-26(e), (f) and (g)	Would update the turbidity, dosage and transmittance requirements for R-1 based on the 2003 National Water Research Institute (NWRI) standards.
§11-62-26(h)	Would add requirement that the new acceptable design requirements and commissioning of new UV disinfection systems shall comply with the 2003 NWRI UV disinfection guidelines.
§11-62-27(b)	Would make grammatical change.
§11-62-31.1(a)(1)(B)	Revising section such that no IWSs shall be allowed for any developments exceeding 15 subdivided lots, rather than the current exemption (exceeding 50 lots), unless the development averages more than one acre per lot, in which case IWSs are allowed rather than centralized treatment (the existing exemption for >1 acre/lot continues.) This proposal will help to protect groundwater and surface waters and parallels the requirements for commercial facilities, which are required to install a wastewater treatment plant for design flows of 15,000 gallon per day. A subdivision of 15 residential lots has a design flow of 15,000 gallons per day. Requiring centralized treatment for >15 lots while continuing the exemption for development with >1 acre/lot is designed to reduce waste from the developments that would have more concentrated waste from IWSs and lower piping costs for centralized treatment than the developments with >1 acre/lot.

Sections proposed for change	Rationales for proposed changes for HAR, Chapter 11-62
§11-62-31.1(d)	Would prohibit the construction of new cesspools to protect groundwater and surface waters. See more detailed rationale for prohibiting new cesspools.
§11-62-31.1(g)	Would make this section consistent with the State Plumbing Code, which has current design standards for gray water systems.
§11-62-33.1(a)(3)	Would delete reference to the Ten State Standards and update the current applicable IAPMO standards for septic tanks.
§11-62-33.1(a)(5)	Would add design criteria for septic tank sizing greater than 1,000 gallons per day. This is needed for septic tank systems receiving variances to allow for tanks that are sized > 1,000 gallons.
§11-62-33.1(a)(7)	Would require that manholes to septic tanks be brought to grade. The cover shall be secured to prevent unauthorized entry/opening of the tank. This revision will allow for better access to a septic tank system for maintenance.
§11-62-33.1(a)(11)	Would delete reference to "permit" and replace it with "approval to use." General permitting program terminated and permits are no longer being issued.
§11-62-33.1(b)(3)	Would add clarification for qualifications of certified operators that are authorized to maintain an aerobic treatment unit. Current requirement is vague and needs clarification.
§11-62-33.1(a)(3)	Would delete reference to the Ten State Standards and update the current applicable IAPMO standards for septic tanks.
§11-62-33.1(b)(4)	Would add section to clarify the minimum contract requirements for the maintenance of an aerobic treatment unit and its disposal system. This section is needed to ensure that proper maintenance of aerobic treatment units are performed by certified operators.
§11-62-33.1(b)(5)	Would delete reference to permittees and replace that with approved for use by the director. The general permit program was terminated. The Department issues approvals to use, not general permits.
§11-62-33.1(b)(6)	Would provide additional restrictions to prevent the direct discharge of pollutants to groundwater. A variance will be required for an aerobic treatment unit with disinfected effluent to discharge directly to groundwater. Direct discharges of aerobic treatment unit effluent to groundwater should be avoided if other disposal options are available. This revision will assist with reducing the pollutant load to groundwater sources and surface waters.
§11-62-34(d)(3)(B)	Would clarify that extended cover was not needed if concrete rings were used for seepage pit construction.
§11-62-33.1(b)(4)	Would add section to clarify the minimum contract requirements for the maintenance of an aerobic treatment unit and its disposal system. This section is needed to ensure that proper maintenance of aerobic treatment units are performed by certified operators.
§11-62-36	Would prohibit the construction of new cesspools and delete as unnecessary the design standards for new cesspools. As explained in the more detailed rationale regarding cesspools, this change would help reduce groundwater and surface water pollution.

Sections proposed for change	Rationales for proposed changes for HAR, Chapter 11-62
§11-62-37	Would clarify that DOH shall review individual wastewater systems before a building permit will be signed. .
§11-62-41 §11-62-50, §11-62-51, §11-62-54.08, §11-62-55.01, §11-62-55.02, §11-62-55.03, §11-62-55.04, §11-62-55.05, §11-62-55.06, §11-62-55.07, §11-62-55.08, §11-62-56, §11-62-57.01, §11-62-57.02, §11-62-57.03, §11-62-57.04, §11-62-58	Would remove reference to the general permit coverage, delete reference to permit, and add "Department approval to use". The general permit program was terminated. The Department issues approvals to use and not general permits.
§11-62-62(b)	Would delete the requirement that pumpers submit quarterly pumping reports to DOH. The purpose is to lessen reporting requirements for pumpers.
§11-62-82	Would clarify that the section applies to the offer to settle and settlement amounts. Would clarify applicable sections that should be cited for spill violations. Would increase amount for spills to waters to $500 for first violation and $2,000 for subsequent violations. Would double the amounts for first and subsequent spill to ground violations from $100/$250 to $200/$500, and apply those amounts as well to violations of rules for: • improper operation and maintenance, • no ATU aerobic treatment unit contract, • failing to respond to department inspection reports, • having a cesspool without a concrete cover, • not having a secured manhole cover for the cesspool, and • a collapsed cesspool. Would add a settlement amount of $1,000 for the 1st violation and $2,500 for a subsequent violation for constructing individual wastewater systems without the Department's approval to construct. This added amount should help deter any property owner from constructing illegal wastewater systems. These proposed changes will help the Department reduce groundwater and surface water pollution and protect public health and safety.
Appendix A	Would remove reference to the general permit coverage. The general permit program was terminated.

