Department of Human Resources
Division of Public Health

Manual
For
On-Site Sewage Management Systems

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Revisions to the manual were made based on actions taken by the DHR Technical Review Committee and recommendations by the Soil Classifiers Certification Advisory Committee and Department of Audits.

Introduction

A major factor influencing the health of individuals where public or community sewerage is not available is the proper treatment and disposal of human wastes and other sewage, including industrial and processing waste. Many diseases, such as dysentery, infectious hepatitis, typhoid and paratyphoid, and various types of gastrointestinal problems are transmitted from one person to another through the fecal contamination of food and water, largely due to the improper disposal of human wastes. Chemical contaminants affecting individuals through individual drinking water supplies have been attributed to groundwater pollution caused by improper subsurface disposal of on-site sewage. Because of such problems, every effort shall be made to prevent the existence of these and other potential health hazards.

Safe disposal of all wastes, human, domestic and industrial, is necessary to protect the health of the individual family and the community and to prevent the occurrence of nuisances. Basically, to accomplish satisfactory results, all such wastes must be disposed of in such a manner that:

1. They will not contaminate any approved drinking water supply;
2. They will not give rise to a public health hazard by being accessible to insects, rodents, or other possible carriers of disease that may come into contact with food or drinking water;
3. They will not give rise to a public health hazard by being accessible to children;
4. They will not violate laws or regulations governing water pollution or sewage disposal;
5. They will not pollute or contaminate the waters of any bathing beach, shellfish breeding ground, stream or lake used for public or domestic water supply, or for recreational purposes; and
6. They will not give rise to a nuisance due to odors or unsightly appearance.

Where public or community sewage disposal systems are not accessible, these criteria can be met by the discharge of sewage to an adequate on-site sewage management system. Such a system properly designed, maintained and installed where soil and site conditions are favorable, can be expected to function satisfactorily. Experience through the years has shown that adequate supervision, inspection, and maintenance are required to insure compliance in this respect.

It is the intention of this manual to serve as:

1. A technical reference to enhance public health protection;
2. A good source of information for professionals and individuals interested in the on-site sewage management program including public health professionals, engineers, scientists, environmentalists, septic system installers and septic tank pumpers, soil consultants, home builders and land developers, and the general public.

Format of the Manual

This manual is designed to be kept in a loose-leaf three-hole binder so that updates, revisions and technical information can be added easily.

Content of the Manual

This manual is divided into 16 sections: Section A provides the Rules of the Department of Human Resources for On-site Sewage Management Systems, “Chapter 290-5-26." Section B covers the general soil provisions for on-site sewage management systems. Chapter C discusses the role of soil information and use of soils in sewage treatment and disposal. Sections D through F cover the technical design standards for on-site sewage management systems. Section G describes the concept and process for obtaining permits for experimental systems. Section H discusses site modifications. Section I describes procedures for septage removal and disposal. Section J provides the sewage flow schedule. Section K details field inspections needed before on-site sewage management systems are put into operation. Section L covers operation and maintenance for the systems. Section M discusses lot sizing for development of individual properties, subdivisions, and mobile home parks. Section N provides procedures for certification and de-certification of septic tank contractors, inspection personnel, pumpers, soil classifiers, and maintenance personnel. Section O provides the appendices while Section P provides a list of references.

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Rules
Of
Department of Human Resources
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Chapter 290-5-26
On-Site Sewage Management Systems

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290-5-26-.01 Applicability. These Rules will have application in all except the following cases:

(a) any facility or system under the jurisdiction of and regulated by the Department of Natural Resources or its successor;

(b) any public or community sewage treatment system;

(c) other shared jurisdiction by Memoranda of Agreement or other agreements.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History**. Original Rule entitled ADefinitions≅ was filed on December 1, 1969 as 270-5-25-.01; effective December 20, 1969. Amended: Rule renumbered as 290-5-26-.01. Filed June 10, 1980; effective June 30, 1980. **Amended:** Rule repealed and a new Rule entitled AApplicability≅ adopted. Filed March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.02 Definitions. For the purpose of this chapter, the following words and phrases shall have the meaning as indicated beside each listing:

(a) “Absorption Field” means a configuration of absorption trenches installed in a portion of land and used for the absorption and final treatment of sewage.

(b) “Absorption Line” means a pipe line of perforated pipe laid in an absorption trench to serve as a conduit for sewage effluent.

(c) “Absorption Trench” means an excavation in which an absorption line is laid.

(d) “Absorption Trench Bottom and Side Soil Area” means the total interface of bottom and side soil area with undisturbed soils of all absorption trenches in an absorption field and occurring horizontally and downward from the point of distribution into the soil, expressed in square feet.

(e) “Aggregate” means washed gravel or washed stone meeting the Georgia Department of Transportation standards for hardness or other materials approved by the Department that shall be one half inch (1/2”) to two inches (2") in diameter.

(f) “Alternative On-Site Sewage Management System” means any approved on-site sewage management system which differs in design or operation from the conventional or chamber septic tank system or privy.

(g) “Approved” or “Approval” means compliance with applicable specifications or criteria developed or accepted by the Department.

(h) “Auxiliary System” means a system to serve a portion of a residence, a pool house or other adjunct facility.

(i) “Bedroom” means any room that is designed primarily for sleeping purposes, as shown on the building plan.

(j) “Black Water” means wastewater generated by water closets, urinals, bidets, kitchen sinks and garbage disposals.

(k) “Building Drain” means that part of the lowest piping of a building drainage system inside the walls of a building, which receives the discharge from soil, waste or other drainage systems and conveys the discharge to the building sewer.

(l) “Building Sewer” means that part of the horizontal piping of a building drainage system beyond the building drain which receives the discharge from the building drain and conveys it to a public sewer, private sewer, on-site sewage management system or other disposal.

(m) “Central On-Site Sewage Management System” means an on-site sewage management system serving more than one building, business, residence or other facility designed or used for human occupancy or congregation.

(n) “Chamber Septic Tank System” means a septic tank and a chamber system as defined in (o).

(o) “Chamber System” means a system of chambers with each chamber being a molded polyolefin plastic, arch shaped, hollow structure with an exposed bottom area and solid top and louvered sidewall for infiltration of effluent into adjoining bottom and sidewall soil areas. Chambers may be of different sizes and configurations to obtain desired surface areas.

(p) “Community Subsurface Treatment System” means any system which treats primarily domestic wastewater other than those serving single family residences or non-domestic sewage systems.

(q) “Conventional System” means a traditionally used system that is composed of perforated pipe surrounded by gravel or stone masking for the infiltration of effluent into adjoining bottom and side soil areas.

(r) “Conventional Septic Tank System” means any septic tank and conventional system as defined in (q), but does not include alternative or experimental systems.

(s) “County Board of Health” means the County Board of Health established by the Official Code of Georgia Annotated (O.C.G.A. 31-3-1) or its designee.

(t) “Department” means the Department of Human Resources of the State of Georgia or its designee.

(u) “Distribution Device” means a watertight structure which receives sewage effluent from a septic tank, dosing tank or other sewage retention device and distributes it in equal portions to two or more absorption lines.

(v) “Dosing Tank” means an approved watertight tank, located after a septic tank or other sewage retention device, to receive and retain sewage effluent, and so equipped as to discharge sewage effluent intermittently to a distribution device, either by pump or by siphon.

(w) “Experimental On-Site Sewage Management System” means any on-site sewage management system proposed for testing and observation, and provisionally approved for such purposes by the Department, but which has not been fully proven under field use.

(x) “Failure” means an on-site sewage system in such a condition that it constitutes a public hazard by inadequate treatment and/or disposal of sewage.

(y) “Filter” means an approved device that removes solids or other materials from the effluent that could cause failure of an on-site sewage management system.

(z) “Flood Plain” means a generally flat plain or depression susceptible to being flooded from any source, including small and intermittent water courses and coastal areas subject to intermittent tidal action.

(aa) “Gray Water” means wastewater generated by water-using fixtures and appliances, excluding water closets, urinals, bidets, kitchen sinks and garbage disposals.

(bb) “Grease Trap” means a device in which the grease content of sewage is intercepted and congealed, and from which grease may be skimmed or otherwise removed for proper disposal.

(cc) “Individual Water Supply System” means a system of piping, pumps, tanks or other facilities, utilizing groundwater to supply a single family dwelling.

(dd) "Lot" means a portion of a subdivision, or any other parcel of land, intended as a unit for transfer of ownership, or for development, or both, and shall not include any part of the right-of-way of a street or road.

(ee) "Manual for On-Site Sewage Management Systems" means the technical handbook currently adopted and periodically updated which is used by the Department in the implementation of this Chapter and is available for inspection at the appropriate State Office in Atlanta or at local health departments. The Manual for On-Site Sewage Management Systems and its provisions are herein adopted unless inconsistent with other provisions of law or regulation and is hereafter referred to as the "Manual" or "Manual for On-Site Sewage Management Systems."

(ff) "Mobile Home Park" means a parcel of land developed for subsequent rental or lease or placement of two (2) or more mobile homes.

(gg) "On-Site Sewage Management System" means a sewage management system other than a public or community sewage treatment system serving one or more buildings, mobile homes, recreational vehicles, residences, or other facilities designed or used for human occupancy or congregation. Such term shall include, without limitation, conventional and chamber septic tank systems, privies, and experimental and alternative on-site management systems which are designed to be physically incapable of a surface discharge of effluent that may be approved by the department.

(hh) "Percolation Coefficient" means the ratio of trench bottom area to percolation time; it is expressed as the allowable rate of sewage application in gallons per square foot per day.

(ii) "Percolation Rate" means the time, expressed in minutes per inch, required for water to seep into saturated soil at a constant rate.

(jj) "Percolation Test" means the method used to measure the percolation rate of water into soil as described in the Department's current Manual for On-Site Sewage Management Systems.

(kk) "Person" means any individual, partnership, corporation, or association and may extend and be applied to bodies, both political and corporate.

(ll) "Physical Development" means development which includes, but is not limited to site preparation, erection of a structure, road construction, well construction or installation of on-site sewage management systems.

(mm) "Privy" means a structure (and necessary appurtenances) used for the sanitary disposal or storage of human wastes without the aid of water carriage; the term does not include chemical, composting, portable or incinerator toilets.

(nn) "Public Water Supply System" means a system for the provision of piped water to the public for human consumption, if such system has at least fifteen service connections, or regularly serves an average of at least twenty-five individuals daily, at least sixty (60) days out of the year.

(oo) “Septage” means a waste that is a fluid mixture of partially treated or untreated sewage solids, liquids and sludge of human or domestic waste, present in or pumped from septic tanks, malfunctioning on-site sewage management systems, grease traps or privies.

(pp) “Sewage Treatment System” is a system that provides primary treatment and disposal, including absorption field components, devices and appurtenances intended to be used for disposal of sewage by soil absorption, but does not include a conventional or chamber septic tank system. The system shall be designed to be physically incapable of a surface discharge of effluent.

(qq) “Septic Tank” means an approved watertight tank designed or used to receive sewage from a building sewer and to affect separation and organic decomposition of sewage solids, and discharging sewage effluent to an absorption field or other management system.

(rr) “Sewage” means and includes human excreta, all water carried wastes, and liquid household waste from residences or commercial and industrial establishments.

(ss) “Sinkhole” means a depression in the land surface, generally in a limestone region, which communicates or has the potential to communicate with a subterranean passage developed by solution; typical sinkholes can be broad, closed basin-like features or steep-sided dropouts, or variants thereof.

(tt) “Site” means the location where the absorption field will be installed to include replacement area.

(uu) “Soil Classifier” means a person who holds at least a Bachelor of Science degree from an accredited college or university with a major in Agronomy, Soil Science, or related field, as approved by the Soil Classifiers Certification Advisory Committee. Must have completed a minimum of 15 semester hours or 25 quarter hours in approved soil science courses including a course in pedology and have four years or more of full time experience as a Soil Classifier/Soil Scientist actively mapping, identifying and classifying soil features, and interpreting the influence of soil features on soil uses. Certification shall be in accordance with guidelines published in the Manual for On-Site Sewage Management Systems.
Any person who holds a valid certificate of registration as a geologist issued pursuant to O.C.G.A. Chapter 19 of Title 43, or who holds a valid certificate of registration as an engineer issued pursuant to O.C.G.A. Chapter 15 of Title 43 and is practicing within his or her area of engineering competency may register with the Department as a Soil Classifier.

(vv) “Subdivision” means any division of a tract or parcel of land into five or more lots, building sites, mobile home sites, or other divisions, resulting in any single lot of less than three acres, for the purpose, whether immediate or future, of sale or legacy, and includes resubdivision and, where appropriate to the context, relates to the process of subdividing or to the land or area subdivided, provided; however; that the following are not included within this definition:

1. The combination or recombination of previously platted lots or portions thereof where the total number of lots is not increased and the resultant lots conform to the standards of these rules.

2. The division of land into parcels, all of which are three acres or more in size with minimum width of one hundred and fifty feet (150') for a distance sufficient to provide an adequate area for the placement of structures and improvements including wells and approved installation of approved on-site sewage management systems.

(ww) “Well” means an excavation or opening into the ground by which groundwater is sought or obtained.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled AGeneral Provisions≅ was filed on December 1, 1969 as 270-5-25-.02; effective December 20, 1969. **Amended:** Rule renumbered as 290-5-26-.02. Filed June 10, 1980; effective June 30, 1980. **Amended:** Rule repealed and a new Rule entitled ADefinitions≅ adopted. Filed March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.03 General Provisions.

(1) “On-Site Sewage Management System Required” - Where public or community sewage treatment systems are not available, the owner, lessee or agent thereof of every building, residence or property, designed, used or intended to be used for human occupancy or congregation, shall provide an approved on-site sewage management system sufficient for persons normally expected to use or frequent the building, residence or other property for two hours or more. Connection shall be made to a public or community sewage treatment system when such system is available within two hundred feet (200') of the property line, or available in a public right-of-way abutting the property. Where a public or community sewage treatment system is to be constructed, or an existing public or community sewer is to be extended to serve a lot, or an approved on-site sewage management system is to be used, the building sewer shall be installed so that it will insure gravity flow at a self-cleaning velocity throughout. If an existing on-site sewage system fails, immediate connection shall be made to a public or community sewerage system if such a system is available.

(a) Any facility that produces a waste stream with BOD_5 (Biochemical Oxygen Demand) and TSS (total suspended solids) higher than 200 mg/L shall be required to pretreat the waste to reduce the BOD_5 and TSS to 200 mg/L or below before disposal through a conventional or chamber septic tank system.

(2) “On-Site Sewage Management System Construction Permit Required” - No person may begin the physical development of a lot or structure thereon, where an on-site sewage management system will be utilized, nor install an on-site sewage management system or component thereof without having first applied for and obtained from the County Health Department a construction permit for the installation.

(a) Application for such a construction permit shall be made in writing on forms provided by the County Board of Health. The County Board of Health shall approve or disapprove such application within twenty days after the receipt of a completed application. The application shall include:

1. Name and address of the owner and the applicant, if other than the owner;

2. Location of property;

3. Plans and specifications including location and design of the proposed on-site sewage management system including surface and subsurface drainage and piping;

4. Nature of the facility to be served;

5. Location of all water supplies, geothermal systems, or other utilities and trash pits on or off the lot, which will bear upon the location of the on-site sewage management system;

6. Number of bedrooms in the dwelling, or the number of persons to be served in other types of establishments, or other sewage flow or water usage data;

7. Soil characteristics, including soil types and capabilities, frequency and evaluations of seasonal high groundwater tables, occurrence of rock and other impervious strata;

8. Signature of the owner or agent applying for permit; and

9. Any additional information deemed necessary to determine the suitability of the site.

(b) The County Board of Health may waive submission of part of the information required for the application, provided the Board deems that such information is available from previously submitted subdivision or mobile home park data, or from other sources. The information must be sufficient to make an adequate appraisal of the acceptability of the proposed lot for the installation of an on-site sewage management system.

(c) Repairs, replacement, or additions to existing systems must be permitted and inspected.

(d) Any person preparing to modify a lot for the purpose of obtaining a construction permit for the installation of an on-site sewage management system shall submit plans showing the type and extent of modifications. No modifications shall be carried out prior to the approval of the plans by the County Board of Health. Such approval shall be in accordance with the provisions of the Department’s current Manual for On-Site Sewage Management Systems.

(3) “Requirements for On-Site Sewage Management System Construction Permit Issuance or Denial” - On-site sewage management system construction permits shall be issued only after a site inspection by the County Board of Health shows favorable findings relative to absorption rates, soil characteristics, groundwater, rock and any other factors which would affect the acceptability of the lot. No construction permit for an on-site sewage management system shall be issued prior to the approval of the public water supply system, where a public water supply system is to be utilized. Lot suitability and approval is to be determined by the criteria established by the Department=s current Manual for On-Site Sewage Management Systems.

Lots shall be sized according to the regulations of the County Board of Health. The County Board of Health may deny or revoke an on-site sewage management system construction permit upon finding the lot unsuitable or for failure of the applicant to comply with the provisions of

these rules. Such denial shall be made in accordance with the provisions of O.C.G.A. 12-8-1, 31-5-2, 31-5-3, 31-5-4, 31-5-5 and 31-5-6. On-site sewage management construction permits shall remain valid for not more than twelve (12) months from the date of issue.

(a) Issuance of a construction permit for an on-site sewage management system, and subsequent approval of same by representatives of the County Board of Health shall not be construed as a guarantee that such systems will function satisfactorily for a given period of time; furthermore, said representatives do not, by any action taken in affecting compliance with these rules, assume any liability for damages which are caused, or which may be caused, by the malfunction of such system.

(b) On tracts or parcels of land of three acres or more, the conventional or chamber septic tank system may be utilized where the percolation rate does not exceed 120 minutes per inch. All other conditions must comply with the requirements of the regulations for on-site sewage management systems.

(4) "Inspections" - No person may backfill or use an on-site sewage management system until final inspection has been made by the County Board of Health to determine compliance with the provisions of the construction permit issued under Section 290-5-26-.03(3) and written approval has been issued by the County Board of Health.

(a) A copy of the final inspection of an on-site sewage management system shall be provided to the owner, builder, developer or agent, whichever is appropriate.

(b) Grading, filling, digging trash pits or other landscaping or construction activities on the lot subsequent to final inspection by the County Board of Health which may adversely affect the on-site sewage management system shall render the approval void. Removal or alteration of system components after final inspection by the County Board of Health shall render the approval void.

(5) "Design Limits for Conventional or Chamber Septic Tank Systems" - To provide for the maintenance of sanitary conditions through the proper functioning of a conventional or chamber septic tank system for a reasonable period of time, no such system may be installed, constructed, or used, having a septic tank design capacity of less than one thousand (1000) gallons or greater than ten thousand (10,000) gallons, or where the total length of absorption trenches required would exceed three thousand (3,000) linear feet, or where the total absorption trench bottom area required would exceed nine thousand (9,000) square feet.

(6) "Submission of Plans, Specifications, and Soil Data" - Plans, specifications, soil data and, if required, absorption test data, submitted to the County Board of Health for the purpose of obtaining a construction permit to install an on-site sewage management system, which will produce a sewage flow in excess of two thousand (2,000) gallons per day, shall bear the registration number and signature of a Registered Professional Engineer, certified and registered under the laws of this State. The County Board of Health may accept plans, specifications, soil data, and absorption test data for facilities with sewage flow of two thousand (2,000) gallons or less per day, when prepared in accordance with these rules, from any person who demonstrates to the satisfaction of the County Board of Health that they have sufficient knowledge of on-site sewage management system design.

(7) “Soil Data Acceptability for Individual Lots” -Soil evaluations shall be conducted by individuals meeting the requirements established in the Department=s current Manual for On-Site Sewage Management Systems.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled ASewers≅ was filed on December 1, 1969 as 270-5-25-.03; effective December 20, 1969. **Amended:** Rule renumbered as 290-5-26-.03. Filed June 10, 1980; effective June 30, 1980. **Amended:** Rule repealed and a new Rule entitled AGeneral Provisions≅ adopted. Filed March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.04 Sewers.

(1) “Size of Sewers” - Sewers connecting component parts of on-site sewage management systems shall be of sufficient size to serve anticipated flow conditions.

(2) “Sewers” - All solid pipe and fittings used in an on-site sewage management system, beginning at the house, shall be NSF International schedule 40 PVC or equivalent and shall be a minimum of four inches in diameter. Sewers under driveways or similar areas of load or impact shall be of material capable of withstanding anticipated loads or installed so as to provide protection from crushing.

(3) “Construction” - Sewers, other than perforated pipe or drain tiles used in absorption fields, shall be laid with sealed, watertight, root-resistant joints. Such sewers shall be laid on a firm foundation, shall not be subject to settling, and shall be installed on a grade that will insure a self-cleaning velocity. Where on-site sewage management systems are used, and where installation of building drains and building sewers is not covered by duly adopted local plumbing codes, or in the absence of a local plumbing code and/or plumbing inspections, the County Board of Health may verify the adequacy and acceptability of all or any portion of the building sewer or the building drain.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled ASeptic Tanks≅ was filed on December 1, 1969 as 270-5-25-.04; effective December 20, 1969. **Amended:** Rule renumbered as 290-5-26-.04. Filed June 10, 1980; effective June 30, 1980. **Amended:** Rule repealed and a new Rule entitled ASewers≅ adopted. Filed March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.05 Septic Tanks.

(1) “Minimum Design and Construction” - Septic tanks shall provide a minimum of 24 hours of retention and shall be designed and constructed to equal or exceed minimum design and construction criteria established by the Department as published in the current Manual for On-Site Sewage Management Systems. After the effective date of these regulations, any person seeking approval of septic tanks to be used in on-site sewage management systems, shall submit detailed plans and specifications for tank manufacture and other information as may be required by the Department. Manufacturers and suppliers may be subject to periodic inspection, and approval by the County Board of Health or the Department. Both the inlet and outlet tees shall be ASTM 3034 rated or equivalent. In addition, an approved filter shall be installed on the outlet end of the septic tank in compliance with the Manual for On-Site Sewage Management Systems.

(2) “Location” - No septic tank shall be installed less than fifty feet (50') from existing or proposed wells/springs, sink holes, or suction water lines, and tanks shall be located downgrade from wells or springs if physically possible; less than twenty-five feet (25') from lakes, ponds, streams, water courses, and other impoundments; less than ten feet (10') from pressure water supply lines, or less than ten feet (10') from a property line. No septic tank shall be installed less than fifteen feet (15') from a drainage ditch or embankment. Septic tanks shall be installed so as to provide ready access for necessary maintenance. Normally, the distance a septic tank should be located from a building foundation is at least ten feet (10') but, lesser distances may be allowed by the County Board of Health. The County Board of Health, after site inspection, may require greater separation distances than cited herein due to unusual conditions of topography, or other site configuration; subsurface soil characteristics and/or groundwater interference.

(3) “Capacity” - The liquid capacity of septic tanks for single family dwellings shall be one thousand (1000) gallons for one, two, three or four bedrooms, and 250 additional gallons for each bedroom over four. Septic tank capacity shall be increased by (50%) where garbage grinders are to be used. Auxiliary systems serving single family residences or other facilities shall be based on the maximum daily flow.

(4) “Compartmented Tanks” - Two compartment tanks shall be required. The first compartment shall be at least 2/3 the liquid capacity of the tank.

(5) “Tanks in Series” - The County Board of Health may approve the installation of two septic tanks placed in series provided that the capacity of the first tank is at least one thousand (1000) gallons and at least equal to the capacity of the second tank. When tanks in series are used, they shall be connected with a sealed sewer line, and all sewage shall initially enter the first tank.

(6) “Foundation and Backfill” - Septic tanks will be constructed or installed level, on a foundation that will prevent settling; backfill shall be placed so that a stable fill results and undue strain on the tank is avoided. Earth backfill shall be free of voids, large stones, stumps, broken masonry, or other such materials. A minimum earth cover of six inches (6") over the tank is recommended. With proper documentation the County Board of Health may approve less cover. All openings and manholes shall be constructed so as to prevent the entrance of surface water.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled ADistribution Boxes≅ was filed on December 1, 1969 as 270-5-25-.05; effective December 20, 1969. **Amended:** Rule renumbered as 290-5-26-.05. Filed June 10, 1980; effective June 30, 1980. **Amended:** Rule repealed and a new Rule entitled ASeptic Tanks≅ adopted. Filed March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.06 Distribution Devices and Dosing Tanks.

(1) “Minimum Design and Construction of Distribution Devices” - Distribution devices shall be designed and constructed in accordance with minimum design and construction criteria established in the Department=s current Manual for On-Site Sewage Management Systems.

(2) “Minimum Design and Construction of Dosing Tanks” - Where required, dosing tanks shall be designed, constructed, and installed in accordance with the Department=s current Manual for On-Site Sewage Management Systems.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled ANitrification Fields≅ was filed on December 1, 1969 as 270-5-25-.06; effective December 20, 1969. **Amended:** Rule renumbered as 290-5-26-.06. Filed June 10, 1980; effective June 30, 1980. **Amended:** Rule repealed and a new Rule entitled ADistribution Boxes and Dosing Tanks≅ adopted. Filed March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.07 Absorption Fields.

(1) “Absorption Area” - The absorption area shall be based upon the anticipated volume of treated sewage and upon the characteristics of the soil in which absorption fields are to be located as specified in the Department=s current Manual for On-Site Sewage Management Systems. Soil characteristics and other related data, including percolation tests, may be required by the County Board of Health. Absorption areas shall be classified as follows: aggregate, non-aggregate and other.

(2) “APrior Approved Systems” - Any APrior approved system≅ as defined in the Official Code of Georgia Annotated 31-2-7 (a) (4) is approved for installation according to the manufacturer=s recommendation.

(3) “Location” - No absorption field will be constructed less than one hundred feet (100') from existing or proposed wells, springs or sinkholes; less than ten feet (10') from water supply lines and buildings with basements and less than five feet (5') from buildings without basements, other structures, drives and property lines; less than fifteen feet (15') from an embankment, drainage ditch or trash pits; not less than fifty feet (50') from the normal water level of any impoundment, tributary, stream, or other body of water, including ponded areas of wetlands. If the water supply line crosses or comes within ten feet (10') of the absorption field, the water supply line shall be installed at least twelve inches (12") above the top of the aggregate layer of the absorption line, non-aggregate absorption line or other absorption line, and shall be encased in a single length of larger diameter water pipe. No absorption field shall be installed in areas where groundwater, soil characteristics or adverse geological formation may interfere with the absorption or effective treatment of sewage effluent.

(4) “Minimum Design and Construction for Absorption Fields” - Absorption lines and absorption trenches shall be designed and installed in accordance with the minimum design and installation criteria established in the Department=s current Manual for On-Site Sewage Management Systems.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled ASubdivisions≅ was filed on December 1, 1969 as 270-5-25-.07; effective December 20, 1969. **Amended:** Rule renumbered as 290-5-26-.07. Filed June 10, 1980; effective June 30, 1980. **Amended:** Rule repealed and a new Rule entitled AAbsorption Fields≅ adopted. Filed March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.08 Privies.

∀Minimum Design and Construction"- Privies shall be designed and constructed in accordance with minimum design and construction criteria established by the Department=s current Manual for On-Site Sewage Management Systems.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled APit Privy≅ was filed on December 1, 1969 as 270-5-25-.08; effective December 20, 1969. **Amended:** Rule renumbered as 290-5-26-.08. Filed June 10, 1980; effective June 30, 1980. **Amended:** Rule repealed and a new Rule entitled APrivies≅ adopted. Filed March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.09 Alternative On-Site Sewage Management Systems.

(1) "Alternative On-Site Sewage Management System" means any approved on-site sewage management system which differs in design or operation from the conventional or chamber septic tank or privy.

(2) "Design and Construction" - Alternative on-site sewage management systems shall be designed and constructed in accordance with the minimum design and construction criteria established by the Department's current Manual for On-Site Sewage Management Systems. The department shall maintain a list of approved alternative on-site sewage management systems.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled ASoil Data and Percolation Tests≅ was filed on December 1, 1969 as 270-5-25-.09; effective December 20, 1969. **Amended:** Rule renumbered as 290-5-26-.09. Filed June 10, 1980; effective June 30, 1980. **Amended:** Rule repealed and a new Rule entitled AAlternative and Experimental On-Site Sewage Management Systems and Site Modifications≅ adopted. Filed March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.10 Experimental On-Site Sewage Management Systems.

"Experimental On-Site Sewage Management System" means any on-site sewage management system proposed for testing and observation, and provisionally accepted for such purposes by the Department=s technical review committee. Any limitations to the use of experimental systems shall be decided by the Department's technical review committee.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 431-2-4, 31-2-7. **History**. Original Rule entitled AGrease Traps≅ was filed on December 1, 1969 as 270-5-25-.10; effective December 20, 1969. **Amended:** Rule renumbered as 290-5-26-.10. Filed June 10, 1980; effective June 30, 1980. **Amended:** Rule repealed and a new Rule entitled APercolation Tests and Test Borings≅ adopted. Filed March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER.. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.11 Septage Removal and Disposal.

(1) "Permit Required" - No person shall engage in the removal or disposal of the contents of septic tanks, pit privies, or other on-site sewage management or experimental systems without having first applied for and obtained from either the Department or a County Board of Health a septage removal permit, renewed annually, for such activities. The application for such septage removal permit shall be submitted in writing on forms provided by the Department or the County Board of Health at least ten (10) days prior to engaging in such activities. The application shall

include but not be limited to: the business name and address, name and address of the applicant, the manner by which such contents are to be removed, transported and given final disposal, and such other documentation as may be required by the County Board of Health, including evidence that septage removed and transported will be accepted at approved disposal sites.

(a) Suspension and Revocation - The permit shall be subject to suspension and revocation for failure to comply with the requirements of these regulations or the Department=s current Manual for On-Site Sewage Management Systems.

(2) "Pumping and Disposal Methods" - Approved methods of pumping and disposal of septage from on-site sewage management systems shall be: discharge to a public or community sewage treatment system for treatment in treatment plant, treatment at separate septage handling facilities, or direct land application. Pumping and disposal shall be in accordance with the requirements of the Department=s current Manual for On-Site Sewage Management Systems.

(3) "Vehicle Identification" - The name and address of the person or firm engaging in the removal of septage from on-site sewage management systems and the permit number shall be lettered on both sides of each vehicle used for septage removal purposes. Letters and numerals shall not be less than two inches (2") in height and shall be readily visible.

(4) "Vehicle Maintenance" - Every vehicle used for removal of septage from on-site sewage management systems shall be equipped with a watertight tank or body and properly maintained. Liquid wastes shall not be transported in open bodied vehicles. All pumps, hose lines, valves and fittings shall be maintained to prevent leakage.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled AEnforcement≅ was filed on December 1, 1969 as 270-5-25-.11; effective December 20, 1969. **Amended:** Rule renumbered as 290-5-26-.11. Filed June 10, 1980; effective June 30, 1980. **Amended:** Rule repealed and a new Rule entitled ASeptage Removal and Disposal≅ adopted. Filed March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER.. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.12 Grease Traps.

(1) "Grease Traps Required" - Grease traps shall be required for commercial or industrial establishments with on-site sewage management systems where it is determined by the County Board of Health that the amount of grease introduced into the system is in excess of 50 mg/l.

(2) "Grease Trap Design" - Plans and specifications for grease traps shall be submitted to the County Board of Health for approval. The County Board of Health shall review the grease trap design in accordance with minimum design and construction criteria established by the Department's current Manual for On-Site Sewage Management Systems. Effluent from grease traps shall be disposed of in a septic tank and not directly discharged to the absorption field. Grease traps shall be located, installed and constructed so that the temperature of the sewage will be reduced to permit congealing or separation of grease, and easy access for cleaning is provided.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History**. Original Rule entitled AGrease Traps≅ was filed on March 28, 1984, effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.13 Sewage Flow.

The design sewage flow of an on-site sewage management system shall be determined from the Department's current Manual for On-Site Sewage Management Systems. The daily sewage flow may be determined by the Department after due consideration of data submitted by the owner or his agent on design criteria. Calculations will be made on the basis of peak flow and not on long term averages.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled ASewage Flow≅ was filed on March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.14 Subdivision and Mobile Home Parks.

(1) "Pre-development Review" - It is recommended that developers considering subdivision or mobile home park development, where public or community sewage treatment systems will not be available, seek a predevelopment review by the County Board of Health prior to developmental improvements. A predevelopment report which indicates disapproval or tentative approval may be obtained by submitting a boundary plat including:

(a) A vicinity map;

(b) A topographic map;

(c) A preliminary soil study conducted in compliance with the Department=s current Manual for On-Site Sewage Management Systems.

(2) "Proposals and Plans Required" - The following information is required for subdivision and mobile home park proposals:

(a) A boundary plat drawn to a reasonable scale which includes:

1. A vicinity map;

2. Proposed lots and streets including lot identification, dimensions, building lines and square footage of lots;

3. A topographic map depicted in two foot (2') contour intervals**.** Lesser contour intervals may be approved by the County Board of Health if the slope is sufficiently steep;

4. A soil map and soil descriptions based on a high intensity soil study conducted in compliance with the Department's current Manual for On-Site Sewage Management Systems;

5. The location of all present and proposed wells, water systems, water courses, flood plains, sewage systems, structures, right-of-ways, utilities, storm water drainage systems and easements on the property and within one hundred feet (100') outside the perimeter of the property; and

6. The name, registration number and seal of the professional surveyor or engineer that prepared the development plan.

(b) A completed Subdivision Analysis Record on forms provided by the Department.

(c) A copy of the following documents issued by the Environmental Protection Division of the Department of Natural Resources:

1. The land disturbance activity permit issued by either the Environmental Protection Division or the local "Issuing Authority". For the purposes of this section, "Issuing Authority" means the governing authority of any county or municipality, which is certified pursuant to subsection (a) of Code Section 12-7-8 by the director of the Environmental Protection Division;

2. A letter of approval to begin construction of a public water supply system and approving the source of the water supply where a public water supply system is to be utilized; and

3. For a development, which will result in the disturbance of more than five (5) acres, a copy of the Notice of Intent (NOI) submitted to the Environmental Protection Division to be covered under NPDES Permit GAR100000 for the discharge of storm water associated with construction activity.

(3) "Approval Required" - No person may sell, offer for sale, lease, rent, begin construction or otherwise begin the physical development of a lot or lots in a subdivision or mobile home park until written approval of plans for water supply and sewage disposal has been obtained from the County Board of Health. This approval constitutes general acceptance of all lots, except those lots excluded, for development with on-site sewage management systems. (Excluded lots may receive further consideration based on additional information.)

(4) "Limits on Use of On-Site Sewage Management Systems for Subdivision and Mobile Home Parks" - Approval of subdivisions and mobile home parks utilizing on-site sewage management systems shall not be granted:

(a) When a public or community sewage system is available within five hundred feet (500') off the subdivision or mobile home park;

(b) When soil maps, descriptions, and reports compiled by a registered Soil Classifier indicate that soil conditions prohibit safe development of on-site sewage management systems.

(c) Prior to receipt of a letter(s) from the Environmental Protection Division approving the plans to construct the public water supply system and approving the source of the water supply where a public water supply system is to be utilized.

(5) “Construction Permits” - Construction permits for on-site sewage management systems shall be issued in accordance with Section 290-5-26-.03(2)(a) of the Rules for On-Site Sewage Management Systems.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled ASubdivision and Mobile Home Parks≅ was filed on March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.15 Subdivision, Mobile Home Park Water and Sewage.

(1) “Subdivision and Mobile Home Park Water Supply”

(a) Connection to a public water supply system shall be required if available within one thousand feet (1,000') of the proposed subdivision or mobile home park.

(2) “Subdivision and Mobile Home Park Percolation Tests” - Where required for planning purposes and determination of the general absorptive capacity of soils, the number of percolation tests to be made shall be one (1) per lot, in the area where absorption fields are to be located. Before construction of on-site sewage management systems, individual lots within the proposed development shall comply with Section 290-5-26-.14 of the Rules for On-Site Sewage Management Systems.

(3) “Subdivision and Mobile Home Park Test Bores” -Where required for planning purposes, test bores to determine groundwater elevations and subsurface rock formations shall be made at locations, in numbers and at depths to be determined by the Department or County Board of Health.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled ASubdivision, Mobile Home Park Water and Sewage≅ was filed on March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.16 Technical Review Committee.

(1) “Technical Review Committee” - The Department shall appoint and maintain a technical review committee consisting of a maximum of fifteen individuals with technical or scientific knowledge relating to on-site sewage management systems. The duties of the committee will be to approve new systems, periodically review systems performance, assist the Department with the development of standards and guidelines for new technology, assist with the periodic updating of the Manual for On-Site Sewage Management Systems, revisions to standards and serve as the authority for product approval, evaluation, and the development of installation standards. The Committee shall also maintain a list of approved systems.

(2) “AMembership” - The Committee shall include at least one individual from the following disciplines:

(a) An Environmental Health Section staff person who shall serve as the secretary;

(b) Local County Environmentalist;

(c) Health District Environmentalist;

(d) Engineering;

(e) Manufacturing;

(f) Home Builders Association;

(g) Soil Classifier;

(h) University/academia;

(I) District Health Director;

(j) Environmental Protection Division;

(k) Well Driller;

(l) Georgia On-Site Wastewater Association;

(m) Land Developer;

(n) Septic Tank Contractor.

(3) "Meetings" - The Committee shall meet as deemed appropriate by the Department.

(4) "Fee" - The Department shall adopt a fee schedule for the technical review of new products and technology.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** Original Rule entitled AEnforcement≅ was filed on March 28, 1984; effective April 27, 1984, as specified by the Agency. **Amended:** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, same title adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.17 Certification and Decertification of Septic Tank Contractors, Inspection Personnel, Pumpers, Soil Classifiers and Maintenance Personnel.

(1) "Certification Required" - Individuals performing services related to site approval, the design, location, installation, inspection and maintenance of an on-site sewage management system, must be certified by the Department.

(a) Guidelines defining certification qualifications for septic tank contractors, inspection personnel, pumpers, soil classifiers and maintenance personnel shall be established by the Department and shall be published in the Manual for On-Site Sewage Management Systems. The guidelines shall be based on education, experience, testing and performance.

(b) The Department shall write a protocol for decertification of persons certified under the provisions of this Section.

(c) Certification shall be required every two years and shall be based on meeting continuing education requirements.

(2) “Fee” - The Department shall adopt a fee schedule for the certification and recertification of the persons listed in this Section.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, entitled ACertification and Decertification of Septic Tank Contractors, Inspection Personnel, Pumpers, Soil Classifiers and Maintenance Personnel≅ adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.18 Maintenance and Operation.

(1) “Prohibited Discharge” - No person shall allow the unapproved discharge or spillage of sewage, nor shall an on-site sewage management system be used or maintained in such a manner that will allow the seepage or discharge of effluent from such system to the ground surface, to a water course, drainage ditch, open trench, canal, storm drain or storm sewer, water well, abandoned well, lake, stream, river, estuary, groundwater, or other body of water.

(2) “Maintenance” - The property owner shall be responsible for properly operating and maintaining the on-site sewage management system to increase the life expectancy and prevent failure. Maintenance of the system shall be in accordance with the criteria established in the Department’s current Manual for On-Site Sewage Management Systems. Where an on-site sewage management system is proposed to serve facilities under separate ownership, a contract to insure proper operation and maintenance of the system signed by all owners, shall exist as a precondition to the issuance of a permit for the construction of an on-site sewage management system.

(3) “Additives” - No strong bases, acids or organic solvents shall be used in the operation of an on-site sewage management system.

(4) “Existing System Evaluations” - If a performance evaluation of an existing system is conducted, the evaluation shall be performed in accordance with the procedure established in the Department’s current Manual for On-Site Sewage Management Systems.

(5) “Variances” - The County Board of Health may grant variances in the cases of hardship where existing systems are malfunctioning.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule covering the same subject matter superseding this ER. **Amended:** ER. repealed and permanent Rule, entitled AMaintenance and Operation≅ adopted. F. Jan 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.19 Enforcement. The administration and enforcement of this chapter shall be in accordance with O.C.G.A. Chapter 31-5.

Authority O.C.G.A. Secs. 12-8-1, 31-2-2, 31-2-4, 31-2-7. **History.** ER. has been adopted. F. Jan. 2, 1998; eff. Jan. 15, 1998, as specified by the Agency, to be in effect for 120 days or until the effective date of a permanent Rule ER covering the same subject matter superseding this. **Amended:** ER. repealed and permanent Rule, entitled AEnforcement≅ adopted. F. Jan. 23, 1998; eff. Feb. 20, 1998, as specified by the Agency.

290-5-26-.20 Standards for Non-Conventional On-Site Sewage Management Systems.

(A) The Department shall review absorption field products that differ in design from the conventional on-site sewage management system. The following standards will be used to determine equivalency to the conventional on-site sewage management system.

1. The design infiltrative surface is the wetted trench bottom area.

2. Due to the combined effects of compaction, contact area and fines associated with gravel aggregate, the effective infiltrative surface area is reduced by an estimated 50%.
3. The minimum amount of effective trench bottom infiltrative surface area per linear foot shall be equivalent to the conventional 36-inch wide gravel system.
4. Sidewall area shall not be considered for design reduction. The minimum amount of effective sidewall infiltrative surface area per linear foot shall be equivalent to the conventional 36-inch wide gravel system.
5. The minimum storage volume required for a system shall be equivalent to the conventional 36-inch wide gravel system.
6. The design absorption area required is based on the most hydraulically limiting soil horizon that comes into contact with the infiltrative surface of the sidewall, trench bottom and for a distance 1 foot below the absorption trench bottom.

Infiltration area for conventional 36-inch wide gravel trench absorption

Sidewall Infiltration Area: 2 sq. ft./ft x .50 = 1 sq.ft. / linear foot

Trench Bottom Infiltration Area: 3 sq. ft./ft x .50 = 1.5 sq.ft. / linear foot

Storage Volume: 3 cubic feet / linear foot x 7.48 gallons / cubic foot x .35
= 7.85 gallons / linear foot

(B) Prior Approval: Lots approved for development based on a reduction in absorption trench length up to 50% shall continued to be approved and permitted for up to a 50% reduction in absorption trench length provided the lot is part of a recorded plat or part of a preliminary development plan submitted to the County Board of Health within one year of rule adoption. Preliminary plans must include as a minimum: proposed lots and streets with lot identifications, lot dimensions and square footage; a topographic map with water courses and flood plain identified; a level 3 soil report; the location of the water supply system, right-of-ways, easements and utilities; and the name, registration number and seal of the professional surveyor or engineer.

Authority O.C.G.A. Sec. 31-2-7. Adopted Jan. 21, 2004; eff. March 1, 2004. Amended: Rule repealed and adopted April 27, 2005, effective June 27, 2005.

On-Site Sewage Management
Systems General Site Provisions

1. Soil Characteristics - An On-Site Sewage Management System Construction Permit shall be denied where soil studies, soil types, on-site investigations or other geological data indicate soil conditions which preclude safe and proper operation of an On-Site Sewage Management System or when the installation of a system would create an actual or potential health hazard. Soil survey maps and reports prepared on the usual broad scales of 1:15840 feet or 1:20000 feet are not sufficient to approve property for development with on-site sewage management systems. On-site analysis of soils is required to validate the soil data before construction permits can be approved or denied.

2. Ground Water - On-Site Sewage Management System construction permits for conventional or chamber septic tank systems shall be denied where the seasonal high ground water elevation is less than two feet below the bottom of the proposed absorption field, or pit for a privy, or less than one foot where aerobic pretreatment of the effluent, to Class I quality, is used. Water table elevations will be determined by criteria established in Section C of the manual.

3. Bedrock and Impervious Strata - On-Site Sewage Management System construction permits for conventional or chamber septic tank systems shall be denied where bedrock or other impervious strata are less than two feet below the bottom of the proposed absorption field, or pit for a privy, or less than one foot where aerobic pretreatment of the effluent, to Class I quality, is used.

4. Topographical and Other Site Conditions

(A) *Fill* - Areas consisting of fill shall be excluded from consideration for use of conventional or chamber septic tank systems unless the County Board of Health, after consideration of special studies, allows the use of a controlled, uniform fill of permeable soil, interfaced with the original permeable soil, and provided that the infiltrative surface of the absorption trench is located in the original soil or in a fill that meets the above requirements. A soil classifier, registered engineer or registered geologist shall certify that the in-place fill meets the requirements in Section H of the manual or with County Board of Health approval, a Level II Certified Environmental Health Specialist trained in fill evaluation may approve in-place fill meeting the requirements in Section H of the manual.

(B) *Cuts and Grading* - If grading, cuts, ditching, trenching or other modifications planned for the site will ultimately affect the vertical location of the proposed absorption field in the soil, soil evaluation and percolation tests are to be made after alterations have been completed. This is done so that tests will be conducted in soil of the same characteristics and at the same depth at which the absorption field will be installed.

(C) *Slope* - The suitability of the area to be used for the proposed absorption field with regard to slope shall be determined by consideration of lateral flow of effluent to the surface of the slope. Slopes of more than 25 percent shall be considered unsuitable unless the application for the construction permit includes the results of a special investigation by a soil classifier, which demonstrates that the slope limitation can be overcome by design or by site modifications

(D) *Drainage* - Areas with gullies, ravines, dry stream beds, natural and man made drainage ways, sink holes and/or other similar conditions shall be excluded from consideration for any on-site sewage management system utilizing soil absorption as a method for final disposal. Areas subject to frequent flooding should not be considered for installation of on-site sewage management systems.

Soil Information and Use of Soils in Sewage Treatment and Disposal

1. PREFACE

Soil information and its proper application can contribute to the solution of many waste disposal problems in Georgia. It can effectively be combined with geology, engineering and ecology to yield an integrated approach to environmental improvement. This manual concentrates primarily on evaluating the suitability of soils for disposal of liquid waste from individual homes through septic tanks and subsurface soil absorption systems.

It is hoped that the following information will help to point out how to avoid the mistakes frequently made in choosing sites, which are suitable for development where the soil is to be used for treatment and disposal of liquid waste. Such mistakes can result in increased land use conflict, environmental degradation and a waste of time and money.

Although these sections of the Manual were developed to provide information to all people interested in solving relevant waste disposal problems where soil characteristics are contributing factors, the majority of the material will probably be most useful to environmental health specialists and other environmental health workers, surveyors, engineers, developers and other persons and groups frequently confronted with making significant land use decisions.

2. INTRODUCTION

A. Soil and Environmental Health

Soil is a term that means different things to different people. To some it is a material in which plants grow in a yard or a field. To some, the color of the soil is important and they speak of red soil, yellow soil or blue clay. To others, the soil texture is important and they speak of sandy soil, clay soil, light soil or heavy soil. To some the soil is everything above hard rock and to others it is the plow layer. Thus a part of soil evaluation deals with communicating exactly what is meant by the terms “soil”, “soil types” and “soil characteristics.”

The soil scientist, who deals with the genesis and morphology of soils, thinks of soil as that part of the unconsolidated mantle (parent material), covering the surface of the earth, that has been acted on by the forces of climate and vegetation, on a given relief, over a period of time, to form a separate and distinct body (soil profile). Thus the soil reflects the natural environment of a unit of landscape. By observing the soil characteristics of a given unit of landscape and knowing the environmental conditions that produce such characteristics, a prediction of the problems of the natural environment can be made.

The rapid expansion of the population and its migration into urban and suburban areas has created the need for environmental predictions for planning purposes. A house and lot constitute the environment within which a family makes their home. Such conditions as extremes of wetness or soil permeability on a home site exert a strong influence on the environmental health of the family living on that site. Dampness, ponded water, flooding around or under a house, use and failure of conventional septic tank systems, cracked foundations and the inconveniences that go with these problems, are a direct outgrowth of the soil-water relationship on a lot or within a subdivision.

Problems with environmental health associated with soils; result from errors in man's attempt to modify his environment. These errors are generally made by failing to predict soil suitability and in making allowances for modifications or corrective measures. For example, the natural environment of a lot changes in terms of wetness throughout the year and from year to year with changes in the weather. Thus, an evaluation of the wetness of a lot based on the presence of free water in the soil can be expected to vary throughout the year.

Prevention of environmental health problems associated with soils and waste disposal requires prediction of the problems before development begins. Prediction of the problems allows for modifications to be considered prior to development. Corrective measures made after development are more costly, as well as inconvenient to the homeowner or developer. The use of modifications or corrective measures raises the cost of development of a site in terms of initial investment, in terms of maintenance required and in terms of the end result obtained.

Evaluation of land from an environmental health viewpoint requires an understanding of the problems associated with a given unit of landscape (soil study) and an understanding of the processes of conventional septic tank systems.

B. On-Site Disposal of Liquid Wastes

Wastewater (sewage) contains many substances that are undesirable and potentially harmful. Present are pathogenic bacteria, infectious viruses, putrescible organic matter, toxic chemicals and excesses of the nutrients nitrogen and phosphorus, any of which could create public health hazards and nuisances if the wastes were discharged into the environment without proper treatment. To protect the public and the environment, wastes must be treated and disposed of in a safe and effective manner.

Characteristics of Household Wastes: Normal household sewage consists of all the liquid household waste, including waste from the toilet, bath, kitchen and laundry. This is composed of about 99.9 percent liquids and about 0.1 percent solids. The small percentage of solids is responsible for nuisances and, along with the microorganisms in sewage, is the cause of health hazards. Approximately two-thirds of the solids are of organic composition. The remainder is inorganic.

The organic compounds are the primary cause of odors and the nuisance problems attributed to sewage. These are the compounds that require large volumes of oxygen to make them stable, inoffensive and non-hazardous. Organic compounds in sewage are divided into three groups: nitrogen compounds, carbohydrates and fats. Nitrogen compounds include proteins, amino acids, amines, peptone, urea, etc. The carbohydrates include sugars, starches, cellulose, etc. The fats include fats, oils, grease, soaps, detergents, etc.

The total solids in sewage consist of dissolved (or soluble) solids, suspended (or colloidal) solids and the heavier settleable solids. The dissolved and suspended solids remain in the sewage and do not settle out while the settleable solids are removed from the sewage by gravity. In raw sewage, about 20 percent of the total organic solids are dissolved (soluble) solids. In aged sewage (after 24 hours in a septic tank), the dissolved solids increase to about one-half or slightly more of the total solids initially in the sewage. This is a result of the bacterial action on the suspended and settleable solids.

Treating the Wastes: A successful on-site sewage management system is one which will render the wastes harmless while not allowing harmful pollutants to accumulate to dangerous levels in the environment. It is important to point out that the environment is the part of the system providing the final treatment necessary before the water is of a suitable quality for reuse. It is a stream in the case of a municipal treatment plant and the soil in the case of a conventional septic tank system. If the pollutant load received by the environment is too great, pollutants will not be broken down and they will accumulate, leading to failure of the system.

The environment will perform three functions in the treatment of wastes. It will, (1) tie up inorganic compounds by chemical adsorption in the soil and sediments or by plant or animal uptake, (2) dilute the waste concentrations by the addition of purer surface water or groundwater and (3) break down the wastes and recycle the constituents. The ultimate goal of any wastewater treatment and disposal system is to perform the latter function.

To design a safe and effective wastewater treatment and disposal system, it is necessary to evaluate the physical characteristics of the local environment where discharge of the partially treated wastewater is to be made. Each site has its own characteristics, which limit its potential as a treatment medium. This is particularly critical where on-site sewage management systems are necessary. On-site systems lack the advantage of public or community sewage systems, where wastes can be collected and conveyed to a treatment plant located at a site, which is selected for its suitability to receive the wastes. Thus, there are fewer restrictions for sites serviced by a public or community sewage system. On-site systems, on the other hand, must be located near the point of waste generation and local environmental conditions are often less than optimal. The result is that development must often be prohibited or other means of disposal found.

Conventional Septic Tank Systems: Traditionally, the septic tank-soil absorption system has been used to provide on-site treatment and disposal of liquid wastes. It is an ideal system for disposal of liquid wastes since it is simple, relatively maintenance free and inexpensive when compared to public systems. When properly designed, installed and maintained, it is a very satisfactory system.

In general, the septic tank is used to provide partial treatment of the raw wastewater. Its primary purpose is to protect the soil absorption system from becoming clogged by solids suspended in the raw wastewater. The wastewater is discharged from the home directly into the tank where it is retained for a day or more. During this time, the larger solids settle to the bottom, where a sludge blanket develops, while the greases, oils and other floating particles rise to the top to form a scum layer.

In addition to acting as a settling chamber and providing storage for the sludge and scum, the septic tank also digests or breaks down the solids that have been removed. Anaerobic bacteria, organisms that live without oxygen, feed on the sludge and reduce its volume. In the process, soluble organic matter is released from the sludge

into the effluent. Methane and carbon dioxide gases are also produced which are vented from the tank through the house plumbing vent. Only about 40 percent of the sludge volume can be reduced in this manner, however and about once every three to five years it is advisable to pump the tank to remove the accumulated solids. If this is not done, the tank will fill with sludge to the point where the settled solids will be suspended and washed out into absorption fields, where they can quickly clog the soil pores.

The clarified liquid flows from the septic tank to the soil absorption field for secondary treatment and final disposal. It is an odorous liquid, high in partially degraded waste constituents, suspended solids, organic matter, ammonia and nitrogen. Pathogenic (disease-causing) bacteria and viruses may also be present in high numbers, as indicated by the incidence of fecal coliforms.

However, the conventional septic tank system has no process designed specifically to destroy pathogenic organisms. Should any pathogenic organisms be present in the sewage, they may be removed by the sedimentation process or be killed by the septic conditions existing in the septic tank. However, a large number of any pathogenic organisms present initially in the sewage are carried out of the tank in the effluent. Since the system has no chlorination process, the destruction of these remaining pathogens, as well as the oxidation of the effluent, must be accomplished in the soil. These pathogenic organisms gradually die off or desiccate as the effluent filters through the soil, but during this time they are carried for varying distances. The smaller organisms, especially the viruses, may be carried for great (although unknown) distances. The movement of viruses seems to depend on soil moisture and with high water tables and saturated soil conditions; viruses may move a considerable distance. In one New York state study, it was found that viruses are able to travel more than 200 feet in sandy soils.

Primary and secondary treatment of sewage has the same goal, whether the treatment occurs in a sewage treatment plant, an oxidation pond or an on-site sewage management system. That goal is the destruction of all or most of the pathogenic organisms and the removal by oxidation of the organic matter and other detrimental chemical compounds in the sewage. The main difference is that in a sewage treatment plant, the treatment is controlled and regulated by man through the use of various pieces of equipment. In the on-site sewage management system, the treatment is dependent entirely upon natural processes. Once the system has been installed, man has virtually no control over the functioning of the system and can do little to regulate the treatment processes that are occurring naturally. A certain amount of preventive maintenance can be provided, but, except for removal of accumulated solids from the tank, this is only to avoid external interference.

For this reason, the conditions under which a system is installed must be the most favorable to the functioning of the system. This includes not only the construction of the system, which is controlled by man, but also the natural factors, such as soil conditions, slope of the land, drainage, water table, etc., that are not controlled by man but can be selected by man. The selection of these natural factors is as important to the proper functioning of the absorption field as is the selection of the proper equipment in a sewage treatment plant.

The conventional septic tank system uses sedimentation and anaerobic decomposition in the tank and oxidation in the absorption field to treat the sewage. The two types of treatment occurring in the tank take place at the same time and are counter to each other. The settleable solids in the sewage settle to the bottom of the tank, removing about 35 percent of the solids through putrefaction and fermentation. This decomposition produces large amounts of gases, which tend to stir up the contents of the tank as the gases rise to the top. Because of the rising gases, many of the fine particles which would otherwise settle out, remain suspended in the liquid sewage and are carried out to the absorption field in the effluent.

To a large degree, the amount of solids being carried out to the absorption field in the effluent is determined by the accumulated solids in the tank. The tank will never clog completely as long as effluent is carried out to the absorption field. As the accumulated solids gradually build up in the tank, they increase in the effluent. To some extent, the amount of solids in the tank and in turn in the effluent being carried out to the absorption field can be reduced by increasing the retention time in the tank. This can be done by using a larger tank. When the tank has reached its capacity and can accumulate no more solids, the amount of solids in the effluent will equal the amount of solids in the raw sewage coming into the tank minus those solids that are lost by decomposition. The solids leaving the tank in the effluent are in direct proportion to the accumulated solids in the tank and to the solids in the raw sewage coming into the tank.

The solids being carried out in the effluent can be held to a minimum by having the tank frequently cleaned, i.e., by having the tank pumped to remove the accumulated solids. Except for cleaning the tank, other maintenance is not required. While several septic tank cleaners and other chemicals are on the market to assist the decomposition process occurring in the tank or in the absorption field, these serve no useful purpose. The decomposition process

that occurs in the tank is a natural process carried out by anaerobic bacteria and requires no outside chemical assistance. The aerobic process occurring in the absorption field requires only oxygen, in addition to the bacteria present, for the decomposition process to take place. Chemicals currently on the market do not significantly aid the process and also may have some adverse effects on the system. In fact, some products break down or loosen the sludge layer in the septic tank, which is then flushed into the absorption field and causes premature clogging.

Chemicals such as magnesium and calcium tend to keep the soil open so that the effluent can be absorbed more readily by the soil. However, magnesium compounds are poorly soluble. When combined with the sewage or the effluent, these form compounds that are not readily soluble so that their ions are not readily liberated. This reduces their effectiveness in opening the soil. Sodium and potassium compounds are very soluble so that their ions are readily available. However, these have an opposite effect from magnesium and calcium ions, causing a breakdown in the soil, which increases the chances of clogging. In either case, a relatively large amount of the chemical is needed to cause an effect. If any benefits are derived by the use of the chemicals, it is only on a temporary basis and will not be a solution to any problem.

"Seeding the tank" with anaerobic bacteria is another aid that has been advocated in starting the bacterial process of a new tank. This is done by placing old sewage or sludge or manure in the new tank so that the anaerobic process will begin immediately. However, raw sewage coming into the tank from the building initially contains sufficient anaerobic and facultative bacteria so that the seeding is not necessary, although it has no adverse effects.

Raw sewage initially contains three to five parts per million (ppm) of free oxygen and is acted upon by aerobic and facultative bacteria. This oxygen in the sewage is derived from the liquid waste (wash water, kitchen sink waste, bath waste, etc.) rather than from the human waste. However, the oxygen is soon used up by the aerobic bacteria and the less efficient facultative and anaerobic bacteria become more active. At this point, the sewage becomes septic.

Sewage contains an abundance of nutrients and water, providing an excellent microbiological medium for the growth of bacteria. Raw sewage contains from 100,000 to 1,000,000 bacteria per milliliter. This increases to 10,000,000 to 10,000,000,000 per milliliter in aged sewage. The strictly aerobic bacteria cannot grow in stale or septic sewage and tend to die off. However, many of the strict aerobes are spore formers and exist in the stale or septic sewage in their dormant stage. The majority of the bacteria are facultative and grow in septic as well as raw sewage. These bacteria also grow in the sewage effluent that passes through the tank into the soil. Other microorganisms in sewage include protozoa, fungi, nematodes and viruses. The amoebae are the major intestinal protozoa and exist in the sewage in the cyst stage. Although the yeasts are facultative or anaerobic, most of the other fungi, including the molds and the non-intestinal protozoa, are aerobic. The aerobic organisms tend to die off in the septic sewage or occur in the cyst stage. In this stage they are largely unaffected by the septic conditions. Since the viruses grow only in living cells they do not increase in the septic tank or in the effluent in the soil. Instead, they tend to die off over a varying but usually long period of time.

Many genera of bacteria are present in septic sewage. Among the acid producers, Alcaligenes, Aerobacter, Escherichia, Flavobacterium and Pseudomonas are the most numerous. These are facultative and are also active when the effluent is oxidized. A few of the anaerobes are also acid producers. The methane formers are less numerous and are strict anaerobes. These include species of the genera Methanobacterium, Methanococcus and Methanoscorcina, although other species produce methane as one of their end products. The Desulfovibrio species are strict anaerobes and are important in the reduction of sulfur compounds. Their end product is hydrogen sulfide, which may react with existing metallic ions to form other sulfides, most of which are insoluble.

Since anaerobic bacteria must derive their oxygen from organic matter, they must utilize a larger amount of organic matter than do aerobic bacteria, but their decomposition processes are not as complete as those of aerobic bacteria. The anaerobic decomposition processes, because of the limited source of oxygen, are much slower than are the aerobic decomposition processes. Because of this and the short time that sewage remains in the septic tank, the decomposition of organic matter is incomplete and must be completed through the oxidation processes in the soil.

In the putrefactive and fermentative processes that occur in the tank, the solids are broken down into inorganic compounds, liquids and gases. In addition to these, many of the solids initially in the sewage remain in the effluent since these processes are not carried to completion due to the slow action of the anaerobic bacteria.

The solids that do remain tend to be converted to suspended and dissolved solids. While many settle- able solids still remain in the effluent, they are of a smaller size than are the settleable solids in the raw sewage. These factors make the septic tank an inefficient means of sewage treatment.

The 40-50 percent of nitro-organic compounds (mainly proteins, amino acids and amines) is reduced primarily to simpler compounds (methane gas, ammonia and ammonium compounds) through the process of ammonification. Fermentation of the 40-50 percent carbohydrates (starches, sugars, cellulose, etc.) is partially carried out with the liberation of large quantities of methane, hydrogen sulfide and carbon dioxide gases. The sugars and starches are quickly acted upon by the bacteria. The cellulose, however, is fermented much more slowly and receives only minimal bacterial decomposition while in the tank.

The sulfur compounds are acted upon by sulfur bacteria (species of Clostridium, Proteus, Senatia, etc.), which produce hydrogen sulfide or other sulfides from organic sulfur compounds. These sulfides, including dissolved hydrogen sulfide gas, are carried out to the absorption field along with the compounds not acted upon. Detergents, soaps, fats, greases and small amounts of other chemicals that are present in the sewage are acted upon very little by the bacteria in the tank. Those that do not rise to the top of the tank as scum are carried to the absorption field in the effluent.

The nitrogen cycle, the carbon cycle, the phosphorus cycle and the sulfur cycle are all essential in nature for the decomposition and the reuse of essential materials. They are also essential in the treatment of sewage, whether this treatment is in a treatment plant or in an on-site sewage management system. In the conventional septic tank system, these cycles have their beginnings in the septic tank under anaerobic conditions. The cycles are completed only under aerobic conditions in the absorption field. Aerobic conditions must be found in the soil in the absorption field or these cycles are incomplete and the organic and inorganic matter remains in the unstable and offensive state.

In the nitrogen cycle, the nitrogen compounds (proteins, amino acids, amides, urea, etc.) are partially decomposed into ammonia, methane gases and into ammonium compounds in the septic tank under anaerobic conditions. This cycle is continued in the absorption field where the compounds are oxidized first into nitrites and then into nitrates. The cycle is completed when plants absorb the nitrates out of the soil and convert them into plant protein. A continuation of the cycle is the conversion of the plant protein into animal protein. However, in the area of the absorption field only part of the nitrates is taken up by the plants. The remainder stays in the soil. Nitrates are generally considered quite mobile in soils and can be leached out in the groundwater as well as taken up by plants. Private water supplies in the vicinity of absorption fields will sometimes contain nitrates. The concentration of the nitrates in well water is variable and is dependent upon the porosity of the soil, the concentration of the nitrogen compounds in the sewage, the amount of nitrates absorbed by the plants and the distance of the water supply from the absorption field. A high concentration of nitrates in drinking water should be avoided. A maximum contaminant level of 10 milligrams nitrates per liter of water has been set by the Environmental Protection Division, Georgia Department of Natural Resources.

The oxidation of ammonium compounds to nitrites and nitrates is the nitrification process. In the absence of oxygen, the reverse process is brought about by anaerobic bacteria and the nitrates and nitrites are reduced to ammonium compounds.

The sulfur cycle is also reversible. The sulfur compounds in the sewage are decomposed to hydrogen sulfide and to other sulfide compounds under anaerobic conditions in the tank. In the absorption field, in the presence of oxygen, the sulfur bacteria oxidize these compounds first to sulfites and then to sulfates. Under anaerobic conditions in the absorption field the sulfites and sulfates are reduced to sulfides. Hydrogen sulfide or other sulfides present in the effluent remain unchanged if anaerobic conditions exist in the absorption field. The black odorous substance associated with malfunctioning or poorly functioning absorption fields is ferrous sulfide. The presence of this product in an absorption field indicates the lack of sufficient oxygen and therefore anaerobic conditions. Ferrous sulfide is an insoluble compound and increases the clogging of the soil.

A properly designed and constructed absorption field is a very effective biological and physical filter, which is able to break down the organics and other chemical substances and remove pathogenic organisms, including viruses. This is true, however, only where the soils meet rather specific criteria. Quite often these criteria are not met and failing systems result, causing public health hazards and nuisances.

Unfortunately, many soils in the state do not meet the necessary criteria and thus are unsuitable for on-site liquid waste disposal, while many others are only marginally suitable and may require extensive modification to make them suitable. We are interested in identifying those with minimal or no restrictions and also those soils with marginal suitability that may be successfully modified and safely used for wastewater disposal.

C. Problems and Causative Factors in Failure of Subsurface Waste Disposal Systems.

Failure by Soil Clogging: Regardless of the initial permeability of the soil, many absorption fields fail after a number of years of use. This first type of failure discussed below might be characterized as creeping failure, or death by old age and/or lack of proper maintenance. Failure may be evidenced by the surfacing of untreated effluent causing nuisance odors and public health hazards. Alternatively, subsurface ponding of water in the absorption field may cause the tank to overfill, resulting in sluggishness or stoppage of the drains in the buildings being serviced by the conventional septic tank system. Water then backs up in toilets and other fixtures in the buildings.

The reason for creeping failure is the gradual formation underground of an impermeable clogged or crusted layer in the soil below and around the absorption field. Flow of water through this clogged or crusted zone is severely restricted or even eliminated, although the permeability of the surrounding soil remains essentially unchanged. Consequently, large volumes of septic tank effluent accumulate in the absorption field.

Several physical, chemical and biological phenomena occur, progressively or jointly, to produce zones of gradually decreasing permeability in soils inundated by septic tank effluent. These processes are largely independent of the composition, constitution or texture of the soil at the system site, the design or layout of the absorption field or the nature of the materials and techniques used in its construction. As a result, even the most carefully constructed systems installed in soils of optimum permeability are subject to failure through clogging or crusting. Some of the mechanisms involved in soil clogging by septic tank effluent are described in the following paragraphs.

Every soil is composed of myriads of particles of varying shapes and sizes. Since these particles cannot fit together perfectly to form a solid mass, each soil is replete with a labryinthic series of interjoining pores of capillaries, which are normally filled to varying proportions with air or water depending upon the moisture content of the soil. Because these capillaries or pores are interconnected, moisture such as that from rainfall can slowly pass from higher to lower layers (horizons) in the soil and eventually into the groundwater. Soils composed mainly of large particles (sands) have larger capillaries and conduct water faster (i.e., water soaks or percolates through sandy soils at higher rates). As soil particles size decreases, the size of the capillaries also decreases and although the number of capillaries increases, water soaks or percolates much slower through finer grained soils (Rates decrease in the series: coarse sand >fine sand>sandy loam>silt>silt clay>clay).

When large amounts of pure water are allowed to pass through soils composed of particles of different sizes, the rate of percolation is found to gradually decrease. The reason for this is that the flow of water causes smaller particles to become dislodged and to be swept into some of the larger capillaries where they become lodged in constricted areas, effectively blocking the capillaries.

This phenomenon causes deterioration of the physical structure of the soil and when referred to surface soil it is given the name “puddling.” Compression of puddled soils can cause “smearing,” i.e., more effective blockage of the soil capillaries under compression forces. Smearing can occur during construction of on-site sewage management systems if heavy machinery is run over or used to excavate wet soils. This compression effect can cause reduction in flow through the walls of absorption trenches as it effectively seals off soil capillaries.

Puddling and smearing are not the only phenomena that initiate blockage of the soil capillaries. Although most of the solids present in household waste waters (usually about 400 ppm) settle out as sludge at the bottom of the septic tank and the bulk of fats and grease separates as a floating scum at the top of the tank, the effluent discharged at an intermediate height from the tank into the distribution system leading to the absorption field is not completely free of suspended insoluble solids. Residues of vegetable matter and fibers from toilet tissue and similar items form swollen gel-like particles not very different in density from water. Such particles do not settle out rapidly and some are carried in the effluent into the absorption field. Normal septic tank effluent usually contains about 140-150 ppm of suspended solids. The capillaries in the soil of the absorption field filter out these suspended particles very effectively, but the pores of the soil filter become stopped up by them, reducing the rate of percolation.

Effluent from the tank also contains large numbers of bacteria. The bacterial cells also behave like small particles. They are filtered out of the percolating effluent by the soil capillaries, causing further blockage of the soil pores.

Both these bacteria and the natural soil bacteria present in the absorption field are provided with a constant supply of dissolved inorganic and organic nutrients that contained in the effluent flowing into the field. Consequently, all of these bacteria multiply very rapidly in the soil and the resulting microbial biomass creates further barriers to the seepage of water through the soil capillaries.

Although these phenomena cause a detrimental reduction in the rate of flow of water through the soil, they also produce a beneficial increase in the wastewater treatment capability of the soil. A tighter filter is more efficient at removing suspended solids while the larger bacterial biomass is more efficient at degrading organic wastes in the septic tank effluent.

Septic tank effluent enters the absorption field intermittently in direct relation to amount and frequency of water usage. Effluent entering the septic tank displaces a finite volume of clear liquid into the absorption field. In order to avoid surfacing of effluent or saturation of the absorption field, soil percolation rate must balance the volume of the effluent to be filtered through the soil layers. As a sequel, air enters the absorption field through soil pores to further dry the absorption field.

As long as air continues to be drawn into the absorption field as the water soaks away, a mixed population of aerobic microorganisms will remain in the absorption field to effect biodegradation of the soluble and insoluble organics transported into the absorption field with the septic tank effluent.

However, as more and more soil capillaries become plugged, the rate at which the water seeps away becomes slower and slower so that less and less air is drawn into the absorption field. Under these conditions, aerobic fermentation in the absorption field is gradually replaced by anaerobic fermentation.

During microbial fermentations microorganisms digest organic materials, using part of them for energy maintenance and part for forming their cellular mass. In order to break down and utilize organic compounds, microorganisms must have other compounds available to be used as electron acceptors. The oxygen present in the air is the normal terminal electron acceptor used by all aerobic organisms in this process. The oxygen is reduced to water and used to produce carbon dioxide (CO2) from some organic compounds. If no air is available, microorganisms that can live in the absence of air (anaerobic bacteria) will use other inorganic (e.g., nitrate or sulfate) or organic compounds as electron acceptors. Reduction products associated with organic matter conversion under anaerobic conditions include nitrogen (from nitrate), sulfide (from sulfate) and methane (from organic), each again being accompanied by carbon dioxide (CO2) produced from organic matter decomposition.

In absorption fields, when air is no longer drawn into the soil the range of electron acceptors available to microorganisms in the absorption field becomes very restricted. There is no dissolved oxygen in the septic tank effluent because any air in the water has already been used up in fermentations in the tank. Most of the simple, readily biodegradable organic compounds have also been converted in the tank, so that these, too, are no longer available as electron acceptors. Only minor amounts of methane are produced in ponded effluents. The only significant electron acceptor available in ponded fields is sulfate (4-10 ppm). This is rapidly reduced to sulfide. Even though septic tank effluent is alkaline (pH=7.5-8.0), owing to free ammonia in the water, free hydrogen sulfide (odor) becomes detectable in fields that have been constantly ponded for a few months.

Sulfides are toxic to most microorganisms. Only surface bacteria, which can reduce sulfides further to elemental sulfur, can survive in the presence of high sulfide concentrations. The presence of free sulfide in stagnant absorption fields may therefore kill off many of the bacteria, which would otherwise be degrading organics. Some of the free sulfide may be converted to insoluble sulfur, causing further blockage of soil pores. However, very little of the sulfide produced in the absorption field remains in the free state. The bulk of it combines with ions of heavy or transition metals (e.g., iron, manganese, nickel, copper, magnesium, zinc, etc.) present in the soil or in the wastewater (5 ppm total metal cations in septic tank effluent). This causes the deposit of black, insoluble, inorganic sulfides in the beds. Failed absorption fields invariably have intensely black impervious layers underneath and around the gravel. The gravel itself is generally coated with black slime. This is not surprising since incoming tank effluent already contains 2-5 ppm of sulfide.

The insoluble sulfides contribute to further blockage of the soil capillaries, but this may not be their most deleterious effect. Many elements tied up in insoluble form as sulfides are required by microorganisms for their redox enzymes, the organic catalysts needed for respiratory functions, including degradation of organic matter. Binding of trace elements by sulfides may therefore inhibit organisms otherwise capable of destroying organic materials in the absorption field.

One last contributor to clogging is the action of the anaerobic bacteria themselves. Many microorganisms, especially anaerobic bacteria, produce polysaccharide slimes or gums, which they secrete into their surroundings. These seem to function as a protective sheath around the bacterial cell wall. When formed in situ in the absorption field, such polysaccharides help to form an impermeable layer in the bacterial zone. Organic matter, obtained from clogged layers of ponded fields, contain about 5% polysaccharides, some of which may be from bacterial slimes or gums of this type.

Appearance of Clogged Zone: A combination of physical deterioration in soil structure, soil pore blockage by solids and bacteria from the effluent, proliferation of heterotrophic soil bacteria and deposition of insoluble sulfides and bacterial slimes, gums and metabolites (e.g. sulfur) produces a zone of clogging in the soil which will not allow water to seep away at a tolerable rate. Measurement of the distribution of organic matter through typical clogged layers reveals that the bulk of this material occurs in the soil immediately next to the gravel. The amount decreases abruptly with the distance outward or downward from the gravel. A similar distribution is found in the amount of sulfides in the soil.

Where this type of zone occurs in a coarse textured soil, air can begin to penetrate into the soil beneath the clogged areas restoring aerobic conditions when the flow of water diminishes. The minor amounts of organic matter present under the zone of maximum clogging are then apparently oxidized and degraded rapidly, so that the soil in this region reassumes an almost natural appearance. A relatively sharp boundary then results between this aerobic layer and the heavily blocked, black anaerobic layer. The dense anaerobic layer becomes very hard and brittle, assuming the character of a crust in the soil. Occasionally a narrow grey intermediate zone is observed underneath the black crust. This crust is very strong since it is capable of retaining thousands of gallons of stagnant water, which are ponded above it in the field under several feet of hydrostatic head. The soil above the crust is thus permanently saturated with moisture, but that below the crust is unsaturated, generally having about the same moisture content as similar soils at the same depth in areas quite far removed from the field.