Sections proposed for change	Rationales for proposed changes for HAR, Chapter 11-62
Appendix B	Would delete appendix in its entirety because it referred to the general permit coverage. The general permit program was terminated.
Appendix C	Would rename as Appendix B. Would amend Section 6 spill protocol to require that spills of RO water > 1,000 gallons must be reported to DOH. Would revise section 4.g to require that owner/agent of private wastewater systems report spills to DOH. Would revise Spill Protocol section 8, Monitoring of State Waters. Would delete fecal coliform testing requirement and replace it with enterococci testing to be consistent with HAR, chapter 11-54, Water Quality Standards. Would delete table on page 62-C-12 because it is not very useful for program implementation.
Appendix D	Would rename as Appendix C.
Appendix E	Would delete this appendix in its entirety, consistent with proposal to prohibit cesspools Statewide. All areas of the State would be CWDAs.
Appendix F	Would rename as Appendix D. Table 1 – would add flow per capita for barber shops and beauty salons and revise the flow per capita for restaurants. These changes are necessary to clarify and reflect the present flow per capita data for these types of establishments. Table 2 – would clarify that individual wastewater systems should be sited the required distance from the shoreline certification instead of the vegetation. The shoreline certification is a better method to determine where the shoreline starts than the vegetation line, which is not very reliable. Table IV – would revise the Molybdenum pollutant ceiling from 15 mg/kg to 25 mg/kg. Studies have shown that there are no adverse effects to human health with Molybdenum at 25 mg/kg. Facilities are currently having difficult time with meeting the current standards of 15 mg/kg.
Appendix E	Renamed form A to new Appendix E.

APPENDIX A

Proposed Setback Zones to Require Point-of-Sale Upgrades of Cesspools

Costs associated with cesspool removal and upgrades make it desirable to identify those areas where the greatest environmental and health benefit can be realized. Four zones were identified as areas where cesspools pose the greatest risk to human health and environment. These zones are:

- Drinking water Zone B areas of contribution;
- 750 ft. setback from the shoreline:
- 750 ft. setback from perennial streams; and
- 750 ft. setback from wetlands.

Assessments were done for Kauai, Oahu, Molokai, Maui, and Hawaii Island that include the estimated number of cesspools in the delineated setback zones. The setback zones were mapped for Lanai, but no cesspool inventory was done for this island. Based on a conversation with John Stubbard of the Lanai Company, the vast majority of residence on this island is served by sewer and cesspools are only used for a few part-time residence in remote areas of Lanai. There was too little data are available for Niihau to do valid assessment of that island.

Potential Health and Environmental Risks From Cesspools

On-Site Wastewater Disposal Systems (OSDS) discharge effluent at the site where it is generated and potentially pose significant threats to human health and ecosystems. Pathogens in the OSDS wastewater can spread disease by contaminating drinking water sources (Novello, 2000) or by bodily contact with contaminated water (Calderon et al., 1991). Chemical contaminants in effluent can also be fatal to infants (Knobeloch et al., 2000) and many of the trace organic contaminants are found to have detrimental impact on aquatic organisms (University of Florida, no date; Milnes et al., 2006; Blazer et al. 2007; Vajda et al. 2008). Nutrients in wastewater can induce excessive algal growth in coastal and aquatic waters thereby severely degrading these environments (Hazen and Sawyer, 2009; Gilbin and Gaines, 1990; Lapointe et al., 1990). Cesspools are particularly problematic since the effluent receives no treatment prior to being discharged to the environment. The effluent discharged from cesspools can have 15 to 90 times more nitrogen and 70,000 times more bacteria than if a soil treatment process such as a leach field is utilized (WRRC and Engineering Solutions, 2009; and Whittier and El-Kadi, 2014). Upgrading cesspools to septic systems with leach fields in critical areas can increase the quality of receiving waters and decrease the epidemiological risk to persons coming in contact with the receiving waters.

The highest priority is reducing the epidemiological risk posed by cesspools. Sickness can be caused by ingestion or otherwise coming in contact with waters containing sewage derived pathogens. Since the pathogens have limited survival times outside of the human body the elapsed time between the effluent release and capture by wells or discharge to receiving waters is a critical factor. The other critical factor is identifying the infrastructure and the receiving waters where human contact with the pathogens could occur.

Chemical contamination in the form of excess nutrients (primarily nitrogen and phosphorus) is also a serious concern. Mitigation of chemical contamination is realized by contaminant reduction through mixing with uncontaminated water from upgradient and from infiltration, attaching of the contaminants to the aquifer matrix (i.e. sorption), and degradation of the contaminant. As with

pathogens, the effect of mitigating processes increases with distance between the cesspool and the receiving water or infrastructure (i.e. drinking water well). Groundwater velocity and distance determine the effluent travel time.

Groundwater Velocity

To result in an adverse health impact or in ecological harm the effluent from a cesspool must migrate to a receptor. The primary sensitive ecosystems are nearshore waters,perennial streams, and wetlands. The pathway between a properly functioning cesspool (i.e. a cesspool that is not overflowing) and a receptor is groundwater. The primary health risk associated with cesspools is disease causing organisms. These organisms will start dying off once they enter the wastewater stream so time of travel to a receptor is a prime concern. Crockett (2007) lists *Salmonella* and Fecal *Streptococci* as being long lived pathogens. The time required for a 10^5 reduction in population of these two pathogens is 92 days. Groundwater velocity is a key component in establishing setback zones of sufficient distance between receptors and cesspools. Lau and Mink (2006) state that a typical groundwater velocity is about 0.3 meters per day (m/d) or about 1 feet per day (ft/d). The groundwater velocities measured by the Lahaina groundwater tracer study based on the breakthrough curves varied from about about 9 m/d) (31 ft/d) to about 0.3 m/d (1 ft/d) to (Craig et al., 2013). These velocities represent the groundwater travel time for the first detection of the tracer dye and the time for the dye concentration to decay to below the instrument detection limits. A better metric is the average travel time measured by the tracer test. The average velocity, defined as the time it took 50 percent of dye mass to be discharged at the submarine springs, was about 2.5 m/d (8.2 ft/d). However, the Lahaina groundwater flow velocities are biased high since the tracer got about a 3 million gallons per day boost at the injection wells. Based on the preceding numbers a representative range of groundwater velocities would be from 1 ft/d (the representative velocity stated by Lau and Mink (2006) and also the slow velocity measured by the Lahaina Groundwater Tracer Study), and about 8 ft/d (the average velocity measured by the Lahaina Groundwater Tracer Study). Using a 10^5 die-off rate for *Salmonella*, an appropriate setback distance from streams and the shoreline would vary from 92 ft. to 754 ft. A setback of 750 ft is appropriate since it represents a groundwater velocity that has been physically measured and affords a higher degree of protection.

Descriptions of the Various POS Zones

Drinking Water Well Setback Zones

The setback used for drinking water wells is the Zone B areas of contribution that were delineated as part of the Source Water Assessment Program to protect public drinking water wells from chemical and biological contamination (Whittier et al., 2004). For drinking water wells the Zone B is defined as that area under which groundwater would be captured by the well within two years. The groundwater Zone B's were modeled using a numerical groundwater flow and particle tracking model. A two-year time of travel is more protective than that 92 day time of travel used as the basis for the 750 ft setback for surface waters. However, drinking water is directly ingested increasing the epidemiological risk and thus a more conservative approach is warranted.

Surface Water Setback Zones

Three surface waters bodies were identified as being at increased risk to degradation due to cesspool contaminated groundwater. These waters are:

- Coastal waters;
- Perennial streams; and
- Wetlands.

A 750 ft setback from these water bodies is delineated to represent the increased risk that cesspools located within these zones pose to these waters.

Coastal Waters

All groundwater that is not captured by wells or that discharges to streams will eventually flow into the ocean. Since fresh groundwater is less dense than seawater the groundwater will preferentially discharge at shallow depths near to shore. This puts recreational users at risk from pathogens and the coastal waters and associated reefs at risk of degradation due to nutrient loading and chemical contamination. The 750 ft setback allows sufficient time for pathogens to die or become inactive and allows for reduction in chemical and nutrient contamination by dilution, sorption, or degradation.

Perennial Streams

Perennial streams, basically those streams that flow year around, are sustained even during dry periods by groundwater discharge to the surface. If this groundwater is contaminated by cesspool effluent, the same human contact and water quality concerns associated with coastal waters also apply.

Wetlands

As with perennial streams, wetlands generally have a contribution from groundwater (http://water.usgs.gov/nwsum/WSP2425/definitions.html). Being critical ecosystems for endangered birds and aquatic organisms this water resource should also be afforded protection. The 750 ft. setback will allow for dilution of contaminants and die-off and inactivation of pathogens.