D. Other Causes of Failure:

Other possible causes of failures with on-site sewage management systems that use soil for final treatment include but are not limited to:

1) Seasonal or permanent high ground water elevations;
2) Structural damage to soils with high clay content by construction equipment, especially if soil moisture is high;
3) System improperly installed;
4) Inadequate design capacity for the actual sewage loading;
5) User abuse in the form of overloading, failure to perform maintenance intervals, neglect of leaking or maladjusted plumbing fixtures, inordinate use of chemical additives or other deleterious material and physical damages to part of the sewage system caused by digging, grading, filling, heavy traffic or other damaging actions;
6) Flooding by storm water or other surface water sources; and
7) Adverse soil conditions such as shallow bedrock or very slowly permeable soil conditions.

3. SOIL EVALUATIONS

A. Use of Soil Maps in Evaluating Site Suitability for Soil Absorption Systems

Soil maps are an essential part of the environmental evaluation of an area. They represent parts of the earth surface. Soil evaluation for on-site sewage management systems involves a specific location in the landscape that is difficult to describe without a map.

The soil maps indicate different soil types by soil symbols and the solid lines containing the symbol show the boundary and extent of each area. For example, Troup (Tr) represents a deep, well-drained soil, located on upland ridge tops and hillsides of the Southern Coastal Plains; Chatuge (Ch) represents a deep, poorly drained, nearly level soil located on low stream terraces in mountain valleys. Interpretations of the soil maps will indicate whether or not soil at a particular site is subject to an intermittent high groundwater table or has rock formations near the surface. These will also help to avoid mistakes caused by variable percolation test rates that result from the test being conducted during different seasons of the year.

The preliminary investigation of an area with soil maps will permit the determination of site suitability regardless of the time of year the evaluation is made. The soil map is reliable for predicting general soil capabilities for an area of several acres. However, it generally does not contain enough detail to predict the limitations for a specific disposal site because different types of soil can exist within short distances. Maps are likely to be least reliable in the vicinity of a soil boundary.

The preliminary investigation of an area with the use of soil maps can be an important tool in reducing development costs. If the soil map indicates that a high percentage of an area is unsuited for conventional septic tank/soil absorption systems, it may not be economically feasible to pursue development. This would require consideration of alternative on-site sewage management systems or a community or public sewage treatment system.

If a community or public sewage treatment system is selected, then a lot by lot evaluation could be eliminated.

A subdivision map or plat showing lots and roads is of little value for evaluating an area for the development of conventional septic tank/soil absorption systems unless soil types have been used as a basis for the evaluation. In fact, without consideration of soil types during the preliminary investigation, this could create problems such as road and street relocation, resubdividing and other costly changes.

B. Physiographic Provinces

The physiographic provinces or major land resources areas (MLRA) provide a general idea of what can be expected in terms of soil conditions and parent materials. Georgia has eight provinces that vary greatly from the mountains to the sea.

1) **Sand Mountain**
   This province consists of mountain plateaus with gently sloping ridge crests at elevations of approximately 1500 to 2000 feet above sea level. Side slopes of the plateaus are steep with escarpments of sandstone, shale and limestone. Mean annual rainfall is approximately 54 inches.
2) **Southern Appalachian Ridges and Valleys**
   This province consists of ridges of limestone, cherty limestone, sandstone and gently sloping valleys filled with material eroded from the ridges. Elevations range from approximately 600 to 1500 feet above sea level. Mean annual rainfall is between 52 and 56 inches.
3) **Blue Ridge**
   The Blue Ridge Province consists of mountain ridges with steep slopes, foothills and narrow intervening valleys, underlain by acid crystalline metamorphic rock. Depth to rock is shallow except over some of the colluvial materials occurring near the bottom of slopes. Elevations range from about 700 to 4,700 feet above sea level. Mean annual rainfall is between 52 and 90 inches.
4) **Southern Piedmont**
   This province is a broad plain that has been dissected by streams. It is an old land surface with rounded slopes that is underlain by acid crystalline and metamorphic rock. Elevations range from about 500 to 1500 feet above sea level. Mean annual rainfall is 44 to 56 inches. The degree of the slope has a strong influence on the soils developed over a given parent material. On steep relief, the soils are generally shallow and weakly developed, while on flat relief the soils are usually deeply weathered with deep clay subsoils. Clay or fragipans are frequently associated with flat areas and seasonal water tables are associated with these soils.
5) **Sand Hills**
   This province consists of gently sloping to steep sloping soils derived from marine sands, loams and clays that were deposited on acid crystalline and metamorphic rocks. Elevations range from 300 to 500 feet above sea level. Mean annual rainfall is between 40and 52 inches.
6) **Black Lands**
   This province consists of irregular out- croppings of marl and clays and shallow to moderately deep soils derived from marl and clay. Elevation is approximately 400 feet above sea level. Mean annual rainfall is about 46 inches.
7) **Southern Coastal Plan**
   This province consists of soils occupying broad in stream areas having gentle to moderate slopes and underlain by marine sands, loams and/or clays. Elevations range from approximately 250 to 500 feet above sea level. Mean annual rainfall is between 40 and 52 inches. Soils are generally deep and depth to rock is usually greater than six feet.
8) **Atlantic Coast Flatwoods**
   This province consists of nearly level and shallow depression soils, which generally have seasonal high water tables and are underlain by marine sands, loams and/or clays. Deep sandy surface soils are usually found in this province, but loams and clays underlie most of the area and restrict downward movement of water. Seasonal water tables and drainage are a problem. Elevations range from sea level to about 300 feet above sea level. Mean annual rainfall ranges between 44 and 53 inches.

C. Soil Profile

A soil profile consists of a vertical section of the soil extending through all its horizons and into the parent material. A number of similar soil borings indicate a soil series landscape.

A soil profile will have a surface soil, a subsoil and parent material. Upland soils, other than in the coastal plains, usually have hard rock below the parent material.

Soil borings are made in a unit of landscape to confirm expectations. A record should be kept of the depth, color and texture of each major horizon. The record should show the range in depth, color and texture within a unit of landscape. Several borings may be necessary where deviations are noted.

Soils on hilly or steep topography can frequently be expected to have thin or no subsoils. In some places, the original surface has eroded away and the present surface layer contains subsoil material.

Changes in the soil series may be due to changes in parent material, deposits or capping and depth to restrictive layers such as clay, sand, fragipans or hard rock.

The soil borings will indicate depth to hard rock. The soil color, especially subsoil color, will indicate the presence of a seasonal water table in the soil, which causes problems during wet weather. The soil texture will indicate possible problems with the rate of absorption, as well as the best horizon to test for absorption rates and in which to install absorption lines.

D. Soil Color

Soil color is a reliable guide to the natural drainage of a landscape. It can provide clues as to whether the soil has difficulty absorbing the normal rainfall or can absorb the rainfall without ponding at some point in the soil profile.

Soil color is directly related to the oxidation or reduction of the iron present in most soils. The organic acids passing through the soil require the addition of oxygen from their decomposition to carbon dioxide and water. When soil pores remain filled with water for extended periods, the oxygen supply is restricted and the iron is reduced to help supply the needed oxygen. This produces gray, brown or red mottles or gray matrix color.

The significance of this to the proper function of an absorption field is that colloidal organic matter moves into the absorption field and, if not oxidized, tends to block the soil pores. In addition, unaerated sewage effluent then travels into the ground water for reuse in a very poor quality condition.

Uniform red, brown or yellow soil color does not insure the proper function of an absorption field. It does indicate that the soil is able to absorb the normal rainfall without ponding, but soils with bright colors (red, brown, yellow) may have slow rates of absorption and, consequently, not be capable of absorbing the additional burden of sewage effluent.

Red or Brown - Red or brown colors indicate good natural drainage in relation to rainfall. Soils with these colors occur on upland ridges or side-slopes and allow good runoff of rainfall. Many soils that are red or brown in color may have slow rates of absorption.

Gray - Gray colors indicate a ponding of water in any horizon in which they occur. Soils with gray colors occur on flat or slightly depressed low lands and most of the rainfall soaks into these soils. The ponding of water is generally seasonal in nature and usually will not be present in dry periods. It can occur in sands or clays and may not be directly related to percolation tests. Gray color may also occur in the lower subsoil or at the horizon of some soils on steep slopes and should not be interpreted as a sign of wetness in these instances

Black - Black colors are due to organic matter that masks the true color of the soil. Organic matter accumulates because the soils remain wet most of the time, which prevents its breakdown. Soils with this color exist in shallow depressions or bays.

Gray and Yellow Mottling - Gray and yellow mottling indicates a seasonal ponding of water in the soil at the depth at which the mottling occurs. Absorption lines shall not be placed at depths where the mottling is observed because they can be expected to fill with ground water during wet periods.

To be reliable, moist soil from the subsoil of the profile should be observed for color. In most cases, there is a direct relationship between soil color and landscape positions.

Water may pond in soils for very short periods above the levels indicated by gray mottles. The gray color indicates the water ponds for an extended period. Even a mottle-free soil may be saturated for short periods after a rain.

Gray Color in Soil - The gray color or gray mottles are usually associated with ponded water in the soil profile. It is related to the reduction of the iron in the soil from the ferric to the ferrous form. Reduction of iron

occurs when organic acids are present in a saturated soil with limited oxygen. The organic acids are unable to secure enough oxygen from the water and revert to the next most readily available supply from the ferric iron. Gray mottles or colors indicate the supply of oxygen is limited during wetter portions of the year. A higher percentage of gray in a soil indicates longer duration and greater frequency of the ponding periods.

Soils with gray colors or mottles indicate potential problems with absorption systems. Periods of soil saturation will interfere with the disposal of water into the soil. Soils with a wetness problem have a low oxygen supply during saturated periods and the addition of effluent compounds the problem, causing more rapid clogging of soil pores with organic waste.

Gray colors or mottles indicate about four weeks of saturation on a repeating basis throughout the year. The cause of the saturation of the soil may be due to slow percolation in the gray mottled zone or to a restriction at some depth below the horizon which ponds water into the mottled horizon.

Absorption fields installed in mottled horizons of soil will have difficulty absorbing sewage effluent and organic waste during the periods of saturation. Saturation of the absorption field will eliminate the safety factor provided by the gravel trench storage area and overload the system. Repeated saturation of absorption fields with excess ground water causes blocking of the soil pores with colloidal organic matter due to low oxygen supply. Unsaturated conditions are necessary at both the absorption field depth as well as below the absorption field for a reasonable distance to insure adequate filtration and treatment of sewage effluent.

E. Natural Soil Drainage

The natural drainage of soil depends on how much of the water falling on the soil enters the soil and how well it passes through the soil. The position of the soil on the landscape and the degree of slope influence the former and affect the drainage class of the soil.

Flat land or depression areas have very little runoff and may receive additional runoff from higher ground, most of which must drain through the soil. Poorly drained soils generally occur in these positions. Undulating or rolling land has more runoff and less water must pass through the soil. Soils in these positions are generally well drained or moderately well drained. On steep slopes, most of the water runs off. The amount and types of vegetation also influence the amount of runoff.

The texture of the soil is another factor that influences the natural drainage. Sandy soils drain better than clay soils. A well-drained clay soil may still not be absorbent enough to pass a percolation test. Whether the subsoil is heavy (clay) or light-textured (sandy) may influence the natural soil drainage.

Fragipans and solid rock influence the natural drainage because they restrict the downward movement of water. If the internal drainage is limited, then the capacity of the soil to absorb water is limited and water will stand in the soil above the restriction.

The presence of water above the restriction is reflected in the color of the soil. The colors and where they occur in the soil are used in determining the drainage class of the soil. The drainage classes do not refer to specific depths at which the mottling occurs but rather to the horizons in which mottling occurs. The depth to gray mottles will affect classification of the soil.

The question might be raised as to how the soil could be excessively drained. The excessively drained class is a reflection of the availability of water to plants rather than of drainage as such. It reflects drainage in that these soils do not hold enough moisture for normal plant growth. However, soils that are excessively drained may be undesirable for the installation of on-site sewage management systems due to the fact that the effluent may pass through the soil too rapidly to be properly filtered and thus reaches the groundwater before it has been adequately treated.

The drainage classes are:
- Poorly Drained
- Somewhat Poorly Drained
- Moderately Well-Drained
- Well-Drained
- Excessively Drained

1) Poorly Drained Soils

Poorly drained soils can generally be expected on broad flats or depression areas along drainage ways.

Runoff water moves very slowly and the soil remains saturated for long periods. Frequently, these soils receive additional runoff water from higher surrounding areas. The seasonal water table is at or near the soil surface for long periods. The surface and subsoil colors are grays with a few yellow and reddish mottles. Frequently the subsoils are clay, but poorly drained soils may also be sandy. Percolation tests are not needed on these soils because a seasonal water table will restrict their use. Some of these soils may pass a percolation test during dry periods.

2) Somewhat Poorly Drained Soils
Somewhat poorly drained soils occur on flat to gently sloping relief and most of these areas are subject to flooding. Water drains from the surface soil but not from the subsoil. They are commonly mottled with gray at depths of six (6) to twenty (20) inches from the soil surface. They have a seasonal water table in the lower surface or upper subsoil. The entire soil generally has a yellowish or leached appearance, indicative of internal drainage problems. The percolation tests, if done in such soils, must be conducted above the seasonal water table elevation and be properly saturated prior to running the tests.

3) Moderately Well-Drained Soils
Moderately well drained soils occur on nearly level to strongly sloping topography. These soils have gray mottling in the lower subsoil (below 20 inches), indicating a restriction to drainage below this depth. Soils with restrictive layers, such as fragipans, may have this drainage classification but it is not restricted to soils with fragipans. These soils generally have rather pale surface colors but may have red, brown or yellow colors in the upper subsoil. Percolation tests on these soils will mainly measure lateral movement of water because movement is restricted in the lower subsoil. Deeper percolation tests may be necessary to determine the degree of restriction to internal drainage.

4) Well-Drained Soils
Well-drained soils occur on nearly level to steep relief. They are free of internal restrictions in natural drainage. The soils may be red, brown or yellow in the subsoil. In some places, yellow and red mottling may occur in the lower subsoil. These soils may need to have percolation tests run because some well drained soils are too heavily textured (clayey) to absorb water at the necessary rates.

5) Excessively Drained Soils
Excessively drained soils generally have little or no subsoil development and do not retain much water. Most of these soils are sandy. Many of these soils are shallow to rock north of the fall line. Contamination of shallow ground water aquifers is a concern where these soils are being considered for the installation of on-site sewage management systems using soil absorption for disposal of effluent.

F. Soil Texture

Soil texture depends upon the relative proportions of sand, silt and clay particles in a soil. These proportions can be determined by special equipment in a laboratory. Relative differences in soil textures can be determined in the field by feeling the soil when moist. It is of value to determine if a soil is predominantly sand, clay or silt or is a mixture of various sizes. Within a geographic region, infiltration rate, permeability, aeration and drainage are closely related to soil texture.

The evaluation of texture is needed to provide some indication of the rate of absorption and problems with absorption. Sandy horizons will have larger pores than clayey soils. Thus, a clay soil can be blocked by organic mater in the drainfield more readily and fail more rapidly.

The essential part of texture evaluation is to determine if a soil is sandy or loamy or contains enough clay to produce a ribbon when moist.

G. Seasonal Water Tables and Free Water in Soils

Attempting to determine seasonal water tables by the free water present in a soil at any point in time can create problems with uniformity of evaluation. The problem is one of consistency of evaluation both in wet and dry periods. Therefore, the evidence of gray colors or gray mottling is the best indicator to determine if soils are saturated or have seasonal water tables. Free water may occur above the depth of gray colors or mottling in wet periods and be absent in dry periods. Thus, a reliable evaluation of seasonal water tables must include gray colors. Generally, the presence of Chroma 2 gray color in the soil horizon is an indication of the seasonal high water table.

Free water moves through the larger soil pores after a rain. The distance that the free water moves downward depends on the intensity and duration of rain, the surface absorption capacity of the soil, changes in pore size with soil texture, depth to restrictive layer and the amount of free water already in the soil.

Free water will pond on top of a soil or near the surface causing seasonal water tables that usually can be observed during late winter or spring. Care must be exercised in using the presence of free water to indicate a seasonal water table. A well-drained sand may have free water moving through the profile for a day or two following a heavy rain. Therefore, free water present in the soil shall be associated with gray colors in the form of mottles or base color of the soil to provide consistency in indicating seasonal water tables. When free water is present in the absence of gray soil colors, this could indicate a slow rate of absorption.

Seasonal water tables are the result of restrictions in free water movement. The restrictions can be clay horizons, plinthite horizons, dense sandy horizons, parent material, fragipans and rock.

Oxidation of organic waste is greatly reduced in the presence of free water. Since one of the objectives of an absorption field is the oxidation of organic matter, the accumulation of this waste creates problems. The soil pores are clogged with biomass from the growth of microorganisms. Health hazards may result if a seasonally high water table forces the sewage effluent in an absorption field to surface, causes effluent to back up into a dwelling or commercial establishment or allows the effluent to enter and contaminate ground water.

H. Degree and Type of Slope

Soil information and soil type have a definite relationship with relief and landscape features. Major changes in slope usually indicate changes in soil characteristics. Landscapes can be mentally divided into slope units for evaluation.

Not only the degree of slope, but also the type of slope should be observed. A convex slope has a mounded shape and is shallow to parent material. A concave slope is bowl-shaped and because of the slow movement of runoff water, there is a corresponding increase in the amount of water moving through the soil, which weathers the parent material and forms a deeper soil. The type of slope commonly changes from one side of a drainage way to the other.

Flat Topography

Flat topography receives the maximum impact of climate in the form of rainfall. Slopes are less than 2 percent. Runoff, if it occurs, is very slow and ponding is common for long periods. The rain has time to enter the soil, resulting in more intense and deeper weathering, which causes downward movement of clay and thick sandy surfaces. Internal drainage problems and seasonal water tables are expected on flat landscapes.

Gently Sloping Topography

Gently sloping topography appears flat but actually has a slight convex curve to the surface. Slopes range from two to six percent. This allows for a portion of the rainfall to run off before entering the soil. The soils on this type of topography are generally weathered and deeply developed but can be expected to be better drained than those on flat topography.

Sloping Topography

Sloping topography includes those with slopes in the range of six to fifteen percent. Runoff is increased and the soils are generally shallower to parent material. High clay content layers are common

between 15 and 36 inches from the surface. Natural waterways are a problem in subdivisions, and lot adjustment may be necessary to avoid drainage ways. Erosion of surface soils can be a major problem in subdivisions due to increased slopes with this type of topography.

Concave Relief

Concave relief describes areas of depression. These areas receive large amounts of water and tend to be very wet. Generally they are not acceptable for construction of absorption fields.

I. Position in Landscape

The position of an area of land in the landscape, like the physiographic province, gives some idea of what to expect in terms of soils. The position may be apparent from observation or it may become apparent as soil borings are made.

Alluvial Position - Bottom Land - Floodplain

Alluvial positions are the areas adjacent to streams or rivers where flooding may occur. They differ slightly from colluvial positions in that the soil material has been picked up by floodwaters, sorted by stream flow and deposited. Sandy materials are deposited adjacent to the stream channel and clays are deposited in the slack water adjacent to the valley walls.

The alluvial soils are formed by deposition in layers rather than by weathering of parent material. The soil horizons are not distinct and may be nothing more than textural changes.

The position in the landscape is characteristic in that it is a flat area adjacent to the stream, with the soil having poor definition in terms of surface soil and subsoil horizons.

The soils may range from excessively drained to poorly drained. Rates of absorption are not a problem in dry weather in the better drained alluvial soils. The major hazards are periods of flooding and the complete saturation of the soil that occurs during these times.

Colluvial Positions (Local Alluvial)

Colluvial positions are the areas along drainage ways that periodically flood during and after a rain. Runoff water from the upland carries small rocks and soil material down the slopes and part of this is deposited at the base of the slope with little sorting. The result is a filling of the area with partially sorted soil material and the development of a deep surface horizon. The soil in such a position may range from excessively drained sand to poorly drained clay.

The problem with colluvial areas is the periodic flooding of the soil during and after a rain, the seepage from adjacent uplands that keeps the soil moist and the natural accumulation of organic matter. Flooding does not always remain long enough in some places to reduce the soil and produce a gray color.

The incidence of failure of absorption fields is related to the accumulation of organic matter. Over a period of time, the absorption field fails as the organic matter accumulates in the field and blocks lateral movement of water.

Detailed topographic maps provide a good means of locating drainage ways in the landscape. Observing the landscape before making soil borings may indicate the site to be the lowest point and thus the channel of runoff water. The soil borings may indicate a deep uniform surface soil not expected in upland soils. Rates of absorption may be good in such positions in dry weather.

Old Colluvial

Old colluvial deposits are formed from materials that have moved down-slope by gravity and water. The material has not been sorted and may contain angular and partially rounded rocks of all sizes. These deposits are generally associated with mountainous areas but may occur at a considerable distance from their source.

The distinguishing features are a uniform slope gradient at the base of the mountain and the loose rock throughout the profile. The depth of thickness of the deposit is variable. The natural drainage ranges from well drained to poorly drained.

The area of contact with the old land surface frequently forms a tight layer, resistant to water movement, which may be reflected in the natural drainage of the soil. Local deposits of material occur on mountain slopes and

throughout the Piedmont and Valley provinces.

The soil problems are similar to those of upland soil except that a tight layer can be expected at the point of contact with the old land surface, which may limit absorption. Stability of the material may be a problem when it is cut for roads or house sites.

Weathering of underlying rocks is generally deeper than that of adjacent areas without colluvial depositions.

Terrace Positions

The terrace positions are the old alluvial positions that have been left by the down cutting of streams. The result is that only the low terrace positions may flood under normal rainfall. The terrace positions are generally underlain by gravel depositions. The topography is characterized by the almost flat relief and the location adjacent to streams but at a higher elevation.

The soils range from well drained to poorly drained, with the better drained soils adjacent to the stream and more poorly drained soils adjacent to the valley walls. The soils have developed surface and subsoil horizons similar to upland soils. They are frequently underlain by rounded gravel depositions.

The problems of these soils are similar to those of the upland soils. The gravel deposits may be loose or compact and dense. Many soils in this position have fragipans. The lower terraces are subject to flooding.

Upland Positions

This term includes all areas not covered by other positions. The soils developed in these positions result from the soil-forming factors working on parent material. The natural drainage may range from excessively drained to very poorly drained and is not related to elevation.

The upland soils are strongly influenced by and reflect the type of parent material from which they were formed and are also influenced by the degree of slope.

4. SOIL INVESTIGATIONS

A. Definitions

1) Certified Soil Classifier means a person who holds at least a Bachelor of Science degree from an accredited college or university with a major in agronomy, soil science or related field of science, as approved by the Soil Classifiers Certification Advisory Committee.

a. Must complete a minimum of 30 semester credit hours or equivalent quarter hours in the biological, physical, chemical and earth sciences with a minimum of 15 semester hours or equivalent quarter hours in soil courses meeting the following distribution:
    1. A minimum of one course in soil classification, morphology, genesis and mapping;
    2. The remaining soil course credits must be in at least three of the following eight categories; introductory soil science; soil fertility; soil microbiology; soil chemistry; soil physics; soil management, soils and land use or soils and the environment; soil mineralogy; or a three credit maximum in independent study, geology, or hydrology.
b. Must have four (4) or more years of full time or equivalent part time experience under the supervision of a certified soil classifier, who has met the educational and experience requirements, actively mapping, identifying and classifying soil features in the field and interpreting the influence of soil features on soil uses.
c. Must pass a written examination administered by the Soil Classifiers Certification Advisory Committee.
d. Must be certified as a Soil Classifier by the Environmental Health Section, Department of Human Resources.

2) Certified Soil Classifier in Training means a person who holds at least a Bachelor of Science degree from an accredited college or university with a major in, Soil Science or related field of science, as approved by the Soil Classifiers Certification Advisory Committee.

a. Must complete a minimum of 30 semester credit hours or equivalent quarter hours in the biological, physical, chemical and earth sciences with a minimum of 15 semester hours or equivalent quarter hours in soil science courses meeting the following distribution:

1. A minimum of one course in soil classification, morphology, genesis and mapping;
2. The remaining soil science credits must be in at least three of the following eight categories: introductory soil science; soil fertility; soil microbiology; soil chemistry; soil physics; soil management, soils and land use or soils and the environment; soil mineralogy; or a three credit maximum in independent study, geology, or hydrology.

b. Must pass a written examination administered by the Soil Classifiers Certification Advisory Committee.
c. Must work under the direct supervision of a Certified Soil Classifier.
d. Must be approved as a Soil Classifier in Training by the Soil Classifiers Certification Advisory Committee.

B. Soil Investigation Requirements

1) Subdivisions

a. Pre-Development Review

It is recommended that developers considering subdivision or mobile home park development obtain at least a preliminary soil study from a certified soil classifier, registered engineer or registered geologist prior to developmental improvements.

b. Final Review

A soil map and soil descriptions based on a high intensity soil study are required for subdivisions and mobile home parks prior to approval of such development by the County Health Authority. The soil map shall be overlaid onto a copy of the final subdivision plat and the approved professional (certified soil classifier, registered engineer or registered geologist) must affix their signature and seal on the final plat.

c. Minimum requirements for a High Intensity Soil Study

A High Intensity Soil Study shall be identified as a Level III Soil Survey and Map. A Level III Soil Survey and/or Soil Map are based on a comprehensive soils investigation of a given landscape. The purpose of the soil survey is to identify, delineate and interpret the suitability of the soil series found on the site as it pertains to use for an on-site sewage management systems. The soil survey must meet or exceed specified accuracy and quality standards for the data from which the County Board of Health permits on-site sewage management systems. All Level III Soil Surveys and related interpretive data shall be based on the Georgia Department of Human Resources Manual for On Site Sewage Management Systems, National Cooperative Soil Survey standards and the current Soil Survey Manual (Soil Survey Staff, 1993). Soil series used to name map units must be classified according to the most recent edition of Soil Taxonomy (Soil Survey Staff, 1999), with map unit boundaries and map features plotted on a map at a scale that may range from one inch equals ten feet (1”=10’) to one inch equals one hundred feet (1”=100’). Smaller map scales (1”=200’, 1”=500’, etc.) are not acceptable.

Level III Soil Surveys must be based on a two-foot contour interval topographic map. The topographic map and boundary survey must be provided before the beginning of any fieldwork. The soil survey must include a title block or caption that includes the project and/or client name, location of the project, date of the survey, narrative and bar scale and north arrow. The soil survey shall include any features that may affect the location or performance of on-site sewage management systems. Examples are: the location of springs, wells, existing structures, rock outcrops, ephemeral drains, gullies and visible trash pits. The soil survey must include a legend that defines any symbols used to illustrate these features on the soil map. The soil survey and soil map must bear the name, stamp, address and telephone number of the Certified Soil Classifier, Registered Engineer or Registered Geologist performing the survey. The “Official” Level III Soil Survey used for on-site sewage management system permitting is that which bears the original seal and signature of the individual performing the work. The Certified Soil Classifier, Registered Engineer or Registered Geologist shall affix their signature and seal only on soil surveys that are their work or work performed under their direct supervision. Any revision to a Level III Soil survey must be clearly designated as such and dated.

The Level III Soil Survey must include a table or narrative that describes site-specific properties of each map unit (named for soil series) mapped at the site. For each map unit, the table or narrative must include the

following: soil series name (symbols are not allowed), the percent slope or slope range (symbols are not allowed), minimum depth (range is unnecessary) to seasonal saturation (seasonal high water table), minimum depth (range is unnecessary) to auger refusal or impervious layer (soft or hard bedrock or other horizons that restrict water movement), recommended installation depth (if applicable) and estimated percolation rate at the recommended installation depth (if applicable). The estimated percolation rate shall be based on the most limiting soil horizon that comes into contact with the absorption trench sidewall, bottom and for a distance one (1') foot below the recommended installation depth.

The upper and lower depth limits of the horizon in which installation is recommended shall be provided for each map unit. The depth range over which installation is recommended must be at least 24 inches to encompass a 12 inch sidewall thickness and 12 inches of soil below the trench bottom. If the 24 inch thickness installation zone includes a horizon with lower percolation rate than the optimum, the maximum percolation rate in the depth interval must be used for on site system design. Minimum depths to bedrock or seasonal saturation shall be provided for each map unit and specific depths identified for each boring on the soil map. Phases of soil series are an acceptable method to map depths more narrow than those used to define the series. Variants of series have different interpretations than the named series and these differences shall be reflected in the interpretive table.

An interpretive statement describing the limitations for utilization of on site sewage management systems shall be provided for each Soil Series map unit. This interpretive statement may contain notes, observations or other pertinent information reflecting the soil properties of the map unit that affect it's ability to function for wastewater disposal. These map unit interpretation statements must be based on the soil properties and landscape positions observed on site by the approved professional. Map unit interpretive statements shall be expressed in a narrative format on the soil survey report or soil map.

The number of soil observations required for the Level III Soil Survey will depend on the soil conditions encountered during the study and landscape complexity at the site. At least four (4) pedons shall be evaluated and classified for each one (1) acre mapped. For example, if an area is 1.5 acres, a minimum of 6 test borings must be evaluated and classified. If the site is less than one acre, a minimum of four (4) pedons shall be evaluated and classified. However, the soil classifier, registered engineer or registered geologist shall perform as many soil boring observations as necessary to ensure the named soil series or a soil series with similar or more favorable properties are verifiable onsite. All soil observations must be numbered and flagged on site and their location illustrated with a symbol and corresponding boring number on the finished soil map. All permanent and reproducible ground control points utilized to locate soil observations will be shown on the finished soil map so these observation points can be reestablished at a later date. All soil maps must contain a statement describing the method and/or instruments used to locate each soil observation from control points.

Boundaries between map units are commonly gradual instead of abrupt as implied by a line drawn on a map. In addition, the boundary between map units may be difficult to locate exactly unless definitive landscape features are present or closely spaced soil observations are made to locate the boundary. To ensure that on-site sewage systems are not installed in soils unsuitable for their use, soil delineation lines between suitable soils, limited suitable soils and unsuitable soils shall be accurate to within 20 feet of the delineated soil boundary. If through additional closely spaced soil observations the site evaluator can document the area within 20 feet of the boundary has soils suitable for an on-site sewage system (conventional or alternative), the system may be installed closer than 20 feet from the suitable-limited suitable-unsuitable boundary. The location of all observations used to determine near boundary soil suitability must be shown on the final soil map and characteristics observed must be summarized in the site report.

All soil observations shall be a minimum depth of 72 inches unless a refusal layer, including seasonal saturation horizon, is identified. If the lower limit of the recommended installation depth is greater than 48 inches, the soil observation must be extended to no less than 24 inches beneath this lower limit. Backhoe pits may be substituted for observations from auger borings. Mechanical augers, which disturb soil structure, shall not be used.

The soil classifier, registered engineer or registered geologist must keep field notes for each soil observation that include: boring number, soil series name, percent slope, depth and type of restrictive horizons present and morphological properties of major subsoil horizons (upper and lower depth, texture, matrix and redoximorphic feature color (Munsell notation)). All surveys and related interpretive data shall meet National Conservation Soil Survey (NCSS) and United States Department of Agriculture (USDA) Soil survey manual

standards for map purity. Map units will not have more than 15 percent inclusions of soils with different interpretation for on-site sewage management systems from the named series.

d. Minimum Requirements for Special Soil Investigations

A special soil study shall be identified as a Level IV Soil Survey. The County Board of Health may require special soil studies when alternative on-site sewage management systems are proposed and additional soil data are needed to adequately address site suitability and/or system design. The County Environmental Health Specialist should be consulted prior to the initiation of the special investigation.

The special investigation will typically be made for a specific location within an individual lot or parcel in the area proposed for the installation of an on-site sewage management system. Special investigations may include measurement of percolation rate for specific horizons, excavations to determine bedrock hardness and continuity, monitoring seasonal groundwater tables or other similar data that may be needed to aid in the interpretation of soil suitability and the protection of ground and surface water. Finished soil reports will have clear and obvious designations as to information that is Level III and/or Level IV.

A Level IV Soil Survey expands on the existing Level III Soil Survey in thoroughness and/or detail. Results of the Level IV soil investigation should be presented in a format similar to that of the Level III soil investigation, including a map with more detailed soil delineations and/or location of measurements, an interpretive table and, if needed, narrative statements describing methods and results that impact suitability for an on-site sewage management system. The Level IV Soil Survey shall meet all minimum requirements of the Level III Soil Survey, with the exception that test boring sites from the previous Level III investigation may be used for the Level IV investigation. There is no minimum number of pedon observations required for a Level IV. At a Level IV intensity, individual soil series are expected to be mapped and delineated with such a degree of accuracy that, at any location chosen to investigate within a given map unit, the named soil series or one with similar or more favorable properties for the installation of an on-site wastewater management system must be verifiable. The name, official seal and signature of the Certified Soil Classifier, Registered Engineer or Registered Geologist performing the investigation must be on the report.

2) Soil Data Acceptability for Individual Lots

a. Soil evaluations on individual lots shall be performed by the following individuals:

1.) A Certified Soil Classifier, Registered Engineer or Registered Geologist if a Level 3 Soil Survey is required.

2.) With the approval of the County Board of Health, an Environmental Health Specialist I or higher, District Environmental Health Director, DHR Environmental Health Program Director, meeting the following requirements, may conduct soil investigations for individual lots for single family residences:

a. A Level II Inspector Certification
b. Successfully passes a field examination demonstrating the ability to identify soil texture and expected percolation rate, identify redoximorphic features and identify restricted or impervious soil horizons.

b. Individuals who are approved by the County Board of Health that perform soil evaluations on individual lots for single family residences shall follow the following protocols:

1.) A minimum of three soil borings shall be dug in the proposed location of the on-site sewage management system absorption field and duplicate absorption field area;

2.) All borings shall be dug to a minimum depth of 72 inches unless a refusal layer is identified or to no less than 24 inches beneath the planned absorption trench bottom installation depth.

c. A soil report shall be made containing:

1.) A sketch identifying boring locations;

2.) A table identifying boring number, expected percolation rate and depth at which it occurs, the depth of seasonal high water table and depth of any refusal layer;

3.) Sites with poor percolation, redoximorphic features or impervious soil horizons within 24 inches of the planned absorption trench bottom, a seasonal high water table within 30 inches of the original ground surface or any other questionable soil features will be referred to a certified soil classifier, registered

engineer or registered geologist for evaluation.

3) Evaluation of soil for use as fill material
   a. Evaluation of soil for use as fill material on individual lots may be performed by the following individuals:
      1.) A Certified Soil Classifier, Registered Engineer or Registered Geologist
      2.) With approval of the county board of health, a Level II Certified Environmental Health Specialist I or higher, who has successfully completed training and demonstrated proficiency in soil fill evaluation may approve soil for fill material.

   b. Individuals approved by the County Board of Health to perform soil evaluations of fill material shall follow the following protocols:
      1.) A minimum of four (4) borings shall be dug within the in place fill material.
      2.) All borings shall be dug to a minimum depth twelve (12) inches below the original soil surface.
      3.) A fill site evaluation form shall be completed:
         a) Evidence that the vegetative topsoil has been removed and fill area properly tilled.
         b) The soil fill is examined for texture and fines; percolation rate estimated.
         c) The size of the filled area identified and filled area properly sloped.

GLOSSARY OF SOIL TERMS

1. **Aeration (soil).** The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.
2. **Aggregate (soil**). Many fine particles held in a single mass of cluster. Natural soils aggregate, such as granules, blocks or prisms, are called peds. Clods are aggregates produced by tillage or logging.
3. **Alluvium.** Material, such as sand, silt or clay, deposited on land by streams.
4. **Bottom land.** The normal flood plain of a stream, subject to flooding.
5. **Clay.** As a soil separate, mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand and less than 40 percent silt.
6. **Colluvium.** Soil material, rock fragments or both moved by creep, slide or local wash and deposited at the base of steep slopes.
7. **Depth to rock.** Bedrock is to near the surface for the specified use.
8. **Dissimilar Soil.** Soil that is different from the named soil series in both properties and major interpretations.
9. **Drainage class (natural).** Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

   Excessively drained. Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky or shallows. Some are steep. All are free of the mottling related to wetness.

   Somewhat excessively drained. Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly previous. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

   Well-drained. Water is removed from the soil readily but not rapidly. It is available to plants throughout most of the growing season and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

   Moderately well-drained. Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall or both.

   Somewhat poorly drained. Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall or a combination of these.

   Poorly drained. Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall or a combination of these.

   Very poorly drained. Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.
10. **Flood plain.** A generally flat plain or depression susceptible to being flooded from any source, including small and intermittent watercourses and coastal areas subject to intermittent tidal action.
11. **Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry,

it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

12. **Hardpan.** A hardened or cemented soil horizon or layer. The soil material is sandy, loamy or clayey and is cemented by iron oxide, silica, calcium carbonate or another substance.
13. **Horizon (soil).** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An exploration of the subdivisions is given in the Soil Survey Manual. The major horizons of mineral soil are as follows:

    O horizon. An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

    A horizon. The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

    E horizon. The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum or some combination of these.

    B horizon. The mineral horizon below an O, A or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as: (1) accumulation of clay, sesquioxides, humus or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

    C horizon. The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

    R layer. Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.
14. **Impervious soil.** A soil through which water, air or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.
15. **Infiltration.** The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.
16. **Infiltration capacity.** The maximum rate at which water can infiltrate into a soil under a given set of conditions.
17. **Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.
18. **Intake rate.** The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

    Less than 0.2 very low
    0.2 to 0.4 low
    0.7 to 0.75 moderately low
    0.75 to 1.25 moderate
    1.25 to 1.75 moderately high
    1.75 to 2.5 high
    More than 2.5 very high
19. **Loam.** Soil material that is seven to 27 percent clay particles, 28 to 50 percent silt particles and less than 52 percent sand particles.

    Loamy - Soils ranging from moderately coarse textured to moderately fine textured soils.
20. **Medium textured soil.** Very fine sandy loam, loam, silt loam or silt.

21. **Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition or structure by heat, pressure and movement. Nearly all such rocks are crystalline.
22. **Moderately coarse textured soil.** Sandy loam and clay loam and silty clay loam.
23. **Moderately fine textured soil.** Clay loam, sandy clay loam and silty clay loam.
24. **Morphology, soil.** They physically make up the soil, including the texture, structure, porosity, consistence, color and other physical, mineral and biological properties of the various horizons and the thickness and arrangement of those horizons in the soil profile.
25. **Mottling, soil.** Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance, few, common and many; size, fine, medium and coarse; and contrast, faint, distinct and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than five millimeters (about 0.2 inch); medium, from five to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).
26. **Muck.** Dark colored, finely divided, well decomposed organic soil material.
27. **Organic matter.** Plant and animal residue in the soil in various stages of decomposition.
28. **Pan.** A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, hardpan, fragipan, claypan, plowpan, and land traffic pan.
29. **Parent material.** The unconsolidated organic and mineral material from which soil forms.
30. **Ped.** An individual natural soil aggregate, such as granule, a prism or a block.
31. **Pedon.** The smallest volume that can be called Aa soil.≅ A pedon is three- dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters) depending on the variability of the soil.
32. **Percolation.** The downward movement of water through the soil.
33. **Permeability.** The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:
    Very slow-less than 0.06 inch/hr.
    Slow - 0.06 to 0.2 inch/hr.
    Moderately slow - 0.2 to 0.6 inch/hr.
    Moderate - 0.6 to 2.0 inches/hr.
    Moderately rapid - 2.0 to 6.0 inches/hr.
    Rapid - 6.0 to 20 inches/hr.
    Very rapid - more than 20 inches/hr.
35. **Similar Soil.** Soil that is different from the named soil but has the same interpretations as the named soil series.
36. **Plinthite.** The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.
37. **Ponding.** Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.
38. **Poor filter.** Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.
39. **Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.
40. **Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called groundwater runoff or seepage flow from groundwater.
41. **Sand.** As a soil separate, this is individual rock or mineral fragments from 0.005 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.
42. **Sandstone.** Sedimentary rock containing predominantly sand-size particles.
43. **Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay, and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

44. **Seepage.** The movement of water through the soil. Seepage adversely affects the specified use.
45. **Series, soil.** A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness and arrangement.
46. **Shale.** Sedimentary rock formed by the hardening of a clay deposit.
47. **Shrink-swell.** The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations and other structures. It can also damage plant roots.
48. **Silica.** A combination of silicon and oxygen. The mineral form is called quartz.
49. **Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance and then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet or horizontal distance.
50. **Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.
51. **Subsurface layer.** Technically, the A2 or E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.
52. **Surface layer.** The soil ordinarily moved in tillage or its equivalent in uncultivated soil, ranging in depth from four to 10 inches (10 to 25 per centimeters). Frequently designated as the Aplow layer≅ or the AAp horizon.≅
53. **Taxajunct.** A soil that is different in some minor property but has the same interpretations as the named soil series.
54. **Terrace.** An embankment or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.
55. **Texture, soil.** The relative proportions of sand, silt and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sand clay loam, clay loam, silty clay loam, sandy clay, silty clay and clay. The sand, loamy sand and sandy loam classes may be further divided by specifying Acoarse,≅ fine≅ or Avery fine.≅
56. **Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to top dress road banks, lawns and land affected by mining.
57. **Variant.** A soil that has a major difference in properties and interpretations than the named soil series.
58. **Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Table CT-2 Soil Texture

Soil Class	Dry Soil	Moist Soil
Sand	Loose single grains, which feel gritty and can be seen with the naked eye. Squeezed in the hand the soil mass falls apart when pressure is released.	Squeezed in the hand it forms a cast, which crumbles when touched. Does not form a ribbon. Very gritty.
Sandy Loam	Aggregates are easily crushed; very faint velvety feeling initially but as rubbing is continued the gritty feeling of sand soon dominates.	Feels gritty, forms a cast, which bears careful handling without breaking. Doesn't form a ribbon, will compact when squeezed between thumb and forefinger.
Loam	Aggregates are crushed under moderate pressure; clods can be quite firm. When pulverized loam has a velvety feel that becomes gritty with continued rubbing. Casts bear careful handling.	Cast can be freely handled without breaking. Slight tendency to ribbon. Rubbed surface is rough, slightly gritty.
Silt Loam	Aggregates are firm but may be crushed under moderate pressure. Clods are firm to hard. Smooth, flour like feel dominates when soil is pulverized.	Cast can be freely handled without breaking. Slight tendency to ribbon with rubbed surface having a broken or rippled appearance.
Clay Loam	Very firm aggregates and hard clods that strongly resist crushing by hand. When pulverized the soil takes a somewhat gritty feeling due to the harshness of the very small aggregates which persist.	Cast can bear much handling without breaking. Pinched between thumb and forefinger it forms a ribbon whose surface tends to feel gritty when dampened and rubbed. Ribbon will break easily; barely sustaining it's own weight. Will slick (shine) when rubbed. Soil is plastic, sticky and puddles easily.
Clay	Aggregates are hard and clods are extremely hard which strongly resists crushing by hand. When pulverized it has a gritty texture due to harshness of numerous very small aggregates, which persist.	Casts can bear considerable handling without breaking. Forms a long flexible ribbon and retains its plasticity when elongated. Rubbed surface has a very smooth, satin feeling, sticky when wet and easily puddle.

Georgia Department of Human Resources

SOIL DATA RECORD

Percolation, Water Table, and Soil Data

1. NAME OF PROPOSED DEVELOPMENT _____

LOCATION OF PROPOSED DEVELOPMENT _____

COUNTY _____ LAND LOT _____ G.M.D. OR LAND DISTRICT _____

2. OWNER OR SPONSOR _____ TELEPHONE NO. _____

OWNER OR SPONSOR'S ADDRESS: STREET _____ CITY _____

3. PERCOLATION DATA

TEST HOLE NUMBER	PERCOLATION RATE-MIN/IN	TYPES OF SUBSOIL ENCOUNTERED	TEST HOLE NUMBER	PERCOLATION RATE-MIN/IN	TYPES OF SUBSOIL ENCOUNTERED
1			21		
2			22		
3			23		
4			24		
5			25		
6			26		
7			27		
8			28		
9			29		
10			30		
11			31		
12			32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

4. If it appears that the ground water table may adversely affect the operation of on-site sewage management systems at any time of the year, specify by lot numbers and indicate on topographic map the areas so affected _____

5. If rock, shale, hardpan or similar formations occur as outcroppings or within a six foot depth on any of the lots in this proposed development, specify by lot numbers and indicate on the topographic map the areas affected _____

6. Soil data. (Locate borings on topographic map)

BORING NUMBER	SOIL DATA CONDITIONS
1	
2	
3	
4	
6	
5	
7	
8	
9	
10*	

*Attach additional sheets if necessary

7. I certify the above data was obtained under my supervision and is representative of existing soil conditions.

SIGNATURE _____ TITLE _____

ADDRESS _____ TELEPHONE NO. _____

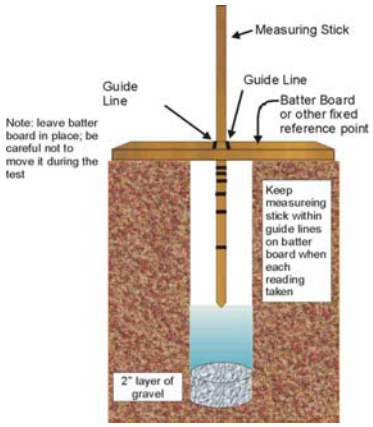
REG. NO. _____ DATE _____

DHR CERTIFICATION TITLE/NUMBER/DATE AWARDED: _____ / _____ / _____

Instructions for conducting Percolation tests and Soil borings

The percolation test is one practical method used for obtaining an appraisal of the soil absorption capacity. In order that a true index of soil absorption might be obtained and to insure uniformity in test procedures, the Georgia Department of Human Resources adopted the Modified Taft Engineering Center Method percolation rate measurement with the current Manual for On Site Sewage Management Systems. The rules require strict adherence to the following procedures and failure to do so will invalidate the test data.

1. **Preparation of Percolation Test Holes** – Percolation test holes shall be dug or bored with vertical sides and a minimum diameter of 4 inches to the depth of the proposed absorption trench. The sides of the test holes shall be scratched with a pointed instrument to remove smeared soil surfaces and to provide a natural soil interface into which water can percolate. Loose materials shall be removed from the percolation test hole and two inches of fine gravel shall be added to protect the bottom of the percolation test hole from sediment.
2. **Saturation and swelling of soil** – Percolation test holes shall be filled with water. Water shall be allowed to stand in the test holes, adding water as necessary until the soil is saturated and until clays have had an opportunity to swell. All soils other than sands shall be soaked at least four (4) hours before percolation rates are measured.
3. **Percolation Rate Measurement (Modified Taft Engineering Method)** – After preliminary soaking, water depths in the percolation test holes shall be adjusted to six (6) inches in depth over the gravel. A fixed point at the grounds surface shall be established and repeated measurements made of the distance in inches from that point to the water surface. Approximately the same time interval shall be used between measurements. Water shall be added to restore the six-inch depth when the water level in the percolation test hole falls to less than two inches over the gravel.
4. **Successive Measurements** – Successive measurements shall be continued at approximately equal time intervals until a constant rate of percolation is demonstrated by the water surface dropping the same distance per time interval. This will require, at a minimum, two consecutive similar readings. The time in minutes required for the water column to drop one (1) inch at this constant rate shall be recorded as the percolation rate expressed in minutes per inch. Extreme variations in test results from different holes in the same area shall require additional percolation tests to clarify the absorption rate or may require relocation of the proposed absorption field to an area with more uniform suitable soil conditions.
5. **Groundwater** – The county board of health may require borings for determination of groundwater elevation. In such cases, borings shall be made to a minimum depth of six feet. Sufficient time shall be provided for the stabilization of ground water before water table elevations are recorded. In sandy soils a minimum not less than 30 minutes is required and in clay soils several hours or overnight may be required. Borings shall be located by numbered on the topographic map and results recorded.
6. **Rock, shale, hardpan** – Where surface outcroppings or subsurface formations appear to exist in such degree to raise doubt concerning the operational effectiveness on an on site sewage management system absorption field, a sufficient number of borings to a minimum depth two feet below the absorption field installation depth may be required by the county board of health to determine whether absorption fields can be expected to give satisfactory service. Borings shall be located by number on the topographic map and results recorded.
7. **Soil Data Record** – data shall be recorded on the soil data record forms provided by the county board of health, or reproduced by the person or firm recording the data. All test holes shall be flagged or otherwise marked on site for easy identification



LEVEL 3 SOIL SURVEY REPORT CHECK LIST

Soil Survey Report

___ Soil survey boundaries mapped at a scale within a range of one-inch equals ten feet to one-inch equals one hundred feet; a bar scale must be included.

___ Clear identification of mapping: intensity, scale and symbols (plus a North arrow).

___ Caption identifying the project or client name, location of the project and county, contact number, and date of survey.

___ Name, address, phone number, and stamp or seal of the Certified Soil Classifier.

___ Level 3 Subdivision reports on a site-specific two-foot contour interval topo. map.

A site specific, custom soil interpretive table that as a minimum includes the following:
(Published order 2 soil survey legends will not be allowed)

___ Name of soil series
(No symbols)

___ Suitability code*
(Custom or CT-1 table)

___ Percent slope

___ Verified seasonal high water table
(Within 72 inches of the surface)

___ Absorption rate and depth of occurrence
(upper and lower limits of horizon)

___ Depth to refusal/restrictive layer

*Suitability code symbols must be clearly defined in [illegible]

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Field Evaluations

___ A minimum [illegible] per 5 acres (Additional borings dependent on differing micro relief and [illegible] on the site).

___ All borings numbered, flagged, and illustrated with their corresponding number on the finished soil map within 15 feet of the true boring location.

___ All borings to a minimum of 72 inches, unless a refusal layer is identified or to no less than 24 inches beneath the planned absorption trench bottom.

___ All reference points numbered and identified on-site.

Comments_____
_____
_____
_____
_____
_____

DHR Representative_____ Date_____

(Reports not including the required information should be returned to the Classifier)

_____ County Environmental Health
Site Evaluation Form

Subdivision _____ Lot _____ Block _____ Acreage _____

Street Address _____ (Directions on Back)

Water Supply: Public _____ Ind. Well_____ Number of Bedrooms _____ Garbage Disposal _____

House Design (Check one) Slab ____ Crawl Space_____ Split Level _____ Basement _____ Other _____
(Specify)

Plumbing Stub Out Location (Check one) Slab ____ Crawl Space ____ Split Level _____ Basement _____

Type of On Site Sewage Management System requested (indicate one): Conventional Septic Tank System _____

Alternative On Site Sewage Management System _____
(Specify System Requested)

The grant of a permit by the county board of health for the installation of any on site sewage management system does not constitute a warranty or endorsement.

The following information must be provided: 1) lot sketch showing lot dimensions, proposed building location/dimensions, proposed building line and side line distances; 2) street or road name; 3) well location if applicable and well locations on adjacent property; 4) driveway, patio or other paved surfaces; 5) underground utilities; 6) plumbing stub out and proposed drainfield location 7) location of easements and flood plain.

Sketch

For Official Use Only

The above information as furnished is true, and correct to the best of my knowledge. I hereby apply for an on site sewage management system construction permit and inspection of that system based upon this information. The applicant and/or owner is responsible for adverse soil conditions, such as rock or water tables, encountered.

_____
Owner's name Owner's address Phone #

_____
Applicant's name Applicant's address Phone #

Signature _____ Date of application _____

_____

Fee Amount Paid _____ Received by _____ Date _____

Date of evaluation _____ EHS _____ Approved _____ Disapproved ____

Lot Evaluation Record

Property Owner: _____

Location/Directions: _____

_____

Boring #	Estimated Percolation Rate	Depth to Estimated Percolation Rate	Depth to High Water Table	Depth to Refusal Layer

* Sites with poor percolation, redoxi[illegible]phic f[illegible]tures[illegible] [illegible]our soil[illegible] 24 inches of the planned absorpt[illegible] trench bo[illegible] [illegible]r [illegible]0 [illegible]ginal ground surface or other questional[illegible]

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[illegible]ng [illegible]ng Location

Comments and Recommendations:

_____

_____

_____

_____

_____

Evaluated By: _____ Date Evaluated: _____

Georgia Department of Human Resources
APPLICATION FOR CONSTRUCTION PERMIT AND SITE APPROVAL
For On-Site Sewage Management System

COUNTY:	SUBDIVISION:	LOT NUMBER:	BLOCK:

PROPERTY LOCATION (ADDRESS/DIRECTIONS):

I hereby apply for a construction permit to install an On-Site Sewage Management System and agree that the system will be installed to conform to the requirements of the rules of the Georgia Department of Human Resources, Chapter 290-5-26. By my signature, I understand that final inspection is required and will notify the County Health Department upon completion of construction and before applying final cover material to the system.

PROPERTY OWNER'S/AUTHORIZED AGENT'S SIGNATURE:	DATE:

PROPERTY OWNER'S NAME:	PHONE NUMBER:	ALTERNATE PHONE NUMBER:

PROPERTY OWNER'S ADDRESS:

AUTHORIZED AGENT'S NAME (IF OTHER THAN OWNER):	PHONE NUMBER:	RELATIONSHIP TO OWNER:

Section A – General Information

1. REQUIRED SETBACK FROM RECEIVING BODIES (wells, lakes, sinkholes, streams, etc.) EVALUATED:	5. TYPE OF STRUCTURE (single/multi-family residence, commercial, restaurant, etc.):	9. SOIL SERIES (e.g. Pacolet, Orangeburg, etc.):
(1) Yes (2) No		
2. WATER SUPPLY:	**WATER U GE BY**	**RCOLATION RATE / HYDRAULIC LOADING RATE:**
(1) Public (2) Private		
3. SEWAGE SYSTEM TO BE PERM	**E B SP**	**STRICTIVE SOIL HORIZON DEPTH (INCHES):**
(1) New (2) Repair		
4. LOT SIZE (SQUARE FEET / ACR	**8. LEVEL OF PLUMBING OUTLET:**	**12. SOIL TEST PERFORMED BY:**
	(1) Ground Level (2) Basement (3) Above ground level	

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Section B – Primary / Pretreatment

1. DISPOSAL METHOD:	3. SEPTIC TANK CAPACITY (GALLONS):	4. AEROBIC UNIT CAPACITY (GALLONS):	5. DOSING TANK CAPACITY (GALLONS):	6. GREASE TRAP CAPACITY (GALLONS):
(1) Septic Tank (2) Privy (3) Aerobic Unit (4) Other:				

2. GARBAGE DISPOSAL:	7. PRESCRIBED TANK LOCATION / REMARKS:
(1) Yes (2) No	

Section C – Secondary Treatment

1. ABSORPTION FIELD DESIGN:	4. TOTAL ABSORPTION FIELD SQUARE FEET REQUIRED:	7. NUMBER OF ABSORPTION TRENCHES:
(1) Level Field (2) Serial (3) Drip (4) Bed (5) Distribution Box (6) Mound/Area Fill (7) Other		
2. ABSORPTION FIELD PRODUCT:	**5. TOTAL ABSORPTION FIELD LINEAR FEET REQUIRED:**	**8. SPECIFIED LENGTH OF ABSORPTION TRENCHES:**
3. AGGREGATE DEPTH (inches):	**6. DEPTH OF ABSORPTION TRENCHES (range in inches):**	**9. DISTANCE BETWEEN ABSORPTION TRENCHES:**

10. PRESCRIBED ABSORPTION FIELD LOCATION:

Permit

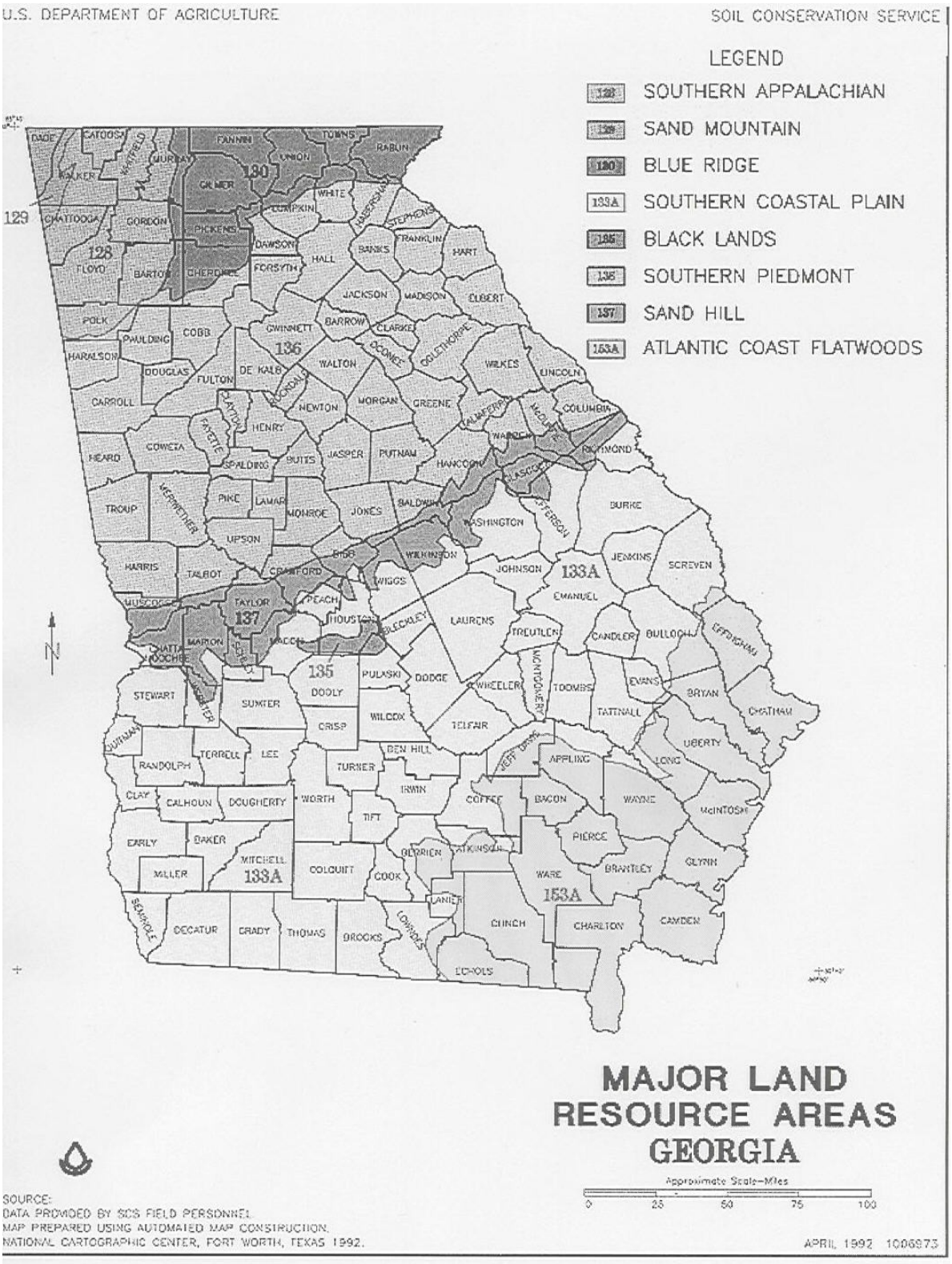
A PERMIT IS HEREBY GRANTED TO INSTALL THE ON-SITE SEWAGE MANAGEMENT SYSTEM DESCRIBED ABOVE. THIS PERMIT IS NOT VALID UNLESS PROPERLY SIGNED BELOW. THIS PERMIT EXPIRES TWELVE (12) MONTHS FROM DATE OF ISSUANCE.

1. SITE APPROVED AS SPECIFIED ABOVE:
(1) Yes (2) No

ANY GRADING, FILLING, OR OTHER LANDSCAPING SUBSEQUENT TO ISSUANCE OF A PERMIT MAY RENDER PERMIT VOID. FAILURE TO FOLLOW SITE PLAN MAY RENDER PERMIT VOID. ANY GRADING, FILLING, OR OTHER LANDSCAPING SUBSEQUENT TO FINAL INSPECTION BY COUNTY HEALTH DEPARTMENT, WHICH ADVERSELY AFFECTS THE FUNCTION OF THE ON-SITE SEWAGE MANAGEMENT SYSTEM, MAY RENDER APPROVAL VOID. INSTALLATION CONTRACTOR IS RESPONSIBLE FOR LOCATING PROPER DISTANCES FROM BUILDINGS, WELLS, PROPERTY LINES, ETC.

ISSUANCE OF A CONSTRUCTION PERMIT FOR AN ON-SITE SEWAGE MANAGEMENT SYSTEM, AND SUBSEQUENT APPROVAL OF SAME BY REPRESENTATIVES OF THE GEORGIA DEPARTMENT OF HUMAN RESOURCES OR COUNTY BOARD OF HEALTH SHALL NOT BE CONSTRUED AS A GUARANTEE THAT SUCH SYSTEMS WILL FUNCTION SATISFACTORILY FOR A GIVEN PERIOD OF TIME; FURTHERMORE, SAID REPRESENTATIVE(S) DO NOT, BY ANY ACTION TAKEN IN EFFECTING COMPLIANCE WITH THESE RULES, ASSUME ANY LIABILITY FOR DAMAGES WHICH ARE CAUSED, OR WHICH MAY BE CAUSED, BY THE MALFUNCTION OF SUCH SYSTEM.

APPROVING ENVIRONMENTALIST:	TITLE:	DATE:	CONSTRUCTION PERMIT NUMBER:



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MANUAL FOR ON-SITE SEWAGE MANAGEMENT SYSTEMS

TABLE CT-1 **VERSION 2.9**

UPDATED 6/25/2004

The suitability code information in this table should be used as a guide. They are based on the range of conditions for the soils as they occur state wide. Qualified Soil Classifiers may assign properties or installation recommendations to the soils encountered onsite in a way not shown in this table. The Soil Classifier may report soils not listed in this table. The Soil Classifiers' report will be based on specific findings from the particular site being mapped. Suitability information or "codes" will be developed and reported based on the Classifiers' onsite investigation. As a minimum, suitability codes and statements will describe the soil's limitations and its capability of functioning with a particular type of on-site wastewater management system. If a site is not suitable for use, the suitability code will state the nature of the soil limitation. Recommendations, specific details and concerns surrounding any particular site which deal with system performance and longevity are explained within the suitability code for the soil series.

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
HAMBLEN	SAND MOUNTAIN	0-3%	>60"		24-36"	determined onsite		**C**
HARTSELLS	SAND MOUNTAIN	2-45%	20-40"	HARD	>72"	determined onsite		**H**
HECTOR	SAND MOUNTAIN	1-60%	10-20"	HARD	>72"	determined onsite		**H**
HECTOR (STONY)	SAND MOUNTAIN	2 - 60%	10-20"	HARD	>72"	determined onsite		**H**
LINKER	SAND MOUNTAIN	1-40%	20-40"	HARD	>72"	determined onsite		**H**
NAUVOO	SAND MOUNTAIN	2-35%	40-60"	SOFT	>72"	determined onsite		**A**
ALBERTVILLE	RIDGES AND VALLEYS	2-25%	40-60"	SOFT	>72"	determined onsite		**N**
ALLEN	RIDGES AND VALLEYS	2-40%	>60"		>72"	determined onsite		**A**
APISON	RIDGES AND VALLEYS	2-25%	20-40"	SOFT	>72"	determined onsite		**H**
ARAGON	RIDGES AND VALLEYS	2-25%	>60"		>72"	determined onsite		**J**
ARKABUTLA	RIDGES AND VALLEYS	0-2%	>60"		12-18"	determined onsite		**C**
ARMUCHEE	RIDGES AND VALLEYS	5-60%	20-36"	SOFT	>72"	determined onsite		**H**
BARFIELD	RIDGES AND VALLEYS	1-50%	8 - 20"	HARD	> 72"	determined onsite		**H**
BELLAMY	RIDGES AND VALLEYS	0 - 6%	> 60"		18 - 36"	determined onsite		**C**
BIGFORK	RIDGES AND VALLEYS		40 - 60"	HARD	> 72"	determined onsite		**A**
BODINE	RIDGES AND VALLEYS	5-70%	>60"		>72"	determined onsite		**A**
CAPSHAW	RIDGES AND VALLEYS	0-12%	40-80"	HARD	24-42"	> 120		*unsuitable*
CARTECAY	RIDGES AND VALLEYS	0-5%	>60"		6-18"	determined onsite		**C**
CEDARBLUFF	RIDGES AND VALLEYS	0-2%	>60"		6-12"	determined onsite		**C**
CHENNEBY	RIDGES AND VALLEYS	0-2%	>60"		12-30"	determined onsite		**C**
CHEWACLA	RIDGES AND VALLEYS	0-2%	>60"		6-24"	determined onsite		**C**
CONASAUGA	RIDGES AND VALLEYS	0-45%	20-40"	SOFT	>72"	> 120		*unsuitable*
CRAIGSVILLE	RIDGES AND VALLEYS	0 - 5%	> 60"		> 72"	determined onsite		**C**
CRAIGSVILLE (GRAVELLY)	RIDGES AND VALLEYS	0-5%	>60"		>72"	determined onsite		**C**
CUNNINGHAM	RIDGES AND VALLEYS	2-25%	40-60"	SOFT	>72"	determined onsite		**J**
DECATUR	RIDGES AND VALLEYS	1-25%	>60"		>72"	determined onsite		**A**
DEKALB	RIDGES AND VALLEYS	0-80%	20-40"	HARD	>72"	determined onsite		**H**
DEWEY	RIDGES AND VALLEYS	2-40%	>60"		>72"	determined onsite		**A**
DOCENA	RIDGES AND VALLEYS	0-6%	>60"		18-36"	determined onsite		**C**
DOWELLTON	RIDGES AND VALLEYS	0-8%	40-60"	HARD	6-12"	> 120		*unsuitable*
EMORY	RIDGES AND VALLEYS	0-5%	>60"		60-72"	determined onsite		**C**
ENDERS	RIDGES AND VALLEYS	1-65%	40 - > 60"	SOFT	>72"	determined onsite		**J**
ENNIS	RIDGES AND VALLEYS	0-5%	>60"		>72"	determined onsite		**C**
ETOWAH	RIDGES AND VALLEYS	0-35%	>60"		>72"	determined onsite		**A**
EUHARLEE	RIDGES AND VALLEYS	2-10%	>60"		>72"	determined onsite		**A**
FARRAGUT	RIDGES AND VALLEYS	2-20%	48 - > 60	SOFT	>72"	determined onsite		**A**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
FULLERTON	RIDGES AND VALLEYS	2-45%	>60"		>72"	determined onsite		**A**
GORGAS	RIDGES AND VALLEYS	2-70%	10-20"	HARD	>72"	determined onsite		**H**
GORGAS (STONY-COBBLY)	RIDGES AND VALLEYS	2-70%	10-20"	HARD	>72"	determined onsite		**H**
GUTHRIE	RIDGES AND VALLEYS	0-2%	>60"		6-12"	determined onsite		**C**
HAMBLEN	RIDGES AND VALLEYS	0-3%	>60"		24-36"	determined onsite		**C**
HANCEVILLE	RIDGES AND VALLEYS	0-40%	> 60"	SOFT	>72"	determined onsite		**A**
HARTSELLS	RIDGES AND VALLEYS	2-45%	20-40"	HARD	>72"	determined onsite		**H**
HECTOR	RIDGES AND VALLEYS	1-60%	10-20"	HARD	>72"	determined onsite		**H**
HOLSTON	RIDGES AND VALLEYS	0-25%	>60"		>72"	determined onsite		**A**
KETONA	RIDGES AND VALLEYS	0-2%	40-72"	HARD	6-12"	> 120		*unsuitable*
KETONA (PONDED)	RIDGES AND VALLEYS	0-4%	40-72"	HARD	0 - 12"	> 120		*unsuitable*
LEADVALE	RIDGES AND VALLEYS	0-15%	48 - > 60"	SOFT	0 - 12"	determined onsite		**C**
LEESBURG	RIDGES AND VALLEYS	2-45%	>60"		>72"	determined onsite		**A**
LILY	BLUE RIDGE	0 - 65%	20-40"	HARD	>72"	determined onsite		**H**
LINKER	RIDGES AND VALLEYS	1-40%	20-40"	HARD	>72"	determined onsite		**H**
LOCUST	RIDGES AND VALLEYS	0-10%	>60"		18-24"	determined onsite		**C**
LYERLY	RIDGES AND VALLEYS	1-10%	20-40"	HARD	>72"	determined onsite		**H**
MINVALE	RIDGES AND VALLEYS	2-45%	>60"		>72"	determined onsite		**A**
MONTEVALLO	RIDGES AND VALLEYS	2-80%	10-20"	SOFT	>72"	determined onsite		**H**
MOUNTAINBURG	RIDGES AND VALLEYS	1 - 65%	12-20"	HARD	> 72"	determined onsite		**H**
MOUNTAINBURG (STONY)	RIDGES AND VALLEYS	1-65%	12-20"	HARD	>72"	determined onsite		**H**
NAUVOO	RIDGES AND VALLEYS	2-35%	40-60"	SOFT	>72"	determined onsite		**A**
NELLA	RIDGES AND VALLEYS	2-60%	>60"		>72"	determined onsite		**A**
NELLA (STONY)	RIDGES AND VALLEYS	2-60%	>60"		>72"	determined onsite		**A**
PANAMA	RIDGES AND VALLEYS	12 - 70%	> 60"		42 - 60"	determined onsite		**A**
PANAMA (GRAVELLY)	RIDGES AND VALLEYS	12-70%	> 60"		42-60"	determined onsite		**A**
RIVERVIEW	RIDGES AND VALLEYS	0-5%	>60"		36-60"	determined onsite		
ROANOKE	RIDGES AND VALLEYS	0-2%	>60"		0-12"			*unsuitable*
ROANOKE (PONDED)	RIDGES AND VALLEYS	0-2%	>60"		< 10"			*unsuitable*
ROME	RIDGES AND VALLEYS	0-6%	>60"		>72"	determined onsite		**A**
SEQUATCHIE	RIDGES AND VALLEYS	0-12%	>60"		>72"	determined onsite		**A**
SHACK	RIDGES AND VALLEYS	2-25%	>60"		24-48"	determined onsite		**C**
SHELLBLUFF	RIDGES AND VALLEYS	0-3%	>60"		36-60"	determined onsite		**C**
SIPSEY	RIDGES AND VALLEYS	4-30%	20-40"	SOFT	>72"	determined onsite		**H**
STASER	RIDGES AND VALLEYS	0-3%	>60"		36-48"	determined onsite		**C**
STEEKEE	RIDGES AND VALLEYS	10 - 50%	20 - 40"	HARD	> 72"	determined onsite		**H**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
SUBLIGNA	RIDGES AND VALLEYS	1-6%	>60"		>72"	determined onsite		**C**
SULLIVAN	RIDGES AND VALLEYS	0-2%	>60"		48-72"	determined onsite		**C**
SUNLIGHT	RIDGES AND VALLEYS	8 - 60%	10 - 20"	SOFT	> 72"	determined onsite		**H**
TAFT	RIDGES AND VALLEYS	0 - 2%	> 60"		12 - 24"	determined onsite		**C**
TALBOTT	RIDGES AND VALLEYS	0-70%	20-40"	HARD	>72"	> 120		*unsuitable*
TANYARD	RIDGES AND VALLEYS	0 - 2%	> 60"		18 - 30"	determined onsite		**C**
TIDINGS	RIDGES AND VALLEYS	2-70%	40-60"	HARD	>72"	determined onsite		**A**
TOCCOA	RIDGES AND VALLEYS	0-4%	>60"		30-60"	determined onsite		**C**
TOWNLEY	RIDGES AND VALLEYS	2-60%	20-40"	SOFT	>72"	> 120		*unsuitable*
TOWNLEY (GRAVELLY)	RIDGES AND VALLEYS	2-60%	20-40"	SOFT	>72"	> 120		*unsuitable*
TUPELO	RIDGES AND VALLEYS	0-6%	>60"		12-24"	> 120		*unsuitable*
WAX	RIDGES AND VALLEYS	0-6%	>60"		18-36"	determined onsite		**C**
WAYNESBORO	RIDGES AND VALLEYS	2-30%	>60"		>72"	determined onsite		**A**
WEHADKEE	RIDGES AND VALLEYS	0-2%	>60"		0-12"			*unsuitable*
WHITWELL	RIDGES AND VALLEYS	0-6%	>60"		24-36"	determined onsite		**C**
WOLFTEVER	RIDGES AND VALLEYS	0-12%	>60"		30-42"	determined onsite		**C**
ARKAQUA	BLUE RIDGE	0-5%	>60"		18-24"	determined onsite		**C**
ASHE	BLUE RIDGE	2-95%	20-40"	HARD	>72"	determined onsite		**H**
ASHE (VERY STONY)	BLUE RIDGE	2-95%	20-40"	HARD	>72"	determined onsite		**H**
BANDANA	BLUE RIDGE	0-5%	>60"		18-24"	determined onsite		**C**
BILTMORE	BLUE RIDGE	0-5%	>60"		>42"	determined onsite		**C**
BRADDOCK	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**J**
BRADSON	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**J**
BRASSTOWN	BLUE RIDGE	2 - 95%	40-60"	SOFT	> 72	determined onsite		**K**
BREVARD	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
BULADEAN	BLUE RIDGE	2 - 95%	40-60"	SOFT	> 72	determined onsite		**K**
BURTON	BLUE RIDGE	5-95%	20-40"	HARD	>72"	determined onsite		**H**
CASHIERS	BLUE RIDGE	2 - 95%	> 60"		> 72"	determined onsite		**A**
CATASKA	BLUE RIDGE	2 -95%	10-20"	SOFT	>72"	determined onsite		**H**
CHANDLER	BLUE RIDGE	2-95%	>60"		>72"	determined onsite		**A**
CHATUGE	BLUE RIDGE	0-15%	>60"		12-24"	determined onsite		**C**
CHEOAH	BLUE RIDGE	8-95%	40-60"	SOFT	>72"	determined onsite		**K**
CHESTNUT	BLUE RIDGE	2-95%	20-40"	SOFT	>72"	determined onsite		**H**
CLEVELAND	BLUE RIDGE	2-95%	10 - 20"	HARD	>72"	determined onsite		**H**
CLIFFIELD	BLUE RIDGE	2-95%	20 - 40"	HARD	>72"	determined onsite		**H**
CLIFTON	BLUE RIDGE	2 - 60%	>60"		>72"	determined onsite		**A**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
CODORUS	BLUE RIDGE	*0-5%*	>60"		12-24"	determined onsite		**C**
COLVARD	BLUE RIDGE	0-5%	>60"		>48"	determined onsite		**C**
COWEE	BLUE RIDGE	2-95%	20-40"	SOFT	>72"	determined onsite		**H**
CULLASAJA	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**R**
CULLOWHEE	BLUE RIDGE	0-5%	>60"		18-24"	determined onsite		**C**
DELANCO	BLUE RIDGE	0-15%	>60"		12-30"	determined onsite		**C**
DELLWOOD	BLUE RIDGE	0-5%	>60"		24-48"	determined onsite		**C**
DILLARD	BLUE RIDGE	0-15%	>60"		24-36"	determined onsite		**C**
DILLSBORO	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
DYKE	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
DYKE (STONY)	BLUE RIDGE	0-35%	>60"		>72"	determined onsite		**A**
EDNEYTOWN	BLUE RIDGE	2 - 95%	>60"		>72"	determined onsite		**A**
EDNEYTOWN (VERY STONY)	BLUE RIDGE	2-80%	>60"		>72"	determined onsite		**A**
EDNEYVILLE	BLUE RIDGE	2-95%	>60"		>72"	determined onsite		**A**
EDNEYVILLE (STONY)	BLUE RIDGE	2-95%	>60"		>72"	determined onsite		**A**
ELLIJAY	BLUE RIDGE	2-95%	>60"		>72"	determined onsite		**J**
ELSINBORO	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
EVARD	BLUE RIDGE	2-95%	>60"		>72"	determined onsite		**A**
FANNIN	BLUE RIDGE	2-95%	>60"		>72"	determined onsite		**A**
FRENCH	BLUE RIDGE	0-5%	>60"		12-30"	determined onsite		**C**
GREENLEE	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**R**
HANMILLER	BLUE RIDGE	2 - 95%	20 - 40"	SOFT	>72"	determined onsite		**H**
HATBORO	BLUE RIDGE	0-5%	>60"		0-6"	determined onsite		**C**
HAYESVILLE	BLUE RIDGE	2-60%	>60"		>72"	determined onsite		**A**
HAYWOOD	BLUE RIDGE	0-35%	> 60"		>60"	determined onsite		**A**
HAYWOOD (STONY)	BLUE RIDGE	2-45%	>60"		>72"	determined onsite		**A**
HEMPHILL	BLUE RIDGE	0-15%	>60"		0-12"			*unsuitable*
HIWASSEE	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**J**
HUNTDALE	BLUE RIDGE	2 - 95%	>60"		>72"	determined onsite		**A**
IOTLA	BLUE RIDGE	0-5%	>60"		18-24"	determined onsite		**C**
JEFFERSON	BLUE RIDGE	2-75%	>60"		>72"	determined onsite		**A**
JEFFERY	BLUE RIDGE	2 - 95%	20 - 40"	HARD	>72"	determined onsite		**H**
JUNALUSKA	BLUE RIDGE	2 - 95%	20-40"	SOFT	>72"	determined onsite		**H**
KEENER	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
KIWKORA	BLUE RIDGE	0-15%	>60"		0-12			*unsuitable*
LILY	BLUE RIDGE	0-65%	20-40"	HARD	>72"	determined onsite		**H**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
LONON	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
LOSTCOVE	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**R**
MAYMEAD	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
MICAVILLE	BLUE RIDGE	2 - 95%	40 - 60	SOFT	> 72"	determined onsite		**K**
NANTAHALA	BLUE RIDGE	2 - 60%	40 - 60"	SOFT	> 72"	determined onsite		**J, K**
NIKWASI	BLUE RIDGE	0-5%	>60"		0 - 12"	determined onsite		**C**
NORTHCOVE	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**R**
OSTIN	BLUE RIDGE	0-5%	>60"		>42"	determined onsite		**C**
PIGEONROOST	BLUE RIDGE	2 - 95%	20-40"	SOFT	>72"	determined onsite		**H**
PLOTT	BLUE RIDGE	2 - 95%	> 60"		>72"	determined onsite		**A**
PORTERS	BLUE RIDGE	2 - 95%	40-60"	HARD	>72"	determined onsite		**K**
PORTERS (STONY)	BLUE RIDGE	6-95%	40-60"	HARD	>72"	determined onsite		**K**
RABUN	BLUE RIDGE	2-50%	>60"		>72"	determined onsite		**A**
RABUN (STONY)	BLUE RIDGE	7-70%	>60"		>72"	determined onsite		**A**
RAMSEY	BLUE RIDGE	3 - 70%	10 - 20"	HARD	> 72"	determined onsite		**H**
RAMSEY (STONY)	BLUE RIDGE	3-70%	10-20"	HARD	>72"	determined onsite		**H**
REDDIES	BLUE RIDGE	0-5%	>60"		24-42"	determined onsite		**C**
ROSMAN	BLUE RIDGE	0-5%	>60"		30-60"	determined onsite		**C**
SALUDA	BLUE RIDGE	2 - 95%	10-20"	SOFT	>72"	determined onsite		**H**
SAWTEETLAH	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
SAVNOOK	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
SHELOCTA	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
SHINBONE	BLUE RIDGE	2 - 95%	40 - 60"	SOFT	> 72"	determined onsite		**K**
SHOUNS	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
SOCO	BLUE RIDGE	2 - 95%	20 - 40"	SOFT	> 72"	determined onsite		**H**
SPIVEY	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**R**
STATLER	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
STELCOAH	BLUE RIDGE	2-95%	40-60"	SOFT	>72"	determined onsite		**K**
SUCHES	BLUE RIDGE	0-5%	>60"		30-48"	determined onsite		**C**
SYLCO	BLUE RIDGE	2-95%	20-40"	HARD	>72"	determined onsite		**H**
SYLVA	BLUE RIDGE	0-10%	>60"		0-12"	determined onsite		**C**
TALLADEGA	BLUE RIDGE	6-80%	20-40"	SOFT	>72"	determined onsite		**H**
TATE	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
THUNDER	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**R**
THURMONT	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
TOECANE	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**R**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
TOCCOA	BLUE RIDGE	0-4%	>60"		30-60"	determined onsite		**C**
TOXAWAY	BLUE RIDGE	0-5%	>60"		0-6"	determined onsite		**C**
TRANSYLVANIA	BLUE RIDGE	0-5%	>60"		24-36"	determined onsite		**C**
TRIMONT	BLUE RIDGE	2-95%	>60"		>72"	determined onsite		**A**
TSALI	BLUE RIDGE	2-95%	10-20"	SOFT	>72"	determined onsite		**H**
TUCKASEGEE	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
TUSQUITEE	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
TUSQUITEE (STONY)	BLUE RIDGE	2-95%	>60"		>72"	determined onsite		**A**
UNAKA	BLUE RIDGE	2-95%	20-40"	HARD	>72"	determined onsite		**H**
UNISON	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
WATAUGA	BLUE RIDGE	2-95%	>60"		>72"	determined onsite		**A**
WHITEOAK	BLUE RIDGE	0-35%	>60"		>60"	determined onsite		**A**
WHITESIDE	BLUE RIDGE	0-10%	>60"		18-36"	determined onsite		**C**
ALAMANCE	SOUTHERN PIEDMONT	0 - 15%	> 60		> 72"	determined onsite		**A**
ALCOVY	SOUTHERN PIEDMONT	2-10%	>60"		24 - 36"	determined onsite		**C**
ALLEN	SOUTHERN PIEDMONT	2-40%	>60"		>72"		determined onsite	
ALTAVISTA	SOUTHERN PIEDMONT	0-10%	>60"		18-30"	determined onsite		**C**
APPLING	SOUTHERN PIEDMONT	0-25%	>60"		>72"	determined onsite		**A**
ASHLAR	SOUTHERN PIEDMONT	0-70%	20-40"	HARD	>72"	determined onsite		**H**
AUGUSTA	SOUTHERN PIEDMONT	0-2%	>60"		12-24"	determined onsite		**C**
BADIN	SOUTHERN PIEDMONT	2-55%	40 - 60"	HARD	>72"			*unsuitable*
BETHLEHEM	SOUTHERN PIEDMONT	2 - 45%	20 - 40"	SOFT	>72"	determined onsite		**N**
BUCKHEAD	SOUTHERN PIEDMONT	6-45%	> 60"		> 72"	determined onsite		**A**
BUNCOMBE	Piedmont & Coastal Plain	0 - 6%	> 60"		> 72"	determined onsite		**C**
CARTECAY	SOUTHERN PIEDMONT	0-5%	>60"		6-18"			*unsuitable*
CATAULA	SOUTHERN PIEDMONT	2-25%	> 60"		24 - 48	determined onsite		***C***
CECIL	SOUTHERN PIEDMONT	0-25%	>60"		>72"	determined onsite		**A**
CHENNEBY	SOUTHERN PIEDMONT	0-2%	>60"		12-30"			*unsuitable*
CHESTATEE	SOUTHERN PIEDMONT	10 - 50%	>60"		>72"	determined onsite		**A**
CHEWACLA	SOUTHERN PIEDMONT	0-2%	>60"		+ 12" - 24"			*unsuitable*
COLFAX	SOUTHERN PIEDMONT	0-15%	>60"		6 - 18"	determined onsite		**C**
CONGAREE	SOUTHERN PIEDMONT	0-4%	>60"		30 - 48"	determined onsite		**C**
DAVIDSON	SOUTHERN PIEDMONT	2-25%	>60"		>72"		determined onsite	
DURHAM	SOUTHERN PIEDMONT	0-10%	>60"		>72"	determined onsite		**A**
DURHAM (PERCHED)	SOUTHERN PIEDMONT	0 - 10%	> 60"		48 - 72	determined onsite		**C**
ENON	SOUTHERN PIEDMONT	2-45%	>60"		>72"	determined onsite		**J**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
FORK	SOUTHERN PIEDMONT	0-7%	>60"		12-24"	determined onsite		**C**
GEORGEVILLE	SOUTHERN PIEDMONT	2 - 50%	>60"		>72"	determined onsite		**A**
GOLDSTON	SOUTHERN PIEDMONT	2-60%	20 - 40"	HARD	>72"			*unsuitable*
GROVER	SOUTHERN PIEDMONT	2-45%	>60"		>72"	determined onsite		**A**
GUNDY	SOUTHERN PIEDMONT	6 - 40%	40 - 72"	SOFT	> 72"		determined onsite	
GWINNETT	SOUTHERN PIEDMONT	2-60%	40-60"	SOFT	>72"	determined onsite		**A or N**
HARD LABOR phase one	SOUTHERN PIEDMONT	0 - 15%	> 72"	NA	30 - 48"	determined onsite		**C**
HARD LABOR phase two	SOUTHERN PIEDMONT	0 - 15%	> 72"	NA	48- 60"	determined onsite		**P**
HELENA	SOUTHERN PIEDMONT	0-15%	>60"		18-30"			*unsuitable*
HERNDON	SOUTHERN PIEDMONT	2-25%	>60"		>72"	determined onsite		**A**
HIWASSEE	SOUTHERN PIEDMONT	2-50%	>60"		>72"	determined onsite		**A**
HULETT	SOUTHERN PIEDMONT	2-15%	>60"		>72"	determined onsite		**A**
IREDELL	SOUTHERN PIEDMONT	0-15%	40 - 60"	SOFT	12 - 24"			*unsuitable*
KIRKSEY	SOUTHERN PIEDMONT	0 - 10%	40 - 60"	HARD	18 - 36"	determined onsite		**J**
LLOYD	SOUTHERN PIEDMONT	2-50%	> 60"		> 72"	determined onsite		**A**
LOUISA	SOUTHERN PIEDMONT	6-80%	10-20"	SOFT	>72"	determined onsite		**N**
LOUISBURG	SOUTHERN PIEDMONT	26 - 45%	> 60"		>72"		determined onsite	
MADISON	SOUTHERN PIEDMONT	2-60%	>60"		>72"	determined onsite		**A**
MASADA	SOUTHERN PIEDMONT	0-25%	>60"		>72"	determined onsite		**C**
MECKLENBURG	SOUTHERN PIEDMONT	2-25%	>60"		>72"	determined onsite		**J**
MOLENA	SOUTHERN PIEDMONT	0-35%	>60"		>72"	determined onsite		**A**
MUSELLA	SOUTHERN PIEDMONT	2-80%	14 - 20"	SOFT	>72"	determined onsite		**H**
NASON	SOUTHERN PIEDMONT	0-50%	40-60"	SOFT	>72"	determined onsite		**N**
ORANGE	SOUTHERN PIEDMONT	0 - 15%	40 - 60	HARD	12 - 36"			*unsuitable*
PACOLET	SOUTHERN PIEDMONT	2-80%	>60"		>72"	determined onsite		**A**
PAGELAND	SOUTHERN PIEDMONT	0-15%	20-40"	SOFT	18-36"			*unsuitable*
POINDEXTER	SOUTHERN PIEDMONT	2 - 60"	40 - 60"	HARD	> 72"	determined onsite		**H**
RAWLINGS	SOUTHERN PIEDMONT	6-45%	20-40"	HARD	> 72"	determined onsite		**H**
RION	SOUTHERN PIEDMONT	2-60%	>60"		>72"	determined onsite		**A**
RIVERVIEW	SOUTHERN PIEDMONT	0-5%	>60"		36-60"	determined onsite		**C**
ROANOKE	SOUTHERN PIEDMONT	0-2%	>60"		0-12"			*unsuitable*
SAW	SOUTHERN PIEDMONT	2 - 45%	20 - 40	HARD	> 72"	determined onsite		**H**
SEDGEFIELD	SOUTHERN PIEDMONT	0-10%	>60"		12-18"			*unsuitable*
SHELLBLUFF	SOUTHERN PIEDMONT	0-3%	>60"		36-60"	determined onsite		**C**
STARR	SOUTHERN PIEDMONT	0-8%	>60"		>72"	determined onsite		**C**
STATE	SOUTHERN PIEDMONT	0-10%	>60"		42 - 72"	determined onsite		**C**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
SWEETAPPLE	SOUTHERN PIEDMONT	6-60%	24-50"	SOFT	>72"	determined onsite		**N**
TALLAPOOSA	SOUTHERN PIEDMONT	5-80%	10-20"	SOFT	>72"	determined onsite		**N**
TATUM	SOUTHERN PIEDMONT	0-50%	40-60"	SOFT	>72"	determined onsite		**N**
TOCCOA	SOUTHERN PIEDMONT	0-4%	>60"		30-60"	determined onsite		**C**
VANCE	SOUTHERN PIEDMONT	2-25%	>60"		>72"	determined onsite		**J**
WAKE	SOUTHERN PIEDMONT	2-45%	11 - 20"	HARD	>72"			*unsuitable*
WATEREE	SOUTHERN PIEDMONT	2-95%	20-40"	SOFT	>72"	determined onsite		**N**
WEDOWEE	SOUTHERN PIEDMONT	0-60%	>60"		>72"	determined onsite		**A**
WEHADKEE	SOUTHERN PIEDMONT	0-2%	>60"		0-12"			*unsuitable*
WICKHAM	SOUTHERN PIEDMONT	0-25%	>60"		>72"	determined onsite		**A**
WILKES	SOUTHERN PIEDMONT	2-60%	40 - 60	HARD	>72"	determined onsite		**N**
WINNSBORO	SOUTHERN PIEDMONT	2 - 25%	40 - 60"	SOFT	> 72"	determined onsite		**J**
WORSHAM	SOUTHERN PIEDMONT	0-8%	>60"		0-12"			*unsuitable*
WYNOTT	SOUTHERN PIEDMONT	2-45%	20-40"	SOFT	>72"			*unsuitable*
ZION	SOUTHERN PIEDMONT	2-45%	20-40"	HARD	>72"			*unsuitable*
AILEY	SAND HILLS	0-25%	>60"		48 - 72"	determined onsite		**A**
BIBB	SAND HILLS	0-2%	>60"		0 - 8"			*unsuitable*
BIGBEE	SAND HILLS	0-5%	>60"		20 - 40"	determined onsite		**C**
CHASTAIN	SAND HILLS	0-2%	>60"		0-12"			*unsuitable*
CHEWACLA	SAND HILLS	0-2%	>60"		+ 12" - 24"			*unsuitable*
CONGAREE	SAND HILLS	0-4%	>60"		30 - 48"	determined onsite		**C**
COWARTS	SAND HILLS	1 - 25%			40 - 60"		determined onsite	
DOGUE	Southern Coastal Plain	0-15%	>60"		18-36"			*unsuitable*
DOTHAN	SAND HILLS	0 - 12%			36 - 60"	determined onsite		**U**
ESTO	SAND HILLS	2-25%	>60"		>72	determined onsite		**J**
EUNOLA	SAND HILLS	0-6%	>60"		18-30"	determined onsite		**C**
EUSTIS	SAND HILLS	0 - 30%	>60"		> 72"	determined onsite		**A**
FACEVILLE	SAND HILLS	0-15%	>60"		>72"	determined onsite		**A**
FUQUAY	SAND HILLS	0-10%	>60"		48 - 72"	determined onsite		**A**
GRADY	SAND HILLS	0-2%	>60"		0-12"			*unsuitable*
GREENVILLE	SAND HILLS	0 - 18%	>60"		>72"	determined onsite		**A**
IUKA	SAND HILLS	0 - 2%	> 60"		12 - 36"	determined onsite		**C**
KINSTON	SAND HILLS	0-2%	>60"		0-12"			*unsuitable*
LAKELAND	SAND HILLS	0 - 85%	>60"		>72"	determined onsite		**A**
LEVY	SAND HILLS	0-2%	>60"		+ 24" - 0"	determined onsite		**C or F**
LUCY	SAND HILLS	0 - 45%	>60"		>72"	determined onsite		**A**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
MASADA	SAND HILLS	0-25%	>60"		>72"	determined onsite		**A**
NANKIN	SAND HILLS	0-60%	>60"		40 - 60"	determined onsite		**J**
NORFOLK	SAND HILLS	0-10%	>60"		48-72"	determined onsite		**A**
OCHLOCKONEE	SAND HILLS	0 - 3%	>60"		36 - 60"	determined onsite		**C**
OCILLA	SAND HILLS	0-10%	>60"		12-30"	determined onsite		**C**
ORANGEBURG	SAND HILLS	0 - 25%	> 60"		> 72"	determined onsite		**A**
OSIER	SAND HILLS	0 - 2%	> 60"		< 12"			*unsuitable*
PELHAM	SAND HILLS	0-2%	>60"		0-12"	determined onsite		**C, or F**
PELION	SAND HILLS	0-15%	>60"		12-30"	determined onsite		**C**
RED BAY	SAND HILLS	0-15%	>60"		>72"	determined onsite		**A**
RIVERVIEW	SAND HILLS	0-5%	>60"		36-60"	determined onsite		**C**
STILSON	SAND HILLS	0-8%	>60"		30-36"	determined onsite		**C or S**
SUSQUEHANNA	SAND HILLS	1-17%	>60"		>72"			*unsuitable*
TROUP	SAND HILLS	0-40%	>60"		>72"	determined onsite		**A**
VAUCLUSE	SAND HILLS	2 - 25%	>60"		> 72"		determined onsite	
WAGRAM	SAND HILLS	0 -15%	>60		> 72"	determined onsite		**A**
WAHEE	SAND HILLS	0 - 4%	72"		12 - 18"	determined onsite		**C or J**
AILEY	Southern Coastal Plain	0-25%	>60"		48 - 72"	determined onsite		**A**
ALAPAHA	Southern Coastal Plain	0-3%	>60"		0-12"	determined onsite		**C**
ALBANY	Southern Coastal Plain	0-6%	>60"		18 - 30"	determined onsite		**C**
AMERICUS	Southern Coastal Plain	0-25%	>60"		>72"	determined onsite		**A**
ARDILLA	Southern Coastal Plain	0-5%	>60"		12-24"	determined onsite		**C**
ARUNDEL	Southern Coastal Plain	2-35%	20-40"	HARD	>72"			*unsuitable*
BAYBORO	Southern Coastal Plain	0-2%	>60"		0-12"			*unsuitable*
BETHERA	Southern Coastal Plain	0-2%	>60"		0-18"			*unsuitable*
BIBB	Southern Coastal Plain	0-2%	>60"		0 - 8"			*unsuitable*
BIGBEE	Southern Coastal Plain	0-5%	>60"		20 - 40"	determined onsite		**C**
BINNSVILLE	Southern Coastal Plain	1 - 17%	7 - 20"	SOFT	20"			*unsuitable*
BLADEN	Southern Coastal Plain	0-2%	>60"		0-12"	determined onsite		**C**
BLANEY	Southern Coastal Plain	0-25%	>60"		>72"		determined onsite	
BLANTON	Southern Coastal Plain	0-20%	>60"		48 - 72"	determined onsite		**A**
BLANTON *(Moderately Wet)*	Southern Coastal Plain	0-20%	>60"		30 - 48"	determined onsite		**C, or S**
BONIFAY	Southern Coastal Plain	0-12%	>60"		48-60"	determined onsite		**A**
BONNEAU	Southern Coastal Plain	0-12%	> 60"		42 - 60"	determined onsite		**A**
BOSWELL	Southern Coastal Plain	1 - 17 %	> 60"		>72			*unsuitable*
BUNCOMBE	Southern Coastal Plain	0 - 6%			> 72"	determined onsite		**C**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
CAHABA	Southern Coastal Plain	0-8%	>60"		>72	determined onsite		**A**
CARNEGIE	Southern Coastal Plain	2-12%	>60"		40 - 60"	determined onsite		**U**
CENTENARY	Southern Coastal Plain	0-5%	>60"		42 - 60"	determined onsite		**A**
CHASTAIN	Southern Coastal Plain	0-2%	>60"		0-12"			*unsuitable*
CHEWACLA	Southern Coastal Plain	0-2%	>60"		+ 12" - 24"			*unsuitable*
CHIPLEY	Southern Coastal Plain	0-8%	>60"		18 - 36"	determined onsite		**C**
CHISOLM	Southern Coastal Plain	0 - 10%	>60"		36 - 60"		determined onsite	
CLARENDON	Southern Coastal Plain	0-6%	>60"		24-36"	determined onsite		**C**
COWARTS	Southern Coastal Plain	1 - 25%			40 - 60"	determined onsite		**N**
COXVILLE	Southern Coastal Plain	0 - 2%	>60"		0 - 12"			*unsuitable*
DASHER	Southern Coastal Plain	0-1%	>60"		+ 12 to 12"			*unsuitable*
DOGUE	Southern Coastal Plain	0-15%	>60"		18-36"	determined onsite		**C**
DOTHAN	Southern Coastal Plain	0 - 12%			36 - 60"	determined onsite		**U**
DUNBAR	Southern Coastal Plain	0 - 2%			12 - 30"	determined onsite		**C, J**
DUPLIN	Southern Coastal Plain	0 - 7%	>60"		24 - 36"	determined onsite		**C, J**
ECHAW	Southern Coastal Plain	0-2%	>60"		30 - 60"	determined onsite		**C**
ELLABELLE	Southern Coastal Plain	0-2%	>60"		<6"			*unsuitable*
ESTO	Southern Coastal Plain	2-25%	>60"		>72	determined onsite		**J**
EULONIA	Southern Coastal Plain	0-6%	>60"		18 - 42"	determined onsite		**C, J**
EUSTIS	Southern Coastal Plain	0 - 30%	>60"		> 72"	determined onsite		**A**
EUTAW	Southern Coastal Plain	0 - 2%	>60"		6 - 18"			*unsuitable*
FACEVILLE	Southern Coastal Plain	0-15%	>60"		>72"	determined onsite		**A**
FLOMATON	Southern Coastal Plain	2 - 40%	> 60"		>72"	determined onsite		**A**
FOXWORTH	Southern Coastal Plain	0 - 25%	> 60"		40 - 72"	determined onsite		**A**
FREEMANVILLE	Southern Coastal Plain	0 - 12%	> 60"		40 - 60"	determined onsite		**U**
FUQUAY	Southern Coastal Plain	0-10%	>60"		48 - 72"	determined onsite		**A or U**
GOLDSBORO	Southern Coastal Plain	0 - 10%	> 60"		18 - 30"	determined onsite		**C**
GRADY	Southern Coastal Plain	0-2%	>60"		0-12"			*unsuitable*
GREENVILLE	Southern Coastal Plain	0 - 18%	>60"		>72"	determined onsite		**A**
GRITNEY	Southern Coastal Plain	0 - 15%	> 60"		18 - 36"	determined onsite		**C, or J**
HENDERSON	Southern Coastal Plain	2 - 20%	> 60"		> 72"			*unsuitable*
HEROD	Southern Coastal Plain	0-2%	>60		0-12"			*unsuitable*
HORNSVILLE	Southern Coastal Plain	0 - 8%	> 60"		30 - 42"	determined onsite		**C, or J**
IRVINGTON	Southern Coastal Plain	0 - 5%	> 60"		18 - 36"	determined onsite		**C**
IUKA	Southern Coastal Plain	0 - 2%	> 60"		12 - 36"	determined onsite		**C**
IZAGORA	Southern Coastal Plain	0 - 8%	>60"		24-36"	determined onsite		**C**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
JOHNS	Southern Coastal Plain	0 - 2%	> 60"		12 - 36"	determined onsite		**C**
JOHNSTON	Southern Coastal Plain	0 - 2%	> 60"		0 - 12"			*unsuitable*
KERSHAW	Southern Coastal Plain	0 - 15%	> 60"		> 72"	(too fast ?)	determined onsite	
KINSTON	Southern Coastal Plain	0-2%	>60"		0-12"			*unsuitable*
KOLOMOKI	Southern Coastal Plain	0 - 5%	>60"		60 - 72"	determined onsite		**A**
KUREB	Southern Coastal Plain	0-20"	>60"		>72"	(too fast?)	determined onsite	
LAKELAND	Southern Coastal Plain	0 - 85%	>60"		>72"	(too fast?)	determined onsite	
LEAF	Southern Coastal Plain	0 - 2%	>60"		6 - 18"			*unsuitable*
LEEFIELD	Southern Coastal Plain	0 - 12%	>60"		18 - 30"	determined onsite		**C**
LEON	Southern Coastal Plain	0-5%	>60"		12 - 24"	determined onsite		**C**
LEON (HYDRIC)	Southern Coastal Plain	0 - 2%	>60"		0 - 6"			*unsuitable*
LOWNDES	Southern Coastal Plain	0 - 17%	> 60"		> 72"	determined onsite		**A**
LUCY	Southern Coastal Plain	0 - 45%	>60"		>72"	determined onsite		**A**
LYNCHBURG	Southern Coastal Plain	0-2%	>60"		6 - 18"	determined onsite		**C**
MARLBORO	Southern Coastal Plain	0 - 10%	>60"		48 - 72"	determined onsite		**A**
MASCOTTE	Southern Coastal Plain	0-2%	>60		6 - 18"	determined onsite		**C**
MAXTON	Southern Coastal Plain	0 - 6%	>60"		60 - 72"	determined onsite		**A**
MEGGETT	Southern Coastal Plain	0-3%	>60"		0-12"	determined onsite		**C, or J**
MUCKALEE	Southern Coastal Plain	0 - 2%	>60"		0-12"			*unsuitable*
MYATT	Southern Coastal Plain	0 - 2%	> 60"		0 - 12"			*unsuitable*
NANKIN	Southern Coastal Plain	0-60%	>60"		40 - 60"	determined onsite		**J**
NOBOCO	Southern Coastal Plain	0 - 6%	> 60"		30 - 40"	determined onsite		**C or S**
NORFOLK	Southern Coastal Plain	0-10%	>60"		48-72"	determined onsite		**A**
OCHLOCKONEE	Southern Coastal Plain	0 - 3%	>60"		36 - 60"			*unsuitable*
OCILLA	Southern Coastal Plain	0 - 10%	>60"		12 - 30"	determined onsite		**C**
OGEECHEE	Southern Coastal Plain	0-2%	>60"		+ 12" - 12"			*unsuitable*
OKTIBBEHA	Southern Coastal Plain	1 - 30%	>60"		> 72"			*unsuitable*
OLUSTEE	Southern Coastal Plain	0 - 2%	> 60"		6 - 18"	determined onsite		**C**
ORANGEBURG	Southern Coastal Plain	0 - 25%	> 60"		> 72"	determined onsite		**A**
OSIER	Southern Coastal Plain	0 - 2%	> 60"		< 12"			*unsuitable*
OUSLEY	Southern Coastal Plain	0-5%	>60"		18 - 36"	determined onsite		**C**
PELHAM	Southern Coastal Plain	0-2%	>60"		+ 12" - 18"			*unsuitable*
PERSANTI	Southern Coastal Plain	0 - 6%	> 60"		18 - 36"			*unsuitable*
PICKNEY	Southern Coastal Plain	0-2%	> 60"		< 10" to 20"			*unsuitable*
PLUMMER	Southern Coastal Plain	0-5%	>60"		0-12"	determined onsite		**C**
RAINS	Southern Coastal Plain	0-2%	>60"		0-12"	determined onsite		**C**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
RED BAY	Southern Coastal Plain	0-15%	>60"		>72"	determined onsite		**A**
REMBERT	Southern Coastal Plain	0-2%			0 - 12"			*unsuitable*
RIDGELAND	Southern Coastal Plain	0-2%	>60"		18-30"	determined onsite		**C**
RIGDON	Southern Coastal Plain	0 - 2%			18 - 30"	determined onsite		**C**
RUTLEGE	Southern Coastal Plain	0 - 2%	> 60"		0 - 6"			*unsuitable*
SHELLBLUFF	Southern Coastal Plain	0-3%	>72"		36 - 60"	determined onsite		**C**
STILSON	Southern Coastal Plain	0-8%	>60"		30-36"	determined onsite		**C or S**
SUFFOLK	Southern Coastal Plain	0 - 50%	>60"		> 72"	determined onsite		**A**
SUMTER	Southern Coastal Plain	1 - 40%					determined onsite	
SUNSWEET	Southern Coastal Plain	2-25%			40 - 60"	determined onsite		**J**
SURRENCY	Southern Coastal Plain	0 - 1%			0 - 6"			*unsuitable*
SUSQUEHANNA	Southern Coastal Plain	1-17%	>60"		>72"			*unsuitable*
TAWCAW	Southern Coastal Plain	0 - 2%	>72"		18 - 30"			*unsuitable*
TELFAIR	Southern Coastal Plain	2-15%	20-40"	HARD	12 - 36"			*unsuitable*
TIFTON	Southern Coastal Plain	0 - 8%	>72"		40 - 60"	determined onsite		**A or U**
TORHUNTA	Southern Coastal Plain	0 - 2%	>60"		6 - 18"	determined onsite		**C**
TROUP	Southern Coastal Plain	0-40%	>60"		>72"	determined onsite		**A**
VALDOSTA	Southern Coastal Plain	0 - 5 %	>60"		>72"	determined onsite		**A**
VARINA	Southern Coastal Plain	0-10%	>60"		48 - 60"	determined onsite		**A or U**
VAUCLUSE	Southern Coastal Plain	2 - 25%	>60"		> 72"		determined onsite	
WAGRAM	Southern Coastal Plain	0 -15%	>60		> 72"	determined onsite		**A**
WAHEE	Southern Coastal Plain	0 - 4%	72"		12 - 18"	determined onsite		**C, or J**
WEHADKEE	Southern Coastal Plain	0 - 2%	> 60		0 - 12"			*unsuitable*
WICKSBURG	Southern Coastal Plain	0-12%	>60		40 - 60"	determined onsite		**A or U**
AILEY	Atlantic Coastal Plain	0 - 25%	> 60"		48 - 72"	determined onsite		**A**
ALBANY	Atlantic Coastal Plain	0 - 6%	>72"		18 - 30"	determined onsite		**C**
ALLANTON	Atlantic Coastal Plain		>60		0 - 6"			*unsuitable*
ARDILLA	Atlantic Coastal Plain	0 - 5%			12 - 24"	determined onsite		**C**
BAYBORO	Atlantic Coastal Plain	0 - 2%	>60"		0 - 12"			*unsuitable*
BETHERA	Atlantic Coastal Plain	0 - 2%	>60"		0 - 18"			*unsuitable*
BIBB	Atlantic Coastal Plain	0 - 1%	>72"		.5 - 1"			*unsuitable*
BLADEN	Atlantic Coastal Plain	0 - 2%	>72"		0 - 12"			*unsuitable*
BLANTON	Atlantic Coastal Plain	0 - 45%	>72"		30 - 72"	determined onsite		**A**
BOHICKET	Atlantic Coastal Plain	0 - 2%	> 60"					*unsuitable*
BONIFAY	Atlantic Coastal Plain	0 - 12%	>72"		40 - 60"	determined onsite		**A**
BROOKMAN	Atlantic Coastal Plain	0 - 2%	> 60"	>72"	0 - 12"			*unsuitable*

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
CAINHOY	Atlantic Coastal Plain	0 - 10%	> 60"		40 - 60"	determined onsite		**A**
CAPE FEAR	Atlantic Coastal Plain	0 - 2%	> 60"		0 - 12"			*unsuitable*
CAPERS	Atlantic Coastal Plain	0 - 2%	> 60"		+ 12" - 12"			*unsuitable*
CARNEGIE	Atlantic Coastal Plain	2 - 12%			40 - 60"	determined onsite		**U**
CENTENARY	Atlantic Coastal Plain	0-5%			42 - 60"	determined onsite		**A**
CHASTAIN	Atlantic Coastal Plain	0 - 2%			0 - 12"			*unsuitable*
CHIPLEY	Atlantic Coastal Plain	0 - 8%			18 - 36"	determined onsite		**C**
CLARENDON	Atlantic Coastal Plain	0 - 6%			24 - 36"	determined onsite		**C**
COWARTS	Atlantic Coastal Plain	1 - 25%			40 - 60"	determined onsite		**N**
COXVILLE	Atlantic Coastal Plain	0 - 2%	>72"		0 - 12"			*unsuitable*
CRAVEN	Atlantic Coastal Plain	0 - 12%	> 60"		24 - 36"	determined onsite		**C**
CROATAN	Atlantic Coastal Plain				0 - 12"			*unsuitable*
DASHER	Atlantic Coastal Plain	0 - 1%			+ 12" - 12"			*unsuitable*
DOTHAN	Atlantic Coastal Plain	0 - 12%			36 - 60"	determined onsite		**U**
DUCKSTON	Atlantic Coastal Plain	0 - 2%	> 60"		0 - 6"			*unsuitable*
DUNBAR	Atlantic Coastal Plain	0 - 2%	> 60"		12 - 24"	determined onsite		**C**
ECHAW	Atlantic Coastal Plain	0 - 2%			30 - 60"	determined onsite		**C**
ELLABELLE	Atlantic Coastal Plain	0 - 2%			+ 12" - 6"			*unsuitable*
EULONIA	Atlantic Coastal Plain	0 - 6%			18 - 42"	determined onsite		**C**
FOXWORTH	Atlantic Coastal Plain	0 - 25%			40 - 60"	determined onsite		**A**
FRIPP	Atlantic Coastal Plain	2 - 30%	> 60"		> 72"			*unsuitable*
FUQUAY	Atlantic Coastal Plain	0 - 10%	> 60"		48- 72"	determined onsite		**A or U**
GRADY	Atlantic Coastal Plain	0 - 2%			+ 24" - 12"			*unsuitable*
HAZLEHURST	Atlantic Coastal Plain	0 - 3%	> 60"		6 - 24"	determined onsite		**C**
HURRICANE	Atlantic Coastal Plain	0 - 5%	> 60"		24 - 42"	determined onsite		**C**
JOHNSTON	Atlantic Coastal Plain	0 - 2%			0 - 12"			*unsuitable*
KERSHAW	Atlantic Coastal Plain	2 - 15%			>72"	(too fast?)	determined onsite	
KINGSFERRY	Atlantic Coastal Plain	0 - 2%	> 60"		0 - 6"			*unsuitable*
KINGSLAND	Atlantic Coastal Plain	0 - 1%	> 60"		+ 2' - 6"			*unsuitable*
KINSTON	Atlantic Coastal Plain	0 - 2%	> 60"		0 - 12"			*unsuitable*
KUREB	Atlantic Coastal Plain	0 -20%			>72"	(too fast?)	determined onsite	
LAKELAND	Atlantic Coastal Plain	0 -85%			>72"	(too fast?)	determined onsite	
LEEFIELD	Atlantic Coastal Plain	0 - 12"			18 - 30"	determined onsite		**C**
LEON	Atlantic Coastal Plain	0 - 5%			0 - 6" or deeper	determined onsite		**C**
LEVY	Atlantic Coastal Plain	0 - 2%	> 60"		+ 2' to 0"			*unsuitable*
LOWNDES	Atlantic Coastal Plain	0 - 17%			> 48"	determined onsite		**A**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
LUCY	Atlantic Coastal Plain	0 - 45%			40 - 60"	determined onsite		**A**
LUMBEE	Atlantic Coastal Plain	0 - 2%	> 60"		0 - 12"			*unsuitable*
LYNN HAVEN	Atlantic Coastal Plain	0 - 5%	> 60"		0 - 6"			*unsuitable*
MANDARIN	Atlantic Coastal Plain	0 - 3%	> 60"		18 - 36"	determined onsite		**C**
MASCOTTE	Atlantic Coastal Plain	0 - 2%			6 - 18"	determined onsite		**C**
MEGGETT	Atlantic Coastal Plain	0 - 3%	>60"		0 - 12"			*unsuitable*
NANKIN	Atlantic Coastal Plain	0 - 60%	>72"		40 - 60"	determined onsite		**J**
NOBOCO	Atlantic Coastal Plain	0 - 6%	> 60"		30 - 40"	determined onsite		**C or S**
OCILLA	Atlantic Coastal Plain	0 - 10%			12 - 30"	determined onsite		**C**
OGEECHEE	Atlantic Coastal Plain	0 - 2%			+ 1' to 12"			*unsuitable*
OLUSTEE	Atlantic Coastal Plain	0 - 2%	> 80"		6 - 18"	determined onsite		**C**
OSIER	Atlantic Coastal Plain	0 - 2%	> 60"		< 12"			*unsuitable*
OUSLEY	Atlantic Coastal Plain	0 - 5%	> 60"		18 - 36"			*unsuitable*
PELHAM	Atlantic Coastal Plain	0 - 5%			+ 1' to 18"			*unsuitable*
PICKNEY	Atlantic Coastal Plain	0 - 2%			< 10" to 20"			*unsuitable*
PLUMMER	Atlantic Coastal Plain	0 - 5%			0 - 12"			*unsuitable*
PONZER	Atlantic Coastal Plain	0 - 2%	> 60"		0 - 12"			*unsuitable*
POOLER	Atlantic Coastal Plain	0 - 2%	> 60"		0 - 12"	determined onsite		**C, or J**
POTTSBURG	Atlantic Coastal Plain	0 - 2%	> 60"		0 - 24"	determined onsite		**C**
RAINS	Atlantic Coastal Plain	0 - 2%			0 - 12"			*unsuitable*
RICEBORO	Atlantic Coastal Plain	0 - 2%	> 60"		0 - 12"	determined onsite		**C, or J**
RIDGELAND	Atlantic Coastal Plain	0 - 2%	> 60"		18 - 30"	determined onsite		**C**
RIGDON	Atlantic Coastal Plain	0 - 2%	> 60"		18 - 30"	determined onsite		**C**
RIMINI	Atlantic Coastal Plain	0 - 10%	> 60"		> 72"		determined onsite	
RUTLEGE	Atlantic Coastal Plain	0 - 2%			0 - 6"			*unsuitable*
SAPELO	Atlantic Coastal Plain	0 - 2%			0 - 18"	determined onsite		**C**
SATILLA	Atlantic Coastal Plain	0 - 1%			0 - 18"			*unsuitable*
SCRANTON	Atlantic Coastal Plain	0 - 2%			6 - 18"	determined onsite		**C**
STILSON	Atlantic Coastal Plain	0 - 5%	>72"		30 - 40"	determined onsite		**C or S**
SUNSWEET	Atlantic Coastal Plain	2 - 25%	> 72"		40 - 60"	determined onsite		**J**
SURRENCY	Atlantic Coastal Plain	0 - 1%	>72"		0 to 0.5"			*unsuitable*
TAWCAW	Atlantic Coastal Plain	0 - 2%	>72"		18 - 30"			*unsuitable*
TELFAIR	Atlantic Coastal Plain	2 - 15%	20 - 40"		12 - 36"			*unsuitable*
TIFTON	Atlantic Coastal Plain	0 - 8%	>72"		40 - 60"	determined onsite		**U**
TROUP	Atlantic Coastal Plain	0 - 40%	>72"			determined onsite		**A**
VALDOSTA	Atlantic Coastal Plain	0 - 5%	>72"		>60"	determined onsite		**A**

SOIL SERIES *SEE SUITABILITY CODES AND INSTALLATION INFORMATION*	**MLRA** *major land resource area*	**SLOPE %** ranges *of the soil type*	**DEPTH TO BEDROCK** (ranges)	**BEDROCK HARDNESS**	**DEPTH TO SEASONAL HIGH H20 TABLE *(inches)***	**ABSORPTION RATE AT RECOMMENDED TRENCH DEPTH MIN/ IN.** *predicted range(s)*	**RECOMMENDED TRENCH BOTTOM DEPTH** (ranges)	**SUITABILITY CODE *and installation information***
WAHEE	Atlantic Coastal Plain	0 - 4%	72"		12 - 18"	determined onsite		**C, or J**
WICKSBURG	Atlantic Coastal Plain	0 - 12%	72"		40 - 60"	determined onsite		**A**

SUITABILITY CODES & INSTALLATION INFORMATION

THESE CODES ARE GENERAL STATEMENTS OF SOIL SUITABILITY AND LIMITATIONS FOR THEIR USE FOR ON-SITE SYSTEMS. AS SUCH, THEY ARE BASED ON THE RANGE OF CONDITIONS GIVEN FOR THE SOILS AS THEY OCCUR STATE WIDE. SUITABILITY CODES AND INSTALLATION RECOMMENDATIONS SUBMITTED TO COUNTY BOARDS OF HEALTH BY QUALIFIED INDIVIDUALS SHOULD BE BASED ON DATA FROM THEIR SITE SPECIFIC EVALUATION AND MAY COMMONLY DIFFER FROM THE GENERAL STATEMENTS BELOW.

A	These soils are suitable for installation of on-site systems with proper system design, installation, and maintenance. Position of the site or other soil and landscape considerations may require the drain field area to be greater than the minimum and/or the drain field design to require equal distribution or level field installation.
C	Because of flooding, shallow seasonal water tables, soil horizons with very slow percolation rate, perched water tables, or imperfect drainage, these soils are not suitable for installation of a conventional on-site system without site modifications, special designs or installation. Properties of the soil and site may require the drain field area to be greater than the minimum and/or the drain field design to require equal distribution or level field installation. Non-conventional systems and installation must be approved by the local Environmental Health Specialist.
F	Because of soil limitations, these soils are unsuitable for installation of an on-site system.
H	These soils have bedrock limitations and are not suitable for installation of a conventional on-site system without special design or installation. Properties of the soil and site may require the drain field area to be greater than the minimum and/or the drain field design to require equal distribution or level field installation. Non-conventional system design and installation must be approved by the local Environmental Health Specialist.
J	These soils commonly have percolation rates that are too slow for installation of a conventional on-site system without special design or installation. Some areas may have favorable rates, which can be identified thorough intensive investigation. Properties of the soil and site may require the drain field area to be greater than the minimum and/or the drain field design to require equal distribution or level field installation. Non-conventional system design and installation must be approved by the local Environmental Health Specialist.
K	These soils are suitable for installation of an on-site system. Shallow bedrock is common in this area, however, small areas of soils with shallow bedrock may occur as inclusions in these map units. It is recommended that intensive investigations be made or that the on-site system is installed prior to home construction to ensure bedrock limitations are not present on the site.

N	Because of soft bedrock at a shallow depth, these soils typically are not suitable for installation of a conventional on-site system. Hydraulic properties of the rock vary, however, and in some areas, the soft rock has a percolation rate suitable for on-site system installation. Intensive investigations are required to evaluate hydraulic properties of the rock and site suitability. On-site system installation before home construction may be required to ensure the system can be properly installed. Properties of the soil and site may require the drain field area to be greater than the minimum and/or the drain field design to require equal distribution or level field installation. Non-conventional system design and installation must be approved by the local Environmental Health Specialist.
P	These soils have deep seasonal water tables that require shallow installation of on-site system drain fields. Intensive investigations and data collection may be needed to ensure percolation rates in shallow horizons have suitable percolation rates. Properties of the soil and site may require the drain field area to be greater than the minimum and/or the drain field design to require equal distribution or level field installation. Design and installation of an alternative system on these soils must be approved by the local Environmental Health Specialist.
R	These soils are suitable for installation of an on-site system. However, they are very rocky or stony which may require design modifications including increased drain field area and special measures for excavations and system installation.
S	These soils have seasonal water tables and are commonly poorly suited conventional on-site system installation. Very shallow, above ground, and other system designs may allow the site to be used. Design and installation of an alternative system on these soils must be approved by the local Environmental Health Specialist.
U	These soils are generally suitable for installation of on-site systems. However, slowly permeable subsoil horizons may result in short periods of saturated soils that impede on-site system function. Shallow installation of the drain field trenches along with site water management will minimize this problem.

Codes Related to Site Conditions

G	Because of severe slope conditions, on-site installation is not recommended.

Pretreatment

An on-site sewage pretreatment unit means a watertight sewage treatment structure designed and constructed to receive raw sewage, separate solids from liquids, digest organic matter through a period of retention and allow clarified effluent to discharge to a subsurface soil absorption system. Such pretreatment units fall into three basic categories:

a) Septic tanks -- which rely predominantly on anaerobic bacterial action for treatment;
b) Aerobic units -- which introduce atmospheric air into the sewage to promote treatment by aerobic bacteria; and
c) Combination units -- which provide treatment through anaerobic and aerobic bacterial action and/or mechanical filtering, ozonation or ultraviolet irradiation.

Septic Tank Pretreatment Units

The primary purpose of the septic tank is to remove solids suspended in the wastewater. It is to provide quiescent conditions for a sufficient period of time to allow the settleable solids to fall to the bottom and the scum to rise to the top. The sludge (accumulated solids) and scum collect in the septic tank for a few years (usually 3-5 years) without disturbing the sedimentation function.

Anaerobic biological reduction of the sludge is a beneficial result of prolonged storage of solids in the tank. The bacteria in the tank deplete any oxygen that may be dissolved in the waste while feeding on the concentrated organics. In the anaerobic environment, facultative and anaerobic bacteria attack the organic molecules reducing them to soluble compounds and gases. The digestion has several effects on tank performance:

a) The sludge volume can be reduced up to 40 percent, reducing the septage pumping frequency;
b) The rising gas bubbles from the sludge blanket may carry active organisms with them, seeding the clear liquid space of the tank to speed decomposition of the solids, which remain suspended in the liquid;
c) The rising bubbles may interfere with effective settling and, thereby, carry out of the tank suspended solids; and
d) A toxic and explosive atmosphere may result from the accumulation of the gases produced in the tank. These toxic gases can be fatal to septage pumpers and for this reason no one is advised to enter a septic tank without appropriate personal protective equipment.

1. Precast Concrete Septic Tanks

The following are minimum standards of design and construction for precast reinforced concrete septic tanks:

a) The minimum requirement for the liquid depth is 36 inches.

b) A minimum of nine inches freeboard is required, the freeboard being the air space between the top of the liquid and the bottom side of the lid or cap of the tank.

c) The length of the septic tank shall be at least one and one half (1½) times the tank width.

d) There may be a maximum of three-inlet opening knockouts in the tank: one opening or knockout shall be on the tank inlet end; knockouts on sidewalls of the inlet end are optional. Any knockout(s) shall leave a minimum concrete thickness of one inch in the tank wall. They shall accommodate a minimum of four-inch or a maximum of six-inch pipe. No knockouts or openings shall be permitted below the tank liquid level. Any inlet opening or knockout shall be positioned such that at least a one (1) inch clearance will exist between the top of any inlet tee and the bottom surface of the tank top or access opening insert. Both the inlet and outlet openings may have seals cast into the tank.

e) All plastic plumbing, appurtenances and fittings including the inlet and outlet tees and extension piping shall bear the certification mark of the National Sanitation Foundation International (NSF) * for drain, waste and vent or sewer applications. Company products bearing the NSF mark demonstrate their continual compliance with NSF Standard 14 entitled, "Plastic Piping System Components and Related Materials". As a minimum standard, all plastic pipe used in conjunction with the septic tank shall be type I schedule 40, polyvinyl chloride (PVC) meeting ASTM standard 2665 and bear the NSF certification mark for drain, waste and vent or sewer applications. Inlet and outlet pipes shall be sealed through use of a cast in place low-pressure pipe seal or equivalent neoprene gasket, flexible silicon adhesive or cement.

f) The tees shall extend down a minimum of 25% and a maximum of 50% of the total liquid depth. It shall extend at least 5 inches above liquid level. The installer shall be responsible for proper installation of the tees. The invert of the outlet tee shall be at least two inches lower in elevation than the invert of the inlet tee.

g) The minimum capacity of a septic tank shall be 1000 gallons with manufacturer tolerance of plus (+) or minus (-) four percent (4%). All tanks shall be provided with a concrete partition so that the tank contains two compartments. Tanks without cast in place partitions shall be provided with a concrete partition so that the tank contains two compartments. At the intersection of the partition, for the type with a slip-in partition, the wall thickness at the intersection of the side wall may be reduced to two inches. The partition shall be located at a point not less than two-thirds (2/3) nor more than three-fourths (3/4) the length of the tank from the inlet end. The partition shall provide adequate space for air or gas passage between compartments. The partition shall be cast in such a manner to leave a water passage equal to or greater than the inlet pipe. The passage shall be located below the liquid level a minimum of 25% and a maximum of 50% of the total liquid depth. The partition shall be reinforced through use of six inch by six-inch number 10 gage-welded wire. The reinforcing wire on cast in place partitions shall be bent to form an angle of 90 degrees on the ends in order to form a leg not less than four inches long. When the wire is placed in the mold the four-inch legs should lay parallel with the sidewall wire adjacent to it. It is recognized that there are other methods of constructing a partition or two-compartment tank. Any method other than the one described will be considered on an individual basis for approval by the Department. However, the tank wall thickness must be two and one-half inches thick throughout the tank except for knockouts and at the intersection of a slip-in type partition with the side walls, where it can be reduced to two inches and the top, which must be three and one-half inches (3 1/2") thick.

h) Tank Access Openings: Adequate access openings must be provided in the tank top, which may be either one or two-piece construction. Access shall be provided for cleaning or rodding out of the inlet and outlet pipe, for cleaning or clearing the air or gas passage space above the partition, an entrance for inserting the suction hose for tank pumping, and for routine filter maintenance as needed. This shall be accomplished by properly locating access hole openings having securable, removable covers over the inlet and outlet tees with each having a minimum opening of 15 inches and a maximum of 24 inches as the opening cuts the plane of the bottom side of the top of the tank. The upper surface of the access hole may extend to finished grade or to a depth no deeper than 12 inches below the finished grade. The access hole covers shall be designed and maintained to prevent water inflow; they shall be beveled on all sides in such manner as to accommodate a uniform load of 150 pounds per square foot without damage to the cover or the top of the tank. All below grade access hole covers shall have a handle of steel or other rot-resistant material equivalent in strength to a No. 3 reinforcing rod (rebar).

i) Tank Reinforcing: Where steel reinforcing is used, a minimum of six-inch by six-inch No. 10 gage welded steel reinforcing wire shall be used in the bottom, ends, and sides of the tank; in the top, three eigths inch (3/8") reinforcing rods shall be used with a spacing of 12 inches on center each way extending to a minimum distance of two and one half inches (2 1/2") and a maximum distance of three inches from the outside edge of the tank. The reinforcing wire shall be lapped at least six inches. Concrete cover shall be required for all reinforcement. Reinforcement shall be placed to maximize the structural integrity of the tank. The tank shall be able to withstand a uniform live loading of 150 pounds per square foot in addition to loads to which an underground tank is normally subjected. Examples of this are: the dead weight of the

concrete and soil cover, active soil pressure on tank walls and the uplifting force of the ground water. Additional reinforcement shall be required when the loads on a concrete tank are exceeded by subjecting it to vehicular traffic or when the top of the tank is placed deeper than three feet below the finished grade.

It is recognized there are methods of reinforcing concrete with fiber in lieu of reinforcing wire; however, when fiber is used, the reinforcing in the top must contain 3/8 inch steel rods (rebar) as specified in the paragraph above. When used, fiber reinforcing shall be 100% virgin polypropylene; fibrillated fiber containing no reprocessed olefin materials, and it must be manufactured specifically for use as concrete secondary reinforcement. Volume per cubic yard shall equal a minimum of 0.1 percent (1.5 pounds). Fibers are for the control of cracking due to drying shrinkage and thermal expansion/contraction, reduction in permeability, increased impact capacity, shatter resistance, abrasion resistance and added toughness. Fiber lengths shall be graded as per manufacturer with a maximum length of two inches. Fibrous concrete reinforcement materials used shall produce concrete conforming to specifications where concrete is tested in accord with ASTM C-1116 TYPE III 4.15 and ASTM C-1116 (reference: ASTM C-1018) performance level 15 outlined in Section 21, Note #17.

j) The ends, sides and bottom of the tank must have a minimum thickness of two and one-half inches (2 1/2"). The top must have a minimum thickness of three and one half inches (3 1/2").

k) Compressive strength: A minimum 28-day concrete compressive strength of 4,000 pounds per square inch shall be used in the construction of the septic tank. The concrete shall achieve minimum compressive strength of 3,000 pounds per square inch prior to removal of the tank from the place of manufacture. It shall be the responsibility of the manufacturer to certify that this condition has been met prior to shipment. A septic tank shall be subject to testing to ascertain the strength of concrete prior to its being approved for installation. Recognized devices for testing the strength of concrete include a properly calibrated Schmidt Rebound Hammer or Windsor Probe Test. Accelerated curing in the mold by use of propane gas or other fuels is prohibited, except in accordance with accredited methods and upon prior approval of The Department.

l) After curing, tanks manufactured in two sections shall be joined and sealed at the joint by using a mastic, butyl rubber, or other pliable sealant that is waterproof, corrosion-resistant, and approved for use in septic tanks. The sealant shall have a minimum size of one-inch nominal diameter or equivalent. Before sealing, the joint shall be smooth, intact and free of all deleterious substances. Tank halves shall be properly aligned to ensure a tight seal. The sealant shall be provided by the manufacturer. Other methods of waterproofing tanks may be used as specifically approved in the plans and specifications for the tank.

m) Tank Markings: All tanks shall bear an imprint, cast or stamp in the wall at the right of the outlet within six inches of the top of the wall. It shall identify the manufacturer and indicate the liquid capacity of the tank in gallons.

n) Tank Figures: Figures DF-1, DF-2, and DF-3 provide specifications that meet or exceed minimum septic tank design requirements.

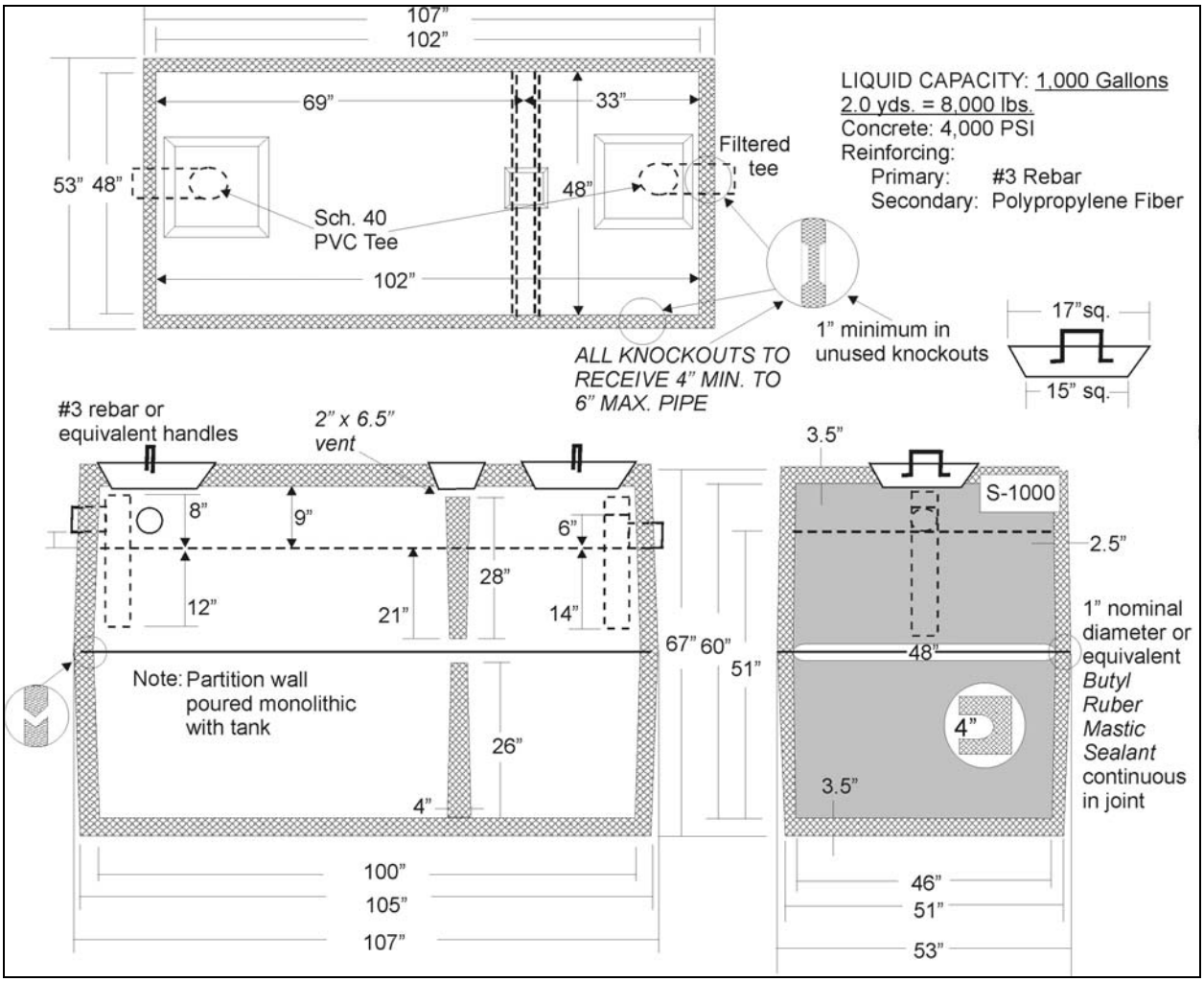

107"
102"
69"
33"
53" 48"
48"
Filtered tee
Sch. 40 PVC Tee
102"
LIQUID CAPACITY: 1,000 Gallons
2.0 yds. = 8,000 lbs.
Concrete: 4,000 PSI
Reinforcing:
Primary: #3 Rebar
Secondary: Polypropylene Fiber
1" minimum in unused knockouts
17"sq.
15" sq.
ALL KNOCKOUTS TO RECEIVE 4" MIN. TO 6" MAX. PIPE
#3 rebar or equivalent handles
2" x 6.5" vent
8"
9"
6"
28"
12"
21"
14"
67"
60"
51"
Note: Partition wall poured monolithic with tank
26"
4"
100"
105"
107"
3.5"
S-1000
2.5"
1" nominal diameter or equivalent Butyl Ruber Mastic Sealant continuous in joint
48"
4"
3.5"
46"
51"
53"

Figure DF-1

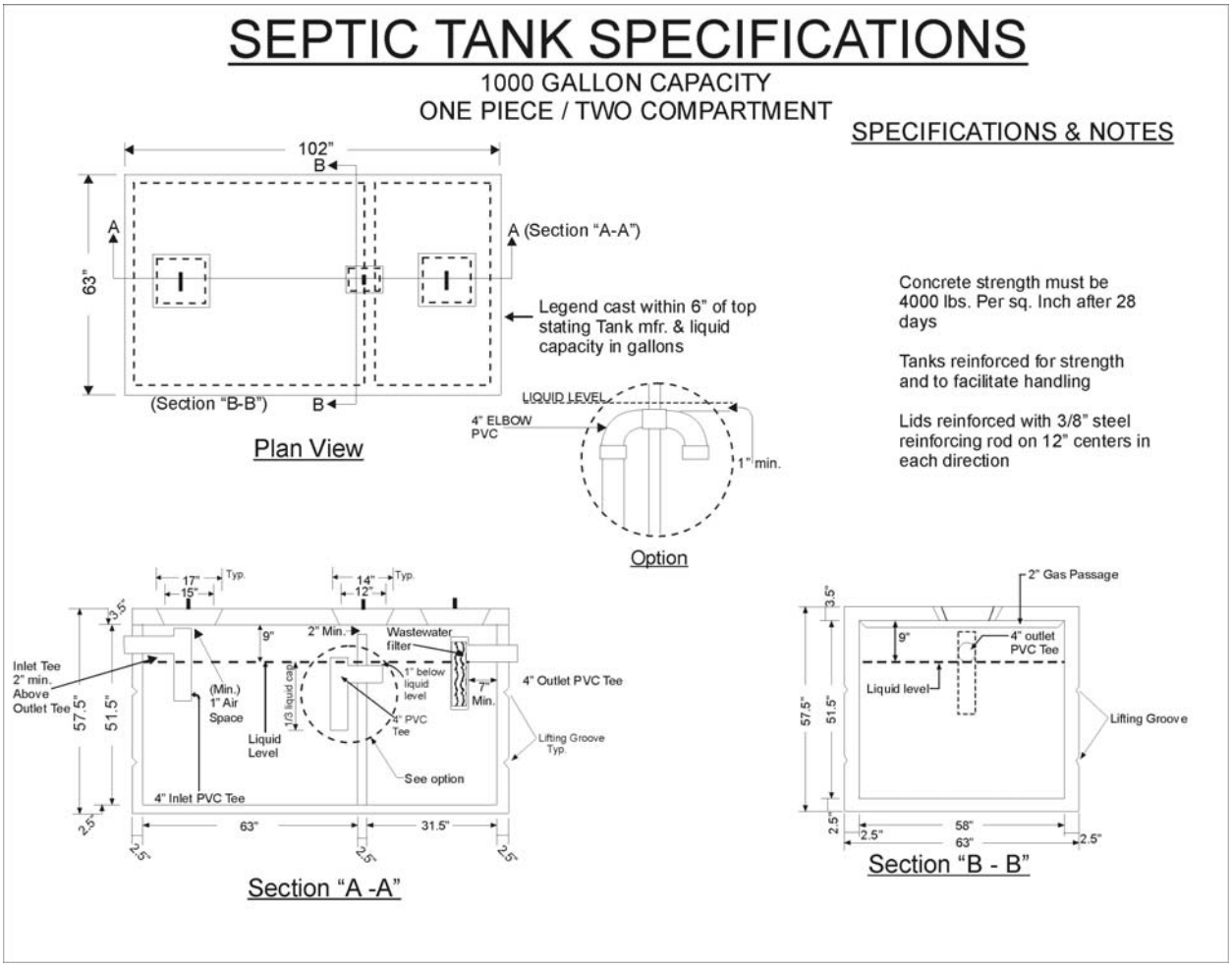

SEPTIC TANK SPECIFICATIONS
1000 GALLON CAPACITY
ONE PIECE / TWO COMPARTMENT
SPECIFICATIONS & NOTES
102"
B
A
63"
A (Section "A-A")
Legend cast within 6" of top stating Tank mfr. & liquid capacity in gallons
(Section "B-B")
B
Plan View
LIQUID LEVEL
4" ELBOW PVC
1" min.
Option
Concrete strength must be 4000 lbs. Per sq. Inch after 28 days
Tanks reinforced for strength and to facilitate handling
Lids reinforced with 3/8" steel reinforcing rod on 12" centers in each direction
17"
15"
Typ.
14"
12"
Typ.
2.5"
9"
2" Min.
Wastewater filter
Inlet Tee 2" min. Above Outlet Tee
57.5"
51.5"
(Min.) 1" Air Space
1/3 liquid cap
1" below liquid level
7" Min.
4" Outlet PVC Tee
Liquid Level
4" PVC Tee
Lifting Groove Typ.
See option
4" Inlet PVC Tee
2.5"
63"
31.5"
2.5"
2.5"
Section "A -A"
2" Gas Passage
3.5"
9"
4" outlet PVC Tee
Liquid level
57.5"
51.5"
Lifting Groove
2.5"
2.5"
58"
63"
2.5"
Section "B - B"

Figure DF-2

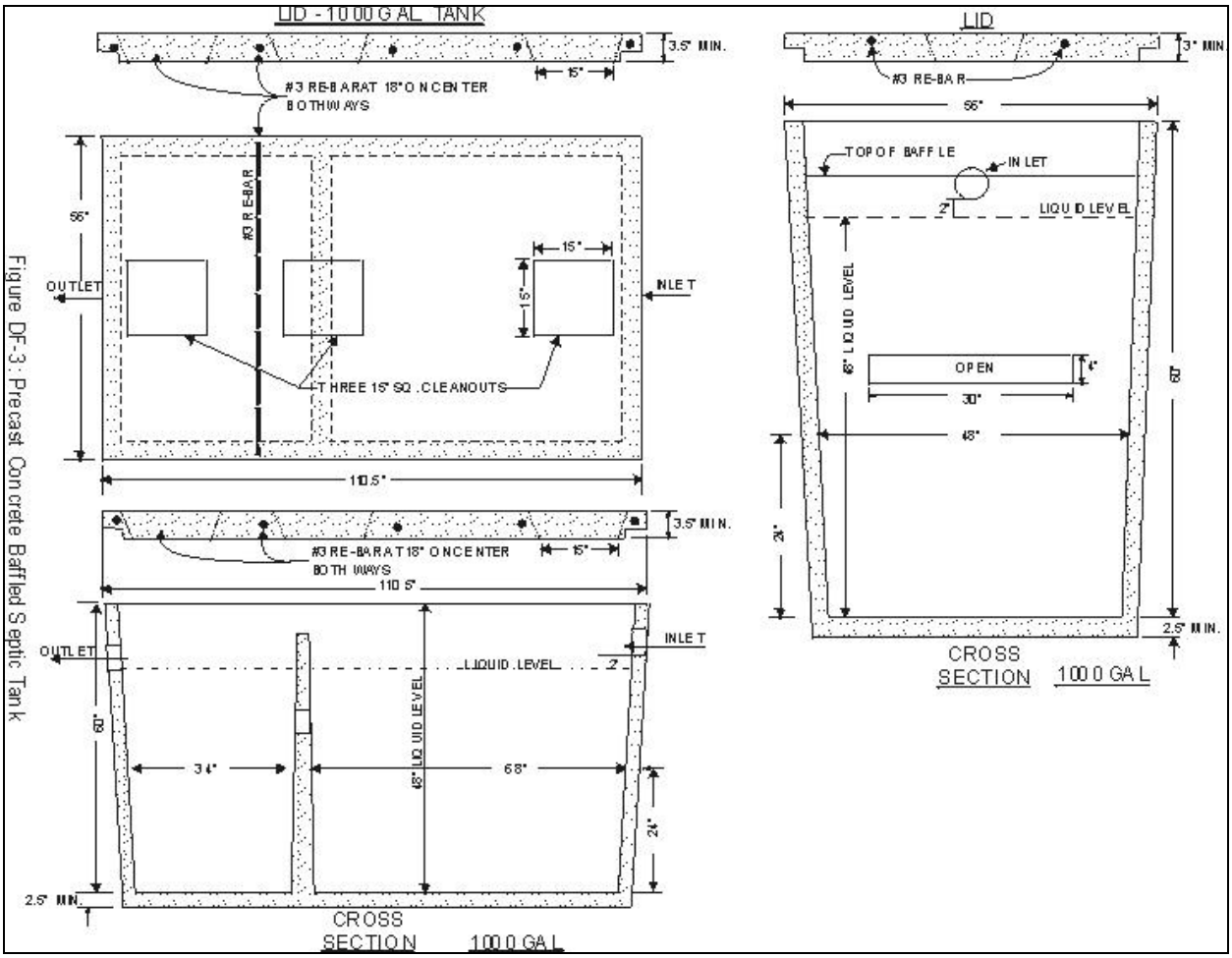

LID - 1000 GAL TANK
3.5" MIN.
15"
#3 RE-BAR AT 18" ON CENTER BOTH WAYS
#3 RE-BAR
56"
OUTLET
INLET
15"
15"
THREE 15" SQ. CLEANOUTS
110.5"
3.5" MIN.
#3 RE-BAR AT 18" ON CENTER BOTH WAYS
15"
110.5"
OUTLET
INLET
LIQUID LEVEL
2"
48"
34"
68"
48" LIQUID LEVEL
24"
2.5" MIN.
CROSS SECTION 1000 GAL
LID
3" MIN
#3 RE-BAR
56"
TOP OF BAFFLE
INLET
2"
LIQUID LEVEL
48" LIQUID LEVEL
OPEN
4"
30"
48"
24"
2.5" MIN.
CROSS SECTION 1000 GAL
Figure DF-3: Precast Concrete Baffled Septic Tank

Figure DF-3

2. Precast Concrete Pump/Dosing Tanks

Pump tanks shall meet the construction requirements for septic tanks with the following differences. See also Section E, Pages E-1 through E-6 and figures EF-4 through EF-10.

a) Tanks shall be cast with a single compartment, or, if a partition is provided, the partition shall be cast to contain a minimum of two four-inch diameter circular openings, or equivalent, located no more than 12 inches above the tank bottom.
b) There shall be no requirement as to tank length, width, or shape, provided the tank satisfies all other requirements of this Section.
c) The invert of the inlet openings shall be located within 12 inches of the tank top. No freeboard shall be required in the pump tank.
d) After joining, tanks manufactured in two sections shall be sealed along the joint by using a mastic, butyl rubber or other pliable sealant that is waterproof, corrosion resistant and approved for use in septic tanks. The sealant shall have a minimum size of one-inch diameter or equivalent. Before sealing, the joint shall be smooth, intact, and free of all deleterious substances. Tank halves shall be properly aligned to ensure a tight seal. The sealant shall be provided by the manufacturer. Other methods of waterproofing tanks may be used as specifically approved in the plans and specifications for the tank.
e) Tanks shall be vented and accessible for routine maintenance. A watertight access with removable cover shall be provided over the pump with a minimum diameter of 24 inches. The cover shall be beveled on all sides in such manner as to accommodate a uniform load of 150 pounds per square foot without damage to the cover or the top of the tank. All below grade covers shall contain at least a handle made of steel or other rot resistant material equivalent in strength to a number (No.) 3 reinforcing rod (rebar). The access cover should extend to finished grade or to no deeper than 12 inches below finished grade. The covers shall be designed and maintained to prevent surface water inflow. Larger or multiple access covers shall be provided when two or more pumps are required. There must be a threaded union on the pump discharge pipe that will allow pump removal without entry into the tank. Access lids and electrical controls shall be secured against unauthorized opening or ingress. Access risers shall be joined to the tank top and sealed in accordance with Paragraphs 1(l) and 2(d) of this Section.
f) Pump Tank Markings: All pump tanks shall bear an imprint, cast or stamp in the wall at the right of the outlet within six inches of the top of the wall. It shall identify the manufacturer and indicate the liquid capacity of the tank in gallons.

3. Septic Tanks Constructed on Site

Septic tanks constructed on site of cast-in-place concrete shall be constructed to conform with the requirements of precast concrete septic tanks except as follows:
a) Cast-in-place concrete septic tanks shall have a minimum wall thickness of four inches.
b) The bottom and top of the constructed on site septic tank shall be poured reinforced concrete with a minimum thickness of four inches.
c) For large capacity (5,000 gallons or more) cast-in-place concrete tanks, maximum liquid depth shall be 66 inches.

4. Fiberglass Reinforced Plastic SepticTanks

Definitions:
The following general definitions shall apply in the interpretation of these standards:

1.1 ASTM: Denotes nationally recognized standards established by the American Society for Testing and Materials.

1.2 Fiberglass Reinforced Plastic: A fibrous glass and plastic mixture, which exhibits a high strength to weight ratio and is highly resistant to corrosion.

1.3 Flexural Modulus of Elasticity: A measure of the stiffness of material.

1.4 Flexural Strength: A measure of the ability of a material to withstand rupture when subjected to bend loading.

1.5 Gel Coating: A specially formulated polyester resin, which is pigmented and contains filler materials, the purpose of which is to provide a smooth, pore-free, watertight surface for fiberglass reinforced plastic parts.

1.6 National Sanitation Foundation (NSF) Standard #14: The NSF standard relating to thermoplastics which have been tested and found satisfactory for potable water supply uses, for drain, waste and vent application.

1.7 Resin: Any number of commercially available polyester products used in the manufacture of fiberglass reinforced products which serve to contribute mechanical strength, determine chemical and thermal performance, and prevent abrasion of fibers, and which must be physically and/or chemically determined to be acceptable for the environment and free from inert filler materials.

1.8 Sealant: A bonding agent specifically designed to bond joining sections of fiberglass reinforced plastic products to each other in such a manner so as to create a durable, long-lasting, watertight seal which does not alter the structural integrity or strength of the two joined fiberglass products.

1.9 Fiberglass Septic Tank: The minimum capacity of a septic tank shall be 1000 gallons. This is an approved watertight tank designed or used to receive the discharge of sewage from a building sewer and to effect separation of solids from liquids, retaining the solids for organic decomposition and discharging sewage effluent to an absorption field or other sewage management system. All tanks shall be provided with a partition so that the tank contains two compartments. The partition shall be located at a point not less than two-thirds (2/3) nor more than three-fourths (3/4) the length of the tank from the inlet end. The partition shall provide adequate space for air or gas passage between compartments. The partition shall provide for at least two passages with each equal to or greater than the cross-sectional area of the inlet pipe. The passage shall be located below the liquid level a minimum of 25% and a maximum of 50% of the total liquid depth.

1.10 Ultimate Tensile Strength: A measure of the resistance of a material to longitudinal stress, measured by the minimum longitudinal stress required to rupture the material.