Nutrient Loading Considerations

Considering the risk posed by pathogens has the advantage that these organisms die-off or are otherwise inactivated. A reduction in nutrient concentrations with time likely will not occur. If the water is chemically oxidizing, which is common for the shallow groundwater in Hawaii, nutrients such as nitrogen and phosphorus tend to be stable in their oxidized states as nitrate and phosphate respectively. There can be some reduction due to sorption, particularly in the case of phosphate. However, when the nutrient source is chronic such as occurs during wastewater injection (cesspool leaching is an example of chronic wastewater addition to the groundwater) the sorption sites on the

aquifer matrix may become saturated resulting in no reduction of nutrients along the groundwater flow path. This appears to be the case with the Lahaina Wastewater Reclamation Facility where the concentration of the phosphate injected into the wells is approximately equal to the concentration discharged at the submarine springs. What determines the nutrient loading to the streams and nearshore waters is the cumulative contribution from cesspools along the groundwater flow path. This is not fully accounted for by the previously discussed setbacks. However, the greater the setback distance, the greater the opportunity for low nutrient recharge to dilute the impact of cesspool contaminated groundwater.

Affected Areas and Cesspools

Figures 1 through 5 show the delineated setbacks zones and locations of the affected cesspools in red (cesspool the are required to be upgraded at the POS) and those cesspools not affected by the upgrade requirement in green, for the islands of Kauai, Oahu, Molokai, Maui, and Hawaii respectively. Figure 6 shows the delineated setback zones for Lanai, but no cesspool locations are included since the OSDS inventory wasn't done for this island. Table 1 list the number of affected cesspools in each category and for each island. The total number of cesspools affected for each island is less than the sum of the cesspools in each category since a cesspool may be located in more than one setback zones. For example near the coast a cesspool could be included in the shoreline setback zone and in the perennial stream setback zone. It is also important to understand that the cesspool inventory does not represent a physical inventory but rather an estimation of the number and location of cesspools based a search of wastewater, property tax, and water/water billing records.

The islands of Kauai, Oahu, and Hawaii had the highest numbers of affected cesspools ranging from about 5,200 for Oahu to about 6,500 for Hawaii. Although the highest number of affected cesspools is on Hawaii, this represents only about 13 percent of the total number of cesspools on this island. By category the greatest number of affected cesspools are in the shoreline and perennial stream setback zones. Drinking water safety should be the prime consideration. Using the Zone B delineated areas requires that approximately 2,500 cesspools will be required to be upgraded at the POS. Using the three setbacks results in approximately 19,800 cesspools or a little less than a quarter of the estimated 87,969 cesspools being required to be upgraded at the POS.

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An inventory of cesspools on each island and near sensitive water resources

			Number of Cesspools Near Sensitive Water Resources			
County	**Island**	**Total Number of Cesspools**	**Within 750 ft of a Sensitive Water Body**	**Near a Drinking Water Well**	**Total[1]**	**Percent of Cesspools Requiring an Upgrade**
Kauai	Kauai	13,688	5,566	391	**5,863**	43%
Honolulu	Oahu	11,253	4,551	727	**5,183**	46%
Maui[2]	Maui	12,242	1,229	638	**1,763**	14%
	Molokai	1,442	497	8	**505**	35%
Maui Co. Total		***13,684***	***1,726***	**646**	***2,268***	***17%***
Hawaii	Hawaii	49,344	5,822	787	**6,479**	13%
Total		**87,969**	**17,665**	**2,551**	**19,793**	**22%**

Note 1. Since a cesspool may fall within a water body setback zone and be near a drinking water well, the total number of affected cesspools is less than the sum of the two zones.

Note 2. Due to the very low number of cesspools and other on-site sewage disposal systems on Lanai, an inventory was not estimated for this island.