General Requirements:

The following general requirements are applicable to fiberglass reinforced plastic septic tanks as defined herein and approved design standards and structural properties shall be not less than those as stated herein.

2.1 Materials:
Resins and sealants used in the tank manufacturing process shall be capable of effectively resisting corrosive influences of liquid components of sewage, gases generated by the digestion of sewage, and soil burial. Materials used shall be formulated to withstand vibration, shock, normal household chemicals, earth and hydrostatic pressure both when full and empty. Not less than thirty percent (30%) of the total weight of the tank shall be fiberglass reinforcement, and for tanks not exceeding 1500 gallons capacity, the minimum wall thickness shall be 1/4 inch; however, isolated small spots may be as thin as 80% of the 1/4 inch minimum thickness.

2.2 Inner Coating:
Internal surfaces shall be coated with an appropriate gel coating to meet the requirements of Paragraph One above.

2.3 Physical Properties:

Tanks shall be constructed so that all parts of the tank shall meet the following requirements:

a) Ultimate tensile strength: Minimum of 12,000 PSI when tested in accordance with ASTM D638-98, Standard Method of Test for Tensile Properties of Plastics.

b) Flexural Strength: Minimum of 19,000 PSI when tested in accordance with ASTM D790-98, Standard Method of Test for Flexural Properties of Plastic.

c) Flexural Modulus of Elasticity: (Tangent) Minimum of 800,000 PSI when tested in accordance with ASTM D790-98, Standard Method of Test for Flexural Properties of Plastics.

2.4 Watertight Integrity:

Tanks shall be so constructed as to be watertight for the designed life of the tank. Lids or covers shall be sufficiently tight when installed to preclude the entrance of surface or ground water into the tank.

2.5 Longevity*:*

Proof from an independent testing laboratory shall be submitted substantiating a minimum life expectancy of twenty years service for the intended use of the tank and appurtenant components such as necessary sealants, connective fastenings, resins, etc.

2.6 Safety*:*

As a safety measure, provision shall be made in the construction of septic tank lids or covers to preclude unauthorized entry or removal when the use of the tank necessitates positioning of access openings at or above ground level.

2.7 Workmanshi*p:*

Tanks shall be of uniform thickness and free from defects that may affect their serviceability or durability. Completed tanks are to present a smooth inside finish free of spalls, pits and honeycombs. Plant quality control shall be sufficient to maintain a high degree of uniformity in tank quality.

Detail Requirements:

Detail requirements for design and construction shall be not less than that specified herein and shall be in conformity with recognized National Standards for design and construction and in accordance with Chapter 290-5-26.

3.1 Capacity and Design Limits:

Capacity of tanks shall comply with the requirements as set forth in Chapter 290-5-26-.05 (3).

3.2 Dimensions:

The inside length of a horizontal cylindrical tank shall not be less than twice the width nor more than three times the width. The liquid depth of septic tanks with capacities of less than 6,000 gallons shall not be greater than five feet. With septic tank capacities from 6,000 to 10,000 gallons, liquid depth may increase to a maximum of six feet. At least fifteen percent of the total volume of the tank shall be above the liquid level. If other shapes are proposed, specifications must be submitted to the Department for approval.

3.3 Compartments:

Multiple-compartmented septic tanks shall be used. The first compartment shall have a minimum capacity of two-thirds of the total tank capacity. Flow between compartments shall be by means of at least one opening in the compartment wall, with a cross-sectional area equivalent to the area of the building sewer, that leads into the tank, with the passage to be located below the liquid depth a minimum of 25% and a maximum of 50% of the total liquid depth. The partition shall provide adequate space for air or gas passage between compartments.

3.4 Inlet:
Provisions shall be made for the building sewer to enter the center of one end of the septic tank two inches above the normal liquid level of the tank. A tee shall be constructed as an integral part of the tank to receive the building sewer or as an alternative, an integrally constructed baffle may be used. If baffles are used, suitable integrally fitted sleeves or collars shall be provided in the inlet openings of the tank to provide surface areas sufficient to insure capability of watertight bonding between the tank and the inlet sewer. If the tee or baffle is constructed of plastic materials, it shall meet NSF Standard #14 for drain, waste, and vent system application. If fiberglass reinforced plastic is used, it shall be of the same constituency as material of which the tank is constructed. The inlet tee or baffle shall extend down a minimum of 25% and a maximum of 50% of the total liquid depth. It shall extend at least five inches above liquid level and be placed and secured in a vertical position so as to be watertight and preclude dislodgement during installation, operation or maintenance activities.

3.5 Outlet:
Provisions shall be made for the outlet sewer to receive the discharge from the tank by providing an opening in the center of the end of the tank opposite the inlet, the invert elevation of which shall be at the liquid level of the tank. A tee shall be constructed as an integral part of the tank to connect to the outlet sewer or as an alternative, an integrally constructed baffle may be used. If baffles are used, suitable integrally fitted sleeves or collars shall be provided in the outlet opening of the tank to provide surface areas sufficient to insure capability of watertight bonding between the tank and outlet sewer. If the tee or baffle is constructed of plastic material, it shall meet NSF Standard #14 for drain, waste and vent system application. If fiberglass reinforced plastic is used, it shall be of the same constituency as material of which the tank is constructed. The outlet tee or baffle shall extend down a minimum of 25% and a maximum of 50% of the liquid depth and be placed and secured in a vertical position so as to be watertight and preclude dislodgement during installation, operation or maintenance activities. The tee shall extend at least five inches above liquid level. A one-inch opening between the top of the inlet tee and top of the tank shall be provided to permit free passage of air or gas between the tank and the house sewer vent.

3.6 Access Openings:
Openings in the top of the septic tank shall be provided over the inlet and outlet tees or baffles with a minimum crossectional width of 15 inches with a minimum area of 225 square inches, sufficient to enable maintenance service to such tees or baffles; access openings in the top of the septic tank shall be provided over each compartment in sufficient number to enable effective removal of solids from all parts of the tank. The access openings may extend to finished grade or to a minimum of 12 inches below finished grade. Covers for the access openings must be provided that are securable and water tight.

3.7 Identifying Markings:
All tanks shall bear an imprint, cast or stamp in the wall at the right of the outlet within six inches of the top of the wall. It shall identify the manufacturer, and indicate the liquid capacity of the tank in gallons.

5. Polyethylene Septic Tanks

A. The following general requirements are applicable to polyethylene plastic septic tanks.
1) Materials: Resins and sealants used in the tank manufacturing process shall be capable of effectively resisting corrosive influences of liquid components of sewage, gases generated by the digestion of sewage, and soil burial. Materials used shall be formulated to withstand vibration, shock, normal household chemicals, earth and hydrostatic pressure both when full and empty.

2) Physical Properties: Tanks shall be so constructed that all parts of the tank shall meet the following requirements:

a) Ultimate tensile strength: Minimum - 2,400 PSI when tested in accordance with ASTM D 638-01, Standard Method of Test for Tensile Properties of Plastics.

b) Flexural Strength: Minimum - 80,000 PSI when tested in accordance with ASTM D790-01, Standard method of Test for Flexural Properties of Plastics.

3) Watertight Integrity: Tanks shall be so constructed as to be watertight for the designed life of the tank. Lids or covers shall be sufficiently tight when installed to preclude the entrance of surface or ground water into the tank.

4) Longevity: Proof from an independent testing laboratory shall be submitted substantiating a minimum life expectance of twenty years service for the intended use of the tank and appurtenant components such as necessary sealants, connective fastenings, resins, etc.

5) Safety: As a safety measure, provision shall be made in the construction of septic tank lids or covers to preclude unauthorized entry or removal when the use of the tank necessitates positioning of access openings at or above ground level.

6) Workmanship: Tanks shall be of uniform thickness and free from defect that may affect their serviceability or durability. Completed tanks are to present a smooth inside finish free of spalls, pits and honeycombs. Plan quality control shall be sufficient to maintain a high degree of uniformity in tank quality.

B. Detail requirements for design and construction shall be not less than that specified herein and shall be in conformity with recognized National Standards for design and construction in accordance with Chapter 290-5-26 as follows:

1.) Capacity and Design Limits - Capacity of tanks shall comply with the requirements as set forth in Chapter 290-5-26-.05 (1) and Chapter 290-5-26-.05 (3).

2.) Dimensions: The inside length of a horizontal cylindrical tank shall not be less than twice the width nor more than three times the width. The liquid depth of septic tanks with capacities of less than 6,000 gallons shall not be greater than five feet. With septic tank capacities from 6,000 to 10,000 gallons, liquid depth may be increased to a maximum of six feet. At least fifteen percent of the total volume of the tank shall be above the liquid level. If other shapes are proposed, specifications must be submitted to the Department for review and approval.

3.) Compartments: Multiple-compartmented septic tanks shall be used, and when used, the first compartment shall have a minimum capacity of two-thirds of the total tank capacity. Flow between compartments shall be by means of at least one opening in the compartment wall, with a cross-sectional area equivalent to the area of the building sewer, that leads into the tank, with the passage to be located below the liquid level a minimum of 25% and a maximum of 50% of the total liquid depth. The partition shall provide adequate space for air or gas passage between compartments.

4.) Inlets: Provisions shall be made for the building sewer to enter the center of one end of the septic tank two inches above the normal liquid level of the tank. A tee shall be constructed as an integral part of the tank to receive the building sewer. As an alternative, an integrally constructed baffle may be used. If baffles are used, suitable integrally fitted sleeves or collars shall be provided in the inlet openings of the tank to provide surface areas sufficient to insure capability of watertight bonding between the tank and inlet sewer. If the tee or baffle is constructed of plastic material, it shall meet NSF Standard #14 for drain, waste and vent system application. The inlet tee or baffle shall extend down to a minimum of 25% and a maximum of 50% of the liquid depth and be placed and secured in a vertical position so as to be watertight and preclude dislodgement during installation, operation or maintenance activities.

5.) Outlet: Provisions shall be made for the outlet sewer to receive the discharge from the tank by providing an opening in the center of the end of the tank opposite the inlet, the invert elevation of which shall be at the liquid level of the tank. A tee shall be constructed as an integral part of the tank to connect to the outlet sewer or as an alternative, an integrally constructed baffle may be used. If a baffle is used, suitable integrally fitted sleeves or collars shall be provided in the outlet opening of the tank to provide surface areas sufficient to insure capability of watertight bonding between the tank and outlet sewer. If the tee or baffle is constructed of plastic material, it shall meet NSF Standard #14 for drain, waste and vent system application. The outlet tee and any tee used as an opening for the baffle shall extend eighteen inches below the design liquid level and be placed and secured in a vertical position so as to be watertight and preclude dislodgement during installation, operation or maintenance activities. A one-inch opening between the top of the inlet tee and the top of the tank shall be provided to permit free passage of gas back to the house vent.

6.) Access Openings: Openings in the top of the septic tank shall be provided over the inlet and outlet tees or baffles, with a minimum crossectional width of 15 inches with a minimum area of 225 square inches, sufficient area to enable maintenance service to such tees or baffles; access openings in the top of the septic tank shall be provided over each compartment in sufficient number to enable effective removal of solids from all parts of the tank. The access openings may extend to finished grade or to a minimum of 12 inches below finished grade. Covers for the access openings must be provided that are securable and water tight.

7.) Identifying Markings: All septic tanks shall bear an imprint, cast or stamp in the wall at the right of the outlet within six inches of the top of the wall. It shall identify the manufacturer and indicate the liquid capacity of the tank in gallons.

6. Filtration Devices for Residential Gravity Flow Septic Tank Systems

Filtration devices for residential gravity flow septic tank systems shall be certified by NSF International or an independent organization accredited by the American National Standards Institute (ANSI) to determine compliance with the requirements of the most current ANSI/NSF Standard 46, Section 10 including but not limited to having the make and model of the effluent filter published in the accredited organizations public document and/or publicly available website that lists the company's name, address, telephone number and those products and model numbers successfully tested against the standard. These outlet filtration devices shall be accepted for installation and use in the state of Georgia.

1. Certified filtration devices shall bear a registered trademark that includes reference to ANSI/NSF Standard 46.
2. Certified components (i.e. Filter casing or filter housing) intended to be used with other components to make a complete functional system, as defined by ANSI/NSF Standard 46, should bear a unit mark. Housing components intended to replace outlet tees (to make a complete functional system) must meet the provisions of DHR Rule 290-5-26-.05(1) and Section D-1(e) and (f) of the Department's Manual for On Site Sewage Management Systems.
3. Each filtration device or filtration system shall bear a permanently marked model designation on the device.

Aerobic Treatment Units

1. Introduction

   A. Aerobic treatment units (ATUs) provide aerobic biodegradation or decomposition of wastewater constituents by bringing the wastewater in contact with air mechanically. ATUs come in different configurations and sizes, and incorporate a variety of approaches, including air pumps, air injectors, lift pumps and biological-contact surfaces (such as pipes, fabric, grids, gravels and rotating disks). Other alternative sewage treatment technologies, such as sand filter systems, may also be described by this characterization, however they are not classified by the Department as aerobic treatment units or systems.

   B. ATUs are stand-alone sewage treatment systems, providing wastewater treatment prior to disposal in a subsurface drainfield system or pre-treatment to other alternative methods of wastewater treatment and/or disposal.

   C. The standards presented in this regulation apply to the use of ATUs for the treatment of sewage from residences (single-family or multi-family); wastewater that can be described as having the constituency and strength combined 5-day biological oxygen demand ($CBOD_5$) typical of wastewater from domestic households (See Table 1). Some residential facilities or settings (group homes, extended care facilities, nursing homes, etc.) may generate sewage that is more complex and more difficult to treat, and may better be described as non-residential. Similarly, other non-residential facilities (such as restaurants, dental or medical clinics, veterinary clinics, beauty shops, laundromats, etc.) may produce high-strength wastewater (significantly exceeding $CBOD_5$ levels acceptable for domestic households) making treatment difficult. Standards for ATUs designed to treat non-residential wastewater or high-strength wastewater are reviewed for compliance by the Georgia Environmental Protection Division.

2. Performance Standards

   A. Listing
   Upon request, the Technical Review Committee (hereafter, the Committee) reviews proprietary ATU products; when the Committee determines that data provided by the manufacturer or designated manufacturer representative demonstrates that the product meets or exceeds the testing requirements, it will be added to the Approved List of the Department for such systems. An ATU must be included on the list of Approved Systems before local health officers may issue permits for installation of on-site sewage systems incorporating such products.

   B. Testing
      1) Aerobic treatment units must be tested by a qualified third-party organization independent from the manufacturer.

      2) The Department and the Committee uses as performance and test criteria, the product standards, testing protocol and application standards for ATUs established by National Sanitation Foundation International (NSF). Testing performed by independent ANSI accredited third-party test facilities will be reviewed by the Committee and approved by the Department on a case-by-case basis.

      3) The testing criteria and performance levels for ATUs designed to treat residential sewage must at least be equal to that specified and required in the current ANSI/NSF Standard No. 40 - Residential Wastewater Treatment Systems. This applies to ATUs submitted to the Department for review and listing after the approval date of these standards.

Table I

Performance Standards/Testing Protocol for Aerobic Treatment Units

ATU Performance Objective	Wastewater Characteristics Influent	Effluent	Test Protocol
NSF Class I	$CBOD_5$ (4): 100-300 mg/L (2)	$CBOD_5$: ≤25mg/L (2) ≤40 mg/L (3)	NSF 40 (1)
	TSS (5): 100-350 mg/L (2)	TSS: ≤30 mg/L (2) ≤45 mg/L (3)	
	pH: No Standard	pH: 6.0-9.0	
	No Bacterial Standard	No Bacterial Standard	

(1) NSF International Standard for Wastewater Technology/Residential Wastewater Treatment Systems – July 12, 2000.
(2) 30 day average
(3) 7 day average
(4) Combined 5-day Carbonaceous Biochemical Oxygen Demand
(5) Total Suspended Solids

3. Application Standards

A. Listed Products
Only ATUs listed on The Department's List of Approved Systems and Products shall be permitted by local health officers for systems installation within their jurisdiction. Only the specific models listed are approved. Other ATU models and/or products in manufacturers' product lines are not approved for use until they have been reviewed and approved by the Committee and placed on the Department list of Approved Systems and Products.

B. Permitting and Installation

1) Installation and if required, operational permits, must be obtained from the appropriate local health officer prior to installation and use.

2) Any variances or changes in the installation or use of these devices different from the conditions, allowances, or criteria contained in the Department's approval and the associated installation permit, awarded by the local health authority, would void both the approval and the installation permit; such an altered system would then be classified as an experimental system, which would require further review by the Committee and a different type of approval by the Department.

3) An ATU must be installed by an authorized representative of the manufacturer approved by the Department.

4) Where an ATU is utilized, the bottom of the infiltrative surface elevation must be at least 12" above maximum seasonal high ground-water table, creviced or porous bedrock or strata of impermeable soil or bedrock (including very slowly permeable soil).

5) There must be sufficient acceptable land area on the property for installation of the ATU and a 100% set aside area for future replacement, should such ever be needed.

C. Pre-treatment

External pre-treatment for solids separation and settling, where required by the manufacturer, may be provided by a conventional single compartment septic tank. If not required by the manufacturer, no external pre-treatment is required. Use of an ATU, following the manufacturer's recommendation for pre-treatment (including volume recommendations) takes precedence over use of a septic tank for such purposes.

D. ATU Size/Model Selection

For residential wastewater flows, in the absence of actual flow data, ATU sizing will be based upon a projection of 150 gallons per day (gpd) flow per bedroom. The size ATU needed will be determined by manufacturer recommendations for the ATU capable of treating the actual or projected gpd flow.

E. Access Ports

Ground level access ports must be sized and located to facilitate the installation, removal, sampling, examination, maintenance, and servicing of components and compartments that require routine maintenance and inspection. In accordance with the manufacturer operation and maintenance manual, access ports must be of sufficient size, design and location so as to allow for the following:

1) Visual inspection and removal of all mechanical or electrical components;
2) Visual inspection and removal of any component which is to be periodically cleaned or replaced;
3) Visual inspection and sampling;
4) Removal (manually or by pumping) of collected residuals; and
5) Protection against unauthorized intrusions. Acceptable protective measures include, but are not limited to:
   a. A padlock;
   b. A cover that can be removed only with tools; and
   c. A cover having a minimum net weight of 65 pounds (29.5 kilograms).
6) Protection from ground water inflow.

G. Failure Sensing and Signaling Equipment

1) The ATU must possess a mechanism or process capable of detecting failures of electrical and mechanical components critical to the treatment processes and delivering a visible and audible alarm signal to notify the owner of such failures that result in:
   a. Water level above normal operating specifications; or
   b. Aeration equipment not functioning within manufacturer specified limits.

2) Both the visual and audible alarm signals must be conspicuous from a distance of 50 feet from the system and its appurtenances. The audible alarm signal must produce sound levels between 60 and 75 dbA at a distance of five feet away from the unit.

3) The visual and auditory signals must continue to be functional in the event of an electrical, mechanical, or hydraulic malfunction of the system.

H. Data plate

1) An ATU must have two permanent and legible data plates. One data plate must be affixed to the front of the electrical control box. The second data plate must be placed on the tank, aeration equipment assembly, or riser at a location accessed during maintenance cycles and inspections.

   The data plates must include:
   a. Manufacturer's name and address;
   b. Model number;
   c. Serial number (required on one data plate only);

d. Rated daily hydraulic capacity of the system; and
e. The system classification as determined by performance testing and evaluation.

2) A clearly visible label or plate that provides instructions for obtaining service must be permanently located near the failure signal.

I. Extended Electrical Power Interruption
ATU performance begins to decrease as a result of extended power failure (generally over 48 to 72 hours). In areas subject to extended power interruptions, the benefit of providing an emergency power supply should be considered in the overall sewage system design/review process.

4. Operation & Maintenance Standards

A. General

1) The residence or facility owner is responsible for assuring proper operation and providing timely maintenance of the ATU and all other components of the on-site sewage treatment and disposal system.

2) The manufacturer must provide the Department and local health authority annually a list of ATU's sold/installed. As a minimum, the list must contain in table format the following:
a. County where installed;
b. City where installed;
c. Owner's name;
d. Owner's street address;
e. Owner's zip code;
f. Owner's phone number;
g. Tank serial number;
h. Installation date; and
i. Date warranty ends and, if different, date service contract ends.

3) The ATU authorized representative must instruct, or assure that instruction is provided to the residence or facility owner in proper operation of the ATU. Emphasis must be placed on those aspects that relate to operating and maintaining the ATU within its normal operating range. This should include instruction regarding items in Product Manual(s) below.

B. Product Manuals

Manufacturers must provide authorized representatives with product literature intended to accommodate all persons who may be involved in the installation, upkeep, or repair of the systems. This information may be provided in the form of separate, discrete manuals or may be combined into one comprehensive manual, as the manufacturer deems appropriate. The manual must be written so as to be easily understood by the intended reader. As a minimum the manual must include specific instruction for: 1. System Installation, 2. Operation and Maintenance, and 3. Trouble Shooting and Repair as described below.

1) System Installation

Manufacturers must provide comprehensive and detailed installation instructions to authorized representatives and the local health officer. At a minimum the following must be included:
a. A numbered list of system components and an accompanying illustration, photograph or print in which the components are respectively identified;
b. Design, construction, and material-specifications for the system's components;
c. Wiring schematics for the system's electrical components;
d. Off-loading and unpacking instructions including safety considerations, identification of fragile components, and measures to be taken to avoid damage to the system;

e. A process overview of the function of each component and the expected function of the entire system when all components are properly assembled and connected;
f. A clear definition of system installation requirements including plumbing and electrical power requirements, ventilation, air intake protection, bedding, hydrostatic displacement protection, water tightness, slope and miscellaneous fittings and appurtenances;
g. A sequential installation procedure;
h. Repair or replacement instructions in the event that a system possesses flaws that would inhibit proper functioning and a list of sources where replacement components can be obtained; and
i. A detailed start-up procedure.

2) Operation and Maintenance

Manufacturers must provide comprehensive and detailed operation and maintenance instructions to authorized representatives, the local health officer and the owner. Comprehensive operating instructions must clearly delineate proper function of the system, operating and maintenance responsibilities of the owner and authorized service personnel and service related obligations of the manufacturer. As a minimum the following must be included:

a. A maintenance schedule for all components; copies of the periodic maintenance reports must be provided to the owner and the local health authority;
b. Requirements and recommended procedures for the periodic removal of residuals from the system;
c. A detailed procedure for visual evaluation of system component functions;
d. A description of olfactory and visual techniques for the evaluation of system effluent and mixed liquor; and
e. A list of household substances that, if discharged to the system, may adversely affect the system, operational processes and/or the environment.

3) Trouble Shooting and Repair

Manufacturers must provide comprehensive and detailed trouble-shooting and repair instructions to authorized representatives, the local health officer, and to the owner. As a minimum, the following must be included:

a. A guide for visually evaluating the system and narrowing the scope of the problem based on effluent characteristics, system operation, and history; detailed methods and criteria must be included;
b. A sequential method for isolating specific component failure;
c. A step-by-step guide for repairing or replacing all system components; and
d. The name and telephone number of an appropriate service representative to be contacted in the reference to the system data plate in the event that a problem arises or service is required to obtain this information.

4) Service Related Obligations

A. Initial Service Policy

1) A three year initial service policy must be furnished to the owner by the manufacturer or the authorized representative; the cost of the initial service policy must be included in the original purchase price. The initial policy must contain provisions for six inspection/service visits (scheduled once every six months over the three year period) during which electrical, mechanical, and other applicable components are inspected, adjusted and serviced.

2) The initial service policy must contain a clause that states that the owner must be notified in writing, about improper system operations that cannot be remedied at the time of inspection, and that the written notification must include an estimated date of correction; if the malfunction is expected to cause a sewage backup into the dwelling or a surface discharge of effluent, then a copy must be furnished to the local health authority.

3) Service providers must maintain accurate records of their Service Contracts, customers, and time lines for renewal of service contracts.

B. Submission of Maintenance Reports
The manufacturer or licensed distributor shall submit to the Department and county health authority by March 15th reports of each visit for maintenance conducted during the previous year. Information such as name and address of the owner, date of visit, reason for the visit, and corrective action taken shall be included in the report. Failure to submit timely reports may result in the suspension of the license to market the system in Georgia.

C. Extended Service Policy
A manufacturer or authorized representative must make available, for purchase by the owner, an extended service policy with services provided as extensive as or greater than those in the initial service policy. The owner must obtain such a service policy or insure that equivalent maintenance and repair service is provided. Maintenance and the periodic reporting requirements noted in paragraph 5B above must continue for the life of the system.

D. Stand-by Parts
In the event that a mechanical or electrical component must undergo off-site repairs, the local authorized representative must maintain a stock of mechanical and electrical components that may be temporarily installed until repairs are completed.

E. Availability of Service
Emergency service must be available within 48 hours of a service request.

F. Limited Warranty
The manufacturer must warrant all components of their ATU to be free from defects in material and workmanship for a minimum of two years from the date of installation. The manufacturer must fulfill the terms of the warranty by repairing or exchanging any components that, in the manufacturer's judgment, show evidence of defect.

G. Owner's Manual
Each ATU must be accompanied by a manufacturer prepared owner's manual. The authorized representative must provide copies of the manual to the owner and the local health officer, at the time of system installation.

Class I Effluent Equivalent Systems

1. The Department recognizes other types of pretreatment systems are capable of producing a Class I effluent. Pretreatment systems capable of producing a Class I effluent must meet the following testing requirements. Third party testing from an accredited testing facility acceptable to the DHR Technical Review Committee showing the system meets current ANSI/NSF Standard 40 testing requirements for Class I effluent.

2. The manufacturer shall provide the Department and local health authority an annual listing of system installations. As a minimum the list must contain the following information:

a. County where installed
b. City where installed
c. Owners name
d. Owners address
e. Owners zip code
f. System serial number
g. Installation date
h. Date the service policy ends
i. Date warranty ends.

3. Service-related Obligations

A. Initial Service Policy

1. The manufacturer or the authorized representative must furnish a three-year initial service policy to the owner; the cost of the initial service policy must be included in the original purchase price. The initial service policy must contain provisions for annual service visits (a minimum of one service visit/year) during which electrical, mechanical, and other applicable components are inspected, adjusted and serviced.
2. The initial service policy must contain a clause that states that the owner will be notified in writing, about improper operations that cannot be remedied at the time of inspection and that written notification must include an estimated date of correction; if the malfunction is expected to cause a sewage backup into the dwelling or a surface discharge of effluent, then a copy must be furnished to the local health authority.
3. Service providers must maintain accurate records of their service contracts, customers and time lines for renewal of service contracts.

B. Submission of maintenance/service reports

The manufacturer or licensed distributor shall submit to the Department and county health authority by March 15th reports of maintenance/service visits conducted during the previous year.

C. Extended Service Policy

The manufacturer or authorized representative must make available, for purchase by the owner, an extended service policy with services equal to or greater than those provided by the initial service policy. The owner must obtain such a service policy or insure that equivalent maintenance is provided. Maintenance and periodic reporting must continue for the life of the system.

D. Owner's Manual

A manufacturer prepared owner's manual must accompany each Advanced Treatment System. The authorized representative must provide copies of the manual to the system owner at the time of installation.

Portable Toilets

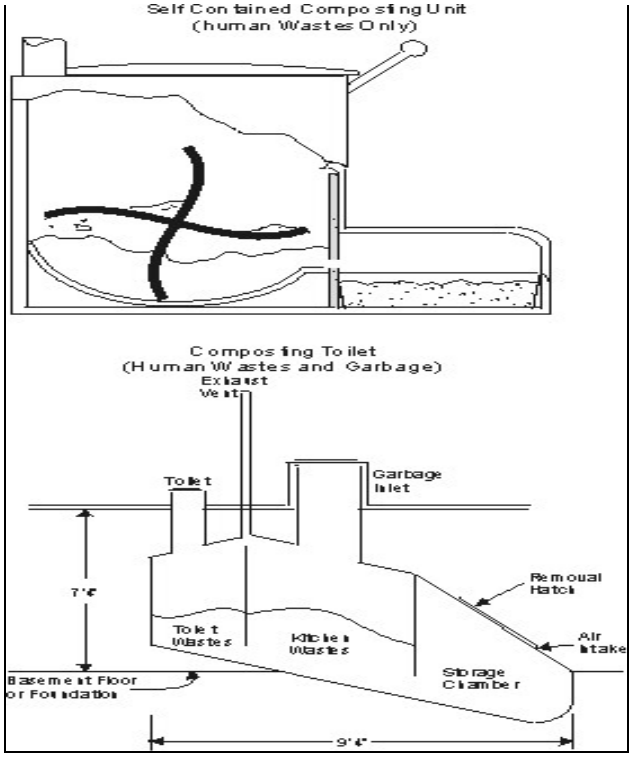
Portable toilets fitted with a sewage receptacle of easily cleanable and impervious construction, which is easily accessible for cleaning, may be used at construction sites or places of public assembly of a temporary nature, provided such toilets are provided in numbers adequate to serve the anticipated usage, and are cleaned and serviced regularly and the waste removed from them is disposed of in a manner approved County Board of Health in accordance with Appendix O-I**,** Rules of The Department of Human Resources, Public Health, Chapter 290-5-59, Special Onsite Sewage Management Systems.

Incinerator Toilets

Where waste generation is greatly limited, such as a remote office staffed by a limited number of people, and where no waste water from kitchens, bath or laundry is expected, incinerator toilets which use gas or electrical energy to incinerate feces and urine in timed cycles may be considered. The waste is reduced to a dry ash product, which must be removed periodically. Disposal of the ash should be accomplished by land burial and covered with a minimum earth cover of six inches. The use of such toilets where kitchen, laundry, bath and toilet waste are expected is not recommended since a conventional septic tank system would be require to treat the kitchen, bath and laundry waste. Incinerator toilets must be certified by the National Sanitation Foundation as meeting the current Standard #41 or certified by the manufacturer as meeting a nationally recognized standard for such purpose.

Composting Toilets

Where the availability of land for installation of conventional septic tank systems is limited so as to allow for only a septic tank and a reduced size absorption field system, composting toilets may be considered. Such units, especially the larger ones, commonly receive garbage and human wastes, which are acted upon by microorganisms, ultimately resulting in the creation of a compost that may be used as a soil amendment. Large composting units can handle toilet and kitchen scraps, while the smaller self-contained units only accept toilet wastes (see Figure DF-4). Laundry, bath, and kitchen wastes must be disposed of in a conventional septic tank system, although the size of the absorption field may be reduced by 35 percent from that required for a conventional system, provided devices which restrict flow to no more than 3 gpm on shower heads and other appropriate water-using fixtures are installed. Composted wastes from the treatment unit shall be removed as per the manufacturer's recommendations and the residue shall be buried by covering with at least six inches of soil. Wastes should not be used as fertilizer for root or leaf crops, which may be eaten raw. All manufacturers' recommendations shall be followed as to the installation, operation and maintenance requirements of the units. Composting toilets must be certified by the National Sanitation Foundation as meeting the current Standard # 41 or certified by the manufacturer as meeting a nationally recognized standard for such purpose.



Water Saving Devices and Fixtures

The County Board of Health may consider a proposal to reduce estimated daily sewage flow where it is clearly established that workable, effective water saving devices will be installed. An example would be the use of low water use toilets in facilities where essentially all of the waste generated is from toilet use.

Separate Black Water - Gray Water Systems

Where a separate gray water system is to be used, the minimum effective capacity of the gray water retention tank shall be 500 gallons. Otherwise the design shall meet the requirements of "Section 290-5-26-.05 Rules for On-Site Sewage Management Systems." If a gray water system is to be used for residential development, for each bedroom over four (4), an additional one hundred and thirty (130) gallons capacity shall be provided. Gray water retention

tank capacities for commercial or industrial developments shall be computed by taking 65% of the total sewage flow, using the sewage flow schedule (see Pages J-1 through J-3).

There are a number of devices which can be used to treat or dispose of the black water waste, such as composting toilets, incinerator absorption fields or mound systems, etc. However, if absorption is selected as the disposal method, the absorption area shall be preceded by a conventional septic tank designed according to Section 290-5-26-.05 "Rules for On-Site Management Systems."

The minimum absorption area for gray water or black water absorption systems serving commercial, industrial, or similar facilities shall be based on the total daily sewage flow (Pages J-1through J-3) and percolation coefficient calculations (Table DT-1). The black water portion of the total daily sewage flow shall be thirty-five percent (35%) and the gray water portion shall be sixty-five percent (65%).

The minimum absorption area for gray water or black water absorption systems serving residential properties (single family and multifamily) shall be based on the number of bedrooms and the percolation rate (see Table DT-2, for single family homes and Table DT-1 for multifamily homes). The black-water portion of the total daily sewage flow shall be thirty-five percent (35%) and the gray water portion shall be sixty-five percent (65%).

Privies

1. **Location** – Pit privies shall be located downgrade and not less than 100 feet from any well or spring used as a source of water supply for domestic use and human consumption and not less than 20 feet from any property line. Pit privies shall meet all additional absorption field setback requirements.
2. **Size of Pit** – the pit shall be an excavation approximately three feet six inches square and not less than three feet deep or greater than five feet.
3. **Floor and Riser** – A floor at least four feet square with a riser and lid shall be placed over the pit in such manner as to prevent access of rodents and insects to the pit. The seat lid shall be hinged as to close automatically and remain closed when not in use.
4. **Earth Backfill** – Sufficient tamped earth fill shall be placed around the base of the pit privy in such a manner as to prevent surface water from entering the pit.
5. **Use** – Privies may be constructed, installed or used for sewage storage and disposal where water under pressure is not available within the building structure or where approved gray water disposal systems are provided. Use of the pit privy shall be discontinued and the pit filled with earth when the contents of the pit accumulate to within 18 inches of the ground surface. (See figure DF-5 for pit privy design, pages D-26 and D-27). Vault type privies may be pumped out.
6. **Soil Evaluation** – A soil report consisting of soil characteristics, including; soil types and capabilities; frequency and evaluation of seasonal high ground water tables, occurrence of rock, and/or other impervious strata shall determine whether a pit privy will be approved for installation (See Section C).

Grease Traps

1. Description – In certain commercial / institutional applications, grease can clog sewer lines and inlet and outlet structures in septic tanks, resulting in restricted flows and poor septic tank performance. The purpose of a grease trap is simply to remove grease from the waste stream prior to treatment. Grease traps are tanks into which grease flows and is retained. Grease floats to the water surface while the cleaner water underneath is discharged to a septic tank. The type of grease traps discussed here are outside tanks. Grease trap tank design is similar to that of a septic tank (See figure DF-6, DF-7, DF-8, DF-9).

2. Application – Influents to grease traps usually contain high organic loads including grease, oils, fats and dissolved food particles. Grease traps are used for treating wastewater when the grease content is in excess of 50 mg/l. This primarily occurs with kitchen wastewater from cafeterias, restaurants, hospitals, schools and other institutions with kitchens that produce a large volume of wastewater. Sanitary wastewater should not be treated through the grease trap. Wastewater from garbage grinders should not be discharged to the grease trap, as higher solids loadings can upset grease trap performance and increase solids accumulation.

3. Factors Affecting Performance – Several factors can affect the performance of grease traps: wastewater temperature, solids concentrations, inlet conditions, retention time and maintenance practices. By placing the grease trap close to the source of the wastewater generator (usually kitchen), where the wastewater is still hot,

allows the grease to flow into the grease trap before congealing. As the grease cools in the grease trap, grease separation is facilitated. Flow control fittings may be needed on the inlet side of smaller grease traps to protect against overloading or sudden surges. These surges can cause agitation in the trap, impede grease floatation and allow grease to escape through the outlet. High loading and short retention time may not allow grease to separate fully, resulting in poor removal. Therefore it is important to properly size the grease trap for the expected peak flow generate by the facility served. Maintenance practices are important, as failure to properly clean and remove grease accumulation can result in excessive buildup that can lead to the discharge of grease into the system.

4. Design – The following sizing equations have been developed through years of field experience for restaurants and other types of commercial kitchens. See examples for the use of the appropriate formulas.
1) Restaurants:

(S) x (GS) x HR/ (12) x (LF) = GT capacity

S = Number of seats in dining area
GS = Gallons of wastewater per seat
(Use 25 gallons per seat)
HR = Number of hours open
LF = Loading Factor – 2.0 Interstate freeway
1.5 Other freeway
1.25 Recreational area
1.0 Main highway
0.75 Other highways

2) Hospitals, Nursing Homes, Other types of Commercial Kitchens with varied seating:

(M) x (GM) x (LF) = GT capacity

M = Meals per day
GM = Gallons per meal
(Use 5 gallons per meal)
LF = Loading Factor – 1.0 with dishwashing
0.5 without dishwashing

Minimum size grease trap should be 125 gallons.

Example 1: For a restaurant with a 75 seat dining area, 12-hour day operation, a typical discharge of 25 gallons per seat and located on a main highway, the size of the grease trap is calculated as follows:

(75) x (25) x 12/(12) x (1.0) = 1875 gal. Capacity

Example 2: A nursing home with 100 beds, serves 300 meals per day, a discharge of 5 gallons per meal and a loading factor with dishwashing of 1.0. The size of the grease trap is calculated as follows:

(300) x (5) x (1.0) = 1500 gal. Capacity

Other design considerations include: facilities for insuring ease of access for cleaning and maintenance; and inaccessibility of the grease trap to insects and vermin.

5. Construction Features – Grease traps are generally made of precast concrete, and are purchased completely assembled. However very large units may be field constructed. Minimum design requirements for precast concrete septic tanks apply to concrete grease trap except as discussed here in Section D and as shown in Figures DF-6 through DF-9, which show various acceptable grease trap designs.

   Grease traps are usually buried so as to intercept the building sewer. They must be level, located where they are easily accessible for cleaning and close to the wastewater source. Where efficient removal of the grease is very important, a two-chamber grease trap design may be used which has a primary grease-separating chamber. The inlet, outlet and baffle fittings are typical of "Tee" design with a vertical extension 12 inches from the tank floor and reaching well above the water line. To allow for proper maintenance, access to finish grade must be provided. The access covers should be gas tight construction and should be designed to withstand expected loads. A check of local plumbing ordinances and codes should always be made before the grease trap is designed or purchased.

6. Operation and Maintenance – In order to be effective, grease traps must be operated properly and cleaned regularly to prevent the escape of appreciable quantities of grease. The frequency of cleaning at any given installation can best be determined by experience based on observation. Generally, cleaning should be done when 75% of the grease retention capacity has been reached. At restaurants, pumping frequencies range from once per week to once every two or three months.

Precast Concrete Risers

Septic tanks with more than 12 inches of soil cover are required to use a riser to bring the tank access to within 12 inches of the grounds surface.

1. Minimum Construction Standards

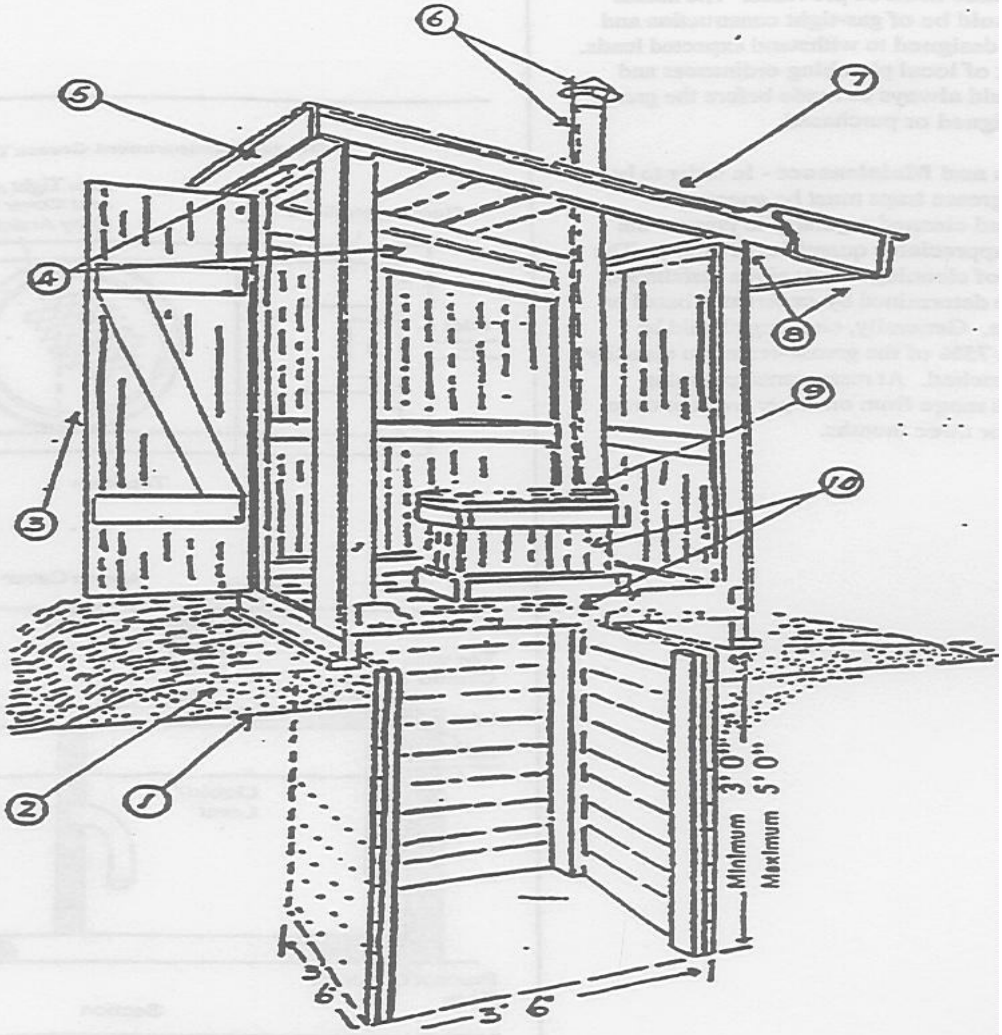
   Risers shall be made of concrete having a minimum 28-day compressive strength of 4,000 PSI.

   a) Risers shall be flanged to facilitate stacking for varying tank depths and shall be attached to the top of the tank by means of butyl mastic or equivalent approved sealant. Individual stacked riser sections shall be jointed with butyl mastic or equivalent approved sealant.
   b) Riser walls shall have a minimum thickness of 2 inches.
   c) All precast concrete risers shall be reinforced with either 6 x 6 inch, # 10 gauge welded wire mesh or reinforcing fiber designed specifically as a secondary concrete reinforcing material.
   d) Riser lids must contain 6 x 6 inch, #10 gauge welded wire mesh as a minimum reinforcing and must maintain a minimum thickness of 3 ½ inches. Riser lids may be designed to fit either as a wedge into the top of the riser or as a flanged seat. All lids must be provided with a handle of 3/8-inch (#3) rebar or equivalent rot resistant material. Lid handles shall have at least a 1-inch clearance between the lid top and the closest point of the handle.
   e) Riser lids shall be designed to withstand a uniform load of 150 pounds per square foot.
   f) Risers that extend to the grounds surface shall have a securable lid to prevent unauthorized access. Concrete riser lids may be considered "secured" if the weight of the lid is a minimum of 65 pounds and cannot be removed by horizontal sliding.

Georgia Department of Human Resources

PIT PRIVY

DESIGN

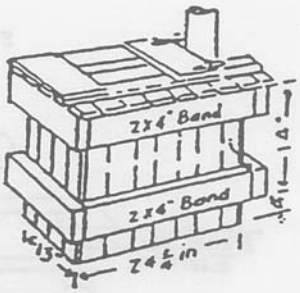


1. Original ground surface
2. 6" tamped fill
3. 2' 0" x 6' 6" door
4. Opening for ventilation
5. 6" band around edge of roof
6. 4" metal vent pipe 6' 6" long with cap
7. Roof projecting 6" front, 9" sides, 16" rear
8. 1 on 4 anglo
9. 16" mesh copper wire screen bottom vent pipe
10. Riser and finished floor standard 4" flooring

Figure DF-5: Pit Privy Design (See continuation on next page)

D-26

BILL OF MATERIALS



2 by 4 material

Rough	2 pieces 10 feet long
	4 pieces 8 feet long
Dressed	4 pieces 14 feet long
	2 pieces 12 feet long
	2 pieces 8 feet long

1 inch material

70 bd. ft. – 1" by ___* inches, rough, 14' long, for pit curbing.

2 pieces – 1" x 6", rough, 14' long, for subfloor.

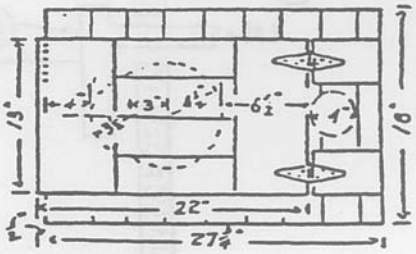
2 pieces – 1" x 8", rough, 12' long, for sheathing.

9 pieces – Standard No. 2, 4" tongue and groove flooring, 12' long (to lay 3 1/4" clear) for floor, riser and seat.

2 pieces – 1" x 6", dressed, 12' long, for roof band.

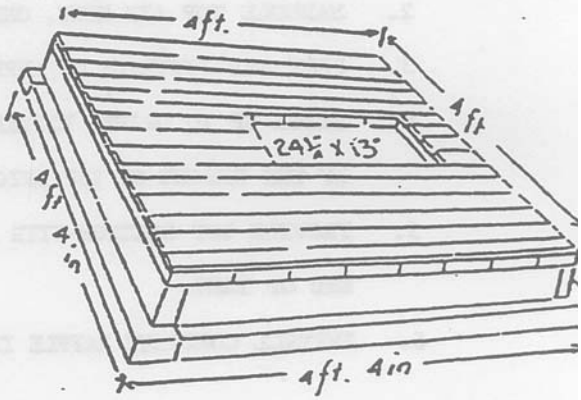
1 pieces – 1" x 6", dressed, 8' long for door brace and battens.

Siding materials of 8" shiplap, or 6" flooring, or 1" rough boards. 1 piece 14' long for sides at front. 106 board feet, 12' long.



Hardware

1-4" galvanized metal vent pipe 6' 6" long, with cap.
1 pair 3" strap hinges, with screws, for lid.
1 pair 6" strap hinges, with screws, for door.
3 pieces corrugated metal roofing 6' long.
1-2 pound roofing cement.
1 piece 16 mesh copper screen 6" square.



Nails

2 pounds 16d
4 pounds 8d
3 pounds 6d, preferable coated.
1 pound lead roofing nails.

* width of the board desired.

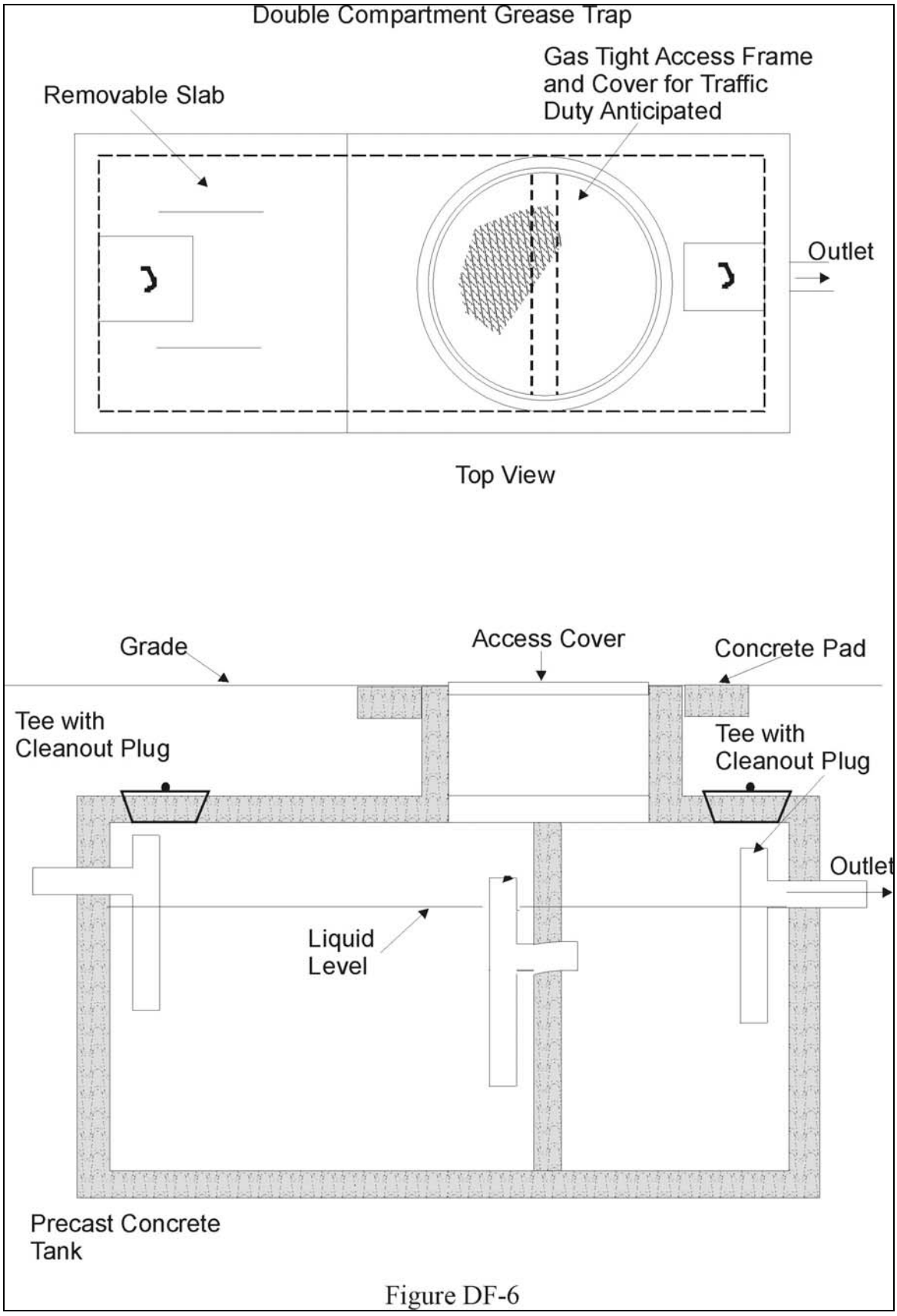
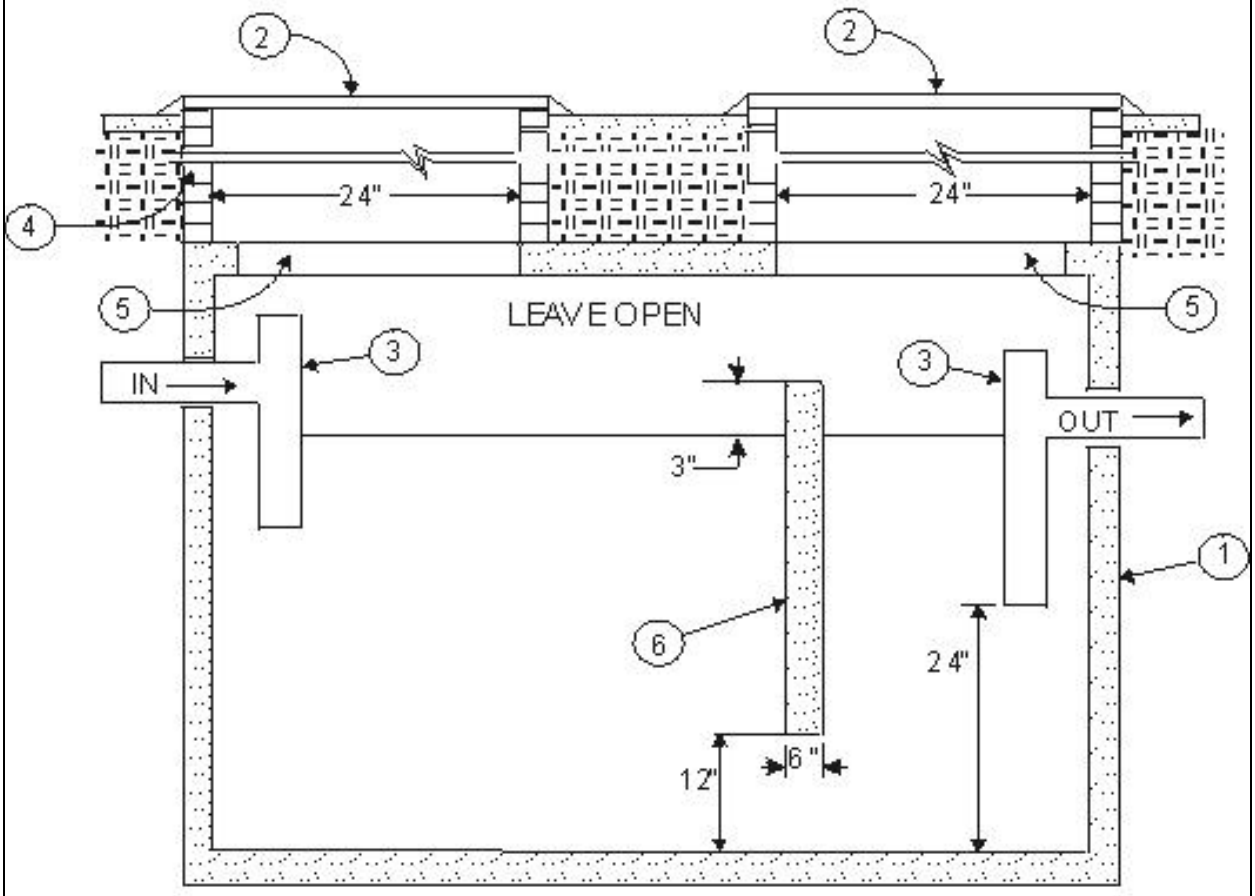

Double Compartment Grease Trap
Gas Tight Access Frame and Cover for Traffic Duty Anticipated
Removable Slab
Outlet
Top View
Grade
Access Cover
Concrete Pad
Tee with Cleanout Plug
Tee with Cleanout Plug
Outlet
Liquid Level
Precast Concrete Tank

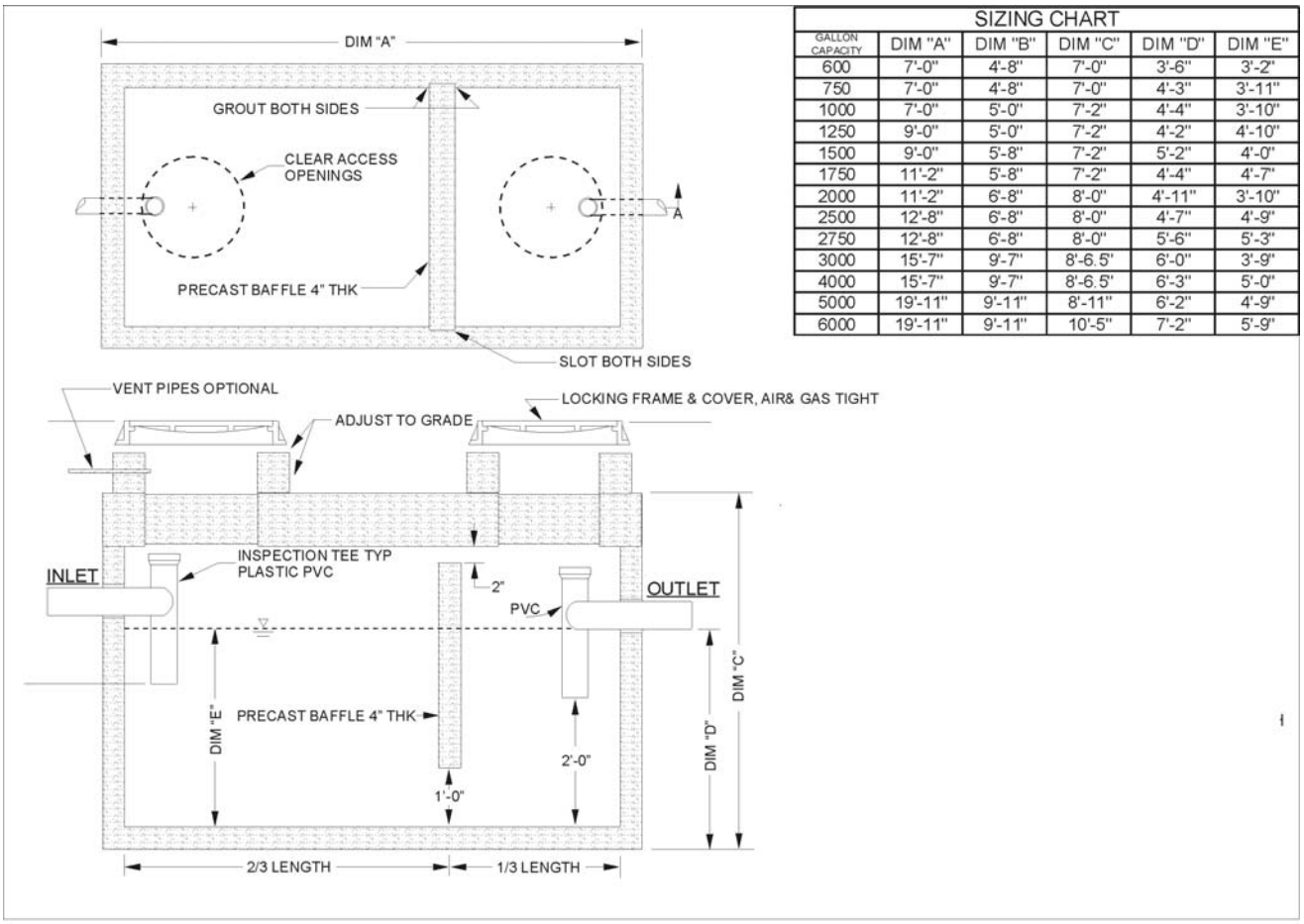
Figure DF-6

STANDARD DESIGN GREASE INTERCEPTOR



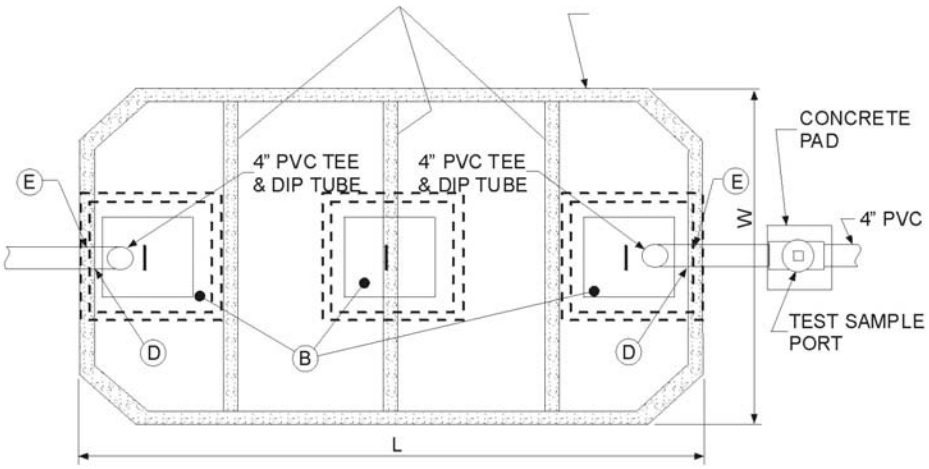
1. PRECAST TANK, _____ GALLONS.
2. MANHOLE TOP AND RING, ONE OVER EACH SECTION.
3. PIPE AND FITTINGS OF APPROVED MATERIALS (SCHEDULE 40 PVC - MINIMUM)
4. BRICK UP TO GRADE. INSTALL MANHOLE STEPS 2'0" ON CENTER IF THE HEIGHT OF THE BRICK WORK IS GREATER THAN 4'0".
5. PROVIDE TOP SECTION WITH 24" DIAMETER OPENING AT EACH END OF THE TANK.
6. INSTALL CONCRETE BAFFLE IN TANK

Figure DF - 7

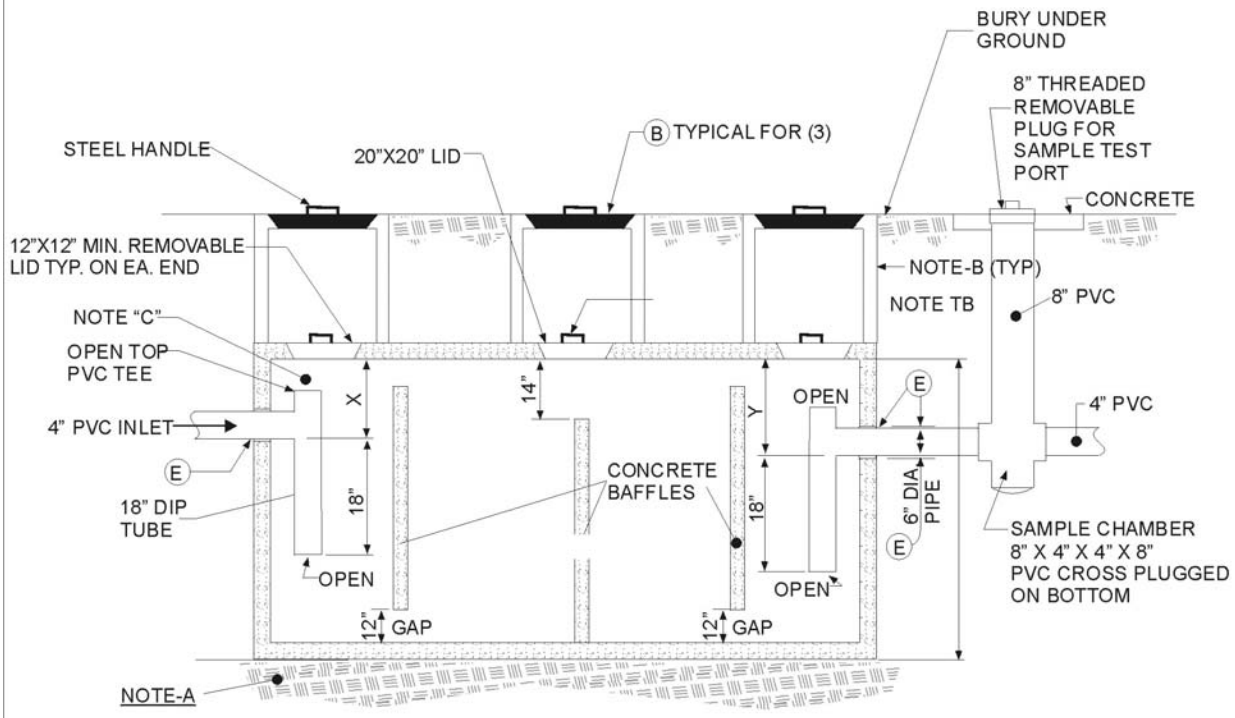


SIZING CHART					
GALLON CAPACITY	DIM "A"	DIM "B"	DIM "C"	DIM "D"	DIM "E"
600	7'-0"	4'-8"	7'-0"	3'-6"	3'-2"
750	7'-0"	4'-8"	7'-0"	4'-3"	3'-11"
1000	7'-0"	5'-0"	7'-2"	4'-4"	3'-10"
1250	9'-0"	5'-0"	7'-2"	4'-2"	4'-10"
1500	9'-0"	5'-8"	7'-2"	5'-2"	4'-0"
1750	11'-2"	5'-8"	7'-2"	4'-4"	4'-7"
2000	11'-2"	6'-8"	8'-0"	4'-11"	3'-10"
2500	12'-8"	6'-8"	8'-0"	4'-7"	4'-9"
2750	12'-8"	6'-8"	8'-0"	5'-6"	5'-3"
3000	15'-7"	9'-7"	8'-6.5"	6'-0"	3'-9"
4000	15'-7"	9'-7"	8'-6.5"	6'-3"	5'-0"
5000	19'-11"	9'-11"	8'-11"	6'-2"	4'-9"
6000	19'-11"	9'-11"	10'-5"	7'-2"	5'-9"

Figure DF-8: Concrete Baffled Grease Trap



PLAN VIEW



SECTIONAL SIDE VIEW INSTALLED

ALSO SHOWS SAMPLE TEST PORT

NOTE TB: TAMP BACKFILL 95% COMPACTION

Figure DF-9: Precast Concrete Baffled Grease Trap

Effluent Distribution and Dosing Devices

Distribution and dosing devices include distribution boxes, flow splitters, siphons, pumps and other flow diversion devices. These devices shall be of sound construction, water tight and not subject to excessive corrosion. They shall provide sufficient volume to accommodate expected flows.

Distribution Devices

1. Precast Concrete Distribution Box

    a. All precast concrete distribution boxes shall be designed and constructed to provide sufficient strength and structural integrity to withstand a vertical uniform load of 150-lb/sq. ft. on the top of the box.
    b. A minimum end product strength of 4,000 pounds per square inch shall be used in the construction of the box and lid.
    c. A minimum thickness of one and one half inches shall be used in the construction of distribution box bottoms, sidewalls, and lids; all shall be reinforced by a minimum No. 10 gage six inch welded steel reinforcing wire or equivalent.
    d. Distribution box lids or covers shall meet the requirements of paragraph (a) above and shall be provided with suitable handles for removal.
    e. Knockouts for inlet and outlet piping shall be of sufficient diameter to accept four inch diameter piping.
    f. The invert of the inlet hole or knockout shall be a minimum of two inches to a maximum of three inches above the invert of the outlet.
    g. The inlet hole or knockout shall be centered left to right. Where multiple outlets are used, they must be located no less than nine inches on center; the outlet(s) shall be no less than three inches from the corners of the box and at least three inches above the inside bottom surface of the box.
    h. All distribution devices offered for sale or use in Georgia shall bear, by imprint, stencil or other acceptable means of marking of the manufacturer's name.

2. Drop Boxes

    a. For concrete drop boxes the invert of lateral outlet holes or knockouts shall be located with a minimum drop in elevation from the inlet invert of one half inch and outlet inverts shall be located a minimum of three inches above the inside bottom surface of the box; the inlet or outlet holes or knockouts shall be located a minimum of three inches from adjacent sidewalls. The requirements in paragraphs (b) and (c) below apply to concret, molded plastic and fiberglass drop boxes.
    b. The centerline of the inlet hole or knockout of drop boxes in series shall be a minimum of five inches above the centerline of the inlet of each successive box.
    c. Drop boxes shall be designed to provide sufficient separation distance (12 inches or greater recommended) between the outlet sidewall and supply inlet sidewall of the next box in series.

3. Molded Plastic and Fiberglass Distribution Boxes.

    a. Distribution boxes shall be constructed of high density polyethylene (type 3, .941 to .965 density as provided in ASTM D 3350), fiberglass or other materials acceptable to the Department.
    b. Distribution boxes shall be constructed of durable watertight materials resistant to deterioration, and designed to withstand a vertical uniform load of 150 pounds/sq.ft. on the top of the box. The box shall accommodate a removable lid. The lids will be capable of being secured.
    c. The invert elevation of all outlets shall be the same, and shall be at least 1.5 inches below the inlet invert.
    d. Each distribution box shall be provided with a sump extending at least two (2) inches below the invert of the inlet.
    e. Distribution box covers shall be marked with the manufacturer's business name.
    f. Each manufacturer shall provide the Department with complete plans and specifications for a given distribution box.

4. Molded Plastic and Fiberglass Drop Boxes

   a. Drop boxes shall be constructed of high density polyethylene (type 3, .941to.965. density as provided in ASTM D3350), fiberglass or other materials acceptable to the Department.
   b. Drop boxes shall be constructed of durable watertight materials resistant to deterioration, and designed to withstand a vertical uniform load of 150 pounds/sq.ft. on the top of the box. The box shall have a removable lid.
   c. The invert of the inlet and overflow port shall be at the same elevation. The invert of the pipe port(s) leading to the disposal trench(es) shall be at least six (6) inches below the invert of the inlet.
   d. Drop box covers shall be marked with the manufacturer's business name.
   e. Each manufacturer shall provide the Department with complete plans and specifications for a given drop box.

5. Plastic Low Pressure Pipe Manifolds

   All plastic pipe, fittings and connectors used in low-pressure pipe supply lines and manifolds shall be of NSF/ANSI schedule 40 PVC construction and materials.

6. Alternating Valves and Devices

   a. Alternating valves and devices shall meet the general design and construction standards listed previously in subsection (1), paragraphs (a) and (d), and if constructed of precast concrete, also meet the standards of paragraphs (b) and (c) of this subsection.
   b. All alternating valves and devices shall be designed and constructed to provide a positive seal to each outlet when in a closed position. The valving device shall be constructed of corrosion resistant materials and be of sufficient strength to withstand normal operational stresses without damage or deformation resulting in valve malfunction.
   c. All alternating valves and devices located beneath the soil surfaces shall be fitted with risers and watertight lids or covers, extending to grade, which will permit unobstructed access for maintenance, inspection and operation.

Dosing Devices

Dosing Tanks

   a. Description - Dosing tanks are watertight tanks that store raw or pretreated wastewater for periodic discharge to subsequent treatment units or disposal areas. Pumps or siphons are mounted in the tank to discharge the accumulated liquid and they shall have appurtenant switches and alarms that notify the owner of a malfunction. Figure EF-1 depicts a septic tank with a dosing tank and siphon. The structure must be equal to a concrete septic tank in strength. Figures EF-5 through EF-8 show typical dosing tanks with pumps.

   b. Application - Dosing tanks are used where it is necessary to elevate the wastewater for further treatment or disposal, where intermittent dosing of treatment units or subsurface absorption fields is desired or where pressure distribution networks are used. If the dosing tank is at a lower elevation than the discharge point, pumps must be used. If the dosing chamber is at a higher elevation siphons may be used, but only if the settleable and floatable solids have been removed from the effluent. Dosing tanks shall meet the same setback requirements applicable to septic tanks.

   c. Factors Affecting Performance - Factors that are to be considered in the design of dosing tanks are: (1) the dose volume; (2) the total dynamic head; (3) the desired flow rate and (4) the wastewater characteristics. When pumps are used, they must be selected based on all four factors. The desired flow rate and the discharge invert elevations determined from the total dynamic head will be the deciding factors for use of automatic siphons.

d. Dosing Tanks for Conventional Septic Tank System - A dosing tank shall be provided where more than 500 linear feet of absorption trench is required, and the operating liquid capacity of the dosing tank shall be equivalent to 60 to 75 percent of the interior volume of the absorption lines to be dosed. For four-inch diameter absorption lines, the dosing tank operating liquid capacity should be based on one-half gallon per linear foot of absorption line. When more than five hundred linear feet and less than one thousand linear feet of absorption trench is required, a single siphon or pump shall be used (See Figure EF-3). Dosing shall be by automatic siphon or by sewage pump installed in the dosing tank. When more than 1000 linear feet of absorption trench is required, alternating siphons or pumps shall be used (See Figure EF-4).

e. Design and Operation of Tank With Siphon - The action of a siphon is simple: as the water entering the tank rises above the sniff hole in the bell it encloses the air within, as the lower portion of the trap is being filled with water. As the water level of the tank rises, the pressure of the confined air gradually forces the water out of the long leg of the trap until a point is reached where the air just starts to escape around the lower bend. As the difference of water level in the two legs of the trap equals the difference of the levels between the water in the tank and the water within the bell, it will be seen that the column of water in the short discharge leg of the trap has practically the same depth as the head of the water in the tank above the level at which it stands in the bell. The two columns of water therefore counterbalance each other at a certain fixed depth in the tank. As soon as this depth is increased by a further supply of incoming water, however small, a portion of the confined air is forced around the lower bend and by its upward rush, carries with it some of the water in the short leg, thus destroying the equilibrium, and the siphon is brought into full action immediately. The water is then drawn out of the tank to the bottom of the bell, the siphon vented by the admission of air through the sniff hole, and the operation automatically repeated. (See Figure EF-2)

f. Dosing frequency – Dosing frequency should be determined on a site specific basis according to the soil characteristics, site conditions, wastewater characteristics and on site sewage management system design.

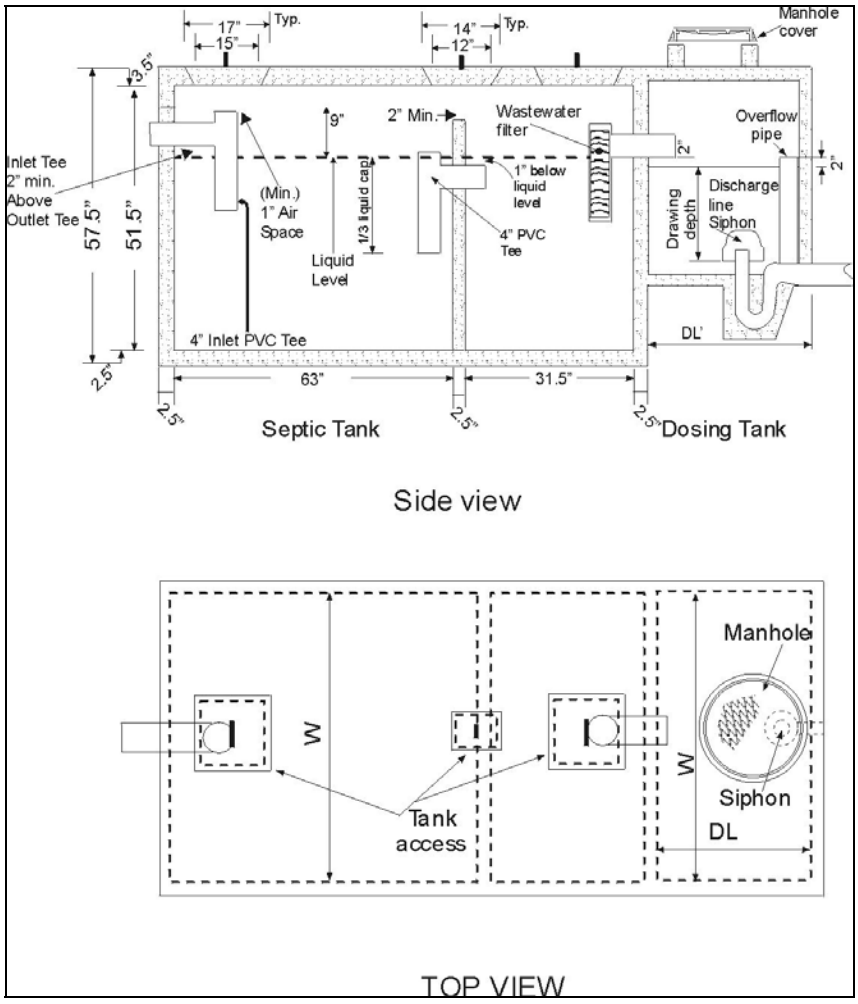

17" Typ.
15"
14" Typ.
12"
Manhole cover
3.5"
9"
2" Min.
Wastewater filter
Overflow pipe
2"
2"
Inlet Tee 2" min. Above Outlet Tee
57.5"
51.5"
(Min.) 1" Air Space
1/3 liquid cap
Liquid Level
1" below liquid level
4" PVC Tee
Drawing depth
Discharge line Siphon
DL'
4" Inlet PVC Tee
2.5"
63"
31.5"
2.5"
2.5"
2.5"
Septic Tank
Dosing Tank
Side view
W
Tank access
W
Manhole
Siphon
DL
TOP VIEW

Figure EF-1

Figure EF-2

Sewage Siphon

3", 4", 5", 6", and 8" Standard Design Single Sewage Siphon

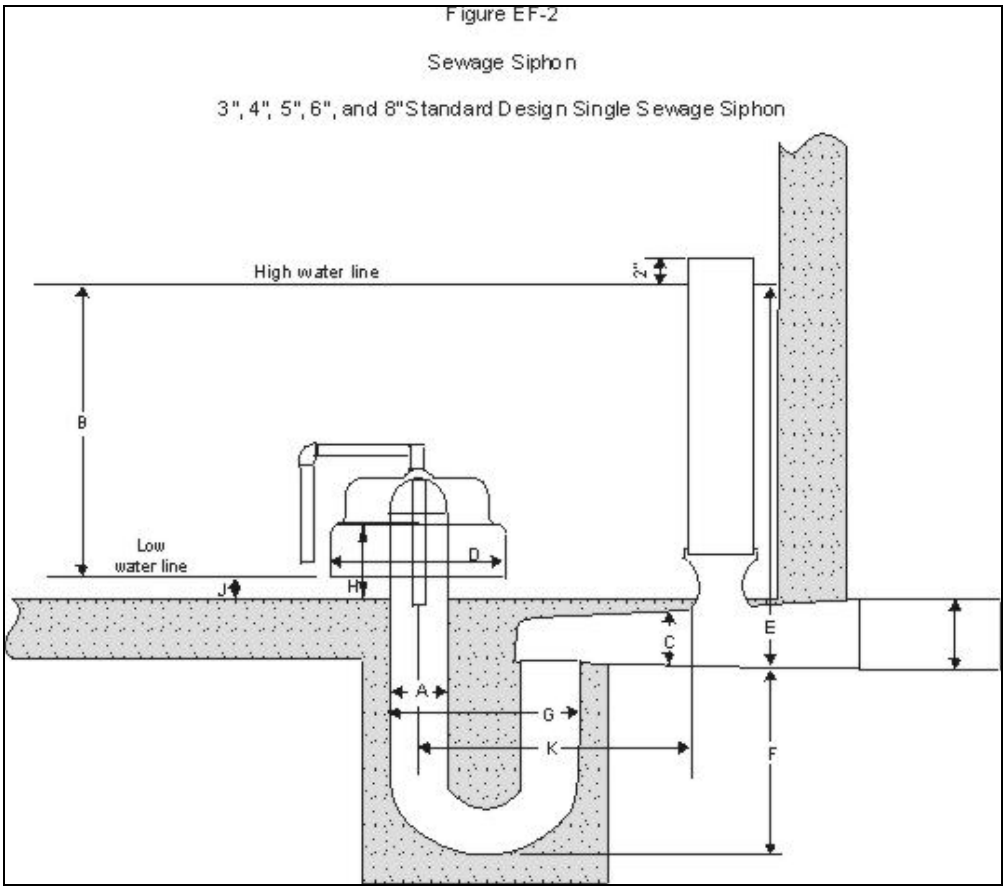


Table ET-1

		Approximate Dimensions in Inches				
Diameter of Siphon	A	3	4	5	6	8
Draw Depth	B	13	17	23	30	35
Diameter of Discharge Head	C	4	4	6	8	10
Diameter of Bell	D	10	12	15	19	24
Invert below floor	E	4 1/4	5 1/8	7 1/8	10	12
Depth of Trap	F	13	14 1/4	23	30 1/4	35 ½
Width of Trap	G	10	12	14	16	22 ½
Height above floor	H	7 1/4	11 3/4	9 1/2	11	13 ½
Invert to Discharge = B + E + J	I	20 1/4	25 1/2	33 1/2	44	52
Bottom of Bell to floor	J	3	3	3	4	5
Center of Trap to end of discharge	K	8 1/8	11 3/4	15 1/8	17 1/2	23 1/8
Diameter of Carrier Pipe	L	4	4 -6	6 - 8	8 – 10	12 – 15
Avg. Discharge Rate- GPM		72	165	328	472	950
Max. Discharge Rate-GPM		96	227	422	604	1270
Min. Discharge Rate- GPM		48	102	234	340	698

Figure EF-3

Single Siphon or Pump
(over 500 linear feet and less than 1000 linear feet of absorption lines)

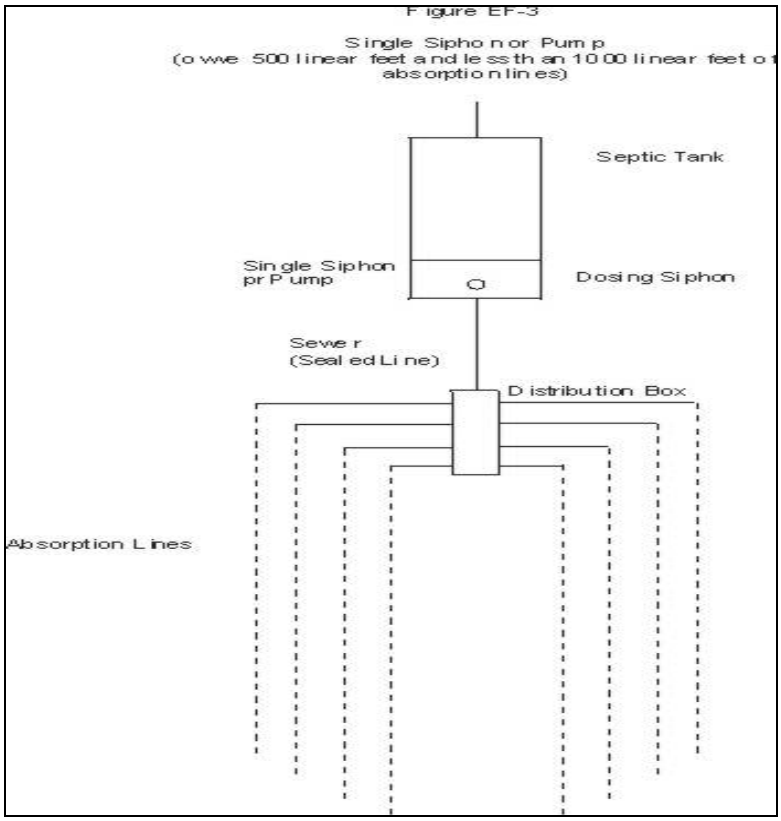
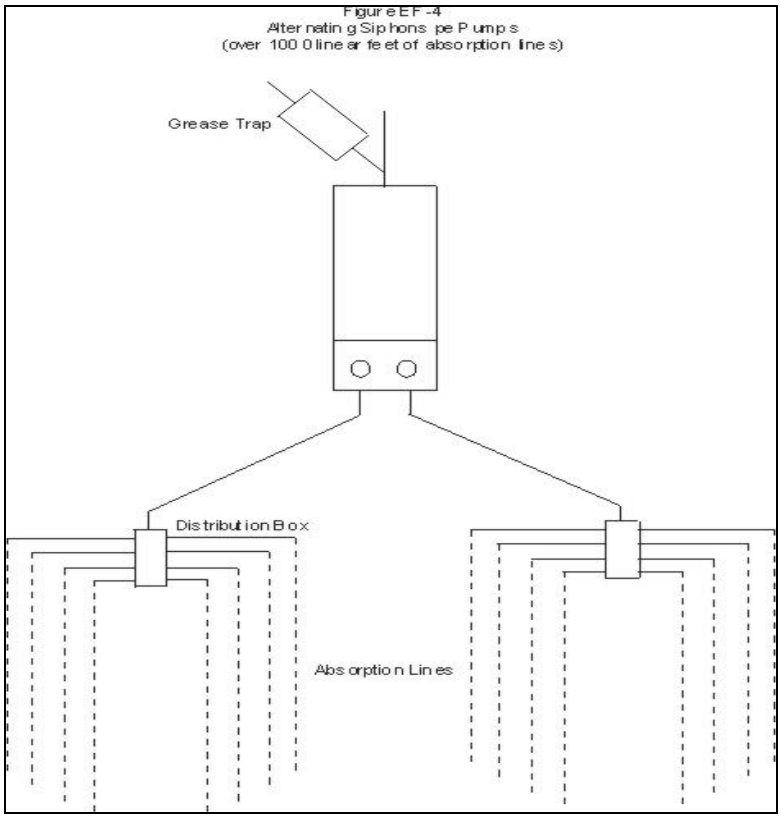


Figure EF-4

Alternating Siphons or Pumps
(over 1000 linear feet of absorption lines)



g. Design and Operation of Dosing Tank with Pump(s).

A dosing tank with a pump (or pumps) consists of a tank, pump, pump controls and alarm systems. Figures EF-5 to EF-8 show cross sections of typical dosing tanks used for pumping pretreated wastewater. The tank can be a separate unit as shown, or it can have common wall construction with the pretreatment unit, usually a septic tank.

The dosing tank shall have sufficient volume to provide the desired dosing volume plus reserve volume. The reserve volume is the volume of the tank between the high water alarm switch and the invert of the inlet pipe. It provides storage during power outages or pump failure. A reserve capacity equal to the estimated daily wastewater flow is used for residential application. For a single-family residence, this shall mean a minimum of 150 gallons per bedroom. In large flow applications, duplex pump units with alternative power source can be used as an alternative to provide reserve capacity. No reserve capacity is necessary when siphons are used. Pump selection is based on the wastewater characteristics, the desired discharge rate and the total dynamic head. Raw wastewater requires a pump with solids-handling capabilities. While pneumatic ejectors may be used in other applications as well, submersible centrifugal pumps are best suited where large volumes are to be pumped in each dose.

The pump size is determined from pump performance curves provided by the manufacturers. Selection is based on the flow rate needed and the total dynamic head. The specific application determines the flow rate needed.

The total dynamic head is calculated by adding the elevation difference between the discharge outlet and the lowest water level in the dosing tank to the friction losses incurred in the discharge pipe. The velocity head can be neglected in most applications.

If the liquid pumped is to be free of suspended solids, the pump may be set on a pedestal. This provides a quiescent zone below the pump where any solids entering the tank can settle, thus avoiding pump damage or malfunction. These solids must be removed periodically.

In cold climates, where the discharge pipe is not buried below the frost line, the pipe should be drained between doses. This may be done by sloping the discharge pipe to the dosing tank and eliminating the check valve at the pump. In this manner, the pipe is able to drain back into the dosing tank through the pump. The dosing volume is sized to account for this backflow. Weep holes may also be used if the check valve is left in place.

The control system for the dosing tank consists of a “pump off “ switch, a “pump on” switch and a “high water alarm” switch. The “pump off ” switch is set several inches above the pump intake. The “pump on” switch is set above the "pump off" switch to provide the proper dosing volume. Several inches above the "pump on" switch, a high water alarm switch is set to alert the owner of a pump malfunction by activating a visual and audible alarm; this switch must be on a circuit separate from the pump switches (See Figures EF-5 to EF-10).

The electrical connections should not be located inside the tank or riser. Pump failures can usually be traced to switch failures resulting in pump burnout; so high quality switches are a good investment. Some types are: Mercury, Pressure Diaphragm, Weighted Float (See Figure EF-9) and Dual or Multiple Function (See Figure EF-10).

Pumps and Ancillary Equipment

Pumping of sewage effluent can cause problems if the right pump is not used. The pump can burn or clog if it pumps the wrong substance. Therefore, choosing the right pumps for on-site sewage management operations is critical.

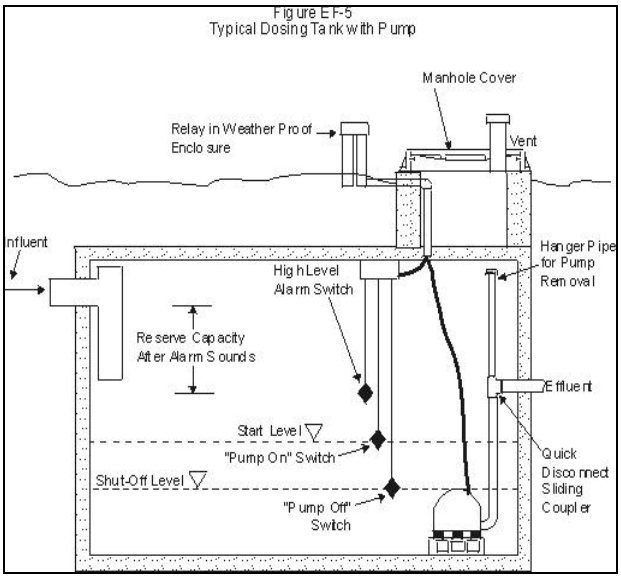
a. Pump
   1. The pump shall be submersible.
   2. The pump shall be designed to handle sewage effluent.
   3. The pump shall be capable of delivering the required flow at the design total dynamic head. The discharge pipe shall be the same size or larger than the discharge of the pump.
   4. The pump shall be constructed of corrosion resistant materials.
   5. Performance curves and specification sheets indicating the above criteria have been met shall be submitted with the plan review application when pumps are to be used in a system.
   6. In order to ensure sufficient fluid velocity to carry any solids present in the septic effluent (generally accepted velocity is at least two feet per second), the following pipe sizes are required: 1 ½” pipe with flows of at least 12 gpm; 2" pipe with 21 gpm; 2 ½” pipe with 30 gpm; and 3" pipe with 46

gpm.

7 A backflow prevention device shall be used on the discharge line where conditions allow, reducing wear on the system.

8. Pipe materials must be Schedule 40 PVC, all fittings shall be pressure fittings, and all connections shall be adequately cleaned with cleaning solvent and glued with PVC solvent cement.
9. If used, the gate or globe valve(s) and check valve shall be either bronze or PVC.
10. The discharge line shall be designed and installed to drain after each use unless system design requires a check valve.

b. Ancillary Equipment
   1. A quick disconnect device shall be included in the discharge piping to facilitate removal of the pump for inspection, repair or replacement.
   2. A corrosion resistant rope or cable of adequate strength shall be affixed to the pump to facilitate installation and removal, so that personnel need not enter the chamber to disconnect the pump.
   3. A pump control device must be adjustable so that the desired dosing volume can be discharged during each pumping cycle. The control device may consist of one or more sealed float or diaphragm switches, which may cooperate with a relay or contactor. Separate control panels located outside the pump tank must be protected from the weather and must provide no air path between the panel and the pump tank.
   4. For safety, access covers for the pump tank must be lockable, heavy enough to prevent easy access or equipped with tamper-proof retainers. Access must be of adequate size and accessible from the surface to allow for installation and removal of equipment and to maintain the system. Foremost, the pump tank must not allow infiltration or exfiltration.
   5. The alarm switch must be placed on a circuit separate from the pump switches.
   6. All wiring and components of the whole system shall conform to the National Electrical Code.



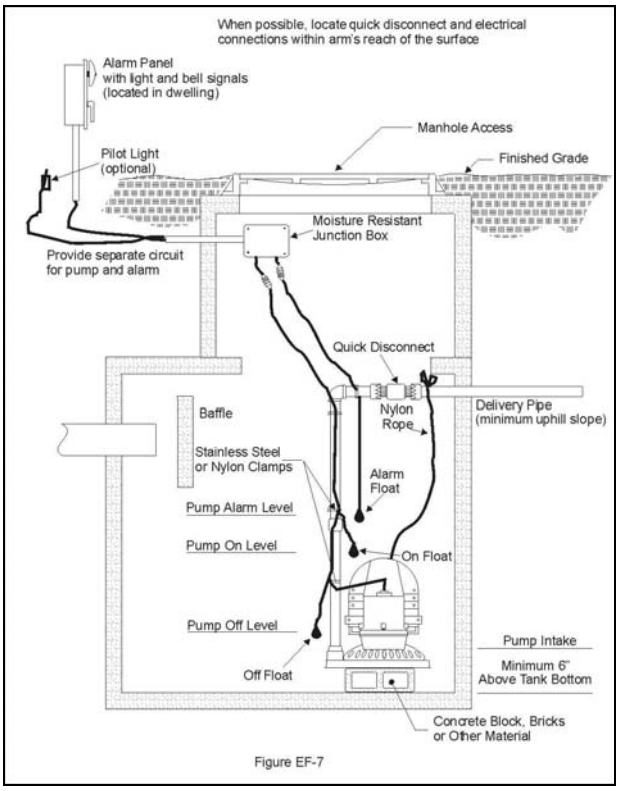
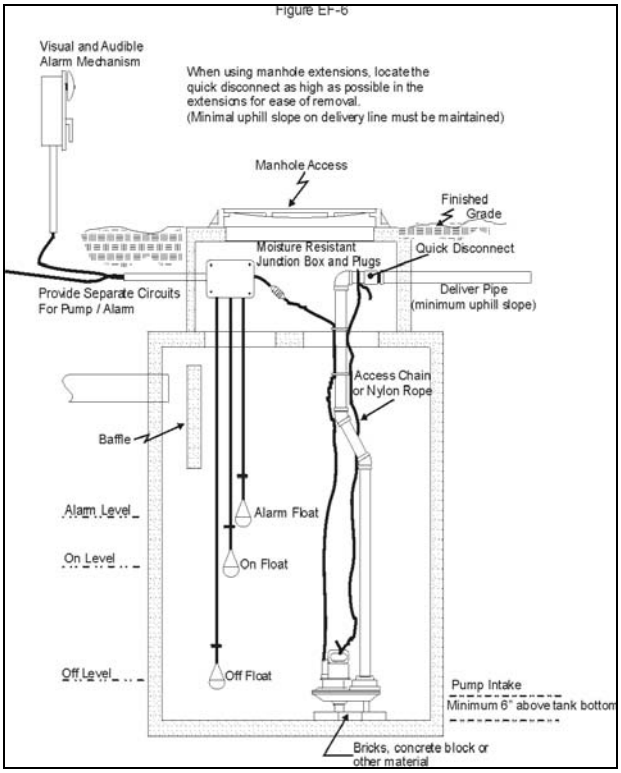


Figure EF-7



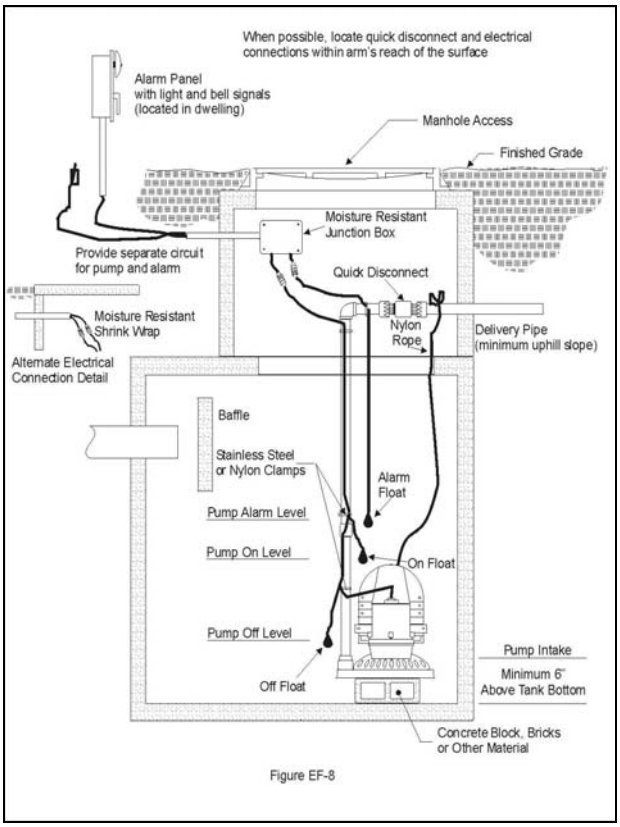


Figure EF-8

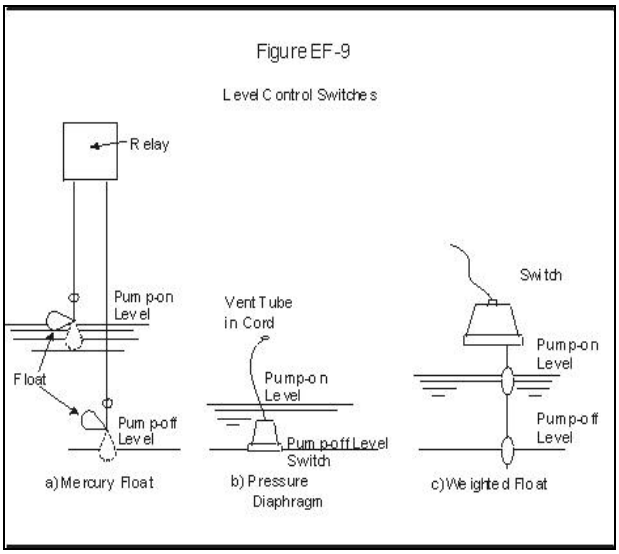
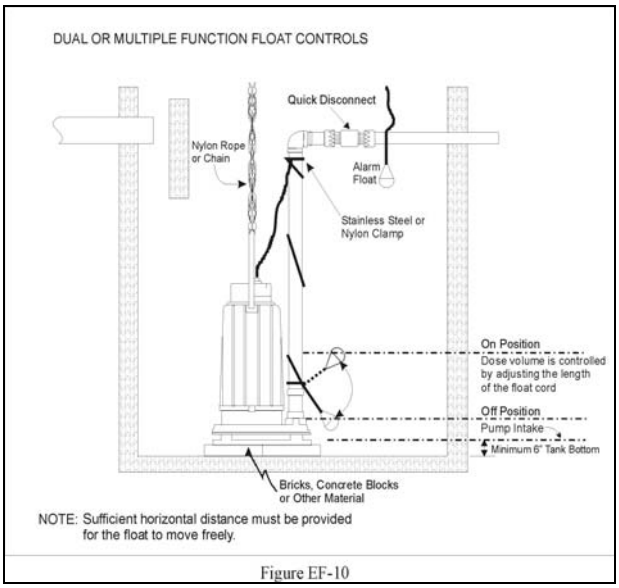


Figure EF-9
Level Control Switches
Relay
Pump-on Level
Float
Pump-off Level
a) Mercury Float
Vent Tube in Cord
Pump-on Level
Pump-off Level Switch
b) Pressure Diaphragm
Switch
Pump-on Level
Pump-off Level
c) Weighted Float


DUAL OR MULTIPLE FUNCTION FLOAT CONTROLS
Quick Disconnect
Nylon Rope or Chain
Alarm Float
Stainless Steel or Nylon Clamp
On Position
Dose volume is controlled by adjusting the length of the float cord
Off Position
Pump Intake
Minimum 6" Tank Bottom
Bricks, Concrete Blocks or Other Material
NOTE: Sufficient horizontal distance must be provided for the float to move freely.
Figure EF-10

Disposal Systems

Subsurface disposal systems are portions of on-site sewage management systems that accept effluent from sewage pretreatment units for further treatment by microbial life within the soil. Treatment also occurs by filtration, chemical decomposition and chemical bonding within the soil itself. These systems consist of:

a. Devices and piping to transport effluent under pressure or by gravity flow and distribute the effluent to the soil absorption surfaces;
b. Trenches, chambers, mounds, drip emitter lines and others, separately or in combination, which form or enclose the soil absorption surfaces; and
c. Rock, gravel, peat or other fill materials required within the system including barrier materials and fill soil within or over the system.

Aggregate Absorption Field Systems

Conventional Septic Tank System

This means a septic tank and absorption field system composed of perforated pipe surrounded by gravel or stone masking for the infiltration of effluent into the adjoining bottom and side soil areas. The Department's Technical Review Committee may recommend approval of other types of aggregate for use in conventional septic tank systems.

Location

Absorption fields shall be installed in areas protected from excessive surface water, ponding or runoff, including but not limited to storm water and discharge from building gutters. Absorption fields shall not be installed where slopes exceed 25% unless the results of special investigations demonstrate that the slope limitation can be overcome by design or site modification. Any site modification plan must be approved by the local county board of health prior to modifications being carried out. There shall be a minimum of 24 inches of vertical separation from the absorption field trench bottom to any seasonal groundwater table, rock or impervious soil layer. Greater vertical separation distances may be required if special investigations indicate a potential for groundwater contamination. On lots or parcels of land less than 3 acres, the maximum percolation rate shall not exceed 90 minutes per inch.

If properties are served by individual water supply systems, the absorption field shall be installed not less than 50 feet from property lines unless wells and on-site sewage management systems are already in place on surrounding property and the required 100 feet separation distance between wells and absorption fields can be maintained. In pre-planned developments, where sites for individual water supplies and on-site sewage management systems are pre-located so as to maintain the 100 feet separation distance, absorption fields may be installed less than 50 feet, but not less than five feet from property lines. No part of the absorption field other than solid Schedule 40 PVC or equivalent pipe with watertight joints shall be covered by buildings, pavements, or used for parking automotive vehicles or vehicular traffic. There shall be available sufficient unobstructed land area, meeting all requirements for the installation of an on-site sewage management system, to provide for the complete replacement of the absorption field. If topographical features permit, this requirement can be met by installing the initial absorption trenches on 16 feet centers, thus allowing for replacement between the original trenches.

Septic tanks and absorption fields are prohibited within 150 feet of any perennial stream bank in a large water supply watershed tributary that is upstream to a water supply reservoir of a governmentally owned public drinking water supply intake and within a seven mile radius of the reservoir boundary as required by Rules of the Georgia Department of Natural Resources, Environmental Protection Division, Chapter 391-3-16-.01-Criteria for Water Supply Watersheds (hereafter Chapter 391-3-16-.01). In a small water supply watershed: septic tanks and absorption fields are prohibited within 150 feet of any perennial stream bank upstream of a small water supply reservoir of a governmentally owned public drinking water supply intake within a seven mile radius of the intake or water supply reservoir; additionally these are further prohibited within 75 feet of any perennial stream bank upstream and outside the seven mile radius within the small water supply watershed as required by Chapter 391-3-16-.01.

Absorption fields may not be installed in the 100 feet buffer area of rivers classified for protection under the Rules of the Department of Natural Resources, Environmental Protection Division, Chapter 391-3-16-.04 Criteria for River Corridor Protection.

Minimum Design and Construction Criteria:

a. Absorption lines and absorption trench bottoms shall be true to grade.
b. Trench bottom depth shall be based on soil conditions as determined by criteria in this manual.
c. A minimum of six to twelve inches of earth cover is required over absorption lines.
d. Absorption line laterals shall be spaced a minimum of seven feet apart, center to center.
e. Absorption trenches shall be no more than 36 inches wide.
f. The minimum depth of aggregate shall be twelve inches with six inches below the perforated pipe and filled to two inches above the pipe.
g. Perforated pipe shall be laid in the center of the trench with the perforations oriented toward the bottom of the trench.
h. A layer of pervious building paper, straw or similar permeable material approved by the technical review committee shall be placed over the aggregate before back filling.
i. Approved solid pipe and fittings with sealed, watertight joints shall be used for horizontal and vertical changes in direction or grade and to cross under roadways or paved areas. Sections of solid pipe shall not be considered in determining the total absorption trench bottom area.
j. Excavation for absorption trenches in soils other than sands shall not be conducted when wet due to the potential irreversible damage to soil structure, such as compaction and smearing.

Absorption Field Methods for Conventional Septic Tank Systems

1. **Distribution Box Method:** On level or sloping topography, the distribution box method may be used and shall be required when dosing tanks are used. A firm earthen foundation secured by concrete or concrete foundation for distribution boxes extending at least 12 inches beyond the walls of the box shall be provided to insure against tilting of the distribution box. Installation of the distribution box shall be made to provide equal flow to each absorption line extending from the box. The top of the distribution box shall have a minimum earth cover of six inches, but no more than twelve inches unless provisions are made for easy access to the distribution box. The sewer from the septic tank or dosing tank shall enter the distribution box and terminate inside the distribution box with an elbow turned downward to form a submerged outlet at normal water level to minimize turbulence. Alternately, a baffle may be used if the same function is accomplished. Absorption lines of equal length shall be connected to the distribution box outlets by watertight independent sewers consisting of four-inch schedule 40 PVC pipe or equivalent. All independent sewer lines shall be installed level at the same elevation for two feet. Beginning two feet from the distribution box to the beginning of the absorption line, independent sewer lines shall be installed to provide a minimum downward grade change of two inches from the distribution box outlet to the perforated pipe at the beginning of the absorption line. Absorption lines shall be installed level or on a uniform grade of no more than four inches of fall for the entire length of the individual absorption line. Absorption lines from distribution boxes used in conjunction with dosing tanks shall not exceed 125 feet in length.

2. **Level Field Method:** On level or sloping topography of five percent or less, the level field method may be used. When this method is used, the absorption field shall be installed level, with all absorption lines interconnected to form a continuous system. A standard tee fitting or approved distribution device shall be used to interconnect the absorption lines. When this method is used, the invert of the absorption line shall be at least six inches lower than the invert of the septic tank outlet. An absorption field consisting of a single absorption line up to 125 feet in length may be installed level without interconnection.

3. **Serial Distribution Method:** On sloping topography, the serial distribution method may be used. When this method is used, level absorption trenches shall be constructed parallel along the ground contours. The sewer from the septic tank shall enter the uppermost absorption line and terminate at any point in the line so all effluent from the septic tank is discharged into the first absorption line. Adjacent absorption lines shall be successively connected by means of overflow sewers constructed at any point along the absorption line in such a manner that each absorption trench fills with effluent to the full depth of the aggregate before the effluent flows through the overflow sewer to the next trench. The invert of the first overflow sewer must be at least four inches lower than the invert of the septic tank outlet. At the point an overflow sewer leaves an absorption trench, the excavation for the overflow sewer shall be dug no deeper than the top of the aggregate in the

absorption trench, so that a minimum 12 inch undisturbed block of earth will remain in place for the full depth of the aggregate. Overflow sewers shall be laid on undisturbed earth with a minimum earth cover of six inches. All pipe and fittings sewer shall be NSF International schedule 40 PVC or equivalent.

Absorption Field Sizing

a. Absorption Field Area: The absorption field area shall be based upon the anticipated peak daily volume of treated sewage, waste stream characteristics and the characteristics of the soil in the absorption field location.
b. Prior to application to the soil, the waste stream must have a BOD5 and TSS of 200 mg/l or less. In addition, grease generating facilities shall reduce the fats, oil and grease content of their waste stream to 25mg/l prior to application to the soil.
c. Soil absorption rates shall determine the absorption trench bottom area of the absorption field.
d. Sewage flow rates for individual residences shall be based on the number of bedrooms. Table DT-2 relates bedrooms to absorption rates for determining the absorption field trench bottom area required.
e. Sewage flow rates for other facilities shall be based on criteria in Section J of this manual. Absorption field trench bottom area for other facilities shall be based on the following formula:

$$\frac{\text{percolation coefficient } (\sqrt{t}/5) \times \text{gallons per day}}{\text{Trench bottom width (feet)}} = \text{Linear feet}$$

4. **Alternating Field Method:** When the soil percolation rate is over 60 minutes per inch, but less than 90 minutes per inch or soil evaluation reports indicate the absorption rate to be between 60 and 90 minutes per inch, an alternating absorption field system may be considered. If used, the total absorption field area required by the percolation rate shall be divided into two equal but separate systems (See figures FF-1 and FF-2). A diversion device shall be used to divert sewage flow from one field to the other (See figures FF-3 thru FF-5). Each field should be utilized for one year before diverting flow to the alternate field so as to give each field a satisfactory resting period, unless the field receiving the flow becomes saturated before one year's use. In the case of saturation of one field, the flow should be immediately diverted to the other field.

   The diversion device shall be constructed of materials designed to resist corrosion and shall be accessible to the surface for routine service.

Figure FF-3
Typical Diversion Valve

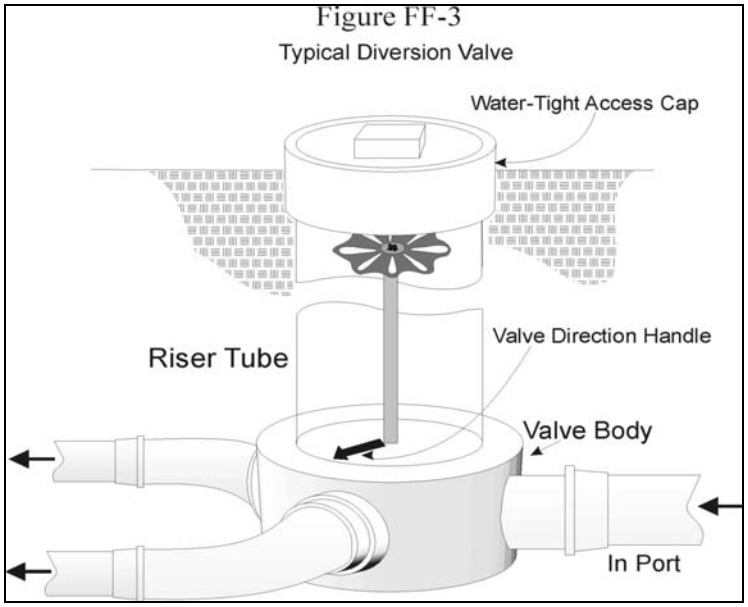


Figure FF-1
Alternating Trench System With Diversion Valve
(Example 1)

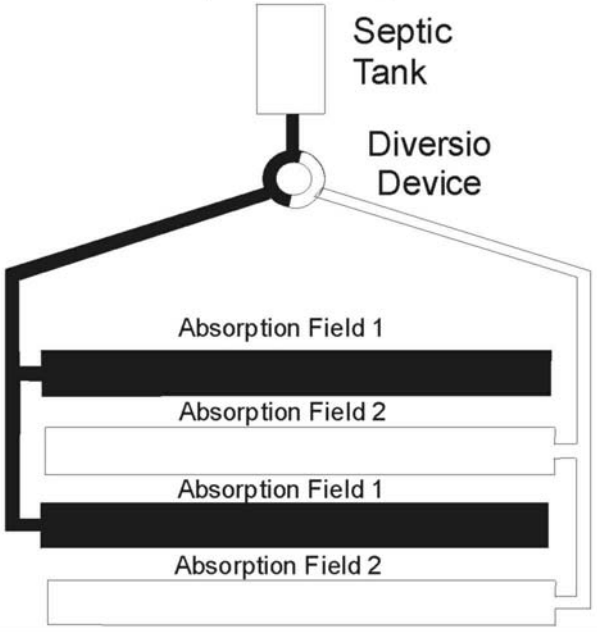
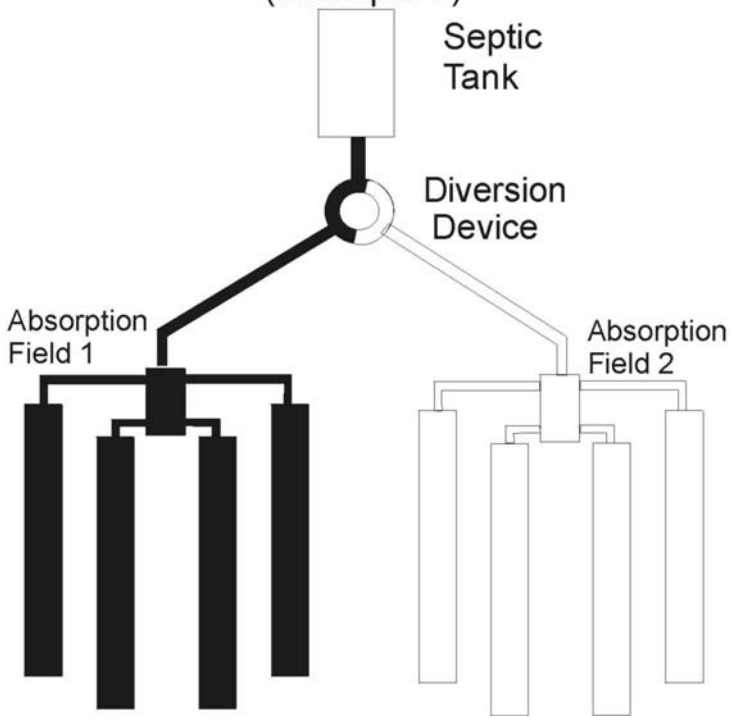


Figure FF-2
Alternating Trench System With Diversion Valve
(Example 2)



5. **Pressure Distribution Systems -** When the soil percolation rate or soils information indicate that the absorption rate of the soil is between 60 and 90 minutes per inch, pressurized dosing of the absorption field may be considered. Basically, this involves the installation of a septic tank followed by a pump tank fitted with a sewage ejector pump to periodically pump the sewage into an absorption field and reduce the problem of saturated soil at the point of discharge.

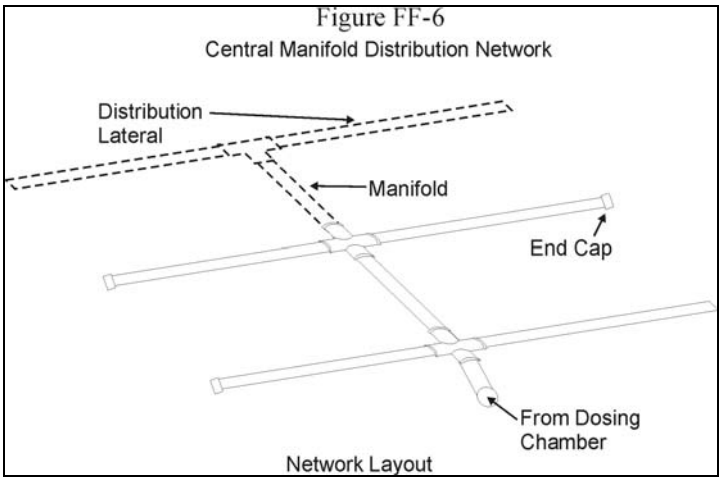
   To achieve uniform distribution, the volume of water passing out each hole in the network during dosing cycle must be nearly equal. To achieve this, the pressure in each segment of pipe must also be nearly equal. This is accomplished by balancing the head losses through proper sizing of the pipe diameter, hole diameter and hole spacing. Thus, approximately 75 to 85% of the total head loss incurred is across the holes in the lateral, while the remaining 15 to 25% of head loss is incurred in the networks; these usually consist of one to 30 inch (3-to 8-cm) diameter laterals, connected by a central or end manifold of larger diameter (See figures FF-6 and FF-7). The laterals are perforated at their inverts with ¼ to ½ inch (0.6 to 1.3 cm) diameter holes. The spacing between holes is two to 10 feet (0.6 to 3.0 m).

   Pumps are used to pressurize the network, although siphons may be used if the dosing tank is located at a higher elevation than the lateral inverts. The active dosing volume is about ten times the total lateral pipe volume. This ensures more uniform distribution since the laterals, drained after each dose, must fill before the network can become properly pressurized. (See Section E for Dosing Tank Design).

   To simplify the design of small pressure distribution networks, Table FT-1and Figures FF-8 thru FF-10 may be used. Example 1, pages F-5 through F-7 and example 2, Pages F-7 thru F-8 illustrate their use. Other design methods may also be equally suitable.

Figure FF-6

Central Manifold Distribution Network



Network Layout

Figure FF-7

End of Manifold Distribution Network

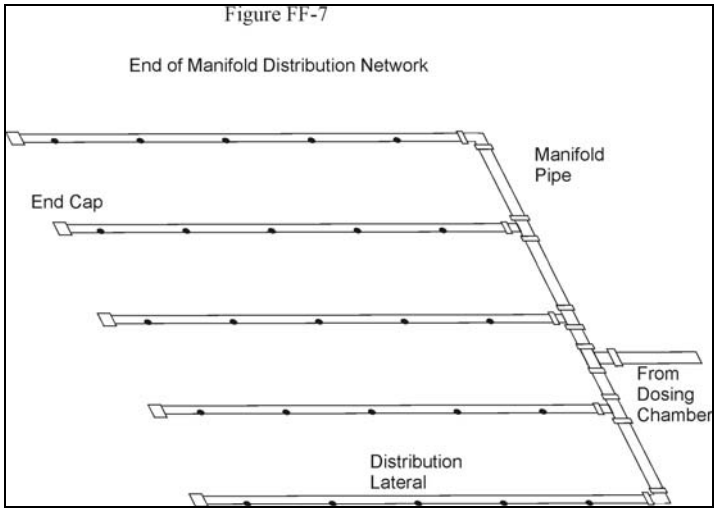
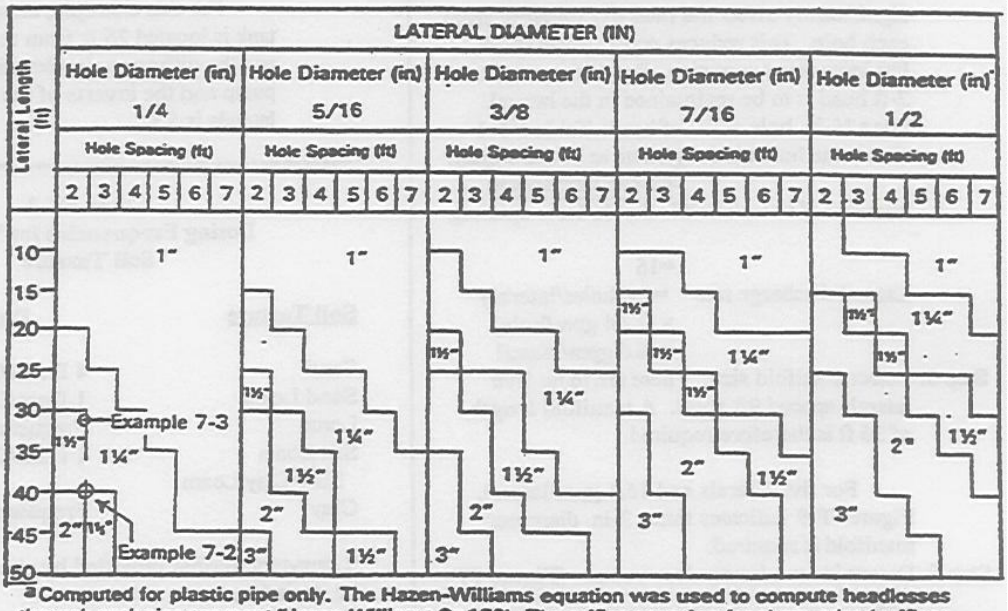


Figure FF-8

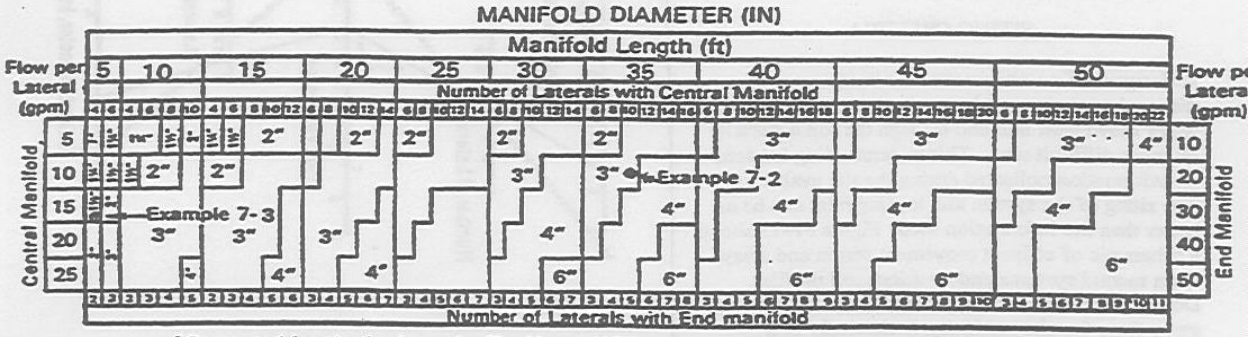
REQUIRED LATERAL PIPE DIAMETERS FOR VARIOUS HOLE DIAMETERS, HOLE SPACINGS, AND LATERAL LENGTHS[a] (FOR PLASTIC PIPE ONLY)



[a] Computed for plastic pipe only. The Hazen-Williams equation was used to compute headlosses through each pipe segment (Hazen-Williams C=150). The orifice equation for sharp-edged orifices (discharge coefficient = 0.6) was used to compute the discharge rates through each orifice. The maximum lateral length for a given hole and spacing was defined as that length at which the difference between the rates of discharge from the distal end and the supply end orifice reached 10 percent of the distal end orifice discharge rate.

Figure FF-9

RECOMMENDED MANIFOLD DIAMETERS FOR VARIOUS MANIFOLD LENGTHS, NUMBER OF LATERALS, AND LATERAL DISCHARGE RATES (FOR PLASTIC PIPE ONLY)



[a] Computed for plastic pipe only. The Hazen-Williams equation was used to compute headlosses through each segment (Hazen-Williams C – 150). The maximum manifold length for a given lateral discharge rate and spacing was defined as that length at which the difference between the heads at the distal and supply ends of the manifold exceeded 10 percent of the head at the distal end.

Table FT-1
Discharge Rates for Various Sized Holes
At Various Pressures (gpm)

Pressure (PSI)	**Hole Diameter (Inches)**				
	1/4	**5/16**	**3/8**	**7/16**	**1/2**
0.43	0.74	1.15	1.66	2.26	2.95
0.87	1.04	1.63	2.34	3.19	4.17
1.30	1.28	1.99	2.87	3.91	5.10
1.73	1.47	2.3	3.31	4.51	5.89
2.17	1.65	2.57	3.71	5.04	6.59

Table FT-2
Friction Loss in Schedule 40 Plastic Pipe, C=150
(ft/100 ft)
Pipe Diameter (Inches)

Flow (GPM)	1	1 1/4	1 1/2	2	3	4	6	8	10
1	0.07								
2	0.28	0.07							
3	0.60	0.16	0.07						
4	1.01	0.25	0.12						
5	1.52	0.39	0.18						
6	2.14	0.55	0.25	0.07					
7	2.89	0.76	0.36	0.10					
8	3.63	0.97	0.46	0.14					
9	4.57	1.21	0.58	0.17					
10	5.50	1.46	0.70	0.21					
11		1.77	0.84	0.25					
12		2.09	1.01	0.30					
13		2.42	1.17	0.35					
14		2.74	1.33	0.39					
15		3.06	1.45	0.44	0.07				
16		3.49	1.65	0.50	0.08				
17		3.93	1.86	0.56	0.09				
18		4.37	2.07	0.62	0.10				
19		4.81	2.28	0.68	0.11				
20		5.23	2.46	0.74	0.12				
25			3.75	1.10	0.16				
30			5.22	1.54	0.23				
35				2.05	0.30	0.07			
40				2.62	0.39	0.09			
45				3.27	0.48	0.12			
50				3.98	0.58	0.16			
60					0.81	0.21			
70					1.06	0.28			
80					1.38	0.37			
90					1.73	0.46			
100					2.09	0.55	0.07		
150						1.17	0.16		
200							0.28	0.07	
250							0.41	0.11	
300							0.58	0.16	
350							0.78	0.20	0.07
400							0.99	0.26	0.09
450							1.22	0.32	0.11
500								0.38	0.14
600								0.54	0.18
700								0.72	0.24
800									0.32
900									0.38
1000									0.46

EXAMPLE 1: DESIGN OF A PRESSURE DISTRIBUTION NETWORK FOR A TRENCH ABSORPTION FIELD

Design a pressure network for an absorption field consisting of five trenches, each 3 ft wide by 40 ft. long, and spaced 9 ft apart center to center.

Step 1: Select lateral length. Two layouts are suitable for this system: central manifold (Figure FF-6) or end manifold (Figure FF-7). For a central manifold design, ten 20-ft laterals are used; for an end manifold design, five 40-ft laterals are required. The end manifold design is used in this example.

Step 2: Select hole diameter and hold spacing for laterals. For this example, ¼ in. diameter holes spaced every 30 in. are used, although other combinations could be used.

Step 3: Select lateral diameter. For ¼-in. hole diameter, 30-in. hole spacing, and 40-ft length, Figure FF-8 indicates either a 1¼-in. diameter or ½-in diameter lateral could be used. The 1½-in. diameter is selected for this example.

Step 4: Calculate lateral discharge rate. By maintaining higher pressures in the lateral, small variations in elevation along the length of the lateral and between laterals do not significantly affect the rates of discharge from each hole. This reduces construction costs, but increases pump size. For this example, a 2-ft head is to be maintained in the lateral. For a ¼-in. hole at 2ft of head. Table FT-1 shows the hole discharge rate to be 1.04 gpm.

40-ft lateral length

Number of holes/lateral = 2.5-ft. Hole spacing
= 16

Lateral discharge rate = (16 holes/lateral) × (1.04 gpm/hole)
= 16.6 gpm/lateral

Step 5: Select manifold size. There are to be five laterals spaced 9ft apart. A manifold length of 36 ft is therefore required.

For five laterals and 16.6 gpm/lateral, Figure FF-9 indicates that a 3-in. diameter manifold is required.

Step 6. Determine minimum dose volume (Figure FF-10).

With: lateral diameter = 1½ in.
lateral length = 40 ft.
number of laterals = 5

Then: pipe volume = 3.7 gal

Minimum dose volume = approx. 200 gal.

The final dose volume may be larger than this minimum depending on the desired number of doses per day (See Table FT-3)

Step 7: Determine minimum discharge rate.

Minimum discharge rate = (5 laterals) × (16.6 gpm/lateral)
= 83 gpm

See Figure FF-11 for distribution network designed for a trench system (example 1).

Step 8: Select proper pump or siphon.

For a pump system, the total pumping head of the network must be calculated. This is equal to the elevation difference between the pump and the distribution lateral inverts, plus friction loss in the pipe that delivers the wastewater from the pump to the network at the required rate, plus the desired pressure to be maintained in the network (the velocity head is neglected). A pump is then selected that is able to discharge the minimum rate (83 gpm) at the calculated pumping head.

For a siphon system, the siphon discharge must be elevated above the lateral inverts at a distance equal to the friction losses and velocity head in the pipe that delivers the wastewater from the siphon to the network at the required rate, plus the desired pressure to be maintained in the network.

For this example, assume the dosing tank is located 25 ft from the network inlet, and the difference in elevation between the pump and the inverts of the distribution laterals is 5 feet.

a. Pump (assume 3-in. Diameter delivery pipe)

1) Friction loss in 3-in. pipe at 83 gpm (from Table FT-2)

= 1.38 + 3/10 (1.73 - 1.38)
= 1.49 ft/100ft
Friction loss in 25ft = 1.49 ft/100 ft x 25ft
= 0.4ft
2) Elevation Head = 5.0ft
3) Pressure to maintain = 2.0ft.
Total pumping head = 7.4 ft

Therefore, a pump capable of delivering at least 83 gpm against 7.4 feet of head is required. This information is found in pump curves.

b. Siphon (assume 4-in. Diameter delivery pipe)
1) Friction loss in 4-in pipe at 83 gpm (from Table FT-2)

= 0.37 + 3/10 (0.46 - 0.37)
= 0.4ft/100 ft
Friction loss in 25ft = (0.4 ft/100 ft) x (25 ft)
= 0.10 ft

2) Velocity head in delivery pipe

Discharge rate = 83 gpm = 0.185 ft^3/sec
Area = $(1/4)\pi (4/12)^2 = 0.087\ ft.^2$

Velocity = $0.185\ ft^3/sec = 2.13 ft/sec$

Velocity Head = $\frac{(Velocity)^2}{2g}$
= $\frac{(2.13\ ft/sec)^2}{2(32.3\ ft/sec)}$

= 0.07 ft
3) Pressure to maintain = 2.0 ft.

Total = 2.2 ft

Minimum elevation of the siphon discharge invert above the lateral inverts must be 2.2 ft.

In summary, the final network design consists of five 40-ft laterals 1½-in. in diameter connected with a 36-ft end manifold 3-in. in diameter, with the inlet from the dosing tank at one end of the manifold. The inverts of the laterals are perforated with ¼-in. holes spaced every 30 in.

Figure FF-10

Nomograph for Determining the Minimum Dose Volume for a Given Lateral Diameter, Lateral Length, and Number of Later

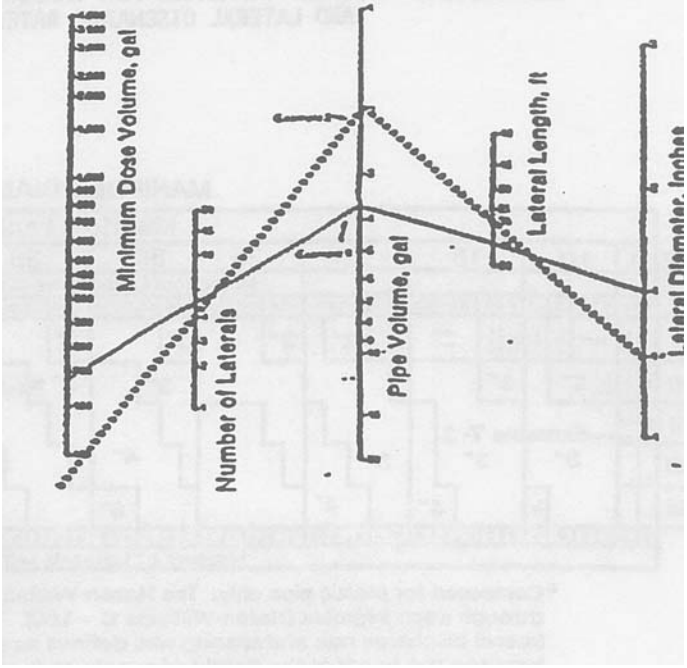
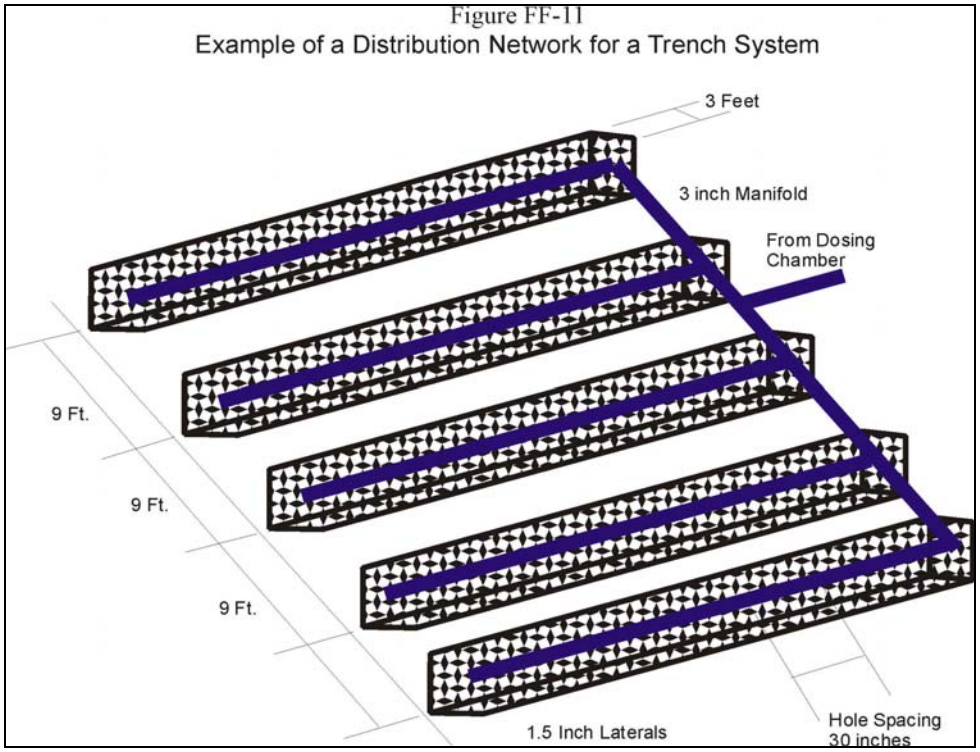


Figure FF-11

Example of a Distribution Network for a Trench System



Perforated Pipe - Gravity Flow Usage

a. All perforated pipe used for gravity flow carriage and distribution of effluent within lateral trenches, mounds or other such applications shall meet 1,500 1b crush strength in accordance with ASTM - F810 standards for rigid piping and ASTM - F405 for corrugated semi-rigid piping.
b. Each standard section of pipe as supplied by the manufacturer shall be plainly marked, embossed or engraved showing the manufacturer's name, the type of pipe material and showing the product meets applicable ASTM standards and a bearing load of 1,500 lbs per foot. In addition, a painted or other clear line shall be marked on each section of pipe to denote the top.
c. For conventional systems, all gravity flow usage perforated pipe shall have a minimum internal diameter of four inches.
d. All four inch diameter or greater pipe shall have at least two rows of holes between ½ inch and ¾ inch in diameter, evenly spaced and placed within an arc of 120 degrees on the bottom of the pipe with a third hole of same size being directly opposite the top marking. Spacing of holes longitudinally shall be every 4 inches on centers along the length of the pipe.

Perforated Pipe - Pressure Usage, Low Pressure Pipe Systems

a. Pipe used for pressure carriage and distribution of effluent within lateral trenches, mounds or other low pressure pipe (LPP) applications shall be of at least 160 psi PVC construction. Deep hub water line shall be used.
b. Each standard section of pipe as supplied by the manufacturer shall be plainly marked, embossed or engraved showing the manufacturer's name or hallmark, the 160 psi designation and the type of pipe material.
c. All such pipe used on an individual LPP system installation shall be of the same type material-mixing of PVC, polyethylene or other equivalent piping is prohibited.
d. Minimum pipe internal diameter shall be determined on a case-by-case basis, based upon system size, configuration and other factors necessary in the design of a low pressure pipe system.
e. Pipe perforations shall run in a straight line along the bottom of the pipe. Where pre-perforated pipe is unavailable, perforations shall be hand-drilled, and deburred. Hole diameters and hole spacing shall be determined on a case-by-case basis relative to design requirements of the low pressure pipe system.

Tire Chip Aggregate: Tire chip aggregate may be used as a replacement for gravel when installed based on conventional septic tank system criteria and absorption field methods.

1. The size of the tire chip aggregate shall be one-half inch to two inches in diameter.
2. The minimum depth of aggregate shall be twelve inches with six inches below the drain pipe and filled to two inches above the drain pipe.
3. The aggregate must be free of balls of wire and fine rubber particles.
4. The percentage of tire chip aggregate with greater than one-half inch exposed wire shall not exceed ten percent.
5. The absorption line with tire chip aggregate must be covered with an approved geotextile fabric or silt screen prior to back filling.
6. The chips must be clean and free of any soil particles either adhering to the chips or floating loose within the chips.

Chamber Systems

"Chamber System" means a system of chambers with each chamber being a molded polyolefin plastic, arch shaped, hollow structure with an exposed bottom area and solid top and louvered sidewall for infiltration of effluent into adjoining bottom and sidewall soil areas. Chambers may be of different sizes and configurations to obtain desired surface areas.

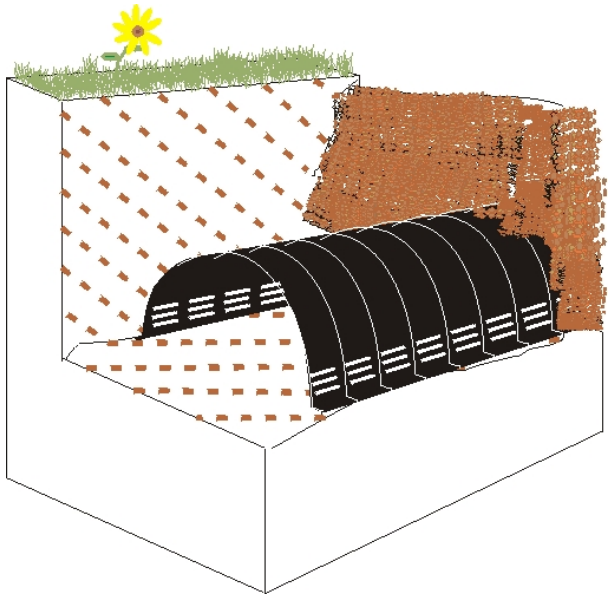
The first step in designing any sewage disposal system is to conduct a thorough site evaluation as covered in other sections of the Manual. Once the feasibility of a septic system is confirmed, the next step is to determine the

appropriate size of the system as specified in the current Manual. Chamber systems may then be equivalently sized according to manufacturers' recommendations and per approval by the Department.

Chamber leaching systems provide flexibility and may be adapted to most design situations including equal distribution, serial distribution, pump-up design, cut and fill, at-grade systems and mounds. Installation instructions for various chambers will be based on specific manufacturer's recommendations, which have been reviewed by the Technical Review Committee and approved by the Department. There must be a totally separate absorption field replacement area equivalent in size to 100% of the chamber field installed or a conventional absorption field, whichever is larger.

All chambers must be designed and constructed to meet the following minimum standards:

a. Metal chamber systems are prohibited.
b. Support vertical uniform loading of 600 lb/sq.ft on the top of the chamber without damage or permanent deformation, meeting American Association of State Highway and Traffic Officials load rating H-10 (16,000 lbs/axle);
c. In non-vehicle traffic areas, chambers may be approved for installation with a final soil cover of 6 inches provided the chambers in the final installed configuration are capable of supporting a 4,000 lb/axle load without collapsing, fracturing, or breaking. The chamber must be capable of supporting a temporary construction loading of 16,000 lbs/axle (American Association of State Highway and Transportation Officials H-10 load) without collapsing, fracturing or breaking. Additional soil cover above the final grade may be used to bridge this load during construction.
d. Provide ports, slots or other similar openings on sidewalls to allow air movement and effluent access to lateral field trench sidewall absorption surfaces;
e. Interlock to allow serial installation of chambers, and be provided with acceptable end plates, caps or other necessary fittings and connectors;
f. All chambers shall be designed to accommodate at least one inspection port of a minimum internal dimension of four inches centrally located in the top of the chamber;
g. All such chambers offered for sale or use in Georgia shall bear, by imprint, stencil or other acceptable means of permanent marking, the manufacturer name and product identification number assigned to the chamber plans and specifications; this shall be located in an easily visible location on each chamber.



Wisconsin Mound Soil Absorption System

The Wisconsin mound wastewater soil absorption system was developed in the early 1970's to be used on sites with specific site characteristics where in-ground gravity flow trench or bed soil absorption systems were restricted. The Wisconsin mound system has been widely accepted and incorporated in many state regulations. It is one of several systems suitable for treating and disposing of the wastewater generated in residential and commercial units and is not suited for all sites.

The objectives are to treat and dispose of the wastewater via the subsurface in an environmentally acceptable manner and to protect the public health.

The concept of an elevated on-site system for sewage disposal was developed in the 1950's (Witz, 1974). In the 1970's significant modifications were made to overcome many system limitation (Converse et al., 1975 a, b, c, ; Machmeier, 1977; Carlile et al, 1977). Fig. FF-12 is a cross section of a Wisconsin mound system. It consists of a septic tank, a dosing chamber and the mound. As with other soil absorption systems, the septic tank removes most of the settleable solids and is a place for liquefaction of the more easily biodegradable solids. The dosing tank contains a pump or siphon, which pressurizes a distribution network of small diameter pipe with small perforations and distributes the septic tank effluent uniformly along the length of the mound. The purpose of the mound is to accept septic tank effluent and along with the native soil treat and purify the wastewater to acceptable standards. The mound consists of a layer of suitable sand, aggregate, distribution system and soil cover. Originally the Wisconsin mound system was designed for individual homes with specific soil and site limitation and with wastewater flows of less than 750 gpd (Converse et al., 1975 a, b, c; Converse 1978). As the need for disposal of wastewater on sites where below grade systems were not appropriate and for deposal of greater wastewater volumes from small communities, clusters of disposal of homes and commercial establishments increased, the demand for the Wisconsin mound system on these sites has increased. It is not unusual to see Wisconsin mound systems receiving wastewater flows in excess of 25,000 gpd. Evaluation of mounds on sites with more restrictions than currently allowed in most codes has resulted in utilizing mounds on more difficult sites. (Converse and Tyler, 1986a; 1986b). Based on the experience of siting, design and construction, concepts have been modified (Tyler and Converse, 1985; Converse and Tyler, 1987). The purpose of this manual is to consolidate these concepts and present the latest siting, design and construction criteria of the Wisconsin mound system.

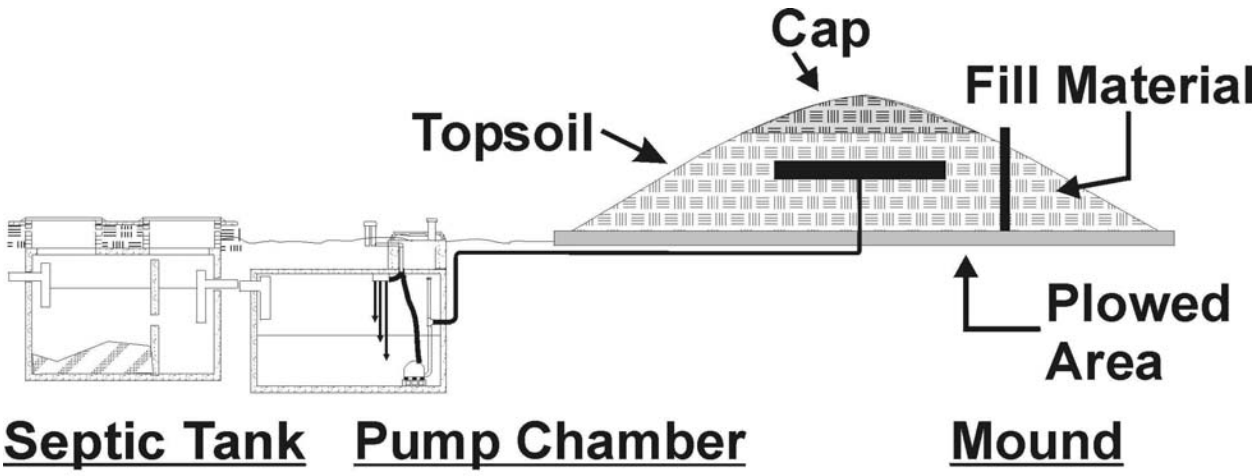


Figure FF-12 Across-setion of a septic tank-mound system for on-site disposal

SITING CRITERIA

A designer of on-site wastewater treatment and disposal systems must have a basic understanding of water movement into and through the soil especially on more difficult sites. This understanding is based on information collected during the site evaluation. The siting of the system and loading rates can be no better than the information used. Figure FF-13 shows a schematic of effluent movement within and away from mound systems under various soil profiles. Depending on the type of profile, the effluent moves away from the site vertically, horizontally or a combination of both. It should be noted that these concepts are true for all soil absorption systems. The sizing and configuration of all soil absorption systems, including the mound, is based on how the effluent moves away from the system and the rate at which it moves away from the system. Thus the designer must predict that movement and rate of movement or the design may be flawed and the system may fail. The prediction is made based on soil and site information obtained during site evaluation.

The siting and design concepts presented in this publication and elsewhere (Converse, et. Al. 1989, and Tyler and Converse, 1986) results in soil absorption systems that are usually long and narrow. The more restrictive the site, the narrower and longer the soil absorption system must be. If these concepts are not followed, then the system may not perform as expected. It should be noted that these concepts will not apply to all soil and site situations, as soil absorptions systems are not compatible to all sites and should not be used on such sites.

Codes, regulating on-site subsurface disposal of wastewater, require a suitable depth of soil to treat the effluent before it reaches the limiting condition such as bedrock or high water table or a slowly permeable soil layer. FF-14 shows the relationship between the type of system that may be best suited and the location of the limiting condition beneath the ground surface, utilizing a 3 ft suitable soil separation distance. This suitable depth of unsaturated soil varies among codes but usually is between 1 and 4 ft. For the mound system this suitable depth consists of the distance from the ground surface to the limiting condition below ground surface plus the depth of sand between the ground surface and the infiltrative surface within the mound (normally the aggregate/sand interface or the exposed surface of chamber units). For the at-grade system, the suitable depth is from the ground surface to the limiting condition (Converse et al., 1989). For example, if the code required 2 ft of suitable soil and the site distance was greater than two feet but less than required for an in-ground system, an at-grade system would be better suited than a mound system for the site. However, if this distance was less, then a mound system may be most appropriate.

This manual does not provide methods and procedures for describing and interpreting soil and site conditions used to determine suitability and design parameters for a Wisconsin mound. A soil classifier or other qualified soil evaluator should be employed to provide site descriptions and interpretations. It is best if the soil classifier works with the designer and installers to insure proper use of the site.

Table FT-4 gives soil and site criteria for the Wisconsin mound based on research and field experience. When the mound was originally developed in the 1970's the criteria were conservative as there was very little experience with mound systems. Since that time considerable research has been conducted on more difficult sites (Converse and Tyler, 1985, 1987). Care must be taken when using these criteria as they are for the most difficult sites utilizing on-site systems. Design configuration, loading rates and construction are very critical for the successful functioning of the systems.

Depth to High Water Table:

High ground water table, including seasonally perched water table, should be greater than about 10" beneath the ground surface. High water table is determined by direct observation and/or interpretation of soil mottling. Since it is impossible to detect soil mottles in black surface horizons, it is difficult to determine the exact location of seasonal saturation during wet periods. At some sites, during wet periods, saturation may occur at the sand/soil interface at the toe of the mound as the effluent is restricted from moving away from the mound. This effluent is usually extremely low in fecal bacteria but has high nitrates and chlorides (Converse and Tyler, 1985; 1987). Under these saturated conditions there is the possibility of leakage of this water from the toe of the mound for a few days during seasonal saturation of the soil.

Depth to Bedrock:

Bedrock should be classified as crevice, non-crevice semi-permeable or non-crevice impermeable. Two feet of natural soil depth is suggested for the crevice bedrock as it is assumed that very little treatment takes place in the crevice bedrock. The natural soil aids in the treatment of the effluent and the extra foot of natural soil acts as a factor of safety as the first water table that the effluent will contact may be permanent and potable. Potable water is usually separated from seasonal water table, therefore shallower depths are required for the non-crevice bedrock as the potential for ground water contamination is much less. In the non-crevice very slowly permeable or impermeable bedrock, the effluent flow will be horizontal and in the semi-permeable sandstones the flow will be both vertical and horizontal.

Soil Permeability:

Most codes have used the percolation test to size the soil absorption system. The percolation test is empirically related to the loading rate and it has been shown that the percolation test is very variable. Loading rates should be based on soil texture, structure and consistence with the percolation test, if required, to confirm morphological interpretations. This approach requires more detailed site evaluation and will be used for mound design and siting. Table FT-5 gives the design soil loading rates based on morphological interpretations.

Slope:
Mound systems on steep slopes with slowly permeable soils should be narrow to reduce the possibility of toe seepage. Slope limitation is primarily for construction safety. It is very difficult to operate equipment on such steep slopes and installers should be warned about the construction hazards.

Filled Sites:

Fill is defined as the soil placed on a site to raise the elevation of the site. Typically it is placed on top of the natural soil and may consist of soil with textures ranging from sand to clay or a mixture of textures. During placement soil structure is destroyed and the soil is usually compacted. Under these circumstances the permeability of the soil is reduced and variable. Thus, if a system is to be placed on the site, sufficient time must pass to allow the soil structure to develop and compaction to be reduced via warm and/or freeze/thaw activity. A more intensive soil evaluation must be done because of the variability encountered in filled sites over naturally occurring sites. Many more observation locations are generally needed for filled sites compared to non-filled sites.

Over Old Systems:

Mounds have been successfully placed over failing in-ground soil absorption units. The soil above the system has been disturbed and must be treated as a filled site when evaluating the soil for loading rate. A more detailed evaluation of the effluent movement must be done especially if a mound is placed over a large in-ground system.

Flood Plain:

It is not recommended to install any soil absorption system in a flood plain, drainage ways or depressions unless flood protection is provided.

Horizontal Separation Distances:

The same separation distances between the mound and the respective site features that apply for in-ground systems should apply for the Wisconsin mounds. On sloping sites the upslope and end distances should be measured from the upslope edge or ends of the aggregate to the respective features and the down slope distance should be measured from the down slope toe of the mound to the respective features. As with all wastewater infiltration systems on sloping sites that have primarily horizontal flow from the mound, a greater down slope horizontal separation distance may be appropriate to avoid weeping into a ditch or basement that may be located down slope.

Sites with Trees and Large Boulders:

Generally, sites with large trees, numerous smaller trees or large boulders are less desirable for mound systems because of the difficulty in preparing the site. If a more desirable site is not available, the trees must be cut at ground level. The stumps should not be removed. If the tree stumps and/or boulders occupy a significant amount of the surface area, the size of the mound should be increased to provide sufficient soil to accept the effluent. The site evaluator should provide location and size information about trees and boulders.

Table FT-4: Recommended Soil and Site Criteria for the Wisconsin Mound System. Based on Research and Field Experience (Converse and Tyler, 1985, 1987)

Parameter	Value
Depth to High Water (Permanent or Seasonal)	10 inches
Depth to Crevice Bedrock	2 feet
Depth to Non-Crevice Bedrock	1 foot
Permeability of Top 10 inches	Moderately Low
Site Slope	25%
Filled Site	Yes*
Over Old System	Yes**
Flood Plains	No

* Suitable according to soil criteria (texture, structure, consistence)
** The area and backfill must be treated as fill as it is a disturbed site.

Table FT-5 Estimated Wastewater Design Basal Loading Rates for Surface Horizon Based on Soil Morphological Conditions for Wisconsin Mound Systems.