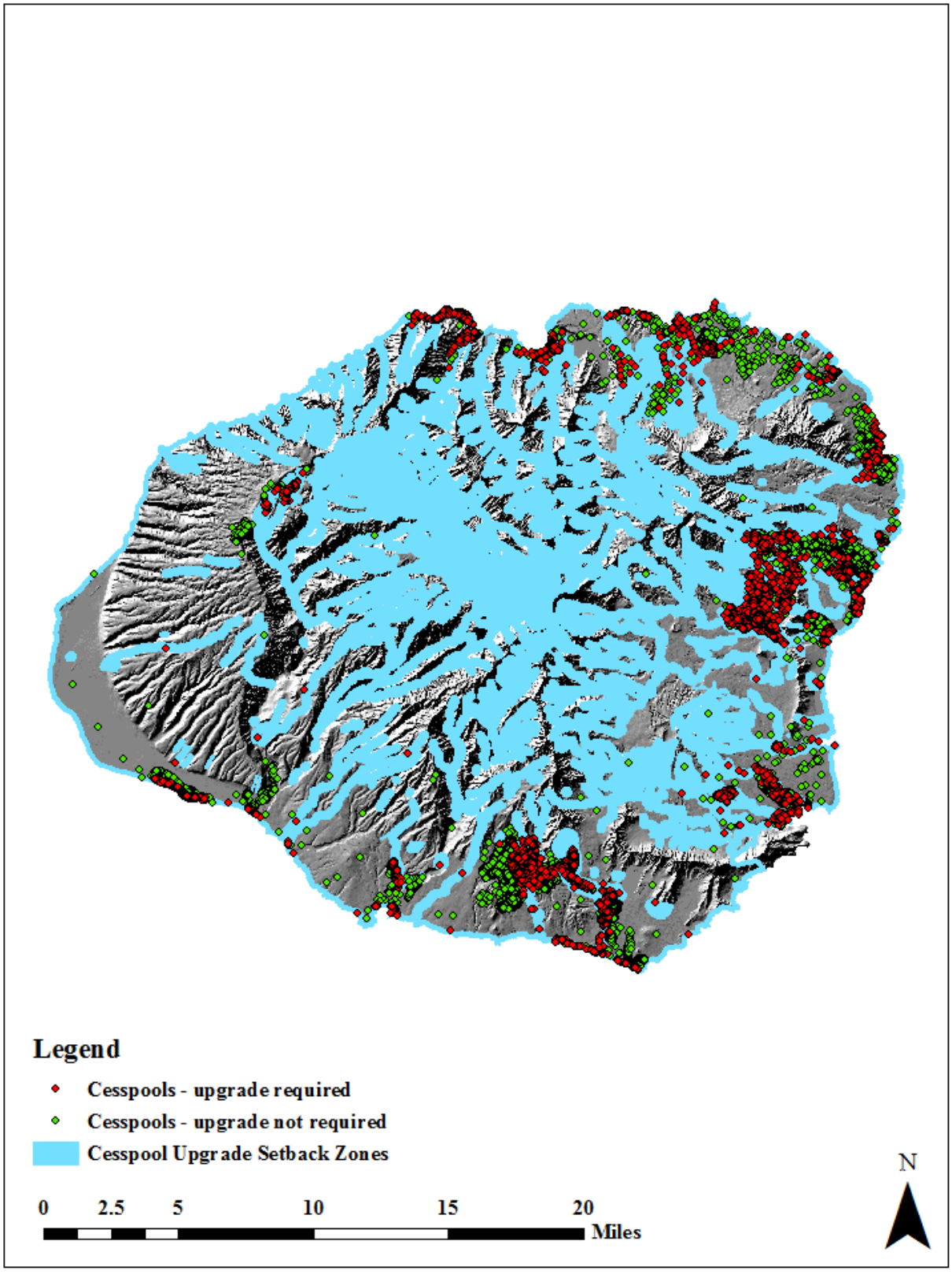

Figure 1. Kauai: The cesspools affected by the upgrade requirement are shown by red symbols, while those not affected by this requirement are shown by the green symbols.