(Instructions: Read questions in sequence. When the conditions of your soil match the question, use that loading rate and do not go further)

Soil Condition of Horizon at Sand/Soil Interface	If yes, Loading Rate in gpd/sq.ft.
A. Is the horizon gravely coarse sand or coarser?	0.0
B. Is consistence stronger than firm or hard, or any cemented class?	0.0
C. Is texture sandy clay, clay or silty clay of high clay content and structure massive or week, silt loam and structure massive?	0.0
D. Is texture sandy clay loam, clay loam or silty clay loam and structure massive?	0.0
E. Is texture sandy clay, clay, or silty clay of low clay content and structure moderate or strong?	0.2
F. Is texture sandy clay loam, clay loam or silty clay loam and structure weak?	0.2
G. Is texture sandy clay loam, clay loam or silty clay loam and structure moderate or strong?	0.4
H. Is texture sandy loam, loam or silt loam and structure weak?	0.4
I. Is texture sandy loam, loam or silt loam, and structure moderate or strong?	0.6
J. Is texture fine sand, very fine sand, loamy fine sand, or loamy very fine sand?	0.6
K. Is texture coarse sand with single grain structure?	0.8

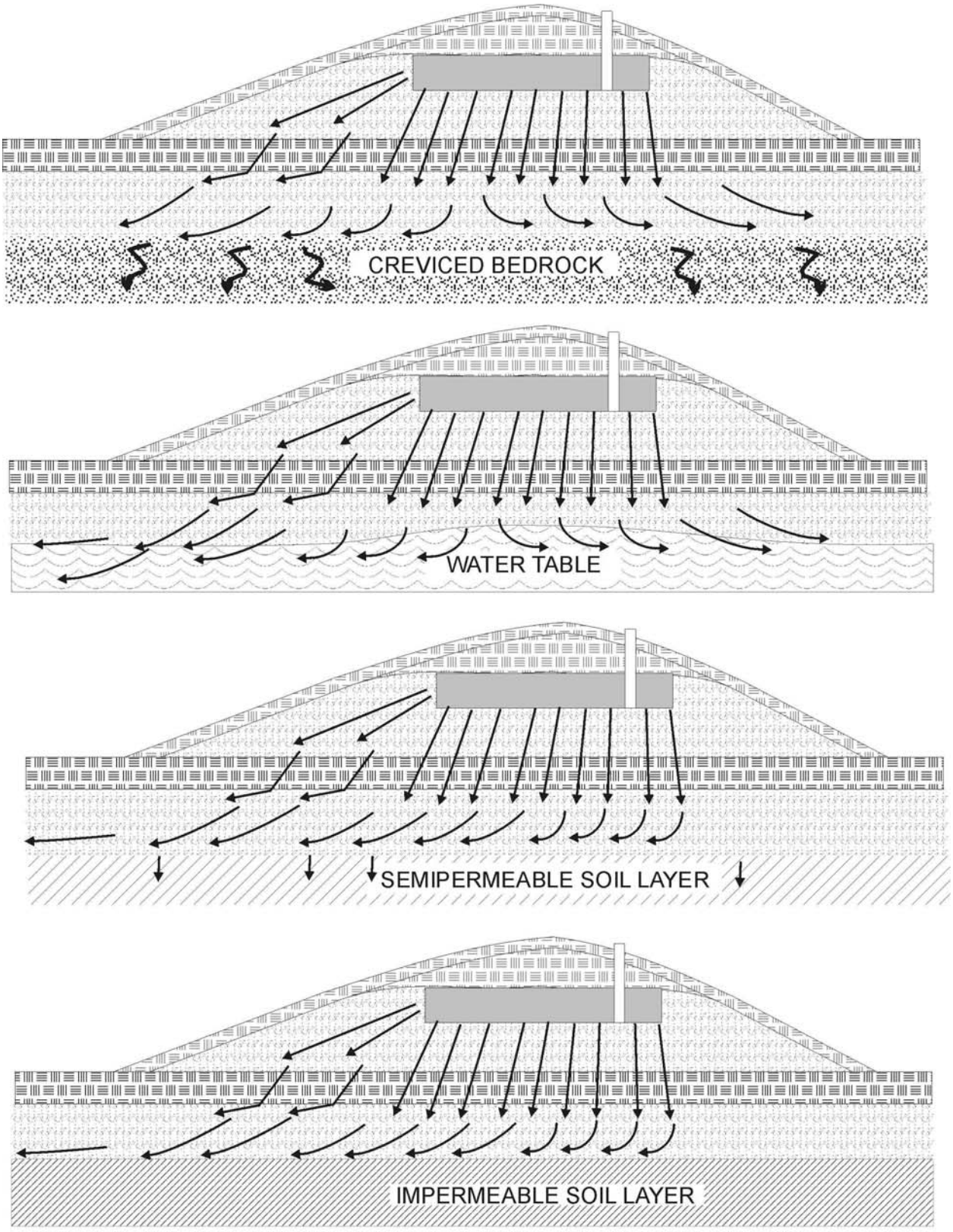


Figure FF-13 Effluent Movement Within and Away from the Wisconsin Mound for Four Different Types of Soil Profiles

MOUND DESIGN CONCEPTS

As with all soil absorption systems, a mound wastewater infiltration system must be sized and configured to match the soil and site conditions and the volume and quality of wastewater applied to it. Thus, it is imperative that the designer has sufficient information about the quality and quantity of effluent, soil and site features and understands the mound operating principles. The soil classifier or site evaluator must accurately estimate the design soil loading rate (Table FT-5) and determine the direction of flow away from the system (Fig. FF-13) before the mound can be properly designed.

The design consists of estimating the: 1) sand fill loading rate, 2) soil (basal) loading rate and 3) linear loading rate for the site. Once these three design rates are determined, the mound can be sized for the site. Figures FF-4 and FF-5 show a cross section and plan view of the mound on sloping and level sites, respectively, and show dimensions that must be determined.

Sand Fill Loading Rate

The design sand loading rate for the absorption area (aggregate/sand interface in Figs. FF-15 and FF-16) is dependent upon the quality of effluent applied and the type and quality of fill material placed beneath the aggregate. The loading rate in this manual assumes a sand is used that meets the guidelines and a typical domestic septic tank effluent quality. If commercial septic tank effluent is used, such as from restaurants, the loading rates should be reduced as the strength of the effluent may be much greater thus accelerating and intensifying the clogging of the aggregate/sand interface (Seigrest et al., 1985). If higher quality effluent is used, such as that from sand filters or aeration units, higher design loading rates may be justified. Limited experience with different qualities of effluent wastewater makes it difficult to predict long term loading rates.

The purpose of the sand fill, along with the native soil, is to treat the effluent to an acceptable level. A very coarse sand will not provide adequate treatment and a very fine sand can not be loaded at acceptable levels without severe clogging, thus resulting in mound failure. Thus a sand must be selected that provides satisfactory treatment and allows for a reasonable loading rate.

During the initial development of the mound, medium sand (USDA classification) was considered suitable for mound fill but it was soon shown that premature failure resulted for sand fill that was on the fine side of medium or was a fine sand. Bank run sand, which was classified as medium sand, was also found unsuitable, in most cases, as it was usually poorly sorted and contained a lot of fines. Currently the recommendation is to use a coarse sand with a minimum amount of fines, which appears to give acceptable treatment at an acceptable loading rate. It is also important to provide a specification that provides acceptable treatment and is available at a reasonable cost. Standard classifications such as USDA are not suitable as they are very broad. For example, a coarse sand may or may not be acceptable while a medium sand may be, as it depends upon a combination of various sand fractions.

Figure FF-17 can be used as a guide for selecting a suitable mound sand fill. Based on a sieve analysis of the total sample, the sand fill specification should fit between the ranges given in Fig. FF-17. In addition the sand fill must not have more than 20% (by wt) material that is greater than 2 mm in diameter, which can include stone, cobbles and gravel. Also there must not be more than 5% silt and clay (<.053 mm) in the fill. This guideline is based on experience and judgment. According to USDA classification this is a coarse sand, however many other sands could be defined as coarse sand according USDA and not meet this guideline for mound sand fill. C-33 specification (ASTM, 1984) for fine aggregate does fit within this guideline but the coarser (>2 mm) and finer (<.053) fractions must be evaluated to make sure they meet the limits. A sand with an effective diameter (D_{10}) of 0.15 to 0.3 and a uniformity coefficient (D_{60} /D_{10}) between 4 and 6 fit within this guideline provided the coarser (>2 mm) and finer (<.053) fractions meet the guideline.

The recommended design loading rate for a sand fill that meets this guideline (Fig. FF-17) is 1.0 gpd/ft^2 if the effluent is a typical domestic septic tank effluent. This assumes that there is a factor of safety provided. It assumes, for design purposes, that a home generates 75 gpcd with two people per bedroom or 150 gallons per bedroom per day. Based on a number of studies, the average quantity of effluent generated per day is about 45 gpcd (Witt et al.

1974). Converse and Tyler, 1987, found, based on water meter reading in the home, that the wastewater generated in the home averaged 47% of design with a range of 29 to 82%. If water meter readings are used for design purposes, the design sand loading rage should be reduced accordingly. Systems loaded to design without appropriate factor of safety will fail due to overloading. Similar procedures should be followed for commercial establishments including lower loading rates due to the higher strength effluent as discussed above.

Basal Loading Rates:

The basal area (sand/soil interface in Figs. FF-15 and FF-16) is the area enclosed by the B(A+I) for sloping sites (Fig. FF-15) and B(A+I+J) for level sites where J equals I for level sites (Fig. FF-16). It is sized according to the long term infiltration rate (assuming a clogging mat forms) for the soil at the sand/soil interface (Table FT-5). This interface receives relatively clean effluent since the wastewater has already passed through sand and normally a clogging mat does not develop at this interface, thus over sizing the basal area. Additional over sizing usually results because the distance required to maintain a 3:1 mound side slope is greater than that required for the infiltration basal width except for maybe the very slowly permeable soils or the very steep sites.

Linear Loading Rate:

The linear loading rate is defined as the amount of effluent (gallons) applied per day per linear foot of the system (gpd/1f). The design linear loading rate is a function of effluent movement rate away from the system and the direction of movement away from the system (horizontal, vertical or combination, Fig. FF-13). If the movement is primarily vertical (Fig. FF-13a), then the linear loading rate is not as critical as if the flow is primarily horizontal (Fig. FF-13d). Other factors such as gas transfer from beneath the absorption area suggests that the absorption area width be relatively small (Tyler et al, 1986). It is difficult to estimate the linear loading rate for a variety of soil and flow conditions but based on the authors' experience "good estimates" can be given. If the flow away from the system is primarily vertical (Fig. FF-13a), then the linear loading rate can be high but should be in the range of 8 to 10 gpd/if otherwise the absorption area is excessively wide, especially for the slower permeable soils such as silt loams. However, if the flow is shallow and primarily horizontal (Fig. FF-13d) then the linear loading rate should be in the range of 3 -4 gpd/1f. This approach will result in long and narrow systems.

Dimensioning the Mound:

Figures FF-15 and FF-16 show the cross section and plan view of the mound for sloping and level sites. The dimensions are based on the site conditions and loading rates that are site specific.

Absorption Area Width (A): The width of the absorption area is a function of linear loading rate and the design loading rate of the sand fill selected.

Absorption Area Width (B): The length of the absorption area is a function of the design loading rate (gpd) and the width of the absorption area (A).

Basal Length and Width: For sloping and level sites the basal width is (I + A) and (I + J + A), respectively, and the basal length is (B). The width is determined by the linear loading rate and the infiltration rate for the surface soil horizon (sand/soil interface).

Slope Width (I) and (J): For sloping sites the down slope width (I) is a function of the basal width (A + I) and the absorption area width (A). Upslope width (J) is a function of the 3:1 recommended side slope and is dependent upon the depth of the mound and the slope of the site. A typical dimension is 8 to 10 ft. but can be greater or less depending on the desired mound side slope and the slope of the site. For level sites the slope widths (J) and (I) are equal and are a function of the required basal width or the minimum recommended mound side slopes, whichever is greater.

Slope Length (K): The slope length (K) is a function of the mound depth and the desired mound end slope. The recommended end slope is 3:1 but can be greater. Steeper mound side slopes are not recommended as they can

become a safety hazard if the mound is to be mowed. Typical dimensions are 10 - 15 ft.

Depth (D): This depth is a function of the suitable soil separation depth required by code and the depth of the limiting condition from the soil surface. If the required separation distance from the absorption surface to the limiting condition, such as bedrock or high water table, is 3 ft and the limiting condition is 1 ft beneath the ground surface, then (D) must be a minimum of 2 ft.

Depth (E): This depth is a function of the surface slope and width of the absorption are (A) as the absorption area must be level.

Depth (F): This depth is at least 9 in. with a minimum of 6 in. of aggregate beneath the distribution pipes, approximately 2 in. for the distribution pipe and 1 in. of aggregate over the pipe.

Depth (G) and (H): The recommended depth for (G) and (H) is 12 in. and 18 in., respectively, for the colder climates and 6 in. and 12 in. for the warmer climates. The (H) depth must be greater than the (G) depth to promote runoff on the top of the mound.

Mound Cover:

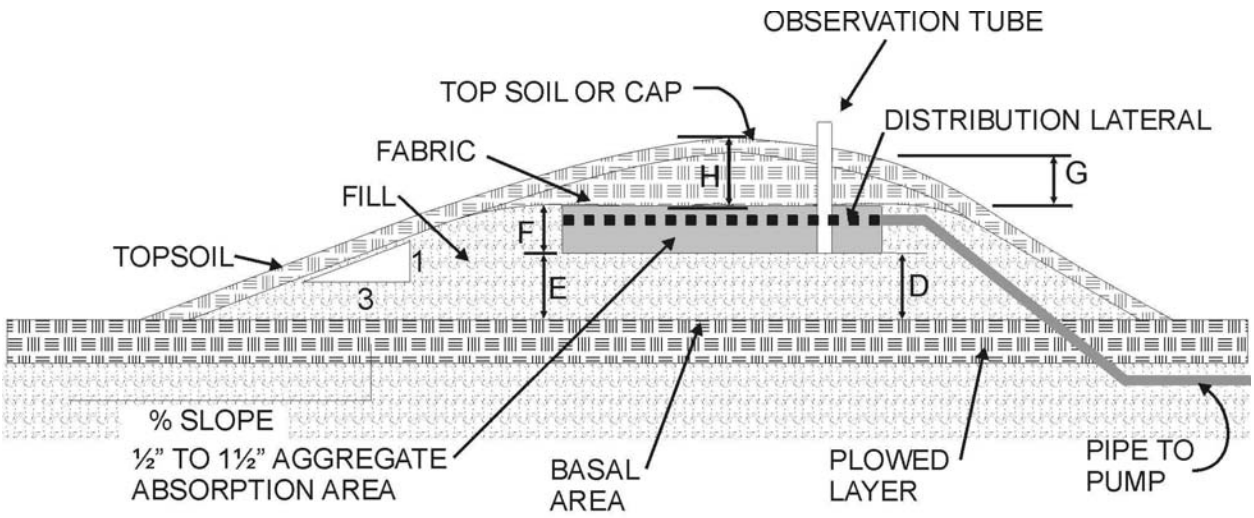
The purpose of the soil cover is to provide a medium for a vegetative cover and protection. Any soil material that will support a suitable vegetative cover is satisfactory. This material may range from a sandy loam to a clay loam. A sand does not support a suitable vegetative cover. A heavier textured soil will promote more precipitation runoff than a lighter texture soil and will also hold more moisture during dry periods thus reducing the drying out of the vegetative cover on the top and sides.

Effluent Distribution Network:

The mound system is designed with a pressure distribution network to distribute the effluent along the length of the mound. Gravity distribution will not distribute it uniformly but drops it in one or two locations (Converse, 1974), Machmeier and Anderson, 1988). Otis, 1981, gives design criteria and examples for pressure distribution.

Observation Tubes:

It is essential for all soil absorption systems to have observation tubes extending from the infiltrative surface (aggregate/sand interface) to or above the ground surface for the purposes of observing the performance of the infiltrative surface. The wells provide an easy access to the infiltrative surface to see if ponding is occurring. Tubes should be placed at 1/6, ½ and 5/6 points along the length of the absorption area. All observation tubes must be securely anchored. Fig. FF-18 illustrates three methods of anchoring the observation tubes. Slip or screw caps can be used. If brought to the surface, they should be recessed slightly as lawn mowers may destroy the caps. If brought above ground surface, Schedule 40 PVC pipe is required.



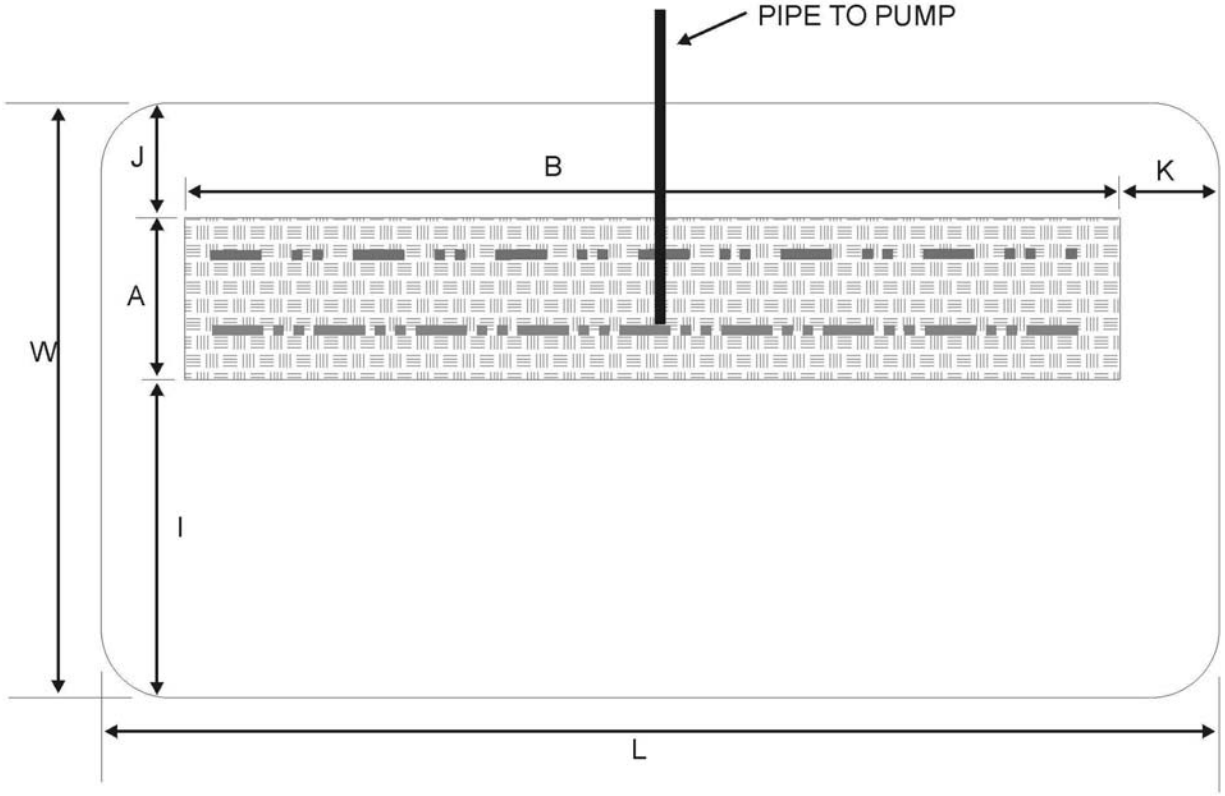


Figure FF-15 Cross Section and Plan View of a Mound System on a Sloping Site

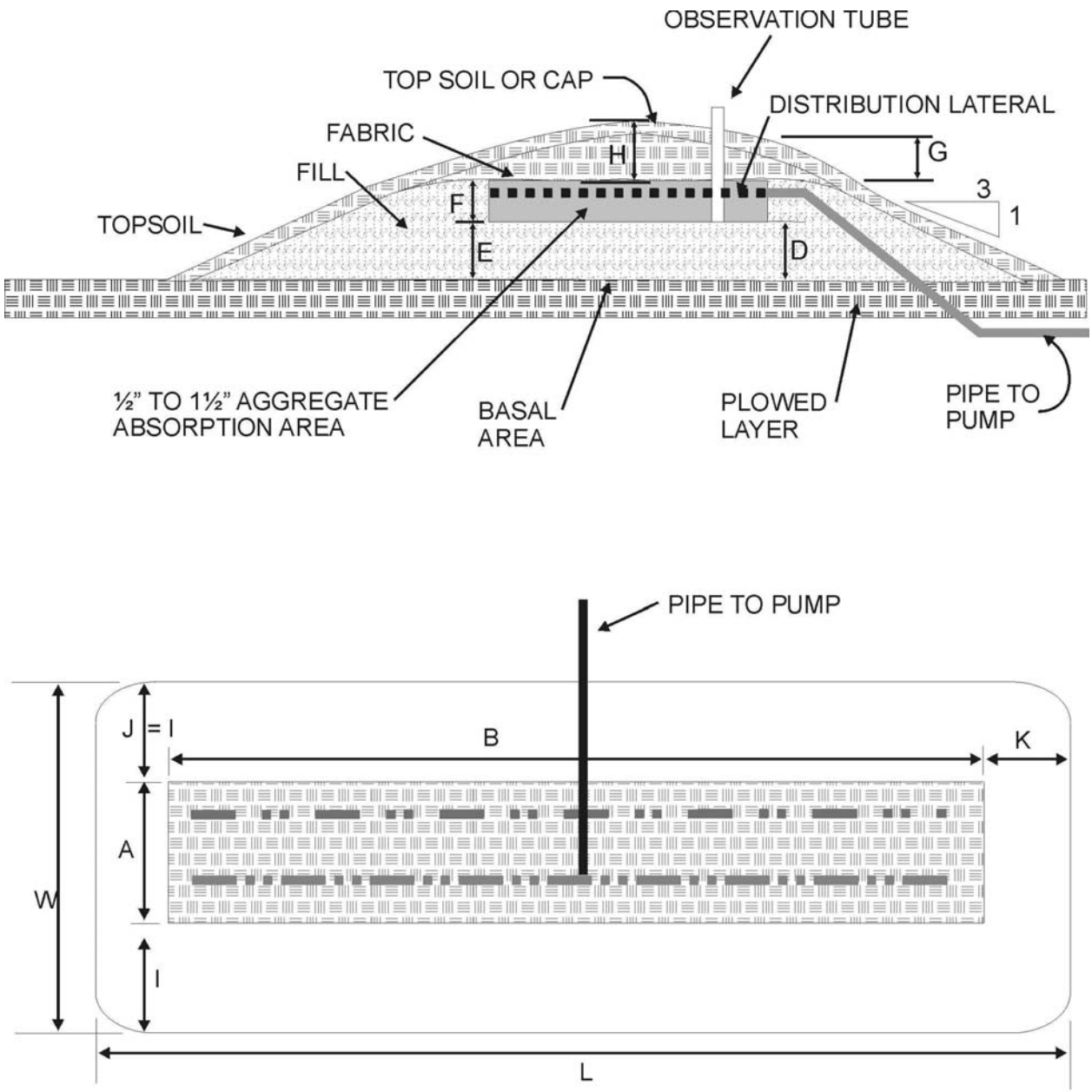
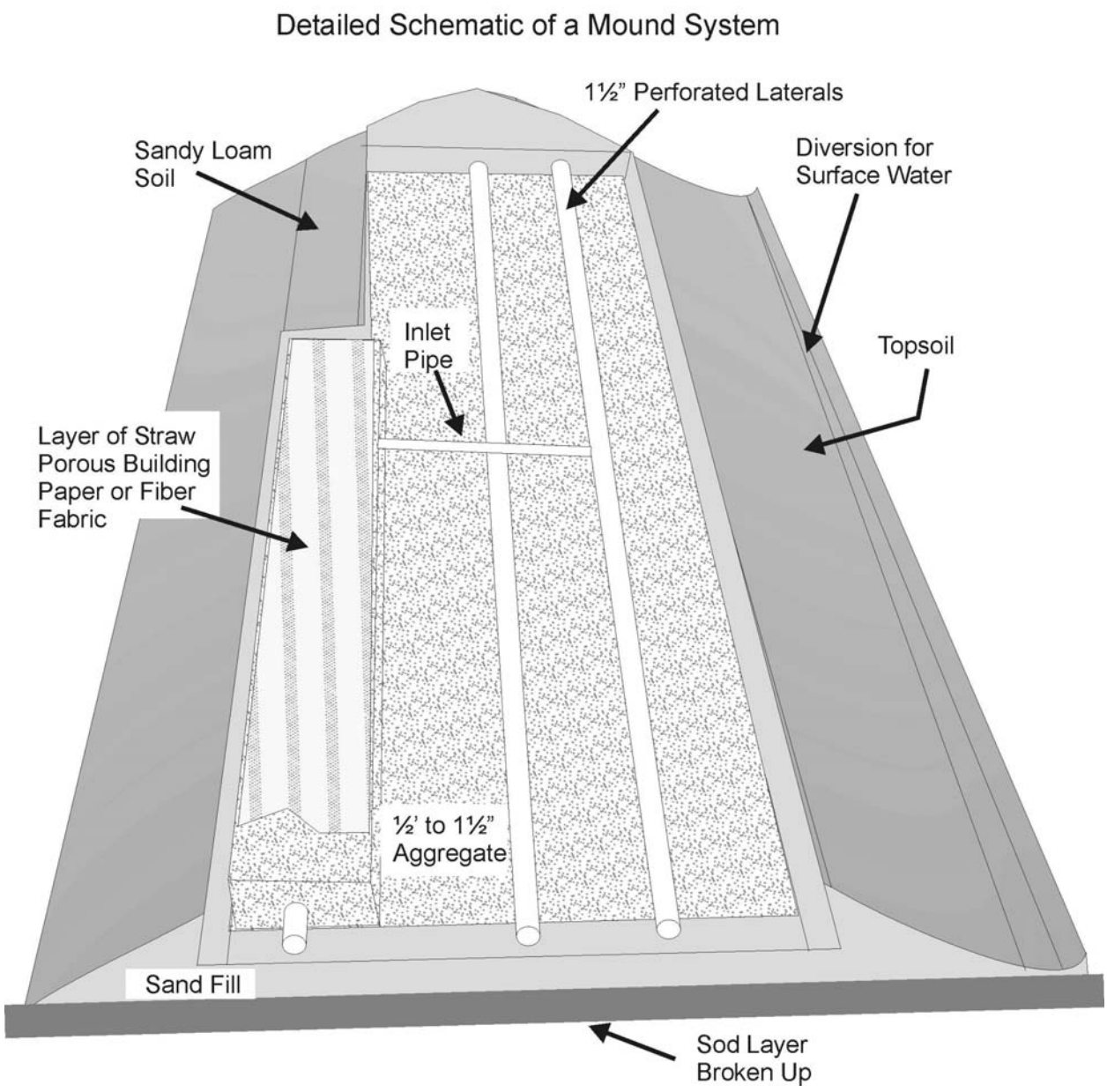


Figure FF-16 Cross Section and Plan View of a Mound System on a Level Site

Figure FF-19


Detailed Schematic of a Mound System
1½" Perforated Laterals
Sandy Loam Soil
Diversion for Surface Water
Inlet Pipe
Topsoil
Layer of Straw Porous Building Paper or Fiber Fabric
½' to 1½" Aggregate
Sand Fill
Sod Layer Broken Up

DESIGN EXAMPLE

Evaluate the following soil profile for a soil absorption system and if appropriate design a soil absorption system for the site.

Site Criteria

1. Soil Profile - Summary of 3 soil pit evaluations.

   0 - 6 in. sil; 10Yr6/4&2/1; strong, moderate, angular blocky structure; friable consistence.

   6 - 11 in. sil; 10&R5/3; moderate, fine platy structure; firm consistence.

   11-20 in. sic; 10YR6/3; moderate, fine, subangular blocky structure; firm consistence; few, medium, distinct mottles starting at 11".

   20-36 in. sic; 10YR5/3; massive structure; very firm consistence; many, medium, prominent mottles.

2. Slope 15%

3. The area available consists of 180 ft long along the contour and 50 ft along the slope. There are 3 medium sized trees in the area.

4. The establishment generates about 300 gallons of wastewater of domestic septic tank effluent quality per day based on meter readings.

Step 1. Evaluate the Quantity and Quality of Wastewater Generated.

For all on-site systems a careful evaluation must be done on the quantity of wastewater generated. As indicated earlier, most code values have a built in safety factor and includes peak flows. Thus these values can be used directly in the design calculations. However, it is appropriate for the designer to assess if the establishment is typical for the code values assigned to it. If metered values are used, it is recommended to double the average daily flow rate for design purposes. However, the average flow rate should be based on a realistic period of time and not be, for example, an average of six months of very low daily flow rates and 6 months of very high flow rates. If that is the case, then the high flow rates should be used for design.

The quality of the wastewater must also be assessed. If it is typical domestic septic tank effluent, these sizing criteria may be used. However, it if is commercial septic tank effluent, lower soil loading rates are recommended (Siegrist, et al., 1985).

Design Loading Rate - 600 gpd.

Step 2. Evaluate the Soil Profile and Site Description for Design Linear Loading Rate and Soil Loading Rate.

For this example and convenience the one soil profile description is representative of the site. A minimum of 3 evaluations must be done on the site. More may be required depending on the variability of the soil. The soil classifier must do as many borings as required to assure that the evaluation is representative of the site. In evaluating this soil profile the following comments can be made:

The silt loam (A) horizon (0 - 6 in.) is relatively permeable because of its texture, structure and consistence. The effluent flow through this horizon should be primarily vertical.

The silt loam (E) horizon (6 - 11 in.) has a platy structure and strong consistence. The consistence will

slow the flow up and the platy structure will impede vertical flow and cause the flow to move horizontally. However, if this layer is tilled, the platy structure will be rearranged and the flow will be primarily vertical. Thus tillage must be done at least 12 in. on this site to rearrange the platy structure.

The silty clay loam (B) horizon (11 - 20 in.) is slowly permeable because of the texture and firm consistence. The flow will be a combination of vertical and horizontal in the upper portions and primarily horizontal flow in the lower portion of the horizon due to the nature of the next lower horizon. During wet weather the (B) horizon may be saturated with flow moving horizontally.

The silty clay (C) horizon (20 - 36 in.) will accept some vertical flow as the effluent moves down slope horizontally in the upper horizons. The flow through this profile will be similar to the profile shown in Fig. FF-13c.

Based on experience a properly designed mound system should function on this site. It meets the minimum site recommendations found in Table 1.

Linear Loading Rate:

Based on this soil profile and discussion under the Linear Loading Rate section, the linear loading rate must be in the range of 3 - 4 gpd/1f.

Linear Loading Rates = 4 gpd/1f.

Soil (Basal) Loading Rate:

A soil loading rate for the soil horizon in contact with the sand (basal area) is selected based on the surface horizon (A). Use Table 2 to determine the design soil loading rate, which, for silt loam soil with moderate structure, is found under item (I), provided the platy structure is tilled.

Soil (Basal) Load Rate = 0.6 gpd/ft^2

Step 3. Select the Sand Fill Loading Rate.

The section entitled “Sand Fill Loading Rate” and Fig. FF-17 gives guidelines for selecting a suitable sand fill quality for the Wisconsin mound system. Other fills may be used but caution should be used as performance data is very limited with other fills.

Design Sand Loading Rate = 1.0 gpd/ft^2

Step 4. Determine the Absorption Area Width (A).

A = Linear Loading Rate / Sand Loading Rate

= 4 gpd/1f / 1.0 gpd/ft^2

= 4 ft

Step 5. Determine the Absorption Area Length (B).

B = Design Flow Rate/Linear Loading Rate

= 600 gpd/4gpd/1f

= 150 ft

Step 6. Determine the Basal Width (A + I).

The basal area required to absorb the effluent into the natural soil is based on the soil at the sand/soil interface and not on the lower horizons in the profile. An assessment of the lower horizons was done in step 2 when the linear loading rate was estimated. As discussed in Step 2, the soil (basal) loading rate is 0.6 gpd/ft^2.

(A+I) = Linear Loading rate / Soil Loading Rate

= 4 gpd/ft / 0.6 gpd/ft^2

= 6.7 ft

Since A = 4 ft

I = 6.7' - 4' = 2.7 ft (will be larger due to mound side slope)

Step 7. Determine Mound Fill Depth (D).

Assuming the code requires 3 ft of suitable soil and soil profile indicates 11 in. of suitable soil then:

D = 36" - 11" = 25 in.

Step 8. Determine Mound Fill Depth (E).

For a 15% slope with the bottom of the absorption area level then:

E = D + 0.15(A)

= 25" + 0.15(48")

= 32 in.

Step 9. Determine Mound Depths (F), (G), and (H).

F = 9 in. (6 in. of aggregate, 2 in. for pipe, and 1 in. aggregate)

G = 12 in. (6 in. in warmer climates)

H = 18 in. (12 in. in warmer climates)

Step 10. Determine the Upslope Width (J).

Using the recommended mound side slope of 3:1 then:

J = 3(D + F + G)

J = 3(25" + 9" + 12")

= 11.5 ft.

(Actual width will be less because of the site slope)

Step 11. Determine the End Slope Length (K).

Using the recommended mound end slope of 3:1 then:

K = 3((D+E)/2 + F + H)

= 3((25" + 32")/2 + 9" + 18")

= 14 ft.

Step 12. Determine the Down slope Width (I).

Using the recommended mound side slope of 3:1 then:

I = 3(E + F + G)

= 3(32 " + 9" + 12")

= 13 ft

(Actual width may be greater because of the site slope)

Note this value is greater than (I) in Step 6 and is the recommended width to use.

Step 13. Overall Length and Width (L + W).

L = B + 2K

= 150' + 2(14')

= 178 ft.

W = A + I + J

= 4 + 13 + 12

= 29 ft

If this site was level, then I = J. For soil profiles allowing more vertical flow, the linear loading rate could approach 10 gpd/1f and the mound would be shorter and wider.

Step 14. Design a Pressure Distribution Network.

A pressure distribution network system, including the distribution piping, dosing chamber and pump or siphons, must be designed (See Appendix O-VII).

MOUND SYSTEM WORKSHEET

1. Determine Flow Rate: _____ gallons/day

2. Determine Basal Loading Rate (see page F-25): _____ gpd / sq.ft.
(Sand Fill/ Soil Interface)

3. Determine Linear Loading Rate _____ gpd / lf
The size and configuration of the mound is based on how the effluent moves away from the system and the rate at which it moves away from the system.
a. Good soil structure, good permeability – Vertical Flow: 8-10 gpd/lf
b. Poor soil structure, slow permeability, shallow – Horizontal Flow: 3-4 gpd/lf

4. Sand fill design loading rate: 1.0 gpd/ sq.ft

A soil classifier should provide information for determining numbers 2 and 3. A soil classifier should certify the fill material as meeting the requirements in the manual.

5. Dimensioning the Mound

Step 4: Determine the Absorption Area Width (A)
A = Linear Loading Rate / Sand Fill Loading Rate

A =

Step 5: Determine the Absorption Area Length (B):
B = Design Flow Rate / Linear Loading Rate

B =

Step 6: Determine the Basal Width (A + I)
(A + I) = Linear Loading Rate / Basal Loading Rate

Basal Width =

I = Basal Width - A

Step 7: Determine Mound Fill Depth (D)
Code requires 2 feet of soil from bottom of absorption trench/bed and seasonal water.

D = 24" - _____ (Soil depth from original ground surface to seasonal water table)

D =

Step 8: Determine Mound Fill Depth (E)

E = D + (% Slope) A % slope is the slope of the land in area proposed for the mound.

E =

Step 9: Determine Mound Depths (F), (G), and (H).

F = Absorption Trench/Bed Aggregate Depth
F = 9" minimum aggregate depth (6" below pipe, 2"PVC pipe, 1" above pipe)

G and H are fill cover depths required over the absorption trench/bed.

G = 12"
H = 18"

Step 10: Determine Mound Upslope Width (J)
A maximum mound side slope of 3 to 1 is required.

J = 3(D + F + G)

J =

Step 11: Determine End Slope Length (K)
A maximum mound end slope of 3 to 1 is required.

K = 3((D + E)/2 + F + H))

K =

Step 12: Determine the Downslope Width (I):
A maximum mound side slope of 3 to 1 is required.

I = 3(E + F + G)

I =

Compare I with calculation in Step 6. Use largest number for downslope width.

Step 13: Overall Mound Length and Width

L = B + 2K

L =

W = A + I + J

W =

MOUND PERFORMANCE

The first Wisconsin mound system of the current design was installed in 1973. In Wisconsin alone there are over 12,000 mound systems. Many other states have adopted the technology. Proper siting of all soil absorption systems, including the mound, is essential otherwise the system may not function as planned.

In Wisconsin the mound system has a success rate of over 95% (Converse and Tyler, 1986). This success rate is due in part to a very strong educational program relating to siting, design and construction.

A mound can fail either at the 1) aggregate/sand interface due to a clogging mat or 2) at the sand/soil interface due to the inability of the soil to accept the effluent. Converse and Tyler (1989) discuss the mechanisms that may cause failure and methods to rectify the problems.

MOUND CONSTRUCTION

A construction plan for any on-site system is essential. A clear understanding between the site classifier, designer, contractor and inspector is critical if a successful system is installed. It is important that the contractor and inspector understand the principles of operation of the mound system before construction commences otherwise the system may not function as intended. It is also important to anticipate and plan for the weather. It is best to be able to complete the mound before it rains on it. The tilled area and the absorption area must be protected from rain by placing sand on the tilled area and aggregate on the absorption area prior to rain. The following points are essential.

1. The mound must be placed on the contour. Measure the average ground elevation (prior to tillage) along the upslope edge of the absorption area, which will be used to determine the elevation of the absorption area.

2. Grass, shrubs and trees must be cut close to the ground surface and removed from the site. In wooded areas with excessive litter, it is required to rake the majority of it from the site.

3. Locate the entrance of the force main into the mound. It is required to bring it into the center on the upslope side. If it must be brought in from the down slope side, especially on sites with horizontal flow, it must be brought in perpendicular to the side of the mound with minimal disturbance to the down slope area.

4. At the proper moisture level, the mound site must be tilled. The proper moisture level to a depth of 7 to 8 in. must be such that the soil will crumble and not take on a wire form when rolled between the palms. The purpose is to roughen up the surface and incorporate most of the vegetation. This can be done with a mold board plow, chisel plow or chisel teeth mounted on a tool bar attached to the bucket of a backhoe. The backhoe bucket teeth are not satisfactory and must not be used. Rototillers are prohibited on structured soils but can be used on unstructured soils such as sands. However, they are not recommended. Tilling along the contour is required. Protect the tilled area from rain by placing a layer of sand on it.

   If a platy structure is present in the upper horizons, it is necessary to till it. Normally the chisel teeth mounted on a backhoe bucket is preferred as it can be used to till around stumps and till deeper than the other methods. Stumps are not to be removed but tilled around. If there is an excessive number of stumps or boulders, then the basal area should be enlarged or another site found.

5. Once the site is tilled a layer of sand should be placed before it rains on the tilled area. Placement of the sand should be such as not to rut up or compact the tilled area. All work shall be done from the upslope side so as not to compact the down slope area especially if the effluent flow is horizontal away from the system. Sand should be placed with a backhoe or moved around the site with a track type tractor. Wheeled tractors will rut up the site.

6. Place the proper depth of sand then form the absorption area with the area bottom being level. Protect this infiltrative area from rain by placing the aggregate prior to rain.

7. Place a suitable aggregate to the desired depth in the area provided. The aggregate must be clean and sound and will not deteriorate. Limestone is not recommended.

8. Place the pressure distribution pipe and connect it to the force main and cover with 1 in. of aggregate.

9. Cover the aggregate with a geotextile synthetic fabric.

10. Place a minimum of 6 inches of suitable soil cover on the sides of the mound and to the prescribed depth on the top of the mound.

11. Final grade the mound and area with light weight equipment so surface water moves away from the mound and does not accumulate on the upslope side of the mound.

12. Seed and mulch the entire exposed area to avoid erosion. Landscape it with shrubs and plants so that it fits into the surrounding area. The top of the mound may be somewhat dry during the summer months and the down slope toe may be somewhat moist during the wet seasons (Schutt, 1981).

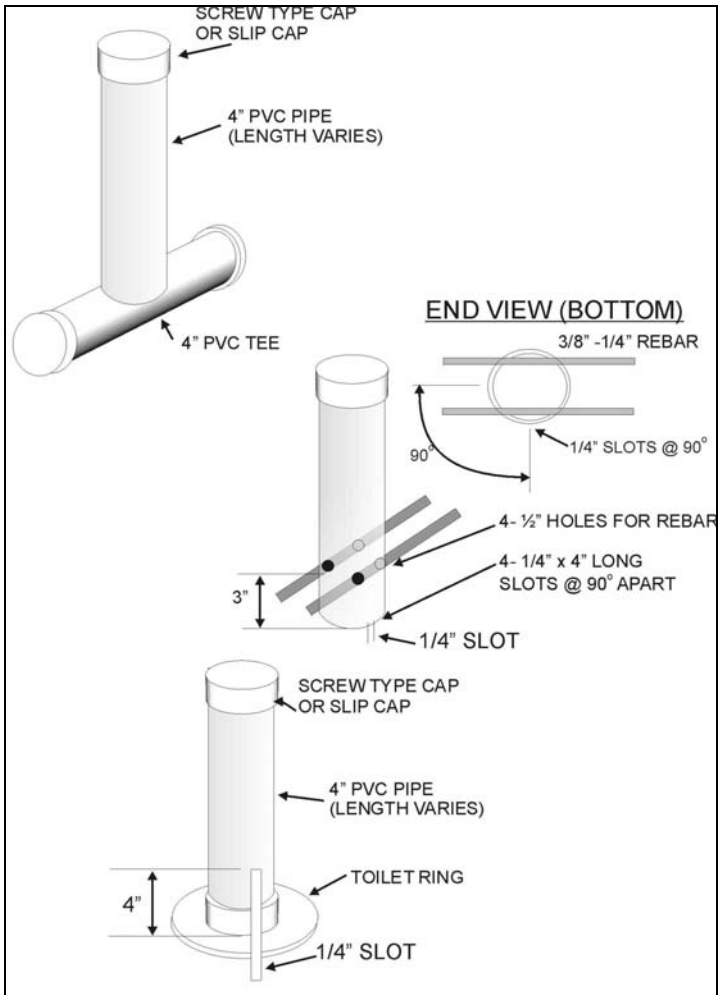


Figure FF-18 Three Methods for Stabilizing Observation Tubes

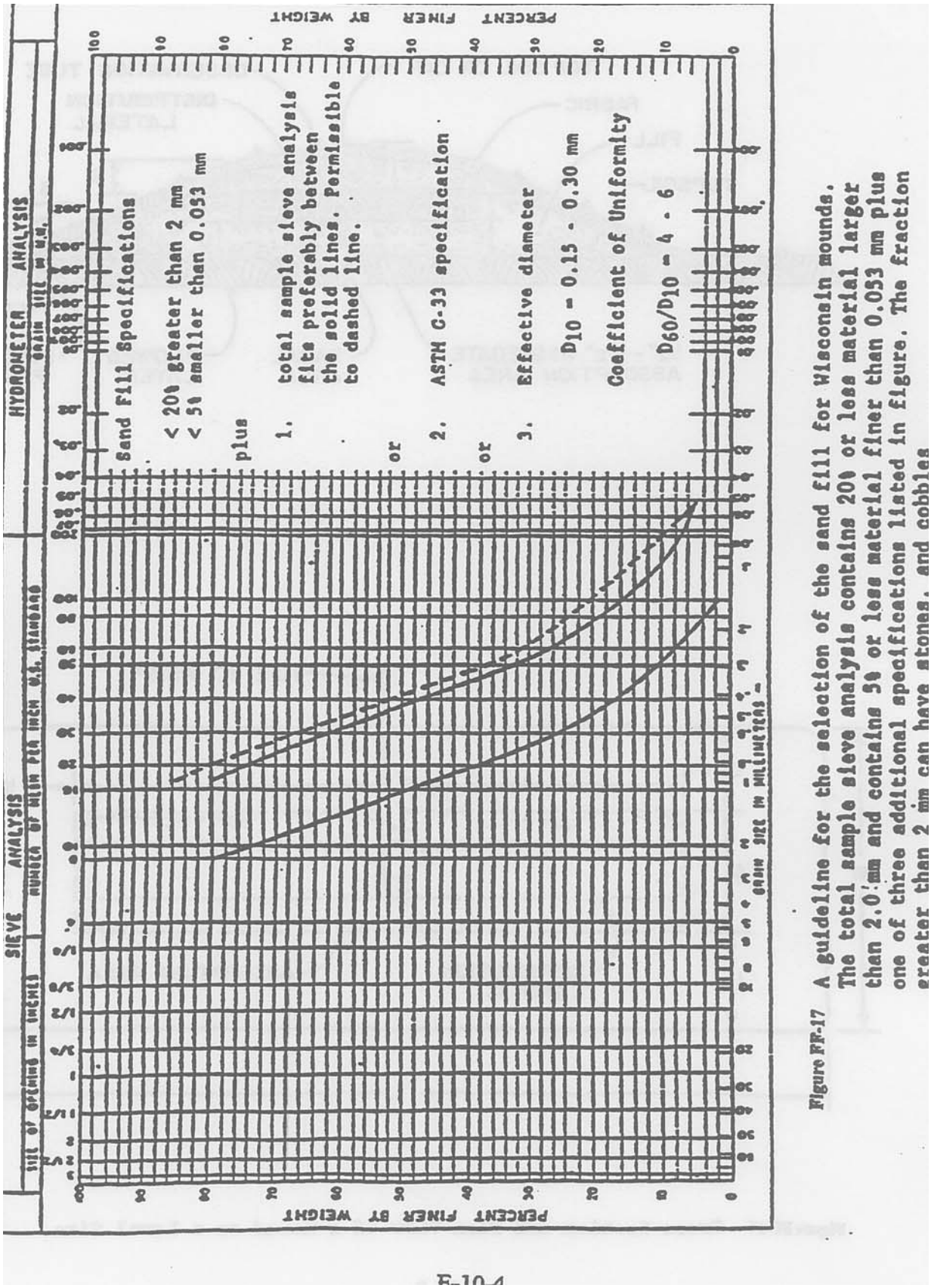


Figure FF-17 A guideline for the selection of the sand fill for Wisconsin mounds. The total sample sieve analysis contains 20% or less material larger than 2.0 mm and contains 5% or less material finer than 0.053 mm plus one of three additional specifications listed in figure. The fraction greater than 2 mm can have stones, and cobbles

F-10.4

Minimum Criteria for Pressurized Subsurface Absorption Fields Utilizing Emitters

Subsurface systems utilizing emitters may be used in lieu of conventional or other alternative absorption fields. The number of subsurface land disposal systems continues to increase as sites are developed with conditions unsuitable for many other wastewater treatment systems. This document provides guidelines and criteria for the planning, design and operation of pressurized subsurface absorption fields utilizing emitters, commonly referred to as drip irrigation.

The term drip irrigation as used in this document refers to the treatment of wastewater by irrigation below the land's surface. These systems are designed and operated so that there is no direct discharge of wastewater to the land's surface. The irrigated wastewater transpires to the atmosphere and enters the groundwater through infiltration and percolation. Organic constituents in the wastewater are consumed or stabilized by soil bacteria. Organic and ammonia nitrogen are taken up by plants, nitrified by soil bacteria, lost to the atmosphere through denitrification, leached into the groundwater or stored as soil nitrogen in the site biota. Phosphorous and many metal constituents are absorbed into soil particles and taken up by plants. Properly designed and operated wastewater irrigation systems produce a percolate water of high quality and thus protect ground and surface waters.

The criteria in this document only apply to domestic wastewater. The drip irrigation technology is based on maintaining aerobic conditions in the soil. Therefore dosing and resting cycles must be established as part of the plan of operation and management. In order for systems to maximize nitrogen removal and prevent nitrate nitrogen from contaminating the groundwater, the installation of the subsurface dripper lines should be within the root zone of the cover vegetation. The on-site wastewater system will consist of aerobic pretreatment followed by a subsurface distribution system utilizing emitters to distribute a controlled flow of wastewater to the soil. Drip irrigation systems must be capable of providing an equal flow distribution of wastewater effluent applied throughout the application field(s) at a predetermined application rate. It is imperative that all drip irrigation systems maintain uniform and accurate control of the effluent emission rates. Equipment must be provided that will identify and record any fluctuations in the wastewater flow through the system. All equipment proposed for use must be certified and warranted by the manufacturer that it has been tested for use with wastewater. A drip irrigation system may be sold as a complete package. All prepackaged systems must be approved by the Department prior to sale in the state of Georgia. A state of Georgia registered engineer must design drip irrigation systems designed on a site-specific basis.

Design Criteria

A. Pretreatment
   1. Aerobic: The drip emitter system shall be preceded by a pretreatment process designed to reduce the wastewater biological oxygen demand (BOD5) to a maximum concentration of 25 milligrams per liter (mg/l) and total suspended solids (TSS) concentration to a maximum of 30 milligrams per liter (mg/l). The aerobic pretreatment process must be reviewed by Technical Review Committee and approved by the Department.

B. Dosing Tanks
   1. The dosing chamber shall meet all requirements established in the On-Site Manual, Chapter 290-5-26-.06 and have a minimum capacity equal to the 24 hour waste flow from the facility served. The dosing chamber shall be equipped with an audible and visible alarm that indicates a high water level or loss of power to the pump or controls.
   2. Time dosing shall be utilized to dose the absorption field or zones. The frequency of dosing shall be based on the soil's hydraulic loading rate and the design flow. Fields or zones shall be time dosed to insure the total 24 hour wastewater effluent flow is applied in a 24 hour period.
   3. All new systems must be equipped to detect a plus (+) or minus (-) 10% change in flow rate in the disposal field due to clogging of the filters, a force main break, emitter clogging, leaks in the field lines and a flush valve failure.

C. Subsurface Absorption Field

All components of the subsurface absorption system must be reviewed by Technical Review Committee and approved by the Department for use in the state of Georgia. Any component changes will require a review and approval prior to use. The emitter subsurface absorption field system must meet the following requirements:

1. Dose the entire absorption field or zone equally. The length of each distribution line shall not exceed the manufacturers' specifications to insure equal application of wastewater effluent from each emitter. No more than a 10 percent variation in flow between individual emitters anywhere within a separately dosed zone, including drain back is acceptable.
2. Drain back - When slopes exceed five percent, check valves or other approved means shall be used in the supply and return manifolds to minimize drainage into the lowest area of the zone.
3. Emitter line and emitters must be warranted by the manufacturer for wastewater application and approved by the Department. Emitter lines must be identified with the manufacturer's name and product number. Emitters shall be pressure or non-pressure compensating emitters. Emitters shall be spaced either one foot or two feet apart within the emitter line.
4. The wastewater effluent must be filtered to emitter manufacturer's specifications to insure the proper operation of the distribution system.
5. Filtration system shall be automatically self-cleaning and the filter residue and backwash returned to the treatment unit, with provisions made to minimize disturbance of any solids settling chamber (ex. Provide baffles or comparable intake structure in septic tank to minimize solids re-suspension in the inlet compartment).
6. Typically, separation between emitter line laterals will be two feet. However, a one-foot separation between emitter line laterals may be allowed without a reduction in absorption field area. Lateral spacing of three feet or greater is required on slopes exceeding 20%.
7. Individual emitter lines shall be designed and installed level, following the naturally occurring ground contour, with a maximum allowable variance of plus (+) or minus (-) six (6") inches within any linear one hundred (100') foot segment.
8. Emitter lines shall be installed in the root zone of the cover vegetation, a depth of 8 to 12 inches from the original undisturbed ground surface, and /or shall be a minimum of eight inches from the ground surface.
9. A system for automatic flushing of distribution lines should be provided and performed according to manufacturer's recommendations, at a minimum on a bi-monthly basis. Velocities must be a minimum of two feet per second at the distal end of each drip irrigation line or return line during the flushing operation.
10. All materials shall meet applicable ASTM standards, be chemical resistant, and be approved for wastewater usage.
11. Equipment susceptible to freezing must be adequately protected to prevent freezing.
12. There must be a totally separate absorption field replacement area equivalent in size to 100% of the emitter field installed or for a conventional absorption field, whichever is larger.
13. A vibratory plough, ditch witch or backhoe may be utilized for drip line installation.

D. Site Criteria

1. The minimum horizontal setback requirements established in the On-Site Sewage Management System Manual, Chapter 290-5-26-.07(3) shall be met.
2. Required vertical separation requirements shall be measured from the bottom of the drip tubing or trench bottom, whichever is greater.
    a. There shall be a minimum vertical separation of 12 inches between the bottom of the absorption field and any seasonal groundwater table, rock or impervious soil strata. Greater vertical separation may be required if a site is hydraulically limited as determined by soil investigations by the soil classifier or design engineer.
    b. Areas subject to surface water ponding shall not be considered for installation.

E. Absorption Field Sizing

1. Table FT-6 shall be used in determining the hydraulic loading rate for subsurface absorption fields utilizing emitters. The design hydraulic loading rate shall be based on the most hydraulically limiting, naturally occurring soil horizon within one (1') foot of the drip line or trench bottom, which ever is greater.
2. Facilities utilizing approved aerobic pretreatment shall not have a waste stream that exceeds a fat, oil and grease content of 25mg/l prior to soil application.
3. In calculating the number of square feet for the absorption field, the design daily sewage flow shall be divided by the maximum hydraulic loading rate determined by the Table FT-6. In calculating the minimum linear length of drip emitter line required, the total square footage of the absorption field shall be divided by two feet.
4. There shall be a totally separate area available for 100% replacement of the emitter absorption field or a conventional absorption field, whichever is larger.

F. Application Requirements

1. The following information shall be submitted to the local county health department for evaluation and approval in order to obtain a construction permit for on on-site sewage management system utilizing pressurized subsurface absorption fields with emitters:
   a. A level IV soil investigation including detail with soil horizons identified and hydraulic loading rates determined for each horizon.
   b. A site plan at a minimum scale of 1 inch to 40 feet including; topography with two feet contour changes and soil types overlaid; house or facility location scaled with driveways, sidewalks, parking, and other structures shown; location of utilities, wells, water bodies or courses and easements.
   c. Sewage system must be scaled on site plan including; pretreatment unit, drip line (wastewater approved), force main, return line, manifolds, location of check valves and air vents.
   d. System Design Criteria including; type of pretreatment, sewage flow rate, absorption line calculation, pump size (make and model #), and pipe sizes identified (Schedule 40).
   e. Type of emitter tubing (manufacturer and product # - wastewater approved).
   f. A manufacturer certified system design approved by the Department or a state of Georgia registered engineer system design is required. A state of Georgia registered engineer shall design systems with a design sewage flow in excess of 2,000 gallons per day.
   g. Site plans shall bear the signature of the designer and the following statement: I certify this sewage system design meets the minimum design requirements established by the Georgia Department of Human Resources Manual for On-Site Sewage Management Systems.

G. Operation and Maintenance

Satisfactory operation and maintenance of pressurized subsurface absorption fields are necessary to safeguard the health of the user and the public.

1. A three year initial service policy shall be furnished to the user by the manufacturer or licensed distributor, and shall be included in the original purchase price. This policy shall provide:
   a. A minimum of 6 inspection/service visits (scheduled once every six months over the three year period), during which electrical, mechanical, and other applicable components are inspected, adjusted, serviced and/or replaced.
   b. Emergency service shall be available within no more than two days following a request. The owner and local county health authority shall be notified immediately in writing of any improper operation observed which can not be corrected at the time of the service call and the estimated date of correction.
   c. A clearly visible, permanently attached label or plate, giving instructions for obtaining service, shall be placed at the visual alarm signal.

2. A user's manual shall be provided by the manufacturer or licensed distributor to the facility owner.
3. Facility owners shall be offered a continuing service contract.

4. Facilities with a design flow in excess of 2,000 gallons per day shall submit to the local health authority a Plan of Operation and Management. The plan must address wastewater application rates, drip field cycling, monitoring requirements, maintenance schedules and all other information necessary for successful operation.

Table FT-6
Hydraulic Loading Rates for Fields Utilizing Emitters
Class I Effluent

Soil Group	Soil Textural Classes (USDA classification)	Percolation Rate (min./in.)	Maximum Hydraulic Loading Rate (gpd/sq.ft)
I.	Sands (Sand and Loamy Sand)	<10	0.4 to 0.3
II.	Coarse Loams (Sandy Loam and Loam	10-30	0.3 to 0.15
III.	Fine Loams (Sandy Clay Loam, Silt Loam, Clay Loam, Silty Clay Loam, Silt)	30-60	0.15 to 0.1
IV.	Clays (Sandy Clay, Silty Clay, Clay)	>60	0.1 to 0.04

Guidelines for domestic wastewater application for absorption fields designed for Class I effluent

1. Systems producing a Class I effluent quality are allowed a vertical separation distance of 12 inches between the bottom of the absorption trench and any restrictive horizon with no reduction in absorption field size.
2. System producing a Class I effluent quality are allowed an absorption field reduction provided the restrictive horizon is a minimum of 24 inches below the bottom of the absorption trench.
3. Maximum absorption field reduction shall be based on the standards established through the Technical Review committee as illustrated in Table FT-7.
4. When a Class I effluent system is used in conjunction with an absorption field bed design, timed dosing of the effluent shall be utilized to dose the absorption field. The frequency of dosing shall be based on the soil's hydraulic conductivity and the design flow. The absorption field bed shall be timed dosed in a manner that uniformly distributes the effluent across the entire bed with no more than a 10% variation in flow. The absorption field shall be timed dose to ensure the expected 24 hour effluent flow is applied in a 24 hour period.
5. The required absorption field area shall be based on the most hydraulically limiting soil horizon in contact with the infiltrative surface of the absorption field sidewall, bottom and extending for a distance one (1') foot below the absorption field.

Table FT-7
This chart correlates (approx.) percolation rates, soil texture and infiltration rates for the purpose of absorption field sizing for approved systems in Georgia producing a Class I effluent for domestic wastewater application.

Percolation Rate	**Soil Group**	**Infiltration Rate Bed Absorption Field**		**Infiltration Rate Trench Absorption Field**
Minutes/Inch	**Classification/Texture**	**Gal/Day/Sq. Ft.**		**Gal/Day/Sq. Ft.**
		Depth to Limiting Horizon		
		2 Ft.	**1 Ft.**	**2 Ft.**
5	Group I – Sand, Loamy Sand	1.31	.97	1.6
10		1.18	.71	1.5
15		1.09	.61	1.4
20		1.0	.59	1.3
25		0.92	.54	1.2
30	Group II – Sandy Loam, Loam	0.82	.50	1.1
35		0.75	.47	1.0
40		0.67	.45	0.9
45		0.63	.42	0.85
50		0.59	.37	0.8
55		0.55	.35	0.75
60	Group III – Sandy Clay Loam, Silt Loam, Clay Loam, Silty Clay Loam, Silt	0.51	.34	0.7
65		0.47	.33	0.65
70		0.43	.32	0.6
75		0.39	.31	0.55
80		0.36	.31	0.5
85		0.32	.30	0.45
90		0.28	.30	0.4
95		Not approved		0.39
100	Group IV – Sandy Clay, Silty Clay, Clay	Not Approved		0.385
105		Not Approved		0.38
110		Not Approved		0.375
115		Not Approved		0.37
120		Not Approved		0.365

Table DT-1

Percolation Coefficient Calculations
(Commercial and Industrial Facilities)

Public Health Service Formula $C = \frac{5}{\sqrt{T}}$

Perc Time Min/In	Sq Root of T	Sq Ft/Gal (Multiply)	Gal/Sq Ft (Divide)	Perc Time Min/In	Sq Root of T	Sq Ft/Gal (Multiply)	Gal/Sq Ft (Divide)
T	$\sqrt{T}$	$\frac{\sqrt{T}}{5}$	$\frac{5}{\sqrt{T}}$	T	$\sqrt{T}$	$\frac{\sqrt{T}}{5}$	$\frac{5}{\sqrt{T}}$
5	2.236	.447	2.236	49	7.000	1.400	.714
6	2.449	.490	2.042	50	7.071	1.414	.707
7	2.646	.529	1.890	51	7.141	1.429	.700
8	2.828	.566	1.768	52	7.211	1.442	.693
9	3.000	.600	1.667	53	7.280	1.456	.687
10	3.162	.632	1.581	54	7.348	1.470	.680
11	3.317	.663	1.507	55	7.476	1.483	.674
12	3.464	.693	2.443	56	7.483	1.497	.668
13	3.606	.721	1.387	57	7.550	1.510	.662
14	3.742	.748	1.336	58	7.616	1.523	.657
15	3.873	.775	1.291	59	7.681	1.536	.651
16	4.000	.800	1.250	60	7.746	1.549	.646
17	4.123	.825	1.213	61	7.810	1.562	.640
18	4.243	.849	1.178	62	7.847	1.575	.635
19	4.359	.872	1.147	63	7.937	1.587	.630
20	4.472	.894	1.118	64	8.000	1.600	.625
21	4.583	.917	1.091	65	8.062	1.612	.620
22	4.690	.938	1.066	66	8.124	1.625	.615
23	4.796	.959	1.043	67	8.185	1.637	.611
24	4.899	.980	1.021	68	8.246	1.649	.606
25	5.000	1.000	1.000	69	8.306	1.661	.602
26	5.099	1.020	.981	70	8.367	1.673	.598
27	5.196	1.039	.962	71	8.426	1.685	.593
28	5.292	1.058	.945	72	8.485	1.697	.589
29	5.385	1.077	.929	73	8.544	1.709	.585
30	5.477	1.095	.913	74	8.602	1.720	.581
31	5.568	1.114	.898	75	8.660	1.732	.577
32	5.657	1.131	.884	76	8.718	1.744	.573
33	5.745	1.149	.870	77	8.775	1.755	.570
34	5.831	1.166	.857	78	8.832	1.766	.566
35	5.916	1.183	.845	79	8.888	1.778	.562
36	6.000	1.200	.833	80	8.940	1.789	.559
37	6.083	1.217	.822	81	9.000	1.800	.556
38	6.164	1.233	.811	82	9.055	1.811	.552
39	6.245	1.249	.801	83	9.110	1.822	.549
40	6.325	1.265	.791	84	9.165	1.833	.546
41	6.403	1.281	.781	85	9.220	1.844	.542
42	6.481	1.296	.771	86	9.274	1.855	.539
43	6.557	1.311	.763	87	9.327	1.865	.539
44	6.633	1.327	.754	88	9.381	1.876	.533
45	6.708	-1.342	.745	89	9.434	1.887	.530
46	6.782	1.356	.733	90	9.487	1.897	.527
47	6.856	1.371	.729				
48	6.928	1.386	.722				

Table DT-1 (cont'd)
Percolation Coeficient Calculations
(Commercial and Industrial Facilities)

Public Health Services Formula $C = \frac{5}{\sqrt{T}}$

Perc Time Min/In	Sq Root of T	Sq Ft/Gal (Multiply)	Gal/Sq Ft (Divide)
T	$\sqrt{T}$	$\frac{\sqrt{T}}{5}$	$\frac{5}{\sqrt{T}}$
91	9.549	1.908	0.524
92	9.592	1.918	0.521
93	9.644	1.929	0.518
94	9.695	1.939	0.516
95	9.747	1.949	0.513
96	9.798	1.960	0.510
97	9.849	1.970	0.508
98	9.899	1.980	0.505
99	9.950	1.990	0.503
100	10.000	2.000	0.500
101	10.050	2.010	0.498
102	10.100	2.020	0.495
103	10.149	2.030	0.493
104	10.198	2.040	0.490
105	10.247	2.049	0.488
106	10.296	2.059	0.486
107	10.344	2.069	0.483
108	10.392	2.078	0.481
109	10.440	2.088	0.479
110	10.488	2.098	0.477
111	10.536	2.107	0.475
112	10.583	2.117	0.472
113	10.630	2.126	0.470
114	10.677	2.135	0.468
115	10.724	2.145	0.466
116	10.770	2.154	0.464
117	10.817	2.163	0.462
118	10.863	2.173	0.460
119	10.909	2.182	0.458
120	10.954	2.191	0.456

Table DT-2
Absorption Field

After determining the site percolation rate, the following table shall be used to determine the required absorption field area.

Percolation Rate (Minutes/Inch)	**Absorption field area per Bedroom** (Square Feet)
5	125
10	165
15	190
20	210
25	230
30	250
35	265
40	280
45	300
50	310
55	325
60	335
65	345
70	355
75	365
80	370
85	375
90	380
95	385
100	390
105	395
110	400
115	405
120	410

For sites less than 3 acres in size, soil horizons that exceed a percolation rate of 90 minutes per inch shall not be considered for installation of a conventional on-site sewage management system.

For sites of 3 acres or more in size, soil horizons that exceed a percolation rate of 120 minutes per inch shall not be considered for installation of a conventional on-site sewage management system.

Experimental On-Site Sewage Management Systems

1. DEFINITION:

   An Experimental Onsite Sewage Management System is defined as "any onsite sewage management system proposed for testing and observation and provisionally approved for such purpose by the Department but which has not been fully proven under field use."

2. REQUEST FOR APPROVAL:

   Manufacturers shall make application to the Department for an individual experimental onsite sewage management system (experimental system) temporary approval for the installation of a limited number of systems to be evaluated over a prescribed period of time. The application shall include the following as applicable:

   a. Remittance of the current fee for the technical review of new onsite sewage management products/systems.
   b. Description of the system, including materials used in construction and its proposed use.
   c. Summary of pertinent literature, published research and previous experience and performance with the system.
   d. Results of any available testing, research or monitoring of pilot systems or full-scale operational systems conducted by a third party research or testing organization.
   e. Identification and the qualifications of any proposed research or testing organization and the principal investigators, as well as an affidavit certifying that the organization and principal investigators have no conflict of interest and do not stand to gain financially from the sale of the experimental system.
   f. A monitoring protocol, outlining a research and testing plan for a representative number of installations. The protocol shall include a defined list of objectives, parameters to be monitored and test methodology, data collection and reporting forms and a schedule for the completion of the outlined activities. The minimum period of research, testing and monitoring is three years.
   g. Specification of the number of systems proposed to be installed, the criteria for site selection, system monitoring and reporting procedures.
   h. Operation and maintenance procedures, system classification, proposed management entity and system operator.
   i. Procedure to address system malfunction and replacement or premature termination of any proposed research or testing.
   j. Notification of any proprietary information system, component or device.

3. TECHNICAL REVIEW:

   The Technical Review Committee (the Committee) shall review applications for such proposed experimental systems and upon the Committee's recommendation, the Department may forward an experimental system temporary approval and system registration to the manufacturer. A copy of this approval will be distributed to all District Environment Health Program Directors. The approval will indicate the conditions under which a limited number of a given type of experimental system may be installed as outlined in applicable parts of paragraphs 2b-2j above. No more than ten experimental systems of one individual type system will be allowed to be installed in each District, unless the Committee specifies a greater or lesser number may be allowed.

4. PERMITTING:

   Property owners, authorized distributors or installers shall make an application for each installation of an approved experimental system to the County Environmental Health Office. In addition to documentation required by Chapter 290-5-26-.03(2), the Committee and the Manual, the application will include a consent letter from the property owner or authorized agent, on forms provided by the Department, acknowledging the experimental nature of the system and holding the Georgia Department of Human Resources and cooperating County, District and State personnel harmless regarding the installation or use of an experimental system. The property owner or authorized agent shall agree to allow the distributor, installer and environmental health personnel from the County, District and State, access to the site at reasonable hours to evaluate the functioning of the system.

The County Environmental Health Office will evaluate the permit application, which must include data on soils acceptability; such data may include but not be limited to: test holes, percolation tests and soil report(s) by a certified Soil Classifier. An onsite evaluation will be performed and a proposed experimental system installation permit developed for each proposed installation site.

When permitting installation of the experimental system, the permit conditions shall include requirement of a reserve area sufficient for installation of a conventional system, except:

a. When an existing and properly functioning wastewater system is available for immediate use including connection to a public or community wastewater system; or
b. When the experimental system is to serve as a repair to an existing malfunctioning system.

The special maintenance, monitoring, testing and reporting requirements shall also be specified as permit conditions, in accordance with the research and testing program/protocol approved by the Committee. All required review documentation will be forwarded along with the proposed installation permit to the District for approval.

The District shall approve or deny requests for individual installations of approved experimental systems based on the review of the required information. Once three installations of a given type of experimental system have been permitted, the District may delegate approval to the County for subsequent permit approvals. Approval or denial shall be issued within ten days of the receipt of the complete review information.

The County will issue an installation permit once it is signed by the permit applicant, and payment of appropriate County permitting fees have been received; only then can construction of the experimental system begin.

5. INSTALLATION:

The manufacturer will identify its distributors and installers in the State of Georgia that have been instructed and trained on the installation, operation and maintenance of the experimental system. Installers shall be certified in accordance with Chapter 290-5-26-.17. Certified installers shall be the ONLY personnel approved to install experimental systems. Failure to carry out the installation permit conditions shall be grounds for permit suspension or revocation.

The County staff will inspect the installation of the experimental system. Once final approval has been granted to the installation, a copy of the completed inspection documentation will be forwarded through the District to the Department.

Repairs or modifications to an approved experimental system installation must be recorded and reported by the manufacturer to the County for issuance of an appropriate repair permit, inspection and approval of the repair(s).

6. RECORD KEEPING:

The Department, District and County will maintain a separate filing system and database to track experimental system installations.

7. MONITORING AND TESTING:

As indicated in paragraph 3 above, the Committee will approve design of a monitoring, testing and reporting protocol as appropriate for each approved experimental system. The Department, District and County, as applicable, shall implement the protocol. Unless otherwise approved by the Committee, no more than ten of a given experimental system will be allowed to be installed in each District during this monitoring and testing period.

8. FINAL DISPOSITION:

Upon completion of the monitoring, research and testing, the manufacturer or appropriate research and testing organization or individual and appropriate District and County Environmental Health Offices, shall provide a final report including recommendations on future use of the system to the Committee for review. Based upon the Committee's action, the Department may issue a final disposition on the status of the experimental system. This will consist of, but not necessarily be limited to, denial or approval as an alternative onsite sewage management system for statewide use.

ADMINISTRATIVE AND MONITORING CRITERIA FOR AN EXPERIMENTAL SEWAGE SYSTEM

The undersigned, in support of the attached proposal to use a(n) _____
(system type)
experimental sewage system (ESS) to serve the property at, _____
(address)
_____, _____, _____, submits the following:
(municipality/city) (state) (county)

This proposal is for a full-time, single family residential or other Property. It is not for a seasonal, part-time or recreational use structure.

As owner of the property to be served by a(n)_____ experimental sewage system. I acknowledge the importance of conducting the monitoring, reporting and maintenance activities in a timely fashion and accept responsibility for performing these activities for a period of three (3) years from the date of system installation and start-up. I realize that the monitoring program is a condition of the permit, which is enforceable at law.

The monitoring program for this system shall consist of the following activities:

1. Determining whether the observation ports contain ponded liquid and recording these results;
2. Measuring and recording the depth of any liquid in the ports;
3. Conducting a visual examination of the areas immediately adjacent to and down slope of the experimental sewage system for seepage, sponginess, leakage or any other evidence of discharge of liquid from the experimental sewage system; and recording and reporting the results of this examination on the monitoring report form included in this proposal (see page G-5);
4. Recording monthly water usage data (gallons);
5. Performing the activities in 1, 2, 3, and 4 above monthly and submitting a report to the County Environmental Health Program Director (CEHPD) with a copy forwarded through the District Environmental Health Office to the Department every three months (quarterly).

I am aware that this is an experimental system that may fail and that in the event this system malfunctions, I am solely responsible to replace or repair the system in accordance with the replacement provision of this proposal. (See Plot Plan for replacement area location and provisions for its protection).

I acknowledge my responsibility to inform the CEHPD immediately of any malfunction or modification of the system by others or myself.

As owner of the property, I grant environmental health personnel from the County, District and Department access to my property for the purpose of conducting additional testing, observation and monitoring for the duration of the experiment proposal (three years from the date of system activation).

Further, I agree to notify the CEHPD at least seven days prior to system installation so the District and Department may observe and monitor the system installation.

The septic tanks, which are part of this experimental sewage system, will be pumped at least once, during the last quarter of the third year, to prolong system life. Evidence, in the form of a receipt from the septic tank pumper, that the pumping has been performed will be submitted with the last quarterly monitoring report at the end of the third (3rd) year.

_____
Owner/Applicant Date

EXPERIMENTAL SEWAGE SYSTEM MONITORING RECORD

(Property Owner) (Street Address) (City) (County)

(P. O. Address) (State) (Zip) (Type of System) (Date Installed)

INSTRUCTIONS: Record all information each month; use the comments column to record maintenance activities, locations of surface discharge of sewage effluent or describe unusual conditions.

Date mo/day/ yr	Liquid Seepage Over Trench or Down slope		Observation Ports-Liquid Levels						Comments
			Port #1			Port #2			
	Yes	No	No (Inches)	Yes	Depth (Inches)	No	Yes	Depth	

For Official Use Only

NOTE: Monitoring and reporting of results from this experimental system is a permit condition enforceable by law. Each quarter (every three months) for three years from the time of installation, a completed copy of this form must be submitted to the following offices:

1. County Environmental Health Program Director
   (Name)
   P. O. Box/Street City/State/Zip

2. District Environmental Health Program Director
   (Name)
   P. O. Box/Street City/State/Zip

3. Georgia Department of Human Resources
   Division of Public Health, Environmental Health Section
   2 Peachtree Street, N.W., 16th Floor
   Atlanta, Georgia 30303-3186

Site Modifications

1. General guidelines for filling of land are as follows:

a. *Uniformity of fill materials* - Any variability of the fill material used for absorption of sewage effluent will likely cause problems for on site sewage management systems. Fill must not include stumps, logs, rocks, brick, concrete or extraneous materials. Fill material must meet ASTM C-33 Specifications for Fine Aggregate with less than five percent passing a number two hundred sieve, (see section H-6, paragraph 8.). Other fill materials may be acceptable, however, they must have a permeability of between 0.0005 meters per second (m/sec) and 0.00003 (m/sec) at ninety-five percent Standard Proctor Compaction. The simplified falling head permeability test procedure as described in section H-6, paragraph 8 or other ASTM approved testing procedures may be used for determining permeability of fill.

b. *Compaction of Fill* - Fill material must be compacted to a density of undisturbed soil in the proposed absorption field area (90% Standard Proctor Compaction) before the installation of an on site sewage management system can be allowed. This can be done naturally or mechanically. The fill material should be placed in lifts not exceeding 12 inches loose thickness and compacted to the density specified. The County Board of Health may require a Standard Procter Compaction test.

c. *Original soil surface to be plowed* - Heavy topsoil, and black or very dark gray organic topsoil and vegetation must be removed from the fill site area and the exposed underlying soil plowed to prevent formation of an impervious barrier between the fill and natural soil. Plowing of the original soil shall be done only while dry to a depth of six to eight inches, throwing the soil toward the center of the area to be developed. The proper soil moisture must be such that the soil will crumble and not take on a wire form when rolled between the palms. A mold board plow, chisel plow, or chisel teeth mounted on a tool bar attached to the bucket of a backhoe can be used. The backhoe bucket teeth are not satisfactory and must not be used. Once the site is tilled a layer of sand must be placed before it rains on the tilled area. Placement of the fill must be such as not to rut up or compact the tilled area. All work must be done from the up slope side, so as not to compact the down slope area. Fill should be placed with a backhoe or moved around the site with a track type tractor. Wheeled tractors will rut up the site.

d. *Topsoil cover and grass* - A minimum of six inches of a suitable topsoil material shall be placed over the filled area, so grass or other suitable vegetation can be established. The area must be seeded and mulched to avoid erosion before the site can be approved.

e. *Fill area sizing and drainage* - There must be a minimum five feet separation between the shoulder of the fill and the nearest absorption trench. The slope of the fill material from the shoulder to the toe of the fill must have a minimum of a five to one slope. There must be at least a one percent slope from the center of the filled area to the shoulder so water will not pond on top of the filled area. Swales and/or other suitable drainage devices shall be used to divert any storm water away from the filled site area.

f. *Sizing and placement of absorption trenches in fill* - The sizing of absorption trenches shall be based on the most restrictive texture encountered within twelve (12”) inches of the original soil surface. Absorption trenches must be installed across the contours of the original site slope.

g. *Certification of filled site* - A soil classifier, registered engineer or registered geologist must submit a statement to the Board of Health certifying that the in place fill and the filled site meet requirements of these guidelines or with Board of Health approval a Level II Certified Environmental Health Specialist trained in fill evaluation may approve in place fill meeting these guidelines.

h. *Restrictions on the use of area fill* - The minimum depth of original soil to the seasonal high groundwater table, rock or other restrictive soil horizon shall be twelve (12”) inches. The maximum permeability of the top 12 inches of original soil shall be 30 minutes per inch. Area fill should not be used on sites with slopes that exceed 12%.