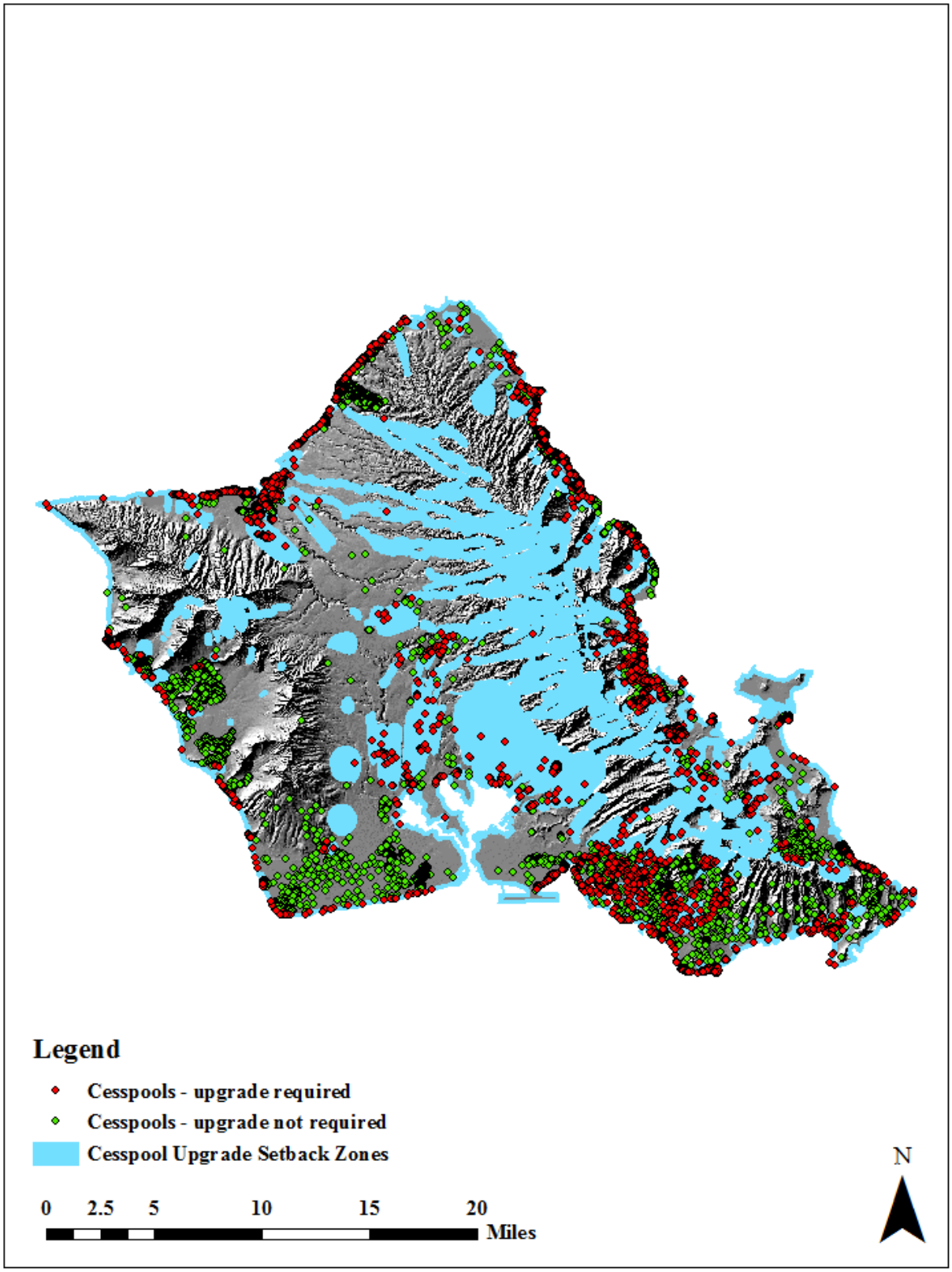

Figure 2. Oahu: The cesspools affected by the upgrade requirement are shown by red symbols, while those not affected by this requirement are shown by the green symbols.