2. General Guidelines for Drainage of Land

General guidelines for the drainage of land for onsite sewage management are more complex because of the multiplicity of possibilities for design and the potential for intercepting sewage- contaminated water flowing laterally from the absorption field. Drainage is commonly accomplished by either surface drainage is commonly accomplished by either surface drainage or by internal drainage (subsurface drainage).

a. *Surface Drainage* - This method is often used for handling storm water runoff and should be an important part of any site plan where surface water is expected to pose a problem either by ponding on site or by flowing across the property. Any plan for surface drainage should be developed under the supervision of the appropriate local governing body having responsibility for approving drainage plans. Along with appropriate property easements obtained, there should be provisions for proper installation and continued maintenance of the drainage facilities since lack of maintenance often allows the drainage ways to become clogged with debris, silt, vegetative growth, etc., to the point where conditions are as bad or worse than before the drainage improvement was installed. Surface drainage is often effective in reducing the length of the period of saturation on a site, but is usually not adequate to prevent temporary saturation with resulting localized malfunctioning of absorption fields.

b. *Subsurface Drainage (Internal Drainage)* - The removal of excess soil water from seasonal high water table elevations or soil saturation caused by natural precipitation is often crucial to proper absorption field operation. In some cases, this may be corrected by installing subsurface drain networks, which remove the excess water as it flows laterally into the drains usually resulting in some lowering of the water level. If the water level can be lowered significantly and to the point where there is vertical separation of the proposed absorption field trench bottoms and the water level, subsurface drainage may be an approvable modification. Many interrelated factors come into play in any drainage plan. Probably the most important variables include the depth of permeable soil and homogeneity of the soil to be drained, depth of water table, availability of gravity flow outlets and frequency of in station of subsurface absorption lines. Any subsurface drainage plan must be prepared and the installation approved by a soil classifier, Agricultural Engineer or other design professional competent in the design of subsurface drainage systems.

c. Subsurface drainage must be located 10 feet up gradient or 30 feet down gradient from any absorption trench.

3. **Artificially Drained Systems**

High water tables that limit the use of absorption trenches can sometimes be artificially lowered to permit the use of this disposal method. Vertical drains, curtain drains and under drains are commonly used subsurface drainage techniques. Soil and site conditions determine which method is selected (See Tables HT-2 and HT-3).

Successful design of artificially drained systems depends upon the correct diagnosis of the drainage problem. The source of the groundwater and its flow characteristics must be determined to select the proper method of drainage. Particular attention must be given to soil stratification and groundwater gradients.

Because each of these drainage problems requires different solutions, it is important that the site evaluation be done in sufficient detail to differentiate between them. Where the need for subsurface drainage is anticipated, topographic surveys, soil profile descriptions and estimation of the seasonally high groundwater elevations and gradients should be emphasized. Evaluation of these site characteristics must be done in addition to evaluation of other site characteristics affecting surface disposal.

4. **Subsurface Drainage Problems**

There are an unlimited variety of subsurface drainage problems but the most common ones can be grouped into four general types. These are (1) free water tables, (2) water tables over artesian aquifers, (3) perched water tables, and (4) lateral groundwater flow problems.

a) *Free Water Tables*

Free water tables typically are large, slow-moving bodies of water fed by surface waters, precipitation, and subsurface percolation from other areas. In the lower elevations of the drainage basin, the groundwater is discharged into streams, on the ground surface in low areas, or by escape into other aquifers. The groundwater elevation fluctuates seasonally. The slope of a free water table surface is usually quite gentle. Where the soil is permeable, under-drains can be used to lower the water table sufficiently to permit the installation of trench or bed disposal systems. In fine textured soils of slow permeability, however, subsurface drainage is impractical.

b) *Water table Over Artesian Aquifer*

An artesian aquifer is a groundwater body confined by an impervious layer over the aquifer. Their pressure surfaces (the elevation to which it would rise in well tapping the aquifer) are higher than the local water table,

and may even rise above the ground surface. Pressure in the aquifer is caused by the weight of a continuous body of water that is higher than the local water table. Leaks at holes or weak points in the confining layer create an upward flow, with the hydraulic head decreasing in the upward direction. The groundwater moves in the direction of the decreasing gradient and escapes as seepage at the ground surface or moves laterally into other aquifers.

Areas with this problem are impractical to drain. The water removed is continually replenished from the aquifer. This requires relatively deep and closely spaced drains and pumped discharges. Onsite disposal options should be investigated in areas with shallow artesian aquifers.

c) *Perched Water Table*
In stratified soils, a water table may develop that is separated from the free water table by a slowly permeable layer, i.e., a perched water table. This occurs when surface sources of water saturate the soil above the layer due to slow natural drainage. Methods employed to drain perched water tables depend upon the particular site conditions. Vertical drains, curtain drains or under drains may be used. Subsurface drainage may be impractical in fine textured soils of slow permeability.

d) *Lateral Groundwater Flow*
Lateral groundwater flow problems are characterized by horizontal groundwater movement across the area. This flow pattern is usually created by soil stratification or other natural barriers to flow. The depth, orientation and inclination of the strata or barriers determine the drainage method used and its location. Curtain drains or vertical drains are usually employed to intercept the water upstream of the area to be drained.

5. **Selection of Drainage Method**
In designing a subsurface drainage system, the site characteristics are evaluated to determine which method of drainage is most appropriate. Table HT-2 presents the drainage method for various site characteristics. In general, shallow, lateral flow problems are the easiest drainage problems to correct for subsurface wastewater disposal. Since the use of the under drains for onsite disposal systems has been very limited, other acceptable disposal methods not requiring drains should first be considered.

a) *Curtain Drains (See Figure HF-1)*
Curtain drains are placed some distance up slope from the proposed soil absorption system to intercept the groundwater, and around either end of the system to prevent intrusion. On sites with sufficient slope, the drain is extended down slope until it surfaces, to provide free drainage. The drain is placed slightly into the restrictive layer to ensure that all the groundwater is intercepted. A separation distance from the soil absorption system is required to prevent insufficiently treated wastewater from entering the drain. This distance depends upon soil permeability and depth of drain below the bottom of the absorption system; however, a separation distance of 10 ft is commonly used.

The size of the drain is dependent upon the soil permeability, the size of the area drained, and the gradient of the pipe. Silt traps are sometimes provided in the drain to improve the quality of the discharged drainage. These units may require infrequent cleaning to maintain their effectiveness.

b) *Vertical Drains (See Figure HF-2)*
Vertical drains may be used to intercept a laterally flowing perched water table. Separation distances between the drain and the bottom of the absorption field are the same as for curtain drains to maintain an unsaturated zone under the absorption field.

The size and placement of the drain depends upon the relative permeability of the saturated soil and the soil below the restrictive layer, and the size of the area to be drained. The infiltration surface of the vertical drain (side walls and bottom area) must be sized to absorb all the water it receives. The width and depth of the drain below the restrictive layer is calculated by assuming an infiltration rate for the underlying soil. If clay and silt are transported by the groundwater, the infiltration rate will be less than the saturated conductivity of the soil. Clogging of the vertical drain by silt can be a significant problem. Unfortunately, experience with these drains in wastewater disposal is lacking.

c) *Under drains (See Figure HF-3)*
Under drains are used to lower the water table when the table is 4 to 5 ft. (1.2 to 1.5m) below the surface in permeable soils. This also provides the necessary depth of unsaturated soil below the infiltrative surface of the soil absorption system, and to prevent poorly treated effluent from entering the drain. Sometimes, a network of drains is required throughout the area where the absorption field is located. The depth and spacing of the drains is determined by the soil permeability, the size of the area to be drained, and other factors.

Figure HF-1
Curtain Drain to Intercept Laterally Moving Perched Water Table
Caused by a Shallow Impermeable Layer

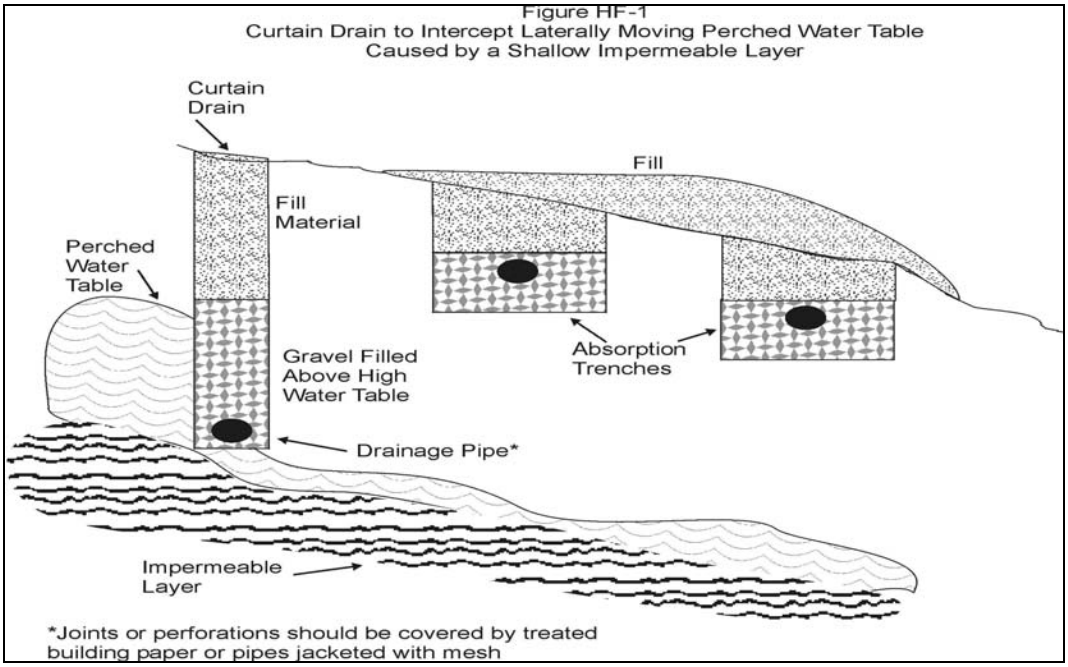
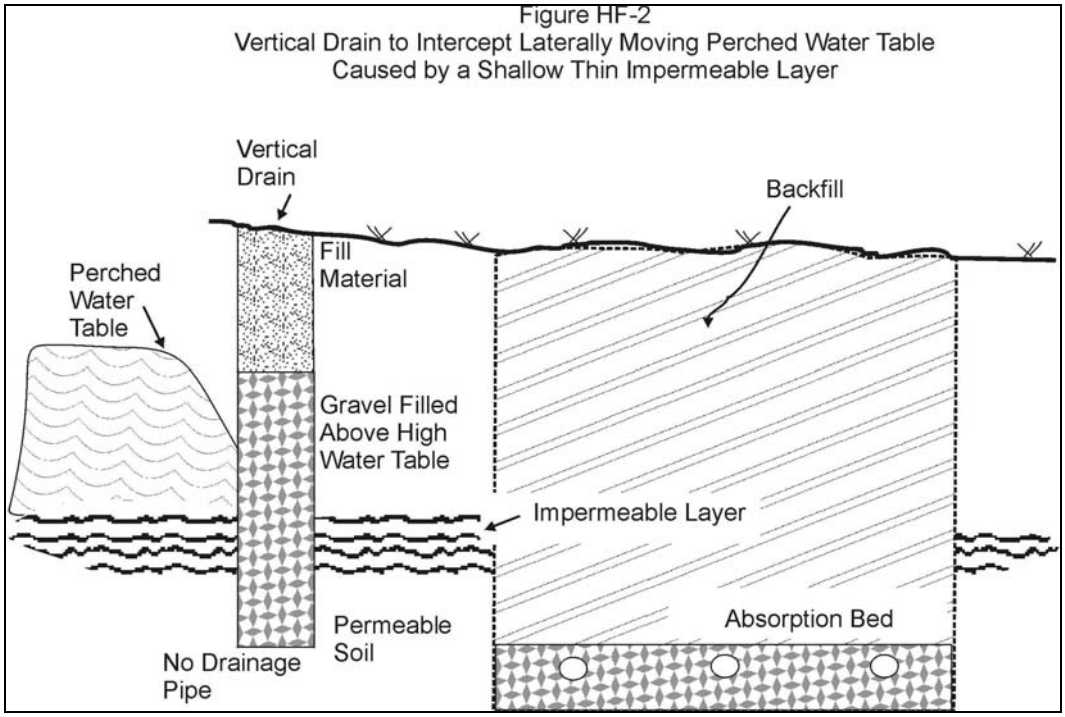


Figure HF-2
Vertical Drain to Intercept Laterally Moving Perched Water Table
Caused by a Shallow Thin Impermeable Layer



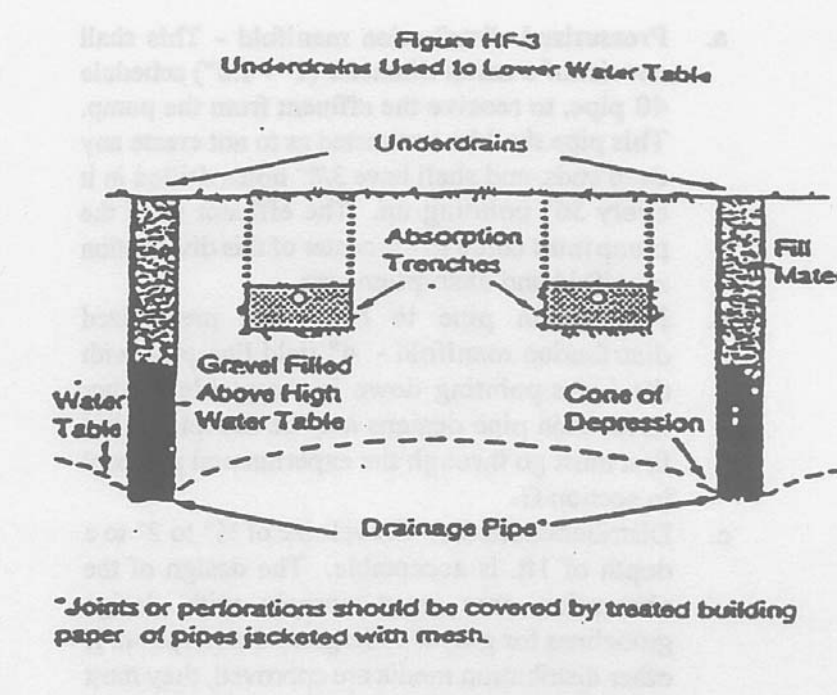


Table HT-2
Drainage Methods for Various Site Characteristics

Drainage Problem	Site Characteristics	Drainage Method
a) Free Water Table	Deep uniform soils mottled or saturated	Underdrain[2]
b) Artesian-Fed Water Table	Saturated Soils above and below restrictive layer with hydraulic gradients increasing with depth	Avoid
c) Perched Water Table	Saturated or mottled soils above a restrictive layer, soil below restrictive layer is unsaturated; site is level or only gently sloping	Underdrain[2] Vertical drain[0]
d) Lateral Flow	Saturated or mottled soils above a restrictive layer with water source located at a higher elevation; site usually sloping	Curtain drain Vertical drain[0]

[0]Use only where restrictive layer is thin and underlying soil is reasonably permeable.
[2]Soils with more than 70% clay are difficult to drain and should be avoided.

Table HT-3
Use of Subsurface Drains
To Control Ground Water Table

Suitable Soils To Place Subsurface Drains	Soils	Depth to Wetness Mottles (gray colors)	Depth of water table after drainage (In) Drain Spacing			
Inches		Inches	120 ft.	100ft.	70ft.	50 ft.
60	Barth		48	50	54	55
	Chipley	24				
	Lyn Haven					
	Ousley					
	Leon					
	Mandarin					
	St. Johns					
50	Albany (klej Sand)	24	39	40	41	42
	Goldsboro					
	Izagora					
	Johns					
	Lynchburg					
	Ona					
	Plummer					
	Sapelo					
40	Bodine	24	30	33	35	36
	Leefield (Klej Shallow)					
	Kanapuha					
	Mascotte					
	Ocilla					
	Olustee					
	Pelham (Weston, thick surface, drains)					
	Rains					
	Rigdon					
	Seneca					
	Stilson					
36	Clarendon	24	22	23	24	26
	Irvington					
	Hazlehurst					

*Suitable-sandy or loamy soils (5 to 35 percent clay)

6. Mound System Modification

When slowly permeable soils exist and or rock formations or high, ground water elevations prohibit issuance of permits for conventional on-site sewage management systems, a mound system may be considered. Construction of such systems shall be in accordance with design standards found in the "Wisconsin Mound Soil Absorption System Siting, Design and construction Manual, January, 1990 edition. See Section F for a copy of this design manual and other acceptable pressure dosing alternatives. Site preparation and suitability of the in-place fill materials used must be certified by a soil classifier, registered engineer or registered geologist as meeting the above criteria before on-site sewage management construction permits can be issued by the Board of Health.

7. Alternative Distribution System Specifications

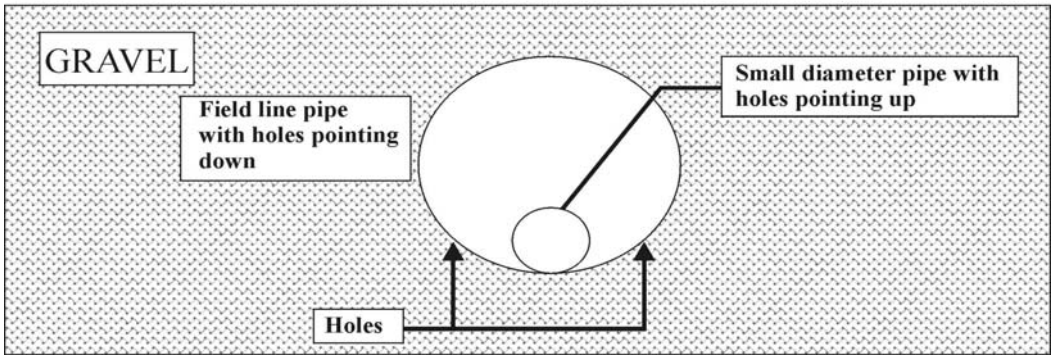
The distribution system in an elevated sand mound shall consist of three components:

a. Pressurized distribution manifold - that shall consist of a small diameter (1" - 1.5") schedule 40 pipe, to receive the effluent from the pump. This pipe shall be connected as to not create any dead ends, and shall have 3/8" holes drilled in it every 36" pointing up. The effluent from the pump must come to the center of this distribution manifold and absorption area.

b. Field drainpipe to house the pressurized distribution manifold - A 4" field line pipe with the holes pointing down is acceptable. Other field drainpipe designs may be acceptable, but first must go through the experimental protocol.

c. Distribution media - ½" to 2" gravel to a depth of 1ft. is acceptable. The design of the absorption area must comply with design guidelines for gravel underground absorption. If other distribution media are approved, they must comply with the appropriate regulations and guidelines.

FIGURE HF-4
SIDE VIEW OF DISTRIBUTION SYSTEM IN ABSORPTION AREA OF AN ELEVATED SAND MOUND



8. Simplified Falling-Head Permeameter Test for Fill Material for Disposal Fields.

The permeameter consists of a Plexiglas clear plastic tube with one end covered by a fine mesh screen. The cylinder is stood in a low plastic container with a layer of filter fabric at the bottom to allow free exit of permeating water. The details and general arrangement of the apparatus are shown in Figure HF-5.

Approximately 60 mm. of the sand to be tested are filled into the cleaned cylinder and compacted by allowing the cylinder to fall 200 mm. five times onto the workbench. More sand is added to the 110 mm. mark and again compacted. The cylinder is then placed in the container and the sand flooded from the bottom up to drive out any air. After allowing the wet sand to drain excess water, the sample is again compacted by dropping five times and the sample is trimmed to a finished height of 100 mm. using a suitable scraper.

The cylinder is now returned to the container, flooded from the bottom up and then water is carefully poured into the top of the cylinder above the upper reference mark. The water level is now allowed to fall, noting the time in minutes that it takes to pass over the 50 mm. gauge length. Measure or judge the temperature of the water used in the test. Now refer to the chart in Figure HF-6 to determine the apparent permeability.

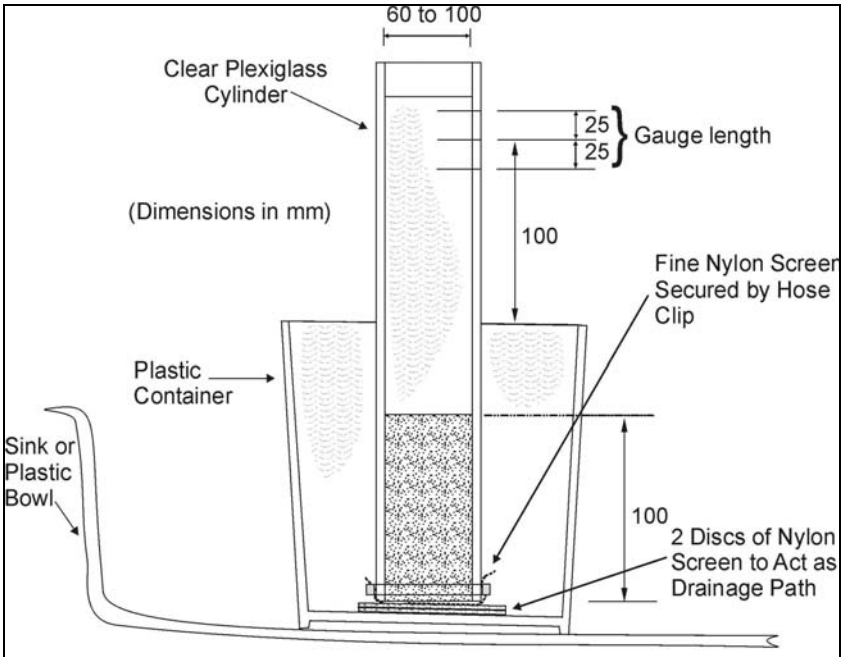


Figure HF-5 **Falling Head Permeameter - Apparatus**

FILLED SITE CERTIFICATION FORM

Property Owners Name: _____

Property Owners Address: _____

Phone Number: _____ **Alternate #:** _____

Location and address of the property: _____

_____

1) Topsoil and vegetation has been removed from filled area. Yes____No_____

2) Filled area has been properly tilled. Yes____No_____

3) The fill material used on the site is coarse/med sand that meets fill regulations. Yes____No_____

4) The proper amount of fill material has been properly placed on the site to construct the absorption field area to comply with distance regulation for the slope fringe area. Yes____No_____

5) The filled area has been properly constructed and has a 5 to 1 slope. Yes____No_____

6) Is there proper surface water control around the filled site (i.e., swales, gutters on house, ditches, or other methods specified for proper drainage? Yes____No_____

7) Is there enough good quality fill on the site to [illegible] on the entire absorption field including Yes____No_____

8) Are there any [illegible] sewage system installed in this fill [illegible] by checking NO, please explain below:

_____
_____
_____
_____
_____
_____
_____
_____
_____

(All site modifications must be maintained for life of system.)

9) The soil type(s) on this site is/are: _____

10) The fill soil has a percolation rate/HLR of (Estimated): _____

11) The size of the fill site is: _____ft. X _____ft.

12) The height of the fill area is: _____inches.

PLEASE CHECK ONE OF THE FOLLOWING:
The fill site is:
APPROVED _____ **DISAPPROVED** _____ (See above comments)
I certify that the information on this document is true.

_____ _____
Signature of Certified Soil Classifier **Date**

_____ _____
Printed Name **Printed Phone Number**

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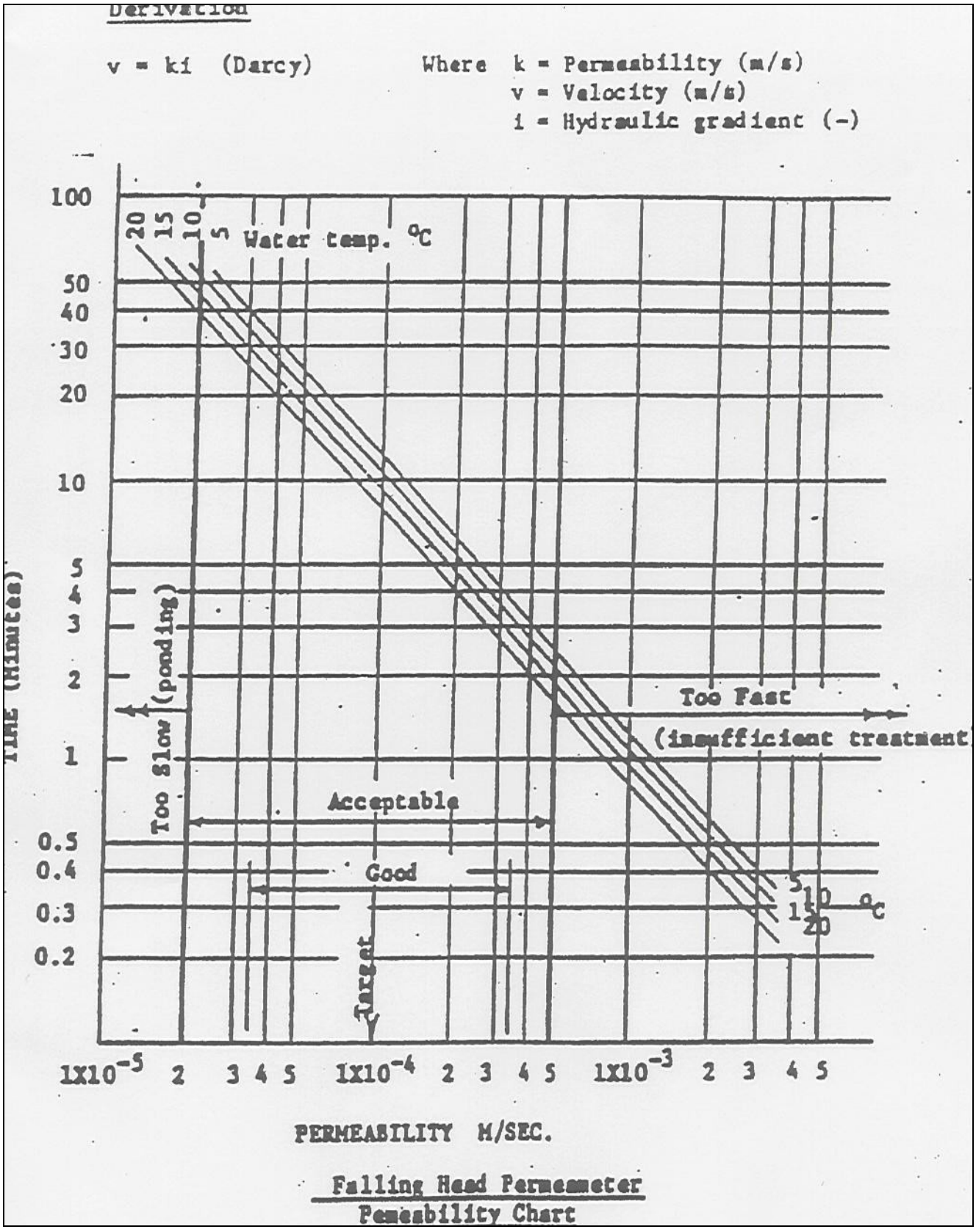

Falling Head Permeameter
Permeability Chart

Septage Removal and Disposal

Septage Removal Permits - Permits shall be valid for a period of twelve months from the date issued and shall be subject to being denied, suspended or revoked by the County Board of Health, unless the complete septage removal and disposal is carried out in accordance with Chapter 290-5-26-.11 and the provisions outlined below.

1. Standards for Septage Removal - The following requirements shall be met by individuals permitted for septage removal.
   a) The manner in which septage will be disposed of, shall be included on the application for septage removal. Written authorization shall be submitted with the application from wastewater treatment plants, separate septage handling facilities or permitted land disposal site.
   b) The manner in which septage will be removed and transported shall be included on the application for septage removal.
   c) Access to the septic tank contents shall be by removal of the lids or access ports. Individuals breaking holes in the septic tank or lids will be subject to permit suspension or revocation.
   d) Septage removal means the complete removal of the contents including the liquid, sludge and scum.
   e) The inlet and outlet "T"s will be inspected for blockage and damage. If "T"s are missing or damaged, the owner will be notified in writing. Missing or damaged "T"s should be replaced.
   f) Excavated soil will be replaced.
   g) Written documentation shall be provided to the septic tank owner, noting the condition of the septic tank. This shall include any damage or missing components observed, and a copy will be provided to the Local Environmental Health Office.
   h) Individuals permitted for septage removal shall maintain a manifest identifying the date and location of system serviced and the date and location of final disposal.

2. Septage Disposal - (See Appendix O-IV Rules for the Land Disposal of Domestic Septage)

   There are three options for septage disposal in Georgia: treatment at a wastewater treatment plant, treatment at a separate septage handling facility and land disposal. Disposal and treatment a wastewater treatment plants and separate septage handling facilities are regulated through the Environmental Protection Division. Requirements for septage disposal by land disposal are as follows:

   a) Land disposal sites that accept septage from a single pumping and hauling business are regulated through the Department of Human Resources Rules and Regulations for the Land Disposal of Domestic Septage, Chapter 290-5-25.

   b) Land disposal sites that accept septage from more than one pumping and hauling business are regulated through the Environmental Protection Division, Department of Natural Resources.

Georgia Department of Human Resources
APPLICATION FOR SEPTAGE REMOVAL PERMIT
For

_____ **COUNTY**

Pursuant to the Rules and Regulations of the Georgia Department of Human Resources (DHR) Chapter 290-5-26, the undersigned hereby applies for a septage removal permit and provides the following information as required by rule 290-5-26-.11, thereof:

BUSINESS NAME:	OWNER:	
BUSINESS ADDRESS:	**CITY:**	**ZIP CODE:**
METHOD OF SEPTAGE REMOVAL:		
METHOD OF SEPTAGE TRANSPORT:		
APPROVED FINAL DISPOSAL FACILITY: (circle)		
(1) Land Application Facility (2) Municipal Wastewater Treatment Plant (3) Septage Handling Facility		
WRITTEN PERMISSION OF PROPER OFFICIAL OR APPROVED LANDOWNER PROVIDED:	**OFFICIAL'S NAME OR LANDOWNER NAME:**	
(1) Yes (2) No		
COMMENTS/REMARKS:		
APPLICANT'S NAME:		
APPLICANT'S ADDRESS:	**CITY:**	**ZIP CODE:**
APPLICANT'S SIGNATURE:		**DATE:**

For Official Use Only

SEPTAGE REMOVAL PERMIT
For

_____ **COUNTY**

A permit is hereby granted to the applicant hereon for the purpose of operating the septage removal business described above in accordance with the Rules and Regulations of the Georgia Department of Human Resources, Chapter 290-5-26 inclusive. This permit is not valid unless properly signed below. This permit expires twelve (12) months from date of issue.

ISSUING OFFICIAL: (print)	INSPECTION APPROVED: (circle)	PERMIT NUMBER:
	(1) Yes (2) No	
ISSUING OFFICIAL'S SIGNATURE:	**TITLE:**	**DATE:**

_____ COUNTY SEPTAGE REMOVAL INSPECTION REPORT

DATE: _____

BUSINESS NAME: _____ OWNER: _____

BUSINESS ADDRESS: _____ ADDRESS: _____

_____ _____

TELEPHONE NO: _____ TELEPHONE NO: _____

DEPARTMENT OF HUMAN RESOURCES CERTIFICATION NUMBER: _____

Level I: Yes____No_____ Level II: Yes____No_____

LOCATION OF DISPOSAL SITE: _____

Permission for Disposal Provided: Yes____No_____

VEHICLE IDENTIFICATION: (All items must be displayed on both sides of vehicle)

	Vehicle One		Vehicle Two		Vehicle Three		Vehicle Four		Vehicle Five	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Name of Person or Firm										
Address										
Permit Number										
2" Letters & Numbe										
Readily Visible										

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VEHICLE MAINTENANCE:

	Vehicle One		Vehicle Two		Vehicle Three		Vehicle Four		Vehicle Five	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Watertight Tank & Body										
Leakage From Pumps										
Leakage From Hoses										
Leakage From Valves										
Leakage From Fittings										

REMARKS: _____

_____

_____

RECOMMEND PERMIT ISSUANCE: **Yes**_____ **No**_____

Evaluated By: _____

Table JT - 1
Sewage Flow Schedule

FACILITY	GPD*
Airport (Also R.R. & Bus Terminal)	5/Passenger
No Food Service	+ 10/Employee
Assembly Hall (Also Stadium, Racetrack)	5/Seat
Bar/Lounge (No Food Service)	30/Seat
Barber Shop	100/Chair
	+ 20/Employee
Bath House for Swimming Pool	10/Swimmer
Beauty Salon	150/Chair
	+ 20/Employee
Boarding House ***	75/Resident
Bowling Alley (No Food Service)	75/Lane
	+20/Employee
Car Wash (Non-Recycling, with EPD Approval)	75/Car
Church (No Kitchen)	5/Sanctuary Seat
(With Kitchen)	7/Sanctuary Seat
Bath House for Travel Trailer Park, Campground ***	
(With Independent Sewer Connections)	50/Space
(Without Independent Sewer Connections)	100/Space
Construction Camp ***	60/Person
(With Use of Chemical Toilets)	40/Person
Cottage/Lodge (Vacation)	50/Bed
Country Club (No Food Service)	25/Member
Dance Hall (No Food Service)	5/Person
Day Camp	20/Person
†Day Care Center *** (No Meals)	15/Person
(With Meals)	20/Person
Dental Office (Continuous Water)	250/Chair
(Demand Water)	100/Chair
	+ 20/Employee
Dump Station for Travel Trailers	50/Vehicle
Fairground (Use Average Attendance)	5/Person
Fitness Center/Spa	50/Person
†Food Service ***	
Restaurants, less than 24 hrs/day	50/Seat
Restaurants, 24 hrs.	75/Seat
Restaurants on Interstates	100/Seat
Drive-In Restaurant	50/Space
Carryout Only; Food Stands	50/100ft² floor space
	+20/Employee
Banquet Rooms	Add 5/seat
Single-Service Only	Subtract 10/Seat
Catering (single service only)	50/100ft² floor space
Catering (full service)	+ 5/meal
Funeral Home	300/Embalming
	+100/Staff Member
	+5/Sanctuary Seat (no kitchen)
	+7/Sanctuary Seat (with kitchen)

Grocery Store	200/1000ft² Floor Space
†Hospital	300/bed
	+100/Resident Staff
Hotel/Motel ***	100/Room
Motel with Kitchenette	150/Room
†Institution	100/Bed
Laundry, Self-service (with EPD Approval)	500/Machine
Marina (pump out facilities)	30/Slip
†Meat Market	50/100ft² Floor Space
Medical Offices	200/Exam Room
Migrant Labor Camp ***	50/Bed
†Nursing Home/Personal Care Home	150/Bed
	+100/Resident Staff
Picnic Park	10/Person
†Prison/Jail	125/Bed
	+20/Employee
Resident Camps *** (With Food Service)	60/Person
(Without Food Service)	50/Person
Residential (for alternative systems)‡	150/Bedroom
Resort ***	75/Person
Rest Area	Determined after consultation with GaDOT
Retail Stores, Convenience Stores (Freestanding)	Larger of 400/restroom or 100/commode or urinal
Rooming House *** (No Meals)	60/Bed
Schools: Day, Toilets Only	12/Person
†Day, Toilets & Cafeteria	16/Person
†Day, Toilets, Cafeteria, Gym	20/Person
Boarding	100/Person
Service Station	
Interstate Location	3000 Minimum
24 Hour Operation	325/commode or urinal
<24 Hour Operation	250/commode or urinal
Shopping Center/Mall	100/1000ft² Enclosed Space
Theaters (Indoor)	5/Seat
(Drive-In)	10/Space
Travel Trailer Park **	
With Independent Water & Sewage Connections	150/Space
Veterinary Office/Animal Hospital ***	100/Run
	+10/Cage
	+20/Employee
Workers Including Factory, Office, School, Commercial and Construction (Without Showers and Industrial Waste)	25/Person
With Showers and No Industrial Waste	35/Person
With Kitchen Add	+5/Person

* GPD means gallons per day

**Means the temporary rental of sites. Add 500 gallons/machine if washing machine installed. Parks established for the permanent placement of RV's shall meet the same requirements established for single-family residential use.

*** Add 500 gallons/machine if washing machine installed.

† Operations with BOD_5 and TSS greater than 200 mg/L require pretreatment to reduce BOD_5 and TSS to 200 mg/L or below.

‡ For residential properties using conventional systems, refer to Section D.

NOTES:

1. Facilities with multiple uses require additive flows, e.g. a grocery store with a food service would utilize 200/1000ft^2 of floor space plus 50/seat.

2. Applicants may submit water usage data for identical or similar operations where uses are not noted in Table JT-1 or where the applicant is requesting design based on a lesser flow than determined from Table JT-1. The Health Department may consider such data as one component in determining peak flow and shall not allow designs based on averages.

TABLE JT-2

Design Basis for Central Septic Tank System
Mobile Home Parks and Multifamily Residences

Central Septic Tank System	Minimum Septic Tank Capacity	Minimum Absorption Field Area (Based on Bedrooms)
Mobile Home Park	1000 gallons / space*	3 Bedroom minimum / space
Multi-family residential	1000 gallons / unit*	Based on # of Bedrooms

*The minimum septic tank capacity shall be 1000 gallons for one, two, three or four bedrooms and 250 additional gallons for each bedroom over four.

Field Inspections

All on-site sewage management systems must be inspected before they are put into operation. This section will give details on what to look for and how to properly inspect the various parts of a system.

Request for Inspection
The following information must be provided to the county environmental health office when requesting field inspection.

a. Name of contractor/installer,
b. Location of property,
c. Installation permit number,
d. Directions to property, and
e. Time system will be ready for inspection.

It is very important that the contractor/installer has a copy of the installation permit onsite. If a copy cannot be made available in a timely fashion, the inspection must be discontinued and rescheduled.

Inspection of Septic Tanks
All installed septic tanks must be inspected carefully to verify that they have been installed in accordance with the permit and the specifications required in the regulations and this manual. The list below represents important points to check during an inspection.

a. The septic tank must be located as marked on the plan. If the tank has been installed at another location, the new location must be approved. The tank must not be installed where it would violate setback requirements.

b. A septic tank must not be installed where it could be flooded, unless it has been designed and installed to remain watertight.

c. The tank must remain visible for inspection prior to backfilling.

d. All septic tanks must be level, side to side and inlet end to outlet end. The inlet and outlet must be located in the right directions so that the effluent will flow to the treatment and disposal field.

e. Septic tank walls must not be cracked, have honeycombs or show other defects that may cause the tank to weaken or leak. Reinforcing steel must be covered with at least 1-inch of concrete to keep it from corroding and thus must not be observable.

f. The baffle wall must be located between two thirds and three-fourths of the tank length from the inlet end and must have a four-inch diameter opening at least the size of the inlet to allow the effluent to flow to the outlet. The top of the baffle wall must leave a two-inch slot for gas passage. Waste concrete may be in this slot--simply break it out to open up the two-inch slot.

g. The sanitary tee must be undamaged and extend into the liquid one-fourth of its depth. The tank outlet must be two inches below the inlet.

h. All joints in the tank must be sealed and watertight. Joints must be sealed with a nominal one-inch diameter bead of mastic or other approved sealer along its joints.

i. A septic tank riser over each access opening is required if the top of the tank is more than 12 inches in the ground. The riser is required to extend to finished grade or to no deeper than 12 inches below finished grade. For easy access, pump tanks should have a riser over the pump access opening and the riser should extend to finished grade.
j. Tank risers must be large enough to allow easy access to the tank access openings and must have a strong

lid with a handle.

k. Pipes must enter and exit the tank through the knockouts provided. The outlet pipe from the tank must be sealed to be sure that it will not leak.

l. Where not inspected by building or plumbing inspector, the inlet pipe from the house must have a minimum slope of 1/8 inch per foot so that the sewage will flow to the septic tank. This pipe must be sealed on the inside and outside of the tank to prevent groundwater from leaking into the septic tank or effluent from escaping into groundwater.

Inspection of Conveyance Piping

The conveyance piping must be inspected to be sure that there are not leaks and that the pipe(s) will not block the flow of the effluent to the distribution device or the treatment and disposal trenches. A separation of at least two feet of undisturbed or compacted soil is needed between the septic tank and the distribution device or trench. This separation reduces the problem of effluent leaking back around the pipe to the septic tank. Conveyance pipes must be solid, non-perforated NSF/ANSI Schedule 40 PVC.

a. The pipes must be installed in trenches with bottoms of undisturbed or compacted soil so that the soil will not settle and break the pipe.

b. All conveyance pipes must have an adequate slope to allow the sewage to flow by gravity to the distribution device or trench. The slope of the pipe can be determined by measuring the height of the pipe at the septic tank outlet and at the distribution device or trench inlet and the length of the pipe. The slope is the height divided by length.

c. The conveyance pipes must be installed to meet all required setback distances.

d. All the joints in the conveyance pipe, its connections to the septic tank and the distribution device or trench must be watertight.

Inspection of Distribution Devices

Distribution devices include distribution boxes, flow splitters and other flow diversion devices. All of these devices must be inspected for proper installation and so that the effluent will flow equally to all the trenches.

a. Be certain that the distribution box, flow splitter or other flow diversion device is installed at the proper location and as marked on the plans. Check that the location meets all setback distances.

b. All distribution devices must be installed on firm earthen foundation secured by concrete or concrete foundation to prevent the soil from settling. If the soil settles, the device can tilt so that the effluent is not evenly distributed and is possibly leaking from the device. A good test is to stand on the box and try to rock it -- it must not rock or tilt.

c. Test all distribution devices, especially distribution boxes, to be sure that the outlets are at the same level. The testing must be done by pouring water into the distribution box in its installed location and watching for the water to flow out of the outlets at the same time and with the same flow from each outlet. Measuring with a builder's level or another instrument is not accurate for this purpose. This means the contractor must have water on site.

d. Check the connections of the conveyance pipes to the distribution device to make sure there are no leaks.

e. Inspect distribution boxes to be sure that they are watertight and sturdy.

f. One way to check for a leaking distribution box is to check the water level early in the inspection and then at the end of the inspection. If the water level has dropped below the outlet, there is a leak in the box.

g. Be sure that the distribution box inlet is two inches higher than the outlet so the effluent will flow out to the treatment and disposal trenches. Distribution boxes may be installed backwards, so it is important to

check the orientation.

h. Make certain the distribution box outlets are at least six inches below the septic tank outlet so the full trench depth can be used without directing effluent back into the septic tank (four-inch tank to box and two- inch box).

Inspection of Trenches

Absorption trenches are where most of the bacterial treatment takes place in on-site sewage disposal. Proper installation of trenches is critical to the overall performance of the system.

a. The trenches must be installed on the contour so that the entire trench is at the same level.

b. The absorption field must be located in the proper place on the site and at the place marked on the plan. If the field has been relocated, check that all setback requirements have been met. It is very important that the relocated absorption field NOT be placed in an area where the soil is unsuitable.

c. The absorption field must not be placed under driveways, roads or buildings. The heavy compaction of the soil under a driveway, road or building could keep the effluent from flowing into the soil.

d. The number of trenches, the length of each trench and the total area of the trench bottom must be as shown on the permit.

e. The width and depth of the trenches must be as shown on the permit.

f. Trenches must be spaced properly, which means that the trenches must be spaced at least seven feet on center and there will be at least four feet of undisturbed soil between the edges of the trenches.

g. Trenches cannot be more than 36 inches wide.

h. Pipes used in the trenches must be stamped ASTM F405 approved, must be located in the center of the trench and be covered with aggregate. The pipe must be four inches corrugated polyethylene (PE) tubing with three ½ -inch to ¾-inch holes around the pipe every four inches along the pipe length. The holes must be oriented toward the bottom of the trench as much as possible.

i. The aggregate or gravel in the trench must be hard and resist crumbling when wet with the effluent. Only washed stones must be used so that the fines have been removed. Fines can plug the soil or fill in the spaces between the crushed stone.

j. There must be six inches of aggregate under the pipe, and the aggregate must surround the pipe on all sides, with 2 inches of aggregate covering the pipe. Acceptable sizes are one half (1/2) inch to two (2) inches in diameter. To avoid grinding the stone together and making more fines, aggregate must not be driven over with equipment. The stone is not to be mixed with the soil at the bottom of the stockpile. Placing a piece of plywood or sheet plastic under the stockpile can reduce the amount of soil that mixes in with the stone.

k. Use of other aggregate such as tire chips must comply with paragraphs j and k above as appropriate.

l. Trenches shall not be dug when soil is wet due to the potential for smearing and compaction. If the soil can be rolled into a wire, it is too wet.

Inspection of a Subsurface Emitter System

The following is a brief checklist of actions and technical areas that must be addressed during on-site inspection of a subsurface emitter system. This will require both initial and final on-site inspections. The final on-site inspection must be performed after all landscaping and dwelling construction are completed.

A. Initial On-site Inspection Check List

1. System is installed according to permit and site plan

   - Treatment units used
     - Aerobic/aeration unit, or
     - Other approved treatment unit
   - Dosing system
     - Tank size as designed
     - Dosing pump (designed for wastewater effluent)
     - Record pump make and model number as specified
     - Ready access provided for maintenance
     - All separation distances are correct

2. Make a field drawing/sketch of system layout

   - Emitter field properly sited
   - Emitter lines have correct footage
     NOTE: Use of a measuring wheel or tape measure required.
   - Emitter trenches at proper depth

3. System Operational Demonstration

   - Field Dosing by timing device
     a. Emitters designed for wastewater
     b. Emitters function properly
   - Pressure relief valves present
   - Check valves present
   - Return lines properly routed to treatment unit
   - Filter back flushes properly
   - Filter readily accessible for maintenance
   - Safety provisions are adequate
     a. Tamper proof lids on risers, etc.
     b. Electrical component connections inspected by appropriate authority.
        - All connector boxes sealed
        - All wiring routed through conduit pipe
        - Electric components connected to power source
   - Air compressors function
   - Air compressor alarms function
   - Pumps function
   - High water alarm functions
   - Drainfield plumbing contains a zone splitter valve
   - Name and phone number of maintenance point of contact posted beside visual alarm

B. Final Onsite Inspection Checklist

1. Landscaping

   · Appropriate groundcover
   · Surface water drainage appropriate

2. Documentation

   · Owner provided copy of maintenance contract and warranty provisions
   · Owner provided copy of inspection documentation

Inspection of Wisconsin Mound Systems

See Section F-30
See Section O-II Inspecting and Troubleshooting Wisconsin Mounds

Georgia Department of Human Resources
ON-SITE SEWAGE MANAGEMENT SYSTEM INSPECTION REPORT

CONSTRUCTION PERMIT NUMBER

COUNTY	COUNTY CODE	HEALTH DISTRICT	MONTH	DAY	YEAR

SUBDIVISION: | LOT | PROPERTY OWNER:

PROPERTY LOCATION / ADDRESS: | SEWAGE CONTRACTOR:

CONTRACTOR LICENSE:

ALL ITEMS: (BLANK) = Not Applicable (0) = Unknown ***ITEMS** (1) = Yes (2) = No

Section A - General

1. WATER SUPPLY:
(1) Public (2) Private
(3) Community

2. ** TYPE OF STRUCTURE:
(see below)

3. STRUCTURE AGE:
(1) New (2) <1 year
(3) >1 year

4. SEWAGE SYSTEM:
(1) New (2) Repair
(3) Addition

5. AGE OF SYSTEM (repairs):
(1) <1 (2) 1-5 (3) 6-10
(4) 11-20 (5) 21-30 (6) 31-40
(7) >40

6. * IN SUBDIVISION?:

7. WATER USAGE BY:
(1) Bedroom Numbers
(2) Gallons per Day

8. NO. OF BEDROOMS/
GALLONS PER DAY:

9. LOT SIZE:

10. PERCOLATION RATE/
LOADING RATE:

11. SOIL CLASSIFIER:

12. SOIL SERIES:

Section B – Primary / Pretreatment

1. DISPOSAL METHOD:
(1) Septic Tank (2) Privy
(3) Aerobic Unit (4) Other:

2. SEPTIC TANK:
a. Capacity (gals):

b. Material:
(1) Concrete (2) Polyethylene
(3) Fiberglass (4) Poured
(5) Other:

c. Distance from (feet):
(1) Well:
(2) Building:
(3) Lake/Stream:
(4) Nearest property line:

d. Manufacturer:

[illegible] capacity:

b. Manufacturer:

5. DOSING TANK CAP.(gals):

6. GREASE TRAP CAP.(gals):

Section C – Secondary Treatment

1. **ABSORPTION FIELD DESIGN**
(1) Level (2) Serial (3) Drip
(4) Bed (5) Distribution box
(6) Mound (7) Other:

2. ABSORPTION FIELD:
a. Total square feet:

b. Total linear feet:

c. Number of trenches:

d. Length trenches (feet):

e. Distance between
trenches (feet):

f. Depth of trenches
(range in inches):

[illegible] proper size:

[illegible] proper depth:

[illegible] from (feet):
Well:

Building:

(3) Lake/Stream:
(4) Nearest property
line:

j. Nearest property line:
(1) Right (2) Left
(3) Front (4) Rear

k. Product used:

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** TYPE OF FACILITY
(1) Single-Family Residence
(2) Multi-Family Residence
(3) Commercial ≤2000
(4) Commercial ≥2000
(5) Restaurant
(6) Mobile Home Park
(7) Other (specify) _____

REMARKS:

Drawing not to scale.

Issuance of a construction permit for an on-site sewage management system, and subsequent approval of same by representatives of the County Board of Health shall not be construed as a guarantee that such systems will function satisfactorily for a given period of time; furthermore, said representatives do not, by any action taken in affecting compliance with these rules, assume any liability for damages which are caused, or which may be caused, by the malfunction of such system.

ENVIRONMENTALIST: | TITLE: | *SYSTEM APPROVED: (see Sect. A 7 & 8)

Operation and Maintenance

Operation

Benefits of proper design and installation of on-site sewage management systems can be completely overshadowed by improper operation, maintenance and/or repair activities. Inadequate maintenance is the primary reason for most on-site sewage management system malfunctions. Problems which can develop even in a properly designed and installed system include:

1. Excessive amounts of water, grease or non-biodegradable materials entering the wastewater system and resulting in backups to homes or flooding of the drainfield;
2. Uneven wastewater distribution;
3. Seepage from the disposal area and surface seepage resulting in pollution of ground or surface waters.

Maintenance

The most common on-site maintenance procedure is pumping out septic tanks. As sludge accumulates in a septic tank, the capacity of the tank to hold and treat incoming wastewater decreases and the quantity of solids leaving the septic tank increases. These solids can clog the soil at the disposal field (drainfield) and unnecessarily pollute the groundwater or a nearby stream or lake. Pumping out septic tanks periodically helps to avoid such problems. The septage, which is pumped out from a tank, must be properly disposed of either at a treatment plant or at an approved land disposal site.

Chemical or biological additives are not a substitute for pumping. In general, these products, which claim to "clean" septic tanks, contain biological based materials (bacteria, enzymes and yeast), inorganic chemicals (acids and bases) or organic chemicals (including solvents) that may result in sludge bulking and interfere with digestion. The resulting effluent may severely damage the soil structure and cause accelerated clogging, even though some temporary relief may be experienced immediately after application of the product.

It is not necessary to add anything but domestic wastewater to the septic tank. Materials that degrade slowly or do not settle well should not be put into septic tanks. Coffee grounds, cooking fats, cigarette butts, bones, wet strength towels, disposable diapers, condoms, feminine hygiene products and similar materials must be disposed of in another manner. They will not degrade in the tank and can clog inlets, outlets and the disposal system.

The recommended minimum frequency for pumping out septic tanks depends upon the size of the tank, flow of wastewater entering the tanks and the solids content of the wastewater. By assuming a minimum wastewater residence time within a tank and assuming a certain percentage of the retained solids are decomposed, minimum pump out frequencies can be estimated. Table LT-1 lists estimated pump out frequencies assuming wastewater residence time of 24 hours and assuming 50 percent of the solids are decomposed or digested.

Lack of any inspection and maintenance allows structural deficiencies to go unnoticed and possibly jeopardizes the absorption system. In septic tanks and pumping chambers, bad seals and cracks which go uncorrected may allow significant amounts of groundwater or surface water to infiltrate and overload the system; baffles which are no longer functional or in their proper location may be permitting significant amounts of undetected solids to pass into the absorption area.

Septic tank designs can be modified to produce an inlet and outlet device, which will be efficient and long lasting in a highly corrosive environment. Inspections made during the repair process often find baffles or concrete tees which have deteriorated and fallen off on the bottom of the tank, thereby allowing solids to flow into the soil absorption area, possibly clogging the soil. Inspection ports on septic tanks extended to the ground surface can help facilitate maintenance checks. Incorporation of ports or access openings would serve to continuously remind the users of the location of the facilities and allow ready access for maintenance.

TABLE LT-1

ESTIMATED SEPTIC TANK PUMPING FREQUENCIES (IN YEARS)
FOR YEAR-ROUND RESIDENCES (Source: Mancl, Karen)

Tank Size (gal)	Household Size (No. of people)									
	1	2	3	4	5	6	7	8	9	10
1000	12.0	5.9	3.7	2.6	2.0	1.5	1.2	1.0	0.8	0.7
1250	16.0	7.5	4.8	3.4	2.6	2.0	1.7	1.4	1.2	1.0
1500	19.0	9.1	5.9	4.2	3.3	2.6	2.1	1.8	1.5	1.3
1750	22.0	11.0	6.9	5.0	3.9	3.1	2.6	2.2	1.9	1.6
2000	25.0	12.0	8.0	5.9	4.5	3.7	3.1	2.6	2.2	2.0
2250	29.0	14.0	9.1	6.7	5.2	4.2	3.5	3.0	2.6	2.3
2500	32.0	16.0	10.0	7.5	5.9	4.8	4.0	4.0	3.0	2.6

NOTES: The frequencies estimated are based on a minimum 24-hour wastewater retention time and 50 percent digestion of the solids entering the tank. More frequent pumping would be needed if garbage disposals were utilized.

Performance Evaluation of Existing On-site Sewage Management Systems

The County Board of Health is routinely asked to conduct performance evaluations of existing on-site sewage management systems. Such evaluations shall be based on available data relating to the system including:

1. Inspection records of initial system installation;
2. Maintenance records of the on-site sewage management system;
3. Site evaluations to determine the current performance of the on-site sewage management system.

Representatives of the County Board of Health will verify the status of the system at the time of the evaluation, based on the availability of the above data using the Existing On-site Sewage Management System Performance Evaluation Report Form.

The Health Department representatives conducting the evaluation should document their findings by completing only one section of the evaluation report form when using Sections A, B, or C using criteria detailed below. Section D should be completed in conjunction with either Section A, B, or C.

Title Section

This section should be completed with the most accurate information available. The original property owner and/or directions may be listed. The Health Department representative should circle the purpose of the evaluation in the right-hand column. Any pertinent existing home information as described by the applicant should be listed in the appropriate box (e.g. 4 bedrooms or 600 gallons per day home with no garbage grinder on public water).

Section A

This section should be completed if all of the following criteria are met.

1. Existing inspection records on file indicated that the system was properly installed, inspected and approved at the time of installation.
2. A copy of the original inspection report is provided with the existing system form.
3. The owner produced maintenance records, which indicate that the tank has been pumped within the past five years, or was installed during that time. If the system has not been pumped within that time frame, it should be pumped, if needed, and documentation of such must be provided to the Health Department prior to completing this section.
4. An on-site evaluation of the property reveals no evidence of damage to the system, of system failure or of the existence of any conditions that would adversely affect the functioning of the system.

All items under this section must be circled yes or no by the Health Department representative. In addition, the comments section may be completed detailing any conditions which might affect the approval. (Ex: The home was unoccupied for more than thirty days prior to the evaluation; the yard was overgrown with weeds making visual inspection of the absorption field difficult, etc.)

Section B

The Health Department representative should complete this section for systems for which no record of inspection exists, provided the following criteria are met:

1. No records exist indicating the appropriateness of the construction, design or installation of the on-site sewage management system.
2. The septic tank was be uncovered sufficiently to allow the Health Department representative to determine if the

tank is properly sized, properly constructed and has acceptable inlet and outlet tees.

3. If allowed by the Health Authority, a Georgia Certified Installer has provided documentation indicating the septic tank and its tees are in good condition, and that it is properly sized and constructed.
4. The owner produces maintenance records that the tank has been pumped within the past five years. If the tank has not been pumped within that time frame, it should be pumped, if needed, and documentation of such must be provided to the Health Department prior to completing this section.
5. An on-site evaluation of the property reveals no evidence of damage to the system, of system failure or of the existence of any condition that would adversely affect the functioning of the system.

Either item number 2 OR 3 should be circled "yes". All other items in this section must be circled yes or no by the Health Department Representative. In addition, the comments section may be completed detailing any conditions that might affect the approval.

Section C

This section should be completed if the initial installation of the system was disapproved by the Health Department and required corrections were never made, or if the on-site evaluation reveals an unapproved septic tank, evidence of system failure, significant changes to the home such as added bedrooms or added garbage disposals or other problems which would adversely affect the proper function of the system. The comments section may be used to detail the reason the system was not approved and/or the required corrective action.

Section D

This section should be completed in conjunction with ONE of the above sections. The Health Department representative should complete this section in cases where another local, municipal, or state agency requires the department's approval prior to additions to the home, additions to the property, or a relocation of a home/mobile home provided the following are met:

1. An existing system is located on the property and has been evaluated in accordance with Section A or B.
2. An on-site evaluation of the property reveals no evidence of damage to the system, of system failure or of the existence of any condition that would adversely affect the functioning of the system; also, the provided information relating to the proposed construction (e.g. location of the construction, type of construction, etc.) or relocation of the home will not adversely affect the performance of the system.

The addition or relocation should not include additional sewage loads. These increased sewage flows should be permitted by the Health Authority as an addition to the existing system. The approximate sewage flow that the existing system should be able to dispose of is to be indicated by number of bedrooms or gallons per day in its box. The septic tank size should be appropriate for a garbage grinder and indicated if so.

If all required corrections are made to a previously unapproved system, a new form must be completed.

Existing On-site Sewage Management System Performance Evaluation Report Form

Property Owner/System Owner Name:			Reason for Existing Sewage System Evaluation: (circle)
			(1) Loan Closing for Home Sale (2) Refinance (3) Home Addition (Non-bedroom) Type:_____ (4) Swimming Pool Construction (5) Structure Addition to Property Type:_____ (6) Mobile Home Relocation
Property/System Address:			
Subdivision Name:	**Lot:**	**Block:**	
Existing System Information: Water Supply (circle)	Number of Bedrooms/GPD:	Garbage Grinder: (circle)	
(1) Public (2) Private Well (3) Community		(1) Yes (2) No	

SECTION A – System on Record

(1) Yes (2) No	Existing On-site Sewage Management System inspection records indicate that all components of the system were properly constructed and installed at the time of the original inspection.	**Comments:**
(1) Yes (2) No	A copy of the original On-site Sewage Management System Inspection Report is attached.	
(1) Yes (2) No	Maintenance records indicate that the system has been pumped out or serviced within the last five (5) years **or** the system was installed within that timeframe.	
(1) Yes (2) No	A site evaluation of the system on this date revealed no evidence of system failure or of conditions which would adversely affect the functioning of the system.	

Evaluating Environmentalist:	Title:	Date:	
			I verify this data to be correct at the time of the evaluation. This verification shall not be construed as a guarantee of the proper functioning of this system for any given period of time. No liability is assumed for future damages that may be caused by malfunction.

SECTION B – System Not on Record

(1) Yes	No inspection records are on file showing the On-site Sewage Management System was inspected and approved at the time of the installation.	**Comments:**
(1) Yes (2) No	The septic tank was installed and approved prior to the adoption of the applicable rules.	
(1) Yes (2) No	Documentation from a licensed professional engineer or registered sanitarian is attached, certifying that the system was installed and is operating properly, and that its construction and installation criteria. A copy is attached.	
(1) Yes (2) No	Maintenance records indicate that the system has been pumped out or serviced within the last five (5) years **or** the system was installed within that timeframe.	
(1) Yes (2) No	A site evaluation of the system on this date revealed no evidence of system failure or of conditions which would adversely affect the functioning of the system; however, appropriateness of the sizing and installation cannot be verified since no initial inspection records exist.	

Evaluating Environmentalist:	Title:	Date:	
			I verify this data to be correct at the time of the evaluation. This verification shall not be construed as a guarantee of the proper functioning of this system for any given period of time. No liability is assumed for future damages that may be caused by malfunction.

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SECTION C – System Not Approved

(1) Yes (2) No	The On-site Sewage Management System was disapproved at the time of the initial installation and is thus not considered an approved system.	**Comments:**
(1) Yes (2) No	Evaluation of the system revealed evidence of system failure or malfunction, and will therefore require corrective action in order to obtain approval of the system.	
(1) Yes (2) No	Evaluation of the system revealed conditions which would adversely affect the proper functioning of the system, and will therefore require corrective action in order to obtain approval of the system.	

Evaluating Environmentalist:	Title:	Date:	
			I verify this data to be correct at the time of the evaluation. This verification shall not be construed as a guarantee of the proper functioning of this system for any given period of time. No liability is assumed for future damages that may be caused by malfunction.

SECTION D – Addition to Property or Relocation of Home (section completed in conjunction with A, B, or C above)

(1) Yes (2) No	An existing On-site Sewage Management System is located on the property listed above and has been evaluated in accordance with Section A or B above.	**Comments:**	
(1) Yes (2) No	A site evaluation on this date as well as the provided information indicate that the proposed construction to home or property **or** that the proposed relocation of the home should not adversely affect the proper functioning of the existing system provided that no additional sewage load is added to the system for the listed size home adjacent.	Number of Bedrooms/GPD:	Garbage Grinder: (circle) (1) Yes (2) No

Evaluating Environmentalist:	Title:	Date:	
			I verify this data to be correct at the time of the evaluation. This verification shall not be construed as a guarantee of the proper functioning of this system for any given period of time. No liability is assumed for future damages that may be caused by malfunction.

On-Site Sewage Management System
Operation and Maintenance Agreement

Georgia,

This agreement made and entered into this _____ day of _____, 20____ by and between _____, a corporation under the laws of Georgia, or said county, hereinafter called "Company" and _____ of _____County, Georgia, hereinafter called "Consumer."

WITNESSETH

Whereas, Company is the owner of the unencumbered fee simple title to the following described property.

Upon which is located an on-site sewage management system to serve the various properties that may now or hereafter be connected to the sewage management system and is also the owner of sewer lines in the streets in said subdivision and of easements for the installation and maintenance of such lines; and

Whereas Consumer is the owner of Lot ____ in _____ Subdivision in _____ County, Georgia, according to a plat thereof recorded in Plat Book _____, Page _____, Clerks Office, _____ County Superior Court and desires to obtain sewage management service which Company desires to furnish; and

Whereas, the parties hereto desire that the benefits and obligation of Consumer run with the land described above.

Now, therefore, the parties hereto agree as follows.

1.

Company covenants and agrees to furnish sewage management service to the aforesaid property of the consumer, and to continuously furnish the same unless and until the operation of said sewage system is taken over or an adequate sewage system is otherwise made available to municipality or other governmental agency or authority, including, but not limited to, foregoing, Company agrees that it will

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Company covenants and agrees that it will install sewer lines where Consumer's lot abuts; however, it is to be the responsibility of Consumer to make connection with said sewer line. Consumer shall first make a deposit of _____ to be held by Company so long as Consumer own the above-described property, which deposit may, at Company's option, at any time be applied in payment of any sum owed to Company by Consumer. In the event that any part of said deposit is so applied, Consumer shall immediately repay such amount to Company, so that Consumer will again have sum _____ on deposit with Company.

3.

Company covenants and warrants that the on-site sewage management system furnished by it shall be of the quality required by the _____ Health Department and that the system shall likewise meet the standards and requirements of the said department; however, nothing contained in this sentence or in this agreement shall be construed as enlarging the liability of Company for personal injuries to Consumer, any member of his family, or any other person, and Company shall be liable for such injuries only if negligent and such negligence shall be determined without regard to the provisions of this agreement. Company agrees to allow inspections of its system by said Health Department, as said Department may deem necessary.

4.

Consumer agrees to pay for the sewage management service provided for said premises the sum of _____ per month. Company shall have the right to change said rate and minimum from time to time but agrees that such rate and minimum shall not be changed to a rate and minimum higher than the highest rate and minimum charged by any town or municipality within a fifty mile radius of _____. Company shall bill Consumer for said service at least quarterly and not more often than monthly, and Consumer agrees to pay for said service within _____days after a bill for the same is submitted and further agrees that, should

he fail to do so, service may be discontinued. In the event that service is so discontinued, Company shall not be obligated to resume such service unless and until Consumer has paid all due bills plus _____ service charge.

5.

Company agrees so long as it is obligated to furnish sewage management service under this agreement that it will maintain a trust account for the benefit of the system in a banking institution or a federal savings and loan association in _____Georgia in an amount not less than the total amount of deposits collected or per lot multiplied by the total number of lots in the subdivision, which ever is greater.

6.

In the event that Company should intentionally fail and refuse to furnish sewage management service in accordance with this agreement, all of the then owners of lots in _____ Subdivision, as shown on said plat referred to above, shall have the right to take over and become the owners of the complete system serving said Subdivision, and the trust account above referred to (but not the other assets of Company) which ownership should be deemed to be appurtenant to the lots in said Subdivision and to run with said lots.

7.

The benefits and obligations of Consumer under this agreement shall run with this lot described above; and this agreement shall bind and benefit Company, its successors and assigns.

8.

Company reserves the right to f[illegible] said system to such additional properties as Company [illegible] terms of this agreement.

IN WITNESS WHEREOF, the [illegible] have hereunto set their hands and affixed their seals on the day and year first above written.

For Official Use Only

_____ (SEAL)

BY: _____ (SEAL)
(President)

Attest: _____ (SEAL)
(Secretary)

COMPANY

_____ (SEAL)

_____ (SEAL)

CONSUMER

Signed, sealed, and delivered in the presence of:

Lot Sizing

To provide for the orderly and safe development of property utilizing on-site sewage management systems, the following criteria for establishing minimum lot sizes are **recommended** for use by County Boards of Health, which are authorized by Georgia statute in OCGA 31-3-5(b) (2) to establish minimum lot sizes. Larger lot sizes may be required to meet the requirements of this manual depending on the proposed development of the property. County Boards of Health and/or County Zoning Authorities may require larger minimum lot sizes; such establishment of larger minimum lot sizes will take precedence.

1. Lot size requirements are as follows for single family dwellings including but not limited to: manufactured or mobile homes, stick built homes, modular homes, etc., and individual lots in subdivisions or mobile home lots located in areas other than commercial mobile home parks. Area requirements for multiple dwellings on a single recorded lot, where not prohibited by local zoning, must be provided in multiples of the following minimum lot sizes for each dwelling to be constructed on the recorded lot. SeeTable MT-1 and subparagraphs 1A through 1F as follows.

Table MT-1

Minimum (Min) Lot Sizes, Minimum Lot Widths and Maximum (Max) Allowable Sewage Flow for the Type of Water Supply System.

	Type of Water Supply System	
	Non-public* (Individual)	Public
Min Lot Size	43,560 square feet	21,780 square feet
Min Lot Width	150 ft.	100 ft.
Max Sewage Flow	600 gpad**	1200 gpad

* In this context "Non-public" means an individual water supply system or any other water supply system, which is not a "public" water supply system.

**gpad = gallons per acre per day=gal/acre/day.

A. The above minimum lot sizes are for the typical size home (3 or 4 Bedroom) with basic appurtenances such as: driveway, minimum number of trees, and water supply line. If larger homes, swimming pools, tennis courts or outbuildings, etc. are proposed to be constructed or if trees would interfere with installation of an on-site sewage management system, the County Board of Health will require larger lots to assure useable soil area.

B. The County Board of Health may also require larger lot sizes when physical factors indicate the need to do so. These factors include, but are not limited to, the availability of sufficient unobstructed land areas for an approved on-site sewage management system and approved replacement system, slope greater than 5%, percolation rates higher than 45 minutes per inch, need for subsurface drainage or adverse topographic features.

C. Lots shall be a minimum width of one hundred feet (100') or one hundred fifty feet (150') measured within the area where an approved on-site sewage management system and replacement system are to be located when served by a public water supply system or non-public water supply system, respectively.

D. The following land areas are not considered as a part of a lot when calculating the required minimum lot size: right of ways of roads, easements (such as power line or pipe line) that exclude installation of an on-site sewage management system, soil conditions that exclude the installation of an on-site sewage management system, bodies of water, land within 50 feet of a lake, river, stream, wetland or other bodies of water and similar limiting factors.

E. There must be an unobstructed area on each lot for installation of an approved on-site sewage management system and an area equal in size for a conventional system or larger area, as appropriate, for an approved

replacement system; this will include sufficient area for necessary site modifications for installation of both the initial system and a replacement system. All pertinent County zoning setbacks and other space requirements must also be met.

F. The maximum daily sewage flow for each lot or parcel of land shall not exceed 600 gpad when served by non-public or individual water supply system or 1200 gpad when served by public water supply system. When sewage flows exceed these quantities (600 or 1200 gpad as indicated) for a given dwelling structure, the minimum lot size or parcel of land shall be increased proportionally. Example: Assume a public water supply exists (so 1200 gpad maximum sewage flow allowed per minimum required land area of 21,780 square feet), and there is a proposed sewage flow of 5,000 gpd. To determine X= the square footage of the lot needed, use the following formula:

$$X = \frac{5000 \text{ gal/day}}{1200 \text{ gal/acre/day}}$$
$$= 4.17 \text{ acre}$$
$$= 4.17 \text{ acres} \times 43560 \text{ ft}^2/\text{acre}$$
$$= 181{,}500 \text{ ft}^2 \text{ area of land needed.}$$

Likewise, for a non-public (individual) water supply, to determine Y= the square footage of the lot needed for a proposed sewage flow of 5000 gpd, use the following formula:

$$Y = \frac{5000 \text{ gal/day}}{600 \text{ gal/acre/day}}$$
$$Y = 8.33 \text{ acres}$$
$$Y = 8.33 \text{ acres} \times 43560 \text{ ft}^2/\text{acre}$$
$$Y = 363{,}000 \text{ ft}^2 \text{ area of land needed.}$$

2. Lot sizing requirements are as follows for multi-family residential dwellings, all other non-single family dwellings and commercial structures, and this also includes mobile homes located in commercial mobile home parks. Paragraphs 1A through 1F above also apply to Table MT-2.

Table MT-2

Minimum (Min) Lot Sizes, Minimum Lot Widths and Maximum (Max) Allowable Sewage Flow for the Type of Water Supply System.

	Type of Water Supply System	
	Non-public* (Individual)	Public
Min Lot Size	43,560 square feet	21,780 Square Feet
Min Lot Width	150 ft.	100 ft.
Max Sewage Flow	600 gpad**	1200 gpad

*In this context "Non-public" means an individual water supply system or any other water supply system, which is not a "Public" water supply system.

** gpad=gallons per acre per day= gal/acre/day

Criteria for Protection of Groundwater Recharge Areas

Rules of the Department of Natural Resources, Environmental Protection Division, Chapter 391-3-16-.02 require the following minimum lot sizes in the State of Georgia Groundwater Recharge areas as defined by the above.

A) Subdivisions and Individual Lots

New homes served by septic tank and absorption field systems shall be on lots having the following minimum size limitations as identified in Table MT-1.

1.) 150 % of the subdivision minimum lot size of Table MT-1 if lot is within a high pollution susceptibility area;
2.) 125 % of the subdivision minimum lot size of Table MT-1 if lot is within a medium pollution susceptibility area;
3.) 110 % of the subdivision minimum lot size of Table MT-1 if lot is within a low susceptibility area.

B) Mobile Home Parks

New mobile home parks served by septic tanks and absorption field systems shall be on lots having the following size limitations as identified in Table MT-2.

1.) 150 % of the subdivision minimum lot size of Table MT-2 if lot is within a high pollution susceptibility area;
2.) 125 % of the subdivision minimum lot size of Table MT-2 if lot is within a medium pollution susceptibility area;
3.) 110 % of the subdivision minimum lot size of Table MT-2 if lot is within a low pollution susceptibility area.

C) If a local government requires a larger lot size than that required by (2A) above for homes or (2B) above for mobile homes, the larger lot size shall be used.