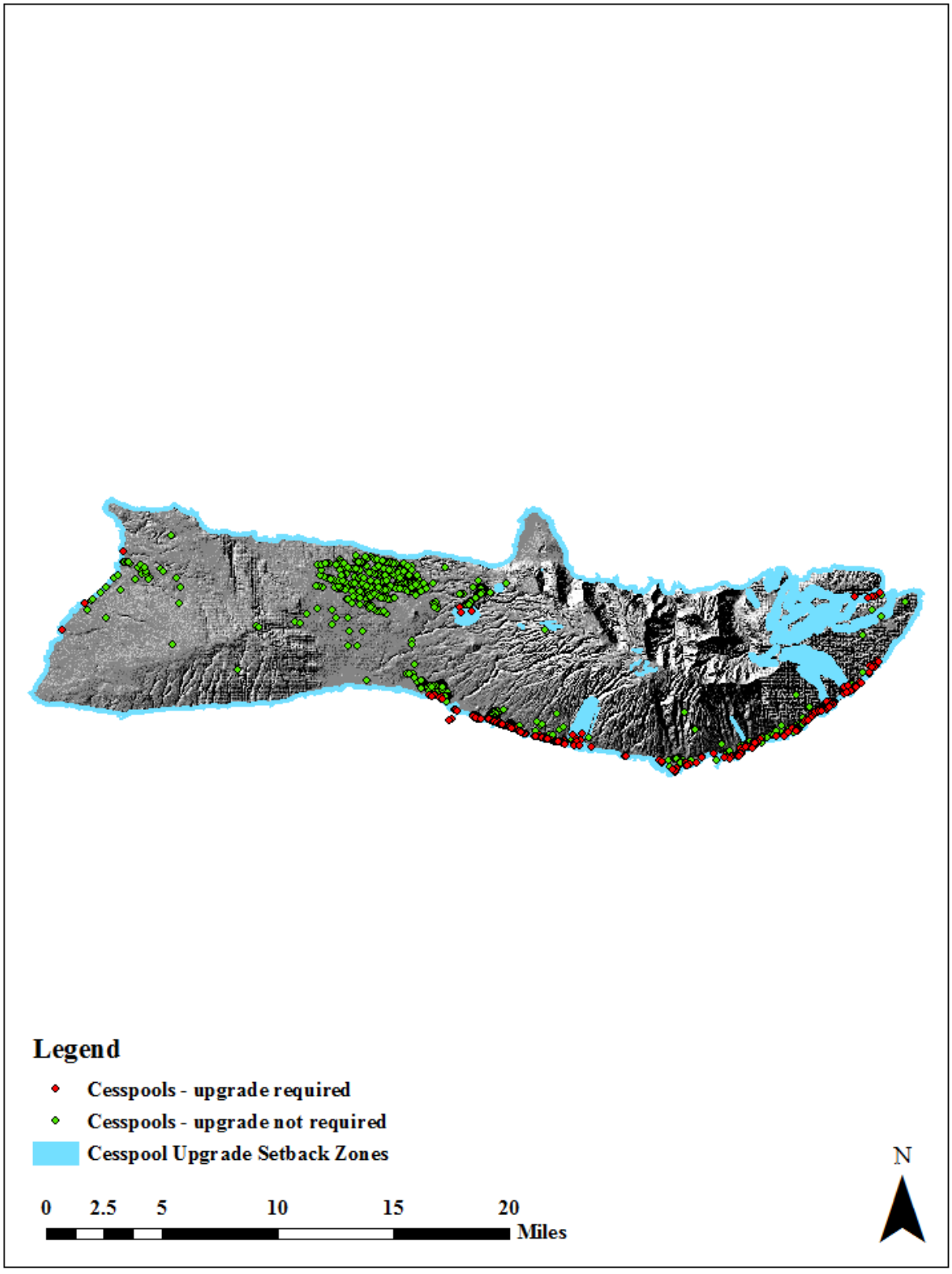

Figure 3. Molokai: The cesspools affected by the upgrade requirement are shown by red symbols, while those not affected by this requirement are shown by the green symbols.

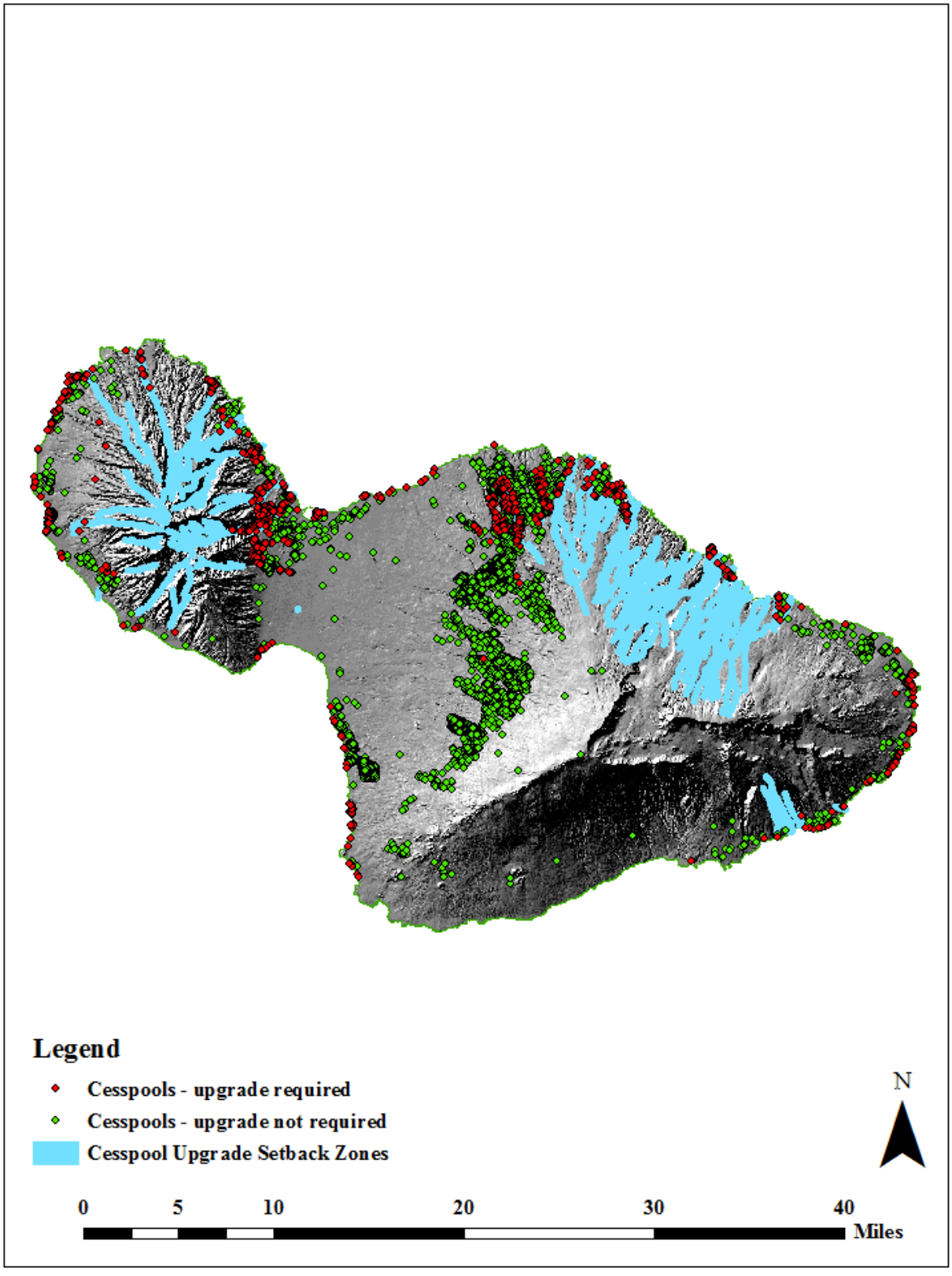

Figure 4. Maui: The cesspools affected by the upgrade requirement are shown by red symbols, while those not affected by this requirement are shown by the green symbols.

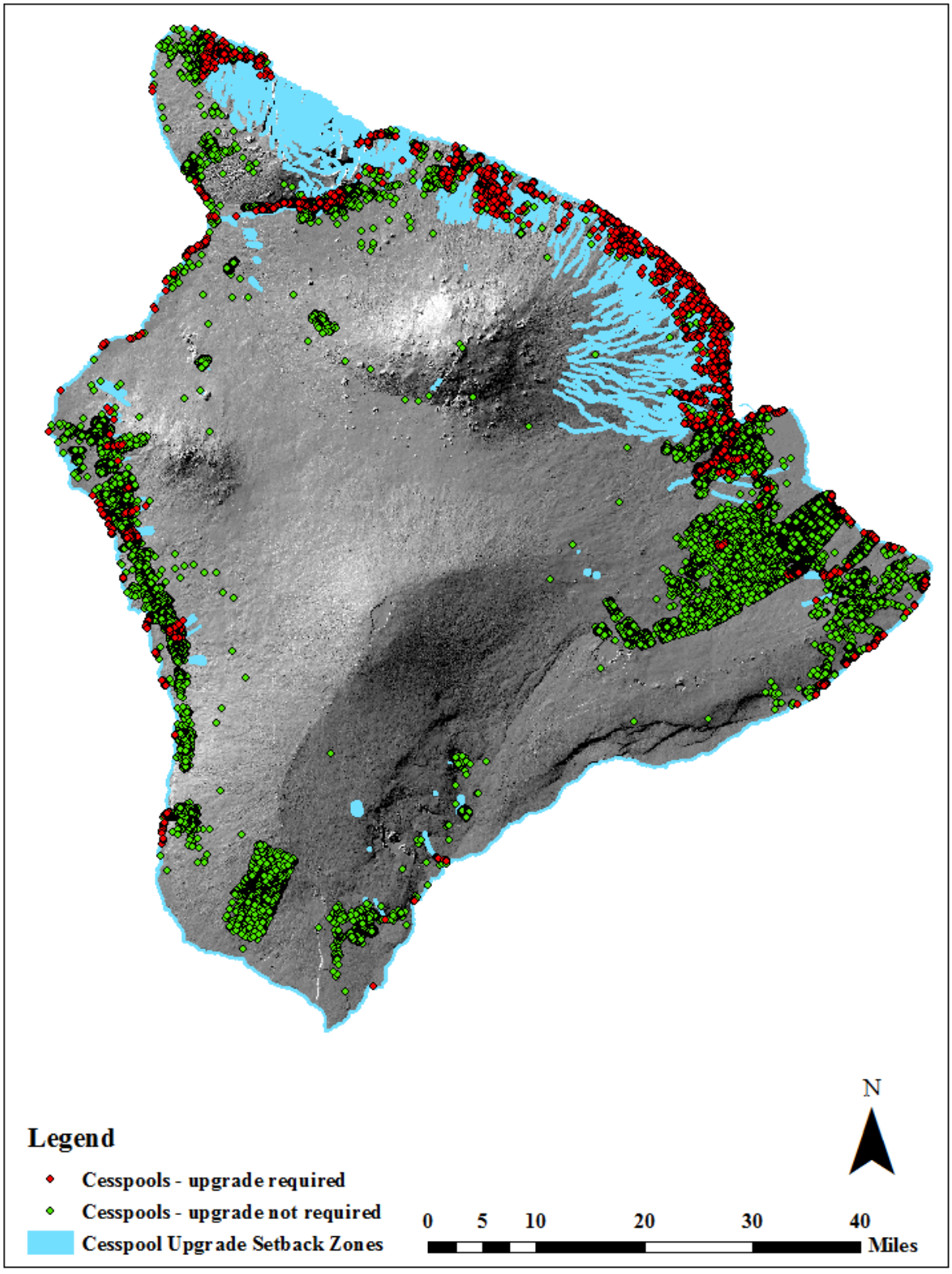

Figure 5. Hawaii Island: The cesspools affected by the upgrade requirement are shown by red symbols, while those not affected by this requirement are shown by the green symbols.