D) Local governments at their option may exempt from the requirements any lot of record prior to the date of adoption of the Rules of the Georgia Department of Natural Resources, Environmental Protection Division, Chapter 391-3-16-.02.

Georgia Department of Human Resources
SUBDIVISION ANALYSIS RECORD

I. General Information

A. Name of Subdivision _____

1. Owner/Agent _____ Telephone _____

2. Address _____

B. Location of Subdivision _____

1. County _____ Land Lot _____ G.M.D. or Land District _____

C. Characteristics of Subdivision:

1. Area of Subdivision _____Acres. Typical lot size _____ sq. feet

2. Number of Lots _____

3. Typical Home: Square footage _____ No. of Bedrooms _____ No. of Baths _____

D. Adjacent Subdivisions

For Official Use Only

Name		Distance

II. Sewage Disposal

A. Public or Community Sewage System Availability (existing or under construction)

1. Name of System _____

2. If community system give owner's name _____

Address _____

3. Nearest sewer (existing or under construction) to subdivision or overall tract if developed in sections:

Distance _____ Size _____ Is gravity flow possible? _____

4. If system is under construction, give completion date _____

B. Future Availability of Sewer (planned or under construction):

1. Are sewers to be extended to serve this area? _____

2. Has the Environmental Protection Division approved plans and specifications? _____

Date _____

3. Estimated date sewer will be available _____

C. Attach letter from responsible public official or community system owner stating position on subdivision connection to system.

D. On Site Sewage Management System:

1. Are on site sewage management systems proposed for each lot? _____

2. Are soil reports, soil maps and soil data sheets from approved soil classifier attached? _____

III. WATER SUPPLY

A. Public or Community Water Supply Availability (existing or under construction)

1. Name of Water System _____

2. Nearest Available Main: Distance _____ Size _____ Pressure _____

3. If public or community water system is privately owned, gi

O r's Name A _____

4. If v rce approval? _____

5. Ha ron Protection Division approved the water supply system? _____

For Official Use Only

B. Future Availability of Water System (planned, not under construction):

1. Is a public or community water system proposed? _____

2. Name of Engineer/Firm _____

Address _____

3. Has the Environmental Protection Division approved plans and specifications? _____

C. Attach letter from responsible official or owner stating status on connection of subdivision to public or community water system.

D. Individual Water Supply:

1. Are individual wells planned for each lot? _____

(For Department Use Only)

Comments and Recommendations

_____

_____

_____

_____

_____

_____

DHR Representative	Title
Agency	Date

Certification

I. Certification Required

Chapter 290-5-26-.17 provides for certification and de-certification of septic tank contractors, inspection personnel, pumpers, soil scientists and maintenance personnel. This section establishes standards for these individuals.

Establishment of the Certification Review Committee

There shall be established a Certification Review Committee that assists the Department with certification, recertification and decertification of all individuals required to be certified under Chapter 290-5-26-.17 with the exception of Soil Classifiers. The Certification Review Committee shall be composed of two individuals from the state environmental health program, one district environmentalist, one county environmentalist, two individuals who are certified under the "Septic Tank Contractor, or Pumper" sections of this chapter and one individual licensed to practice law in the State of Georgia.

The Committee, will assist the Department with the following:

- Establishing written tests that will be administered for the various certifications and revising such tests from time to time;
- Reviewing and responding to complaints regarding poor quality of work and unethical practices;
- Reviewing the content of educational programs and events and assigning appropriate continuing education units;
- Reviewing the established criteria for certification in the assigned specialties and making such modifications as are appropriate for the on-going management of the process;
- Recommending decertification of those individuals who fail to adhere to the standards for certification established in this section; and doing such other activities as would be appropriate to manage the continued operation of the certification effort effectively.

Septic Tank Contractors

Installation and Repair Personnel

Persons engaged in the construction or repair of on-site sewage management systems shall be required to hold a current certificate indicating successful completion of the requirements of this section.

Requirements for Certification

Initial Certification

- Must be at least 18 years of age;
- Must pay an examination fee;
- Must successfully complete a written or oral examination concerning the Rules and Regulations for On-Site Sewage Management Systems, Chapter 290-5-26 and the installation of systems;
- Must submit a copy of business license or other verification of business or submit proof of employment with a certified on-site sewage contracting company;
- Individuals who wish to install an on-site sewage system at their primary residence may do so upon successful completion of the written examination portion of this process. In this circumstance no certification will be issued and the individual's authorization to install a system will terminate upon completion of the installation of the system for his/her residence.

Recertification

- Must not have any outstanding unresolved disciplinary action(s);
- Must submit evidence of completion of eight hours of continuing education approved by the Certification Review Committee;

Certification will be granted to those individuals who successfully complete a written or oral examination and who comply with all requirements established by the Department. The examination(s) will be developed by the

Department, with the assistance of the Committee, and will be structured as a series of modules. The basic residential module will be composed of questions about "conventional on-site sewage management systems" as defined in the current "Rules and Regulations" of the Department and the manual. Additional modules (commercial, drip irrigation and mound/fill) will address each of a variety of alternative sewage disposal methods that currently exist or will be developed in the future. It is recognized that such systems are typically complex in nature and vary significantly in installation from conventional system design. A commercial certification is required for contractors installing a system designed for a flow of 2,000 gallons per day or more. Certification will indicate all types of systems for which successful testing has been accomplished. A minimum of 70% correct responses will be required for certification.

Fees
"Certified Contractor" is defined as an individual or multiple individuals operating under a common business license.

A $50 examination fee will be required of those individuals who wish to take the certification examination. Persons who successfully complete the examination will be issued a numbered certificate upon receipt of a $300 certification fee paid by the certified contractor as defined above. Certification will be for a two-year period and will be continued upon receipt of a $300 renewal fee and submission of evidence of compliance with all other provisions for re-certification established by the Department. Individuals employed by governmental units who are certified for the purpose of doing on-site sewage installation work only for the agency for whom they are employed, shall be exempt from fees.

Pumpers (Septage Removal and Disposal Personnel)

Certification Required: Individuals engaged in the cleaning and pumping of on-site sewage systems shall be certified by the Department. There shall be two levels of certification established that will be determined by the scope of waste disposal activity. Individuals employing waste disposal via waste treatment plants properly permitted by the Environmental Protection Division of the Georgia Department of Natural Resources will be required to hold Level I certification as hereby established. Individuals employing waste disposal via land application will be required to hold Level II certification as also established herein.

Requirements for Level I Certification
Candidates for Level I certification shall meet the following requirements:

- Must be at least 18 years of age;
- Must show proof of ownership or employment with a certified septage removal company currently operating in good standing following Chapter 290-5-26-.11;
- Must successfully complete a written or oral examination concerning proper access, cleaning and pumping of septic tanks and proper hauling and disposal of septage within the scope of Level I certification.

Requirements for Level II Certification
Candidates for Level II certification shall meet the following requirements:

- Must be at least 18 years of age;
- Must show proof of ownership or employment with a certified septage removal and disposal company currently operating in good standing with Chapter 290-5-26-.11;
- Must hold a current Level I certification.
- Must successfully complete a written or oral examination concerning proper access, cleaning and pumping of septic tanks and proper hauling and disposal of septage within the standards established by the Department of Human Resources Rules and Regulations for the Land Disposal of Domestic Septage, Chapter 290-5-25 governing the land application of septage;

Recertification
Individuals holding Level I or Level II certification must be recertified every two years. Recertification will be based on the following criteria:

- Must have no unresolved disciplinary action outstanding;

- Must show proof of ownership or employment with a certified septage removal and disposal company operating in good standing with Chapter 290-5-26-.11.
- Must submit evidence of completion of six hours of continuing education approved by the Certification Review Committee.

Fees
"Certified Contractor" is defined as an individual or multiple individuals operating under a common business license.

A $50 examination fee will be required of those individuals who wish to take the certification examination. Persons who successfully complete the examination will be issued a numbered certificate upon receipt of a $300 certification fee paid by the certified contractor as defined above. Certification will be for a two-year period and will be continued upon receipt of a $300 renewal fee and submission of evidence of compliance with all other provisions for re-certification established by the Department.

Inspection Personnel

Individuals employed by County Boards of Health who are involved in on-site sewage disposal system regulatory programs shall be required to hold current certification indicating successful completion of the requirements of this section. Two levels of certification are hereby established. Level I shall be known as the "system inspector" certification level and Level II shall be known as the "site evaluator" level. Criteria for the attainment of each level shall be as follows:

Level I Certification
Individuals eligible for Level I certification shall be employed in good standing in an environmental health program of the Department of Human Resources or County Board of Health in an "Environmental Health Specialist I" position or higher. Candidates must successfully complete a written examination consisting of questions about the installation of "conventional" and "alternative" on-site sewage disposal systems, basic soil hydrology and other physical soil characteristics. The use of basic equipment used in the evaluation of system installations shall also be covered. Field proficiency will be evaluated by a certified individual employed by the Department. Additional testing modules will be developed to certify technical knowledge of special alternative and experimental system designs. A minimum of 70% correct answers will be required for successful completion of the examination.

Individuals actively employed in an on-site sewage disposal regulatory program at the time of the enactment of this rule, who have a minimum of six months of on-site sewage field experience and demonstrate proficiency in the field activities related to the systems covered in the written testing phase of this program but who are not Environmental Health Specialists I or higher, may be considered for Level I certification.

After enactment of this rule, persons employed to work in the on-site sewage management system regulatory program shall work under the supervision of a certified Level I Inspector until demonstrating proficiency in field inspection activities and passing a Level I certification test. Proficiency in field activities shall be determined by the satisfactory inspection of 50 on-site management systems, or three months of work experience in the on-site sewage program. With approval of the Environmental Health District Director, the individual is eligible for certification Level I testing after demonstrating field proficiency.

Upon completion of the testing and practical segments of this rule, the successful candidate will be issued a numbered certificate indicating basic skills and additional modules tested.

Level II Certification
Individuals eligible for Level II certification shall be employed in good standing in an environmental health program of the Department of Human Resources or County Board of Health in an Environmental Health Specialist I or higher position and be currently certified as a Level I inspector. They must have completed training approved by the Department in the interpretation of soils and soil evaluation data including mapping and topographic interpretation.

Upon completion of the required prerequisite training, candidates for certification will take a written examination

consisting of questions from the required training and additional questions concerning the application of various on-site sewage management methods to specified site and soil conditions. A minimum of 70% correct responses will be required for successful completion of this requirement.

*Environmental Health Technician Provision:
Individuals employed on or before October 19, 1999, in an on-site sewage disposal regulatory program, who have a minimum of six months of on-site sewage field experience, and who demonstrate proficiency in field activities and by written examination related to the systems covered by this program, but are not Environmental Health Specialist I or higher, may be considered for Level II certification.
*Revised October 13, 1999.

Recertification
Environmentalists certified under this section shall be required to recertify every two years. Recertification will be based on performance and continuing education as specified by this Chapter.

In accordance with State Law (i.e. SB 30), "each employee of a county board of health whose duties include enforcing those environmental health regulations of that board of health relating to septic tanks or individual sewage management systems shall be subject to the direction and supervision of the district director of environmental health, although the hiring and termination from employment of such employee shall be subject to the director of that county board of health. The employment activities of such employee with regard to environmental health shall be reported to the director of environmental health through the district director of environmental health at least quarterly. The director of environmental health may recommend to that director of that county board of health personnel actions, including but not limited to termination, which the director of environmental health deems appropriate for such employee's failure or refusal to comply with the direction of the director of environmental health in the carrying out of the environmental health employment duties of such employee".

Recertification of Level I and Level II inspectors will be contingent upon evidence of four hours of approved continuing education per year and satisfactory performance of certified activities.

Fees
Since inspection personnel are employed by agencies that receive funding from the Department as part of the Master Agreement, certification and recertification fees are to be waived.

Soil Classifier/Soil Scientist

When establishing credentials for individuals engaged in evaluating the soils on sites proposed for on-site sewage management systems, the terms “soil classifier” and “soil scientist” shall have the same meaning. A Soil Classifiier is defined as a person who holds at least a Bachelor of Science degree from an accredited college or university with a major in Agronomy, Soil Science, or a related field, as approved by Soil Classifiers Certification Advisory Committee. Must complete a minimum of 30 semester credit hours or equivalent quarter hours in the biological, physical, chemical and earth sciences with a minimum of 15 semester hours or equivalent quarter hours in approved soil science courses and have four years of full time or equivalent part time experience as a Soil Classifier/Soil Scientist actively mapping, identifying and classifying soil features, and interpreting the influence of soil features on soil uses. Such individuals meeting the aforementioned definition shall be certified in accordance with the following provisions:

<u>Establishment of the Soil Classifiers’ Certification Advisory Committee</u>
The Department shall appoint nine individuals from the following professional disciplines who will oversee the certification of “Soil Classifiers”. This body shall be known as the “Soil Classifiers’ Certification Advisory Committee”. It shall be comprised of three environmentalists employed in the environmental health program of County Boards of Health or the Department of Human Resources (county, district and state), one currently certified soil classifier, two soil scientists from academia, a registered engineer, a registered geologist and a lawyer currently licensed to practice in the State of Georgia.

The Advisory Committee shall be responsible for: reviewing applications for certification; administering certification examinations; reviewing and responding to complaints concerning poor quality work and unethical practices; recommending disciplinary action; recommending initial certification and recertification of individuals; reviewing the content of educational programs and events and making recommendations regarding continuing education credits, and doing such other activities as would be appropriate to the operation and maintenance of the soil classifiers certification program.

Initial Certification

- Must be at least 21 years of age;
- Must submit, *as a minimum*, evidence of training, education and experience to the Soil Classifiers Certification Advisory Committee with an application for certification. The Advisory Committee may request additional information as it deems appropriate;
- Must successfully complete a written examination which will include questions on basic concepts of soil science, soil morphology, soil classification, soil interpretation, general geology, the use and application of the Department's soil tables, basic principles of soil water flow and basic septic system absorption design;
- Must submit evidence of current "errors and omissions" insurance or other comparable indemnification in the amount of $1,000,000.

Recertification

Must establish, to the satisfaction of the Soil Classifiers Certification Advisory Committee, a history of satisfactory performance within the scope of the on-site sewage program of the Department.

- Must submit evidence of 10 Continuing Education Units approved by the Advisory Committee;
- Must submit annually, evidence of current "errors and omissions" insurance or other comparable indemnification in the amount of $1,000,000;

Fees

A $100 application processing/examination fee will be required of those persons who wish to be considered for certification in the on-site sewage management program. Persons who successfully pass the examination will be issued a numbered certificate upon receipt of a $400 certification fee. Certification will be for a two year period and will continue upon receipt of a $400 recertification fee and submission of evidence with all other provisions for certification established by the Department.

II. Decertification

Persons certified under the provisions of this chapter shall be subject to decertification as provided for in this section.

Decertification of Individuals Certified Under This Chapter

Certification may be revoked for the following reasons:

- Substantiated evidence of repeated violations of the provisions of Chapter 290-5-26 or other related regulations or statutes governing the function for which the individual is certified under this Chapter;
- Substantiated evidence of repeated instances of poor quality of work or unethical practices;
- Failure to maintain required bonds or insurance;
- Failure to pay required fees;
- Failure to maintain required continuing education credits; or
- Such other conduct as, in the opinion of the Committee, would render continued certification of the individual in question a threat to the health, safety or well being of the individuals or community served.

DECERTIFICATION PROTOCOL PURSUANT TO THE RULES AND REGULATIONS FOR ON-SITE SEWAGE MANAGEMENT SYSTEMS CHAPTER 290-5-26-.17

Grounds for Decertification of Septic Tank Contractors/Companies, Inspection Personnel, Pumpers, Soil Classifiers and Maintenance Personnel

(1) The Department may take disciplinary action including suspension and revocation of an individual or company's certification after a notice and opportunity for hearing pursuant to the Georgia Administrative Procedure Act O.C.G.A. Chapter 50-13, as amended, if the Department finds such individual has failed to comply or maintain compliance with O.C.G.A. 31-2, the DHR Rules and Regulations Chapter 290-5-26, this protocol, or has committed any of the following acts:

(a) Deliberate misrepresentation and/ or falsification of information on the application for certification;
(b) Pending judicial disciplinary action(s) relevant to the on-site sewage industry;
(c) Judicial judgments against the individual or company holding certification;
(d) Any act or omission that is indicative of unethical behavior or practices;
(e) Conviction of company's principal in any court of any felony or other criminal offense; or,
(f) Evidence of questionable business practices.

(2) The holder of any certification that is revoked for failure to comply or maintain compliance with O.C.G.A. 31-2, the DHR Rules and Regulations Chapter 290-5-26, or this Protocol, shall not be entitled to be recertified or be a party to a like industry under any other certification for a period of at least twenty-four (24) months. This provision shall also be applicable to officers, directors, and stockholders of corporate providers involved in any aspect of the on-site sewage industry.

Decertification Process for Septic Tank Contractors/Companies, Inspection Personnel, Pumpers, Soil Classifiers and Maintenance Personnel

(1) After review of the evidence, the Certification Review Committee will make a recommendation to the Department as to whether an individual or company should be decertified.

(2) After receiving the committee's recommendation, the Department will notify the individual or company in writing via certified mail of its intent to decertify, and the basis for such action. The certified intent letter will be sent to the last known address of the company or individual that is the subject of the decertification.

(3) The affected individual or company has ten (10) days from the receipt of the intent letter to request a hearing on the matter. If no reply is received by the deadline, decertification is effective immediately. In the event a reply is received by the specified deadline, then a hearing will be scheduled with the hearing officer.

(4) The Department may take disciplinary action including suspension and revocation of an individual or company's certification after a notice and opportunity for hearing pursuant to the Georgia Administrative Procedure Act O.C.G.A. Chapter 50-13, as amended, if the Department finds such individual has failed to comply or maintain compliance with O.C.G.A. 31-2, the DHR Rules and Regulations Chapter 290-5-26, or this Protocol.

(5) Any person or company who has exhausted all administrative remedies available within the department, and who is substantially aggrieved by a final order or final action of the department, is entitled to judicial review and an appeal to superior court pursuant to O.C.G.A. Section 31-5-3.

(6) Pursuant to O.C.G.A. Section 31-5-3, appeal to the superior court shall be by petition which shall be filed with the clerk's office of such court within thirty (30) days after the final order or action of the department;

the petition shall set forth the names of the parties requesting the appeal, the order, rule, regulation, or decision appealed, and the reason it is claimed to be erroneous. The enforcement of the order or action appealed shall be automatically stayed upon the filing of such petition unless the Commissioner of Human Resources in his/her final order certifies that the decision if stayed will harm the public health and safety, in which case a reviewing court may order a stay only if the court makes a finding that the public health and safety will not be harmed by the issuance of the stay. Upon the filing of such petition, the petitioner shall serve on the Commissioner a copy thereof in the manner prescribed by law for the service of process, unless such service of process is waived. The appeal shall be an appeal de novo to the superior court and the appealing party shall have a right to a jury trial and all rights provided under Chapter 11 of Title 9, the "Georgia Civil Practice Act." The superior court shall render a decision approving, setting aside, or modifying the order or action appealed from.

(7) The holder of any certification that is revoked for failure to comply or maintain compliance with O.C.G.A. 31-2, the DHR Rules and Regulations Chapter 290-5-26, or this Protocol, shall not be entitled to be recertified or be a party to a like industry under any other certification for a period of at least twenty-four (24) months. This provision shall also be applicable to officers, directors, and stockholders of corporate providers involved in any aspect of the on-site sewage industry.

Appeals

Individuals aggrieved or adversely affected by an action of the Department shall have the right to appeal as provided in O.C.G.A. Title 31-5-3.

III. Registered Engineer/Geologist

Any person, who holds a valid certificate of registration as a registered geologist issued pursuant to Chapter 19 of Title 43, or who holds a valid certificate of registration as a professional engineer issued pursuant to Chapter 15 of Title 43 and is practicing within his or her area of engineering competency may register with the Department of Human Resources to conduct investigations of the suitability of a site within the state for an on-site sewage management system.

Initial Registration
A professional engineer/geologist may perform investigations and evaluations of the suitability of a site for an on-site sewage management system provided that:

- The professional engineer demonstrates competency by the successful completion of at least six quarter hours, or the semester equivalent, or college level courses or eight hours of continuing education related specifically to soils classification and suitability of sites for on-site sewage management systems.
- Submit evidence of current “error and omissions” insurance or other comparable indemnification in the amount of $1,000,000.

Fee
No registration fee required.
Continued Registration Requirements
- Continued registration as a registered engineer or geologist in the state of Georgia.
- Must submit annually, evidence of current “error and omissions” insurance or other comparable indemnification in the amount of $1,000,000.

RULES OF THE
DEPARTMENT OF HUMAN RESOURCES
PUBLIC HEALTH
CHAPTER 290-5-59
SPECIAL ONSITE SEWAGE MANAGEMENT SYSTEMS

TABLE OF CONTENTS

290-5-59-.01 Applicability
290-5-59-.02 Definitions
290-5-59-.03 General Provisions
290-5-59-.04 Enforcement

290-5-59-.01 Applicability. These Rules shall be in force from August 1, 1995 and shall have application except in the following cases:

(a) In any county or municipality which has a local health code in effect;

(b) To any facility or system under the jurisdiction of and regulated by the Department of Natural Resources or its successor, under the Georgia Water Quality Control Act or the Georgia Comprehensive Solid Waste Management Act or their successors;

(c) To any public or community sewage treatment system.

Authority O.C.G.A. Sections 12-8-1, 31-2-1, 31-2-2, 31-2-4, 31-12-8. History. Original Rule entitled "Applicability" adopted. F. June 22, 1995; eff. Aug.1,1995, as specified by the Agency. Amended: F. Dec. 12, 1996; eff. Jan. 1, 1997.

290-5-59-.02 DEFINITIONS. For the purpose of this chapter, the following words and phrases shall have the meanings as indicated:

(a) APPROVAL or APPROVED means acceptable or accepted by the Health Authority in accordance with applicable specifications stated herein or with additional criteria accepted by the Authority.

(b) CONTRACTOR means any person who shall contract for the installation, construction, repair, alteration, enlargement, emptying or pumping out of any onsite sewage management system.

(c) DHR means the Georgia Department of Human Resources or its successor agency.

(d) DNR means the Georgia Department of Natural Resources.

(e) HEALTH AUTHORITY means the local county or consolidated health board.

(f) HOLDING TANK means a water tight container utilized temporarily to hold sewage from a flush toilet.

(g) MANUAL FOR ONSITE SEWAGE MANAGEMENT SYSTEMS means the DHR technical handbook currently adopted and periodically updated, used by the Health Authority in the implementation of this Chapter and available for inspection at the appropriate DHR State Office in Atlanta or the local Health Authority. The Manual for Onsite Sewage Management Systems is intended as a guide and its provisions are herein adopted unless inconsistent with other provisions of law or regulation.

(h) NONSEWERED TOILET SYSTEM means any portable structure used for the collection, temporary storage and chemical treatment of human body wastes that is not connected to an onsite sewage management system or public or community sewerage system.

(I) ONSITE SEWAGE MANAGEMENT SYSTEM means a sewage management system other than a public or community sewage treatment system, whether serving single or multiple buildings, mobile homes, recreational vehicles, residences or other facilities designed or used for human occupancy or congregation. Included are conventional septic tank systems, privies, and alternative onsite sewage management systems that may be approved by the local Health Authority.

(j) PERSON means any individual, partnership, corporation or association including bodies political and corporate.

(k) PUBLIC OR COMMUNITY SEWAGE TREATMENT SYSTEM means any sewage treatment system, including pipe lines or conduits, pumping stations, force mains and all other construction devices and appliances appurtenant thereto, designed for treating or conducting sewage for treatment and disposal into lakes, streams and other bodies of surface water.

(l) PUBLIC WATER SYSTEMS means a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections, or regularly serves an average of at least twenty-five individuals, at least sixty(60) days out of the year.

(m) SEPTAGE means a waste that is a fluid mixture of partially treated or untreated sewage solids, liquids and sludge of human or domestic waste, present in or pumped from septic tanks, malfunctioning onsite sewage treatment systems, grease traps or privies.

(n) SEWAGE means human excreta, all water-carried wastes, and/or liquid household waste including grey water from residences or similar wastes or by-products from commercial and industrial establishments.

(o) SPECIAL EVENT means any activity attracting more than fifty (50) persons that is sponsored, organized, promoted, managed or financed by any person, group, partnership,

organization, corporation, business or governmental entity where individuals congregate to participate in or observe an activity in outdoor or portable enclosed or semi-enclosed structures for more than two (2) consecutive hours.

(p) TOILET means a sanitary fixture meeting Health Authority and plumbing code requirements for receipt and conveyance of human body wastes to a public or community sewerage system or an onsite sewage management system.

(q) WELL means an excavation or opening into the ground by which groundwater is sought or obtained.

Authority O.C.G.A. Sections 12-8-1, 31-2-1, 31-2-2, 31-2-4, 31-12-8. History. Original Rule entitles "Definitions" adopted F. Jun.22,1995; eff. Aug. 1, 1995, as specified by the Agency.

290-5-59-.03 GENERAL PROVISIONS.

(1) It is the property owner's responsibility to maintain and operate the onsite sewage management system in a safe and sanitary manner so as not to constitute a public health hazard or nuisance.

(2) No person shall allow the unapproved discharge or spillage of sewage, nor shall an onsite sewage management system be used or maintained in such a manner that will allow the seepage or discharge of effluent from such system to the ground surface, to a water course, drainage ditch, open trench, canal, storm drain or storm sewer, water well, abandoned well, lake, stream, river, estuary, groundwater or other body of water.

(3) Campgrounds, RV Parks and Tourist Accommodations shall not provide more accommodations such as parking spaces and/or hook-ups than the sewage system is designed to serve.

(4) Every premise shall be provided with at least one toilet, privy, or nonsewered toilet system in accordance with the following requirements:

(a) Except as allowed in subparagraph (c) of this paragraph, every toilet shall be connected to a public or community sewerage system or to an approved onsite sewage management system.

(b) Each venue and/or special event sponsor utilizing a holding tank system must have proof of a service contract.

(c) Nonsewered toilet system(s) may be considered for approval by the Health Authority where sanitary facilities are needed on a temporary basis for the general public at a mass gathering or event and on an interim basis (one year maximum) for a limited defined group of people (i.e. employees and security personnel at a work site). A nonsewered toilet system shall be maintained in a sanitary manner.

(5) Employees at all work sites and the general public attending and participating in special events that are inadequately served by sewered toilet facilities should have easy access to nonsewered toilet systems that are maintained in a clean, sanitary, and functional condition for the protection of human health, safety and welfare. Where nonsewered toilet systems supplement or serve in lieu of sewered toilet facilities, the construction and maintenance of the sewered facilities shall meet the following standards:

(a) All employers and sponsors of special events shall provide for acceptable nonsewered toilet systems when sewered toilets are not available or are insufficient in number at the worksite or location of the special event. Such systems shall be furnished by an individual or company licensed by the Health Authority in accordance with the provisions of this paragraph. Systems shall be maintained in a clean, sanitary and functional condition.

(b) Special event sponsors shall obtain a permit for needed nonsewered toilets as a requirement for authorization to hold the event.

(c) Determination of the number of toilets required during anticipated peak attendance at a special event shall be based on previously established calculations provided the environmental specialist and specific tables contained in the Sanitarian and Health Official Guide entitled "Portable Restroom Requirements at Special Events and Crowd Gatherings" as developed by the Center for Business and Industrial Studies, University of Missouri, St. Louis, and shall take into consideration any sewered seated or urinal toilets that may be present at the site of the special event.

(6) Nonsewered toilets shall be constructed in the following prescribed manner and maintained in a clean, sanitary and functional condition:

(a) A nonsewered toilet is a portable self-contained unit equipped with a waste-receiving holding container.

(b) Rooms, buildings or shelters housing toilets shall be of solid construction, easy to clean, and provide shelter and privacy. The toilet room shall be ventilated to the outside and adequately lighted. All ventilation openings to the toilet room shall be covered with 16 mesh screen. Internal latches shall be provided to assure units from inadvertent entry.

(c) Waste containers shall be fabricated from impervious materials. Containers shall be watertight and capable of containing the waste in a sanitary a manner. Containers shall be adequate in size to be used by the number of persons, according to the schedule for minimum requirements under this Rule, without filling the container to more than half of its volume before regularly scheduled service.

(d) Service shall be performed at least once per week by a licensed nonsewered toilet service in accordance with this paragraph and as often as deemed necessary by the Health Authority.

(e) Servicing shall include the use of a sanitizing solution for cleaning urinals and toilet seats, removing waste from containers, recharging containers with an odor-controlling solution and installing an adequate supply of toilet tissue. Employers and event sponsors shall be responsible for contracting servicing intervals frequent enough to ensure clean, sanitary facilities.

(f) Any defective or inadequate toilet unit shall be repaired or withdrawn from service by locking or removal.

(g) Removal of waste shall be conducted in a clean and sanitary manner by means of a vacuum hose to a leak proof tank truck on which all ports are properly valved and capped. Contractor is responsible for clean up of all spillage during unit servicing.

(h) Provisions shall be made so service trucks have safe and convenience access at all times to the toilets to be serviced.

(I) Disposal of waste from tank trucks shall be in accordance with the Health authority requirements.

(7) The location of nonsewered toilets shall be as close as practical to the highest concentration of employees or to the participants, observers and employees of special events. However, the units should be placed as far from the food service area as possible. The safety of users shall be a consideration in the placement of units. At special events, toilet facilities shall be located convenient to participants and accessible at all times for maintenance by truck.

Authority O.C.G.A. Sections 12-8-1, 31-2-1, 31-2-2, 31-2-4, 31-12-8, 31-27-9. History. Original Rule entitled "General Provisions" adopted. F. Jun.22,1995; eff. Aug.1, 1995, as specified by the Agency.

290-5-59-.04 ENFORCEMENT. The administration and enforcement of this Chapter shall be in accordance with O.C.G.A. Chapter 31-5 or its successor.

Authority O.C.G.A. Sections 12-8-1, 31-2-1, 31-2-2, 31-2-4, 31-12-8. History. Original Rule entitled "Enforcement" adopted. F. Jun. 22, 1995; eff. Aug. 1, 1995, as specified by the Agency.

SEWAGE DISPOSAL

QUICK REFERENCE LIST

APPLICATION AND PLANS

- Review/approval process
  - Must be summited within 30 days prior to the actual event
  - Site evaluation
  - Secure permit and appropriate fees
  - Site inspection (prior to and during event)
- Site assessment following the venue

POLICIES AND PROCEDURES FOR ENFORCEMENT

- 1st violation of regulation - notice to comply
- 2nd violation of regulation - (same offense) - citation issued for court

POLICIES AND PROCEDURES

- Plan submittal/review - all responsibilities for plan submittal and review, including application and/or checklists, permitting and collection of fees shall be with the local county health authority.
- Each venue and related sites pertaining to the venue must be provided with adequate sewage disposal facilities (either sewered or nonsewered toilets)

SEWAGE DISPOSAL

PROCEDURES - ORGANIZER OF EVENT

1. Report planned event to the Health Authority 30 days prior to the event.

2. Complete and file the application.

3. Organizer is responsible for providing any vendors with a copy of the sewage disposal regulation.

4. Organizer must submit fees in conjunction with completed application to the Health Authority. A fee is required for organizer participating in the special event for sewage handling and disposal .

5. A late fee will be charged for all applications not submitted 30 days prior to the event.

6. Organizers must comply with the special event sewage disposal regulation.

7. Organizer must submit a diagram of the site showing the location of nonsewered toilets tofacilitate issuance of permits.

8. The organizer agrees to remove and replace any damaged or vandalized units and provide additional units if deemed necessary by the local health authority.

SEWAGE DISPOSAL

PERMIT APPLICATION - NONSEWERED TOILETS

SPECIAL EVENT/FESTIVAL INFORMATION - Please fill out each blank completely. Type or print clearly in ink.

_____

SPECIAL EVENT/FESTIVAL NAME

_____

LOCATION (INCLUDE NAME OF PARK, ETC. AND FULL ADDRESS)

_____

SPONSOR'S NAME

_____

_____

CONTACT PE[illegible] CONTACT'S TELEPHONE NUMBER

For Official Use Only

_____ _____

SITE TELEPHONE NUMBER EMERGENCY TELEPHONE NUMBER

_____ _____

DATES OF EVENT/FESTIVAL TIMES OF EVENT/FESTIVAL

SIZING CRITERIA - Please fill out each blank completely. Put "n/a" in any blank that does not apply to your event.

1. Estimated peak attendance/crowd _____

2. Hours per day the event/festival will be in progress. _____

3. How frequently will you contract to have the nonsewered toilets serviced by the licensed provider?

times(s)/day _____

time(s)/week _____

4. Will alcoholic beverages be available at the event, either provided by the sponsor or the participants/visitors ?

_____

5. How many existing toilets are available for participants or visitors to use:

none_____

Men's toilets/urinals _____

Women's toilets _____

Handicapped toilets _____

6. Will food be served or be available at the event, either provided by the sponsor or brought in by participants/visitors? _____

7. How many people do you anticipate daily? _____

8. When do you anticipate peak crowd? Date _____

From _____ ti

Plea a la rs
event/festiv es

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The de l hereby applied for a permit to utilizes nonswered toilets pursuant to the Georgia Health Code, Chapter 290-5-59 and hereby certifies that he has received a copy of the Special Onsite Sewage Management Systems Rules and Regulation.

I have read and understand all nonsewered toilet information.

_____
Signature of Person in Charge

PERMIT DATA - To be completed by the Health Authority representative only.

Permit number	Minimum no. of units	Health Authority representative	Date permit issued

Fee amount received	Check or money order #	Date fee paid	Receipt number

PERMIT FOR
NONSEWERED T[illegible] SYSTEM

_____ Date Issued

_____ Permit Number

A PERMIT IS HEREB[illegible]ED TO

_____ TO UTILIZE _____ NONSEWERED TOILETS AT THE
(Sponsor Name) (#

_____
(Special Even[illegible]

LOCATED AT _____ GEORGIA
(Street, Highway or RFD)

SUBJECT TO COMPLIANCE WITH CHAPTER 290-5-59, THE [illegible]ON ENTITLED, "SPECIAL ONSITE SEWAGE MANAGEMENT SYSTEMS", AND IS VALID UNT[illegible]DED, REVOKED OR EXPIRES.

EFFECTIVE _____, 19 ____. EXPIRES _____, 19 _____.

By: _____
District Health Officer

_____
Issuing Official

For Official Use Only

DHR / Environmental Health

Nonsewered Toilet System Inspection Report

Event / Venue : _____ Inspector : _____

Date : _____ Shift : _____ Inspector Signature : _____

Contractor / Phone : _____/_____No. of Units Permitted:_____

Location : _____ No. of Units Actual:_____

Inspection Time : **Condition :**

_____No. Of Units Inspected _____No. Of Units Posted

_____ ☐ am ☐ pm ☐ Satisfactory ☐ Unsatisfactory

Corrective Action : _____

_____

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Inspection Time : **Condition :**

_____No. Of Units Inspected _____No. Of Units Posted

_____ ☐ am ☐ pm ☐ Satisfactory ☐ Unsatisfactory

Corrective Action : _____

_____

SEWAGE DISPOSAL

FOLLOW-UP QUESTIONAIRE - NONSEWERED TOILET SYSTEMS

SPECIAL EVENT NAME _____

LOCATION _____ DATE(S) OF EVENT _____

SPONSOR INFORMATION - SPONSOR'S NAME _____

1. Peak Crowd Estimate _____

   Time(s) _____ Day(s) _____

2. Daily Crowd Estimate _____

3. Weather Impact Good _____ Fair _____ Bad _____

Comments: _____

_____

4. Evaluation of N To _____

_____

For Official Use Only

PROVIDER INFORMATION - PROVIDER'S NAME

Person contacted _____ Date _____

1. Toilet spacing adequate Yes _____ No _____
2. Number of toilets adequate Yes _____ No _____
3. Servicing Schedule adequate Yes _____ No _____
4. Access to servicing Good _____ Bad _____
5. Evaluation of Nonsewered Toilet Service _____

_____

_____

Environmentalist's Comments: _____

_____

_____

Environmentalist's Signature _____ Date _____

December 4, 1995

For Official Use Only

SEWAGE DISPOSAL
SUGGESTED UNIT REQUIREMENTS
NONSEWERED TOILET SYSTEMS

PEAK CROWD #OF PEOPLE	* MINIMUM NUMBER OF NONSEWERED TOILETS NEEDED
250	2
500	2
1,000	3
2,000	5
3,000	7
4,000	10
5,000	12
6,000	14
7,000	17
8,000	20
10,000	25
12,500	28
15,000	30
17,500	35
20,000	38
25,000	42
30,000	44
40,000	48
50,000	50
75,000	75
100,000	100

- Determine the appropriate base toilet requirement from the chart above.
- For each sewered toilet available onsite, subtract 1 from the previously calculated number.
- If alcoholic beverages are to be served, add 25% to the base number.
- If toilets are to be serviced more than once per day, subtract 25% from the base number.
- For peak crowd numbers that fall between chart number, extrapolate the required number of toilets needed

	people	units	people	units
Examples:	5,000	12	40,000	48
	5,500	**13**	**45,000**	**49**
	6,000	14	50,000	50

* Additional units may be required as deemed necessary by the Health Authority.

Inspecting and Troubleshooting Wisconsin Mounds

James C. Converse and E. Jerry Tyler

The Wisconsin mound system was developed in the 1970s to overcome some soil site limitations for on-site disposal of septic tank effluent. A recent survey of Wisconsin counties found the mound system to be performing very well. However, the owner or inspector must identify potential problems early and diagnose them correctly, with a minimum of time and expense. This publication outlines potential problems, their symptoms, and solutions. It also presents a systematic method of inspecting and evaluating the system.

Figure 1 is a cross-section view of an entire system. To analyze problems, you must know the location of each portion of your system. Keep a scale drawing of your system handy.

The septic tank and dose chamber of the on-site system must be pumped periodically to remove accumulated solids. The tank and chamber should be pumped at least every 3 years in year-round residences. Seasonally used systems, e.g. in summer cottages and camps, require less frequent pumping.

Heavily used systems, e.g. in restaurants, require more frequent pumping. If you use one of these systems, work closely with an experienced hauler to establish a long-term pumping frequency to help minimize carry-over of solids to the soil absorption unit.

Conserve water when using a soil absorption system. Low-flow toilets, low-volume shower heads, front-loading washers, elimination of garbage grinders, and other techniques can reduce waste water with minimal inconvenience.

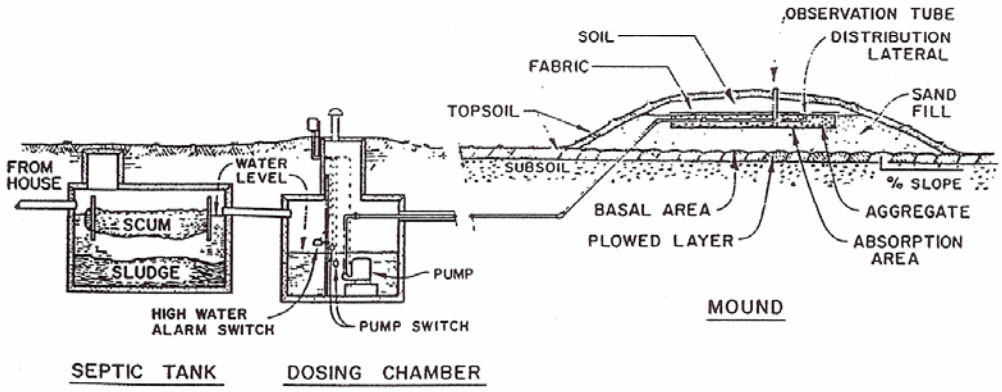

Figure 1. Cross section of Wisconsin mound system.

When you have completed inspecting and troubleshooting your Wisconsin mounds, all questions in Table 1 should have been answered.

Table 1. Questions to be answered when inspecting a mound system.

Yes	No	1. Is the alarm system operating properly?
Yes	No	2. Does waste water ever back up into the house?
Yes	No	3. Do the toilets ever flush slowly?
Yes	No	4. Does the liquid level in the septic tank appear abnormal?
Yes	No	5. Is there a thick scum mat on the surface in the septic tank?
Yes	No	6. Is the liquid level in the dose chamber within operating range?
Yes	No	7. Are there a lot of solids in the bottom of the dose chamber?
Yes	No	8. Is there standing water in the observation tubes in the mound?
Yes	No	9. Are there spongy spots on the top or side areas of the mound?
Yes	No	10. Is there seepage on the side slopes of the mound?
Yes	No	11. Are there spongy spots in the toe area of the mound?
Yes	No	12. Is there leakage at the toe of the mound?

If you answered no to all of the questions, your mound system should be operating properly. If you answered yes to any of the questions, refer to the text for explanations, causes, and solutions.

WARNING: DO NOT ENTER THE TANK OR CHAMBER!!!

NEVER ENTER A SEPTIC TANK OR DOSE CHAMBER WITHOUT SPECIAL EQUIPMENT. PEOPLE HAVE DIED IN SEPTIC TANKS AND DOSE CHAMBERS. THEY CONTAIN TOXIC GASES AND LITTLE OR NO OXYGEN. HOMEOWNERS DO NOT HAVE THE NECESSARY EQUIPMENT OR THE EXPERIENCE TO SAFELY ENTER TANKS.

Following is a list of symptoms, followed by an explanation of the problem, probable causes, and possible solutions. Make sure you investigate all possible causes before you attempt a repair.

Most of these solutions require an experienced plumber, installer or electrician. Most homeowners don't have the tools or expertise for this work. Untrained do-it-yourselfers may cause further damage and expense.

SYMPTOM 1: WASTE WATER BACKING UP AT THE HOUSE OR SOURCE

Explanation: Toilets may flush very slowly; waste water may back up in the floor drain.

Causes: If the toilet flushes slowly, the roof vent may be frosted over.

If waste water backs up in the floor drain and slowly seeps away, tree roots or accumulated solids may be clogging the sewer line to the septic tank. The restriction is often at the inlet to the septic tank. Over time, the blockage prevents waste-water flow from the house. The outlet from the septic tank to the dose chamber may be plugged; or the pump or controls may have failed, causing water to back up into the house.

Solution: Check the water level in the septic tank and dose chamber. If the dose chamber is full, the problem is a faulty control unit or pump or a blockage in the force main or mound. The alarm should have sounded. If not, check the alarm system. Inspect the circuit breaker. It may have tripped.

If the liquid level is normal in the dose chamber, but higher than normal in the septic tank, the pipe connecting the septic tank and the dose chamber is plugged. Call a septic-tank hauler or plumber to unplug the pipe and check the septic-tank baffles.

If the septic-tank level is normal, the inlet to the septic tank or the pipe between the house and the septic tank is plugged. Take care when unplugging the inlet or the pipe. ***DO NOT ENTER THE TANK WITHOUT PROPER SAFETY PRECAUTIONS.***

SYMPTOM 2: ALARM FROM DOSE CHAMBER

Explanation: When the liquid level in the dose chamber reaches a set height above the waste-water level normally needed to activate the pump, it trips an audible alarm or light in the house.

Causes: Faulty pump or pump controls, or a malfunctioning alarm.

Blockage in the force main or distribution system of the mound keeps the pump from moving water to the mound.

Solutions: If the problem appears to be a faulty pump or controls, see Symptom 1.

If the pump runs but the water level doesn't drop, then the force main or distribution laterals are plugged. See Symptom 10.

SYMPTOM 3: EXCESSIVE SOLIDS ACCUMULATING IN THE DOSE CHAMBER

Explanation: Settled solids should be removed in the septic tank. Solids carried to the dose chamber will be pumped to the mound and may plug the distribution system or the mound infiltrative surface.

Causes: Not pumping the septic tank often enough.

Broken baffles in septic tank.

Excessive solids introduced into the system.

Solutions: Pump the septic tank on a regular basis and have baffles checked after each pumping. ***DO NOT ENTER THE TANK WITHOUT PROPER SAFETY PRECAUTIONS.*** Don't use in-sink garbage grinders. They add too many solids to the septic tank.

SYMPTOM 4: PONDING IN THE ABSORPTION AREA OF THE MOUND

Explanation: If you see waste water in the observation tubes (Fig. 2), you have ponding at the sand/aggregate interface. It may be 1) ponding during dosing, 2) seasonal ponding, or 3) permanent ponding.

Ponding during dosing is very temporary and usually disappears shortly after the pump stops.

Seasonal ponding occurs over the winter but usually disappears by early summer. Low bacterial activity allows a clogging layer to develop at the

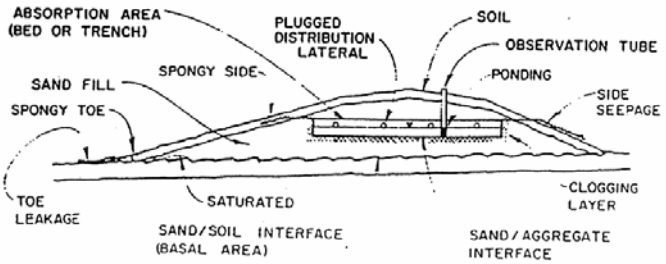

Figure 2. Cross section of a Wisconsin mound showing potential problems.

sand/aggregate interface, which reduces the infiltration rate across the interface. As the weather warms, bacterial activity increases, reducing the clogging mat and increasing the infiltration rate. Seasonal ponding rarely causes problems.

Although not itself a failure, permanent ponding (waste water always visible in the observation tubes) may lead to failure.

Causes: Permanent ponding is the result of a clogging mat at the sand/aggregate interface. It may be caused by overloading of septic tank effluent and/or too fine a sand fill.

Solutions: Check the observation tubes every 3 months to see if permanent ponding is occurring in the mound's absorption area. If the ponding appears to be permanent, reduce water use in your home to reduce the load to the system. This often reduces permanent ponding.

SYMPTOM 5: SEEPAGE OUT THE SIDE OF THE MOUND

Explanation: Seepage out the side of the mound is usually black and smelly. It is primarily septic tank effluent that has been pumped into the mound. The breakout normally occurs around an observation tube or at other locations near the top of the mound. The effluent flows down the side of the mound (Fig. 2).

Causes: A clogging mat prevents effluent from infiltrating into the sand as quickly as it's pumped into the mound. Effluent is then forced to the surface of the mound. The clogging mat appears as a black layer at the sand/aggregate interface. The sand several inches below the interface is usually dry and clean.

Temporary or continuous overloading also causes seepage out the side of the mound, even though a clogging mat may not be causing permanent ponding.

Solutions: Estimate the effluent entering the system. Look for 1) excessive water use in the home, and 2) groundwater entering the dose chamber. Reduce the loading to the mound by conserving water in the home and/or eliminating infiltration through joints in the riser into the dose chamber. To eliminate infiltration, recaulk all the joints on the outside of the riser including the joint between the riser and the tank cover.

Determine the quality of fill. Sample the sand at several locations and have it analyzed for particle size. (Some experienced people can estimate sand texture in the field.) If the sand beneath the absorption area is fine sand, medium sand with a lot of fines in it, or coarse sand containing a lot of fine and very fine sand plus silt and clay, the mound may have to be partially rebuilt.

To partially rebuild the mound:

1) remove the soil above the absorption area, 2) remove the distribution system and aggregate, 3) remove the sand beneath the absorption area down to the natural soil, 4) replace it with an approved sand fill, 5) replace the distribution system, 6) cover with a synthetic fabric, 7) replace, seed and mulch the topsoil.

Another approach may be to lengthen the mound, if you have the space.

1) Remove the topsoil on the end slope, 2) till the natural soil, 3) place the proper-quality sand fill 4) place the aggregate in the absorption area and extend the laterals, 5) place fabric on the aggregate, 6) place topsoil on the mound extension, 7) seed and mulch.

Note that making the absorption area wider may cause leakage, especially on slowly permeable soils. Prior to extending the mound, determine if pump or siphon will provide sufficient head at the end of the distribution laterals.

SYMPTOM 6: SPONGY AREA ON THE SIDE OR TOP OF MOUND

Explanation: A small amount of effluent seepage from the absorption area may cause soft spongy areas on the side or top of the mound.

Causes: Spongy areas indicate ponding in the absorption area—the result of nearly saturated soil materials.

Solutions: See Symptom 5. Spongy areas usually precede seepage.

SYMPTOM 7: LEAKAGE AT THE TOE OF THE MOUND

Explanation: Effluent leakage at the toe of the mound (Fig. 2) may be seasonal or permanent. Extremely wet weather can saturate the toe area, causing leakage. Leakage usually stops a few days after the wet period. In extreme cases the toe may leak continuously, even during dry weather. Research has shown that the water is of high quality with no odor and few if any fecal bacteria. This leakage is often indistinguishable from natural surface water.

Causes: Leakage at the toe may be caused by 1) overloading of the mound due to excessive water use or groundwater infiltration, 2) overestimating the infiltration rate and hydraulic conductivity of the natural soil during design, 3) hydrophobic soils that do not readily accept water, and 4) soil compaction during construction.

Solutions: Conserve water to add less waste water to the system.

If the soil accepts the waste water, but more slowly than anticipated, extending the toe sometimes eliminates the leakage.

To extend the toe:
1) remove the existing toe, 2) allow the soil to dry, 3) till downslope soil area, 4) place sand on the tilled area, 5) place topsoil over the sand, 6) seed and mulch the topsoil.

If the natural soil beneath the mound is dry even though the sand fill above is saturated, the natural soil is hydrophobic, compacted or accepts the waste water very slowly. The waste water is moving horizontally at the sand/soil interface, rather than downward.

Extending the basal area downslope may help. You may also have to increase the length of the mound. This reduces the linear loading rate and reduces the loading at the toe. A combination of both may be required.

In extreme situations, place an interceptor drain at the downslope toe to move leakage away from the toe of the mound to a drainage ditch. Many states prohibit surface disposal of this water, so this approach may not be feasible.

If you know that groundwater is moving laterally downslope on sloping sites, place an interceptor drain on the upslope edge of the mound to intercept the groundwater. This allows the effluent to infiltrate into the soil and replace the intercepted groundwater.

SYMPTOM 8: SPONGY AREA AT THE TOE OF THE MOUND

Explanation: Saturated sand fill and nearly saturated cover soil at the toe makes it soft and spongy.

Causes: Causes are similar to those of Symptom 7, though not as extreme.

Solutions: Same as Symptom 7.

SYMPTOM 9: TOO MUCH EFFLUENT FLOWS BACK INTO THE DOSE CHAMBER AFTER THE PUMP SHUTS OFF.

Explanation: The pump pressurizes the absorption area by forcing effluent into the aggregate and soil above the distribution laterals. When the pump shuts off, the effluent flows back into the dose chamber until the effluent level in the absorption area is below the distribution laterals. Side seepage may or may not occur.

Causes: Permanent ponding fills the aggregate below the laterals. Verify this by checking for effluent in the observation wells. Rapidly overloading the system may also cause excessive flowback.

Solutions: Same as Symptom 5.

SYMPTOM 10: THE PUMP RUNS CONTINUOUSLY WITH NO DROP IN THE LIQUID LEVEL IN THE DOSE TANK.

Explanation: The observation tubes indicate that the absorption area is not ponded, but the mound does not accept waste water satisfactorily.

Causes: Solids plug the small-diameter holes in the distribution system, and effluent can't flow into the absorption area. Items such as disposable wash towelettes or sanitary napkins will not settle out in the septic tank and are carried over into the dose chamber and forced into the distribution pipes.

Solutions: Pump septic tank and dose chamber. (Every 3 years for residential units; more often for heavily used systems.)

Do not flush towelettes and similar materials down the toilets.

If system is plugged, remove the end caps to the distribution laterals and flush out the solids using a high-volume, high-pressure pump. Recap the laterals and force water or air into the distribution system to unplug the holes. Septic tank pumpers, when pressurized, force water into the laterals to remove the accumulated solids and force water out the holes to unplug them.

Consider installing a 1/8-inch screen around the pump or siphon to keep larger solids out of the system. Other types of filters may also minimize the solids carried over to the dose tank.

SYMPTOM 11: OCCASIONAL SEPTIC ODORS

Explanation: Biological activity in the septic tank and dose chamber produces ammonia, hydrogen sulfide and other foul-smelling gases. These gases escape from the dose tank via the vent and possibly the house vent stack.

Causes: Odors generated in the septic tank and dose chamber can circulate to occupied areas under certain humidity and wind conditions.

Solution: There is no easy solution to this problem, because the odors are usually emitted through the vent of the dose chamber. Extending the dose chamber vent to roof level may minimize these unpleasant odors. If the dose chamber is vented back through the septic tank and house stack, you may be able to plug the dose tank vent during warm weather. Occasionally the odors may be caused by gases emitted through the house stack. In this case, nothing can be done.

REFERENCES

Converse, J. C. and E. J. Tyler, 1986. *Wisconsin Mound Performance.* Small Scale Waste-Management Project. College of Agricultural and Life Sciences, 240 Agriculture Hall, University of Wisconsin-Madison.

Table 2. For quick reference: Symptoms, probable causes and solution index.

INSPECTION POINT	SYMPTOM	PROBABLE CAUSE	FOR SOLUTIONS, SEE THESE SYMPTOM NUMBERS IN THE TEXT
1. Alarm	sounding	pump failure alarm switch failure	2
	non-functioning	circuit breaker thrown faulty alarm	2
2. Floor drain	waste on floor	house sewer plugged septic tank inlet plugged septic tank outlet plugged pump failed distribution laterals plugged	1, 2, 10
3. Septic tank	liquid waste level above normal	outlet plugged pump failed distribution laterals plugged	2, 10
	excess solids	excess solids added garbage disposal	3
4. Dose chamber	liquid level above high-water pump switch	pump failure control failure plugged laterals	9, 10
	excess solids	solids carry-over septic tank baffle missing	3
	groundwater inflow	high groundwater leaky joints	5
	odors	pump chamber emitting odors	11
5. Mound	water in observation tubes	soil absorption area plugged excessive water use	4
	seepage of raw sewage on side or top of mound	soil absorption area plugged system overloaded sand fill too fine	5
	spongy on side and top of mound	same as seepage of raw sewage (above)	6
	leakage at toe	slowly permeable soil compaction during construction soil damaged during construction overloading of system	7
	spongy at toe	same as leakage at toe (above)	8

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G3406 Inspecting and Troubleshooting Wisconsin Mounds (1987)

Appendix O-III Pathogenic Microorganisms in Domestic Wastewater and The Diseases They Cause

Microorganism	Disease(s) caused
BACTERIA:	
Salmonella species	Typhoid, paratyphoid, gastroenteritis
Shigella	bacillary dysentery
Yersinia	gastroenteritis
Mycobacterium	tuberculosis
Leptospira	leptospirosis
Campylobacter jejuni	gastroenteritis
Pathogenic coliforms	gastroenteritis, unrinary tract infections
Yersinia enterocolitica	gastroenteritis
Pseudomonas	respiratory and burn infections, diarrhea
Klebsiella	pneumonia, bronchitis
Serratia	respiratory and urinary tract infections, summer diarrhea
VIRUSES:	
polioviruse	poliomyelitis
hepatitis A	infectious hepatitis
echoviruses	respiratory disease, aseptic meningitis diarrhea, fever
coxsackieviruses	respiratory disease, fever, aseptic meningitis myocarditis
Norwalk and Norwalk-like viruses	gastroenteritis
rotaviruses	gastroenteritis
adenoviruses	respiratory disease, eye infections
PARASITES:	
Entamoeba histolytica Giardia lamblia	amoebic dysentery giardiasis ("backpacker's diarrhea")
Balantidium coli	dysentery, gastroenteritis
Ascaris ova	pneumonitis, intestinal and nervous system disorders
Trichuris	chronic gastroenteritis
Enterobius vermicularis	enterobiasis
Cestode ova	chronic gastroenteritis
Coccidia	diarrhea, toxoplasmosis

*(Adapted from Kreissl, 1983, Fitzgerald, 1983 and Sobsey, 1983a)

Rules
Of
Department of Human Resources
Public Health
Chapter 290-5-25
Land Disposal of Domestic Septage

Table of Contents

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290-5-25-.05	Management of Land Disposal Sites	290-5-25-.11	Compliance
290-5-25-.06	Vector Reduction Management		

290-5-25-.01 Applicability. These Rules apply to any land disposal site that receives septic tank waste from only one septic tank pumping and hauling business.
Authority O.C.G.A. 31-2-8. Adopted Feb. 26, 2003; effective. Mar. 18, 2003.

290-5-25-.02 Definitions. The following definitions shall apply in the interpretation and enforcement of this Chapter.

1. "Agricultural Land" is land on which a food crop feed crop or fiber crop is grown. This includes land used as a pasture or forested land.

2. "Agronomic Rate" is the septage application rate based on a dry weight basis determined to provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop or vegetation grown on the land; and to minimize the amount of nitrogen in the domestic septage that passes below the root zone of the crop or vegetation grown on the land to the groundwater.

3. "Annual Application Rate" is the maximum amount of domestic septage that may be applied to a unit area of land during a 365-day period.

4. "County Board of Health" means the County Board of Health or its designee as established by the Official Code of Georgia Annotated (O.C.G.A.), Title 31-3-1.

5. "Department" means the Department of Human Resources of the State of Georgia.

6. "Domestic Septage" is defined in the Code of Federal Regulations (CFR), Title 40, Part 503.9(f) as the liquid or solid material removed from a septic tank, cesspool, portable toilet, type III marine sanitation device or a similar system that receives only domestic sewage. This definition does not include liquid or solid material removed from a septic tank or similar treatment works that receives either commercial wastewater or industrial wastewater or grease removed from a grease trap.

7. "Domestic Sewage" means water and wastewater from humans or household operations that are discharged to a treatment system. This generally includes wastes derived from a toilet, bath, shower, sink, garbage disposal, dishwasher or washing machine. Domestic sewage may include household sewage as well as sewage from establishments such as schools, restaurants, businesses and motels as long as the sewage does not contain types of waste other than those listed above.

8. "Land Application" means the spreading of domestic septage on the land surface, the injection of domestic septage below the land surface or the incorporation of domestic septage into the soil at agronomic rates for the purpose of soil conditioning or fertilization of crops or vegetation grown in the soil.

9. "Land Disposal Site" means the location where domestic septage is applied to the land.

10. "Land frequently used by the public" includes but is not limited to public parks, ball fields, school playgrounds, plant nurseries, turf farms and golf courses.

11. "Pathogen" means a disease causing organism.

12. "Percolation Rate" means the time, expressed in minutes per inch, required for water to seep into saturated soil at a constant rate.

13. "Sinkhole" means a depression in the land surface, generally in a limestone region, which communicates or has the potential to communicate with a subterranean passage developed by solution; typical sinkholes can be broad, closed basin-like features or steep sided dropouts, or variants thereof.

14. "Soil Classifier" means an individual approved by the Department of Human Resources under provisions established in O.C.G.A. §31-3-5 (d)(1)(B) to conduct soil investigations to determine site suitability.

15. "Soil Fertility Test" shall mean a test to determine the nitrogen, phosphorous and potassium requirements for a crop grown on a unit of land.

16. "Soil Report and Map" means a site specific soil interpretative table that identifies as a minimum the following: the name of the soil series, the percent slope, the seasonal high groundwater table, the depth of any refusal or impervious layer and the absorption rate for each horizon. Soils must be classified according to U.S. Taxonomy, with soil series boundaries plotted on a map at a scale that may range from one-inch equals 10 feet to one-inch equals 100 feet. The minimum number of soil pedons observed and classified will be based on the micro relief of the site, but at least one hole shall be bored and classified per .25 acre. All borings shall be bored to a depth of 72 inches, unless a refusal layer is encountered. All borings must be flagged on site and boring locations identified on the soil survey map. The soil survey must bear the name, stamp and/or seal, address and phone number of the soil classifier.

17. "Vector Attraction" is the characteristic of domestic septage that attracts rodents, flies, mosquitoes or other organisms capable of transporting infectious agents.

18. "Well" means an excavation or opening into the ground by which groundwater is sought. This term shall not include monitoring wells used to sample groundwater.

19. "Wetland" means those areas that are inundated or saturated by surface water or ground water at a frequency and duration to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

Authority O.C.G.A. 31-2-8. Adopted Feb. 26, 2003; effective Mar. 18, 2003.

290-5-25-.03 Provisions. Disposal of domestic septage by land application shall only be applied to land with a low potential for public exposure. This is land that the public uses infrequently, which includes but is not limited to agricultural land, forests and reclamation sites located in sparsely populated areas.

(1) Permit.

(a) It shall be unlawful for any person to operate a land disposal site without having first obtained a valid permit from the County Board of Health pursuant to this chapter.

(b) No site, which was not in operation prior to January 1, 2002, shall be permitted without written approval from the county governing authority of each county in which the site is wholly or partially located.

(c) Prior to the issuance of a permit, the applicant shall provide evidence of satisfactory compliance with the provisions of these rules.

(d) Permits are invalidated by a change in property ownership.

(e) The permit shall be the property of the County Board of Health and shall be returned within seven (7) days to the local health department when the site has a change in property ownership or when the permit is revoked.

(f) A permit shall not be valid for more than twelve (12) months.

(2) Application for Land Disposal Site Permit. Application for a land disposal site permit shall be made in writing to the County Board of Health on forms provided by the Department. The County Board of Health shall approve or disapprove such application after the receipt of a completed application and a review of the site. The application shall include:

(a) The name and address of the property owner and a notarized statement signed by the property owner approving the land application of domestic septage;

(b) The septic tank pump and haul business shall obtain a Septage Removal and Disposal Permit from the County Board of Health in which the land disposal site is located. Individuals involved in the land application of domestic septage must hold a valid Level II Pumper Certification from the Department of Human Resources;

(c) A plat of the property, at a minimum scale of one-inch equals 100 feet, with topography showing the drainage characteristics of the property including locations of streams, lakes or other water courses and impoundments either on or within 500 feet of the property. The plat shall show the land disposal site boundaries. The plat shall show the location of water supplies including public, non-public and individual wells within 500 feet of the disposal area. The plat shall show the location of all buildings and land uses within 500 feet of the disposal areas. The plat shall show the location of roadways to and from the disposal areas;

(d) A soil fertility test in the land disposal area;

(e) A pH test of the soil in the land disposal area;

(f) A trace metals soil test in the land disposal area;

(g) A soil report and map from an approved soil classifier;

(h) Vector attraction reduction method;

(i) Method of securing land disposal site; and

(j) Septage Application Records as applicable.

Authority O.C.G.A. 31-2-8. Adopted Feb. 26, 2003; effective Mar. 18, 2003.

290-5-25-.04. Locations of Land Disposal Sites. For land disposal, consideration shall be given to soil characteristics, seasonal groundwater levels, percolation rates, slope, loading criteria, agricultural needs and nitrogen requirements.

1. Sites shall be well drained and are not to be used where soil studies, soil types, areas of Karst or other geological data indicate the existence of soil conditions that would preclude safe and proper disposal.

2. The maximum soil percolation rate of a site shall not exceed 90 minutes per inch. Sandy soils overlaying an unconfined aquifer, which is used or may be used as a principal source of potable drinking water, shall not be utilized as land disposal sites unless special studies conducted by a soil hydrologist confirm that acceptable separation distance between the point of septage application and the seasonal water table can be achieved to prevent groundwater contamination.

3. The minimum seasonal groundwater table, bedrock or other impervious soil layer of a land disposal site shall be a minimum of 42 inches from the original ground surface.

4. Land disposal sites shall not be located within 500 feet of a public, non-public, or individual water supply well.

5. Land disposal sites shall not be located within 300 feet of a residence or other facility or land frequently used by the general public.

6. Land disposal sites shall not be located within 300 feet from the normal water level of any impoundment, tributary, stream or other body of water considered waters of the State, within 300 feet of a sinkhole or within 300 feet of a marsh, wetland or coastal waters.

7. Land disposal sites with slopes exceeding 15% shall not be considered for the land application of septage. Surface spreading shall be limited to land disposal sites with a slope of 6% or less.

Authority O.C.G.A. 31-2-8. Adopted Feb. 26, 2003; effective Mar. 18, 2003.

290-5-25-.05. Management of Land Disposal Sites.

1. Only domestic septage shall be applied to the site. No grease, industrial, solid or hazardous waste shall be applied on the site.

2. The domestic septage shall be screened for removal of solid waste prior to septage land application. Any solid waste shall be collected and properly disposed.

3. The pH of the soil in the land disposal area shall be maintained at 6.5 or greater as measured by annual soil tests.

4. Public access to the land disposal site should be restricted by fencing or other means approved by the County Board of Health.

5. Each site entrance shall have a “No Trespassing” sign posted identifying the area as a land application disposal site. The sign shall include the name and address of the person or business engaging in the land application of septage and the site permit number. All letters and numerals shall not be less than one (1”) inch in height and shall be visible.

6. An annual soil fertility test shall be required and utilized to determine the agronomic application rate. No person shall land apply domestic septage to a site on which the nitrogen requirements have been met for the calendar year.

7. An annual trace metals (pollutant) soil test shall be required to determine the presence of Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium and Zinc. No person shall land apply domestic septage to a site that exceeds the Cumulative Pollutant Loading Rate Limit for any pollutant found in Table 2.

Authority O.C.G.A. 31-2-8. Adopted Feb. 26, 2003; effective Mar. 18, 2003.

290-5-25-.06. Vector Reduction Management. The following management practices, found in CFR, Title 40, Part 503.33, must be met for compliance with vector reduction requirements. Domestic septage may be land applied by one of the following methods:

1. Domestic septage shall be injected below the surface of the land and no significant amount of septage shall be present on the land surface within one (1) hour after septage is injected. Injection may be accomplished by any device(s) that place the septage beneath the soil in a narrow trench at a depth of no greater than eighteen (18) inches and promptly replaces the cover soil in the same action of trenching and placing septage. Excavation of a trench followed by placement of septage and later covering of the trench is not considered injection;

2. Domestic septage applied to the surface of the land shall be incorporated into the soil within six hours after septage application; or

3. The pH of domestic septage shall be raised to twelve (12) or higher by alkali addition and without the addition of more alkali shall remain at twelve (12) or higher for thirty (30) minutes. Each container of domestic septage shall be monitored for compliance with CFR, Title 40, Part 503.33 (b)(12). Domestic septage is to be applied in a manner that will prevent any ponding or standing liquid on the land surface twenty-four (24) hours after application.

Authority O.C.G.A. 31-2-8. Adopted Feb.26, 2003; effective Mar. 18, 2003.

290-5-25-.07. Pathogen Control Management. The following management practices, including practices found in CFR, Title 40, Part 503.32(b)(5), must be met for compliance with pathogen control requirements.

1. Food crops with harvested parts that touch the land surface shall not be harvested for fourteen (14) months after domestic septage application.

2. Food crops with harvested parts that develop above the land surface, feed crops or fiber crops shall not be harvested for thirty (30) days after domestic septage application.

3. Food crops with harvested parts below the land surface shall not be harvested for thirty-eight (38) months after domestic septage application.

4. Turf grown on land where domestic septage is applied shall not be harvested for one (1) year after domestic septage application.

5. Animals shall not be allowed to graze on the land for thirty (30) days after domestic septage application.

6. Public access shall be restricted for thirty (30) days after domestic septage application.

7. Domestic septage shall not be applied to soils already saturated with water, which can result in contaminated runoff or drainage. Domestic septage shall not be applied when the saturated field capacity of the site is 75% or greater. Field saturation can be estimated from Table 1.

8. Domestic septage shall not be applied during rainfall sufficient to cause runoff from the land disposal site.

9. An adequate separation distance and buffer area between the land area used for domestic septage application and surface water shall be maintained. Domestic septage shall not be applied within 300 feet of any lake, stream, tributary, coastal waters or other watercourses and water impoundments considered waters of the State, within 300 feet of a sinkhole or within 300 feet of a marsh, wetland or coastal waters.

10. An undisturbed vegetative buffer strip of at least thirty-three (33) feet wide shall be maintained along all streams and drainage ditches within or adjacent to the land disposal site.

11. Domestic septage shall not be applied within 500 feet of a public, non-public or individual well.

Authority O.C.G.A. 31-2-8. Adopted Feb. 26, 2003; effective Mar. 18, 2003

290-5-25-.08. Application Rate. The annual application rate for domestic septage applied to a land disposal site shall not exceed 40,000 gallons per acre per year. The domestic septage must be spread or injected as evenly as possible over the entire acreage where the crop or vegetation is grown. For maximum use of nutrients, match the domestic septage application to the crop needs.

1. Test the soil to establish existing nutrient fertility levels.

2. Select an agronomic application rate that does not exceed the crop nutrient requirements.

3. The maximum volume of domestic septage that may be applied to any site depends on the amount of nitrogen required for the planned crop and yield. The maximum volume is calculated by the following formula:

$$\text{Annual Application Rate (gallons/acre/year)} = \frac{\text{Annual Pounds of Nitrogen required for the Crop \& Yield}}{0.0026}$$

4. The Annual Pollutant Loading Rate Limit shall not be exceeded for any pollutant listed in Table 2.

Authority O.C.G.A. 31-2-8. Adopted Feb. 26, 2003; effective Mar. 18, 2003.

290-5-25-.09. Septage Holding Facilities. It is necessary that all septage land disposal systems have an alternative method for the temporary holding of domestic septage during periods of adverse weather. Such systems shall meet the following requirements:

1. No overflow or leakage of septage may be allowed from the system onto the ground surface, into surface waters or into the groundwater table;

2. Odors from such systems shall be controlled at all times;

3. Septage is to be removed from the holding facility and applied to the land disposal site as soon as weather and soil conditions permit; and

4. All holding facilities are to be inspected annually for compliance.

Authority O.C.G.A. 31-2-8. Adopted Feb. 26, 2003; effective Mar. 18, 2003.

290-5-25-.10. Record Keeping. Individuals involved in the land application of domestic septage shall maintain the following information for five (5) years. The information shall be available for inspection at the place of business by the Department of Human Resources, County Board of Health, Department of Natural Resources or the United States Environmental Protection Agency. The Septage Application Record form shall be used to record the following information:

1. The location, by either street address or latitude and longitude, of each site on which domestic septage is applied;

2. The number of acres of each site on which domestic septage is applied;

3. The date, time and quantity of domestic septage applied to each site;

4. The crop or vegetation grown on each site;

5. The rate in gallons per acre per year at which domestic septage is applied to each site;

6. A description of how management requirements for pathogen control and vector reduction requirements are met;

7. The name of the individual or company and signature of the person who land applied the domestic septage; and

8. The following certification statement shall be signed by a Level II Department of Human Resources Certified Pumper supervising the land application of domestic septage at the site: "I certify, under penalty of law, that the pathogen control requirements under 290-5-25-.07 and the vector reduction requirements under 290-5-25-.06 have been met. This determination has been made under my direction and supervision. I am aware that there are significant penalties for false certification including the possibility of fine or imprisonment."

Authority O.C.G.A. 31-2-8. Adopted Feb. 26, 2003; effective Mar. 18, 2003.

290-5-25-.11. Compliance.

1. **Operation.** A land application site shall not operate until such time as the appropriate application has been submitted and the County Board of Health has issued a valid permit.

2. **Inspection.**

(a) The County Board of Health shall conduct a minimum of two inspections of the land application site annually and review application records to determine compliance with provisions of these regulations.

(b) Representatives of the County Board of Health, after providing proper identification, shall be authorized to enter any property permitted as a land disposal site at any reasonable time for the purpose of making inspections to determine compliance with this Chapter. Should access be denied, an inspection warrant may be obtained as authorized in O.C.G.A. §31-5-2 et seq.

3. **Suspension or Revocation.** The County Board of Health shall have the power and authority to suspend or revoke permits for failure to comply with the provisions of this Chapter. When an application for a permit is denied or the permit previously granted is revoked, the applicant or holder thereof shall be afforded notice and hearing as provided in O.C.G.A. §31-5-1 et seq. If an application is denied or a permit is suspended or revoked, the applicant or holder of the permit must be notified in writing of any and all reasons why the action was taken. The purpose of these procedures is to state the minimum actions to be taken to fulfill the obligation of the County Board of Health in assuring compliance with the regulations when the continued operation of the land disposal site presents a substantial and imminent health hazard to the public or when a land disposal site is in flagrant violation or continuing violation of this Chapter. Suspension is effective upon service of a written notice and operation must cease immediately. If a hearing is not requested, upon correction of all violations, the permit holder may request an inspection to reinstate the permit.

4. **Notice of hearing.** For the purpose of this Chapter, a notice of hearing is properly served when delivered in person or by registered or certified mail to the permit holder or authorized agent of the land application site.

5. **Enforcement.** The administration and enforcement of these rules shall be as prescribed in O.C.G.A. §31-5-1 et seq.

Authority O.C.G.A. 31-2-8. Adopted Feb. 26, 2003; effective Mar. 18, 2003.

Table 1

Practical Interpretive Chart of Soil Moisture for Various Soil Textures and Conditions

Available moisture in soil	Coarse texture soil	Moderately coarse texture soil	Medium textured soil	Fine and very fine textured soil
0 percent	Dry, loose, and single grained; flows through fingers	Dry and loose; flows through fingers	Powdery dry; in some places slightly crusted but breaks down easily into powder	Hard, baked and cracked; has loose crumbs on surface in some places
50% or less	Appears dry, does not form a ball under pressure*	Appears dry and does not form a ball under pressure	Crumbly but holds together under pressure	Somewhat pliable; balls under pressure
50% to 75%	Appears dry, does not form a ball under pressure	Balls under pressure but seldom holds together	Forms a ball under pressure; somewhat plastic; sticks slightly under pressure	Forms a ball; ribbons out
75% to field capacity	Sticks together slightly; may form a very weak ball under pressure	Forms weak ball that breaks easily; does stick	Forms ball; very pliable; sticks readily if high in clay	Ribbons out easily; has a slick feel
At field capacity (100%)	On squeezing, no free water appears on soil but wet outline of ball is left on hand	Same as coarse textured soil	Same as coarse textured soil	Same as coarse textured soil
Above field capacity	Free water appears when soil is bounced in hand	Free water is released when kneading	Free water can be squeezed out	Puddles, free water forms on surface

From the United States Department of Agriculture, Natural Resource Conservation Service, National Engineering Handbook (Section 15, Irrigation).

* A ball is formed by squeezing a handful of soil very firmly.

Table 2

Land Application Pollutant Limits for Domestic Septage

Pollutant	Annual Pollutant Loading Rate Limits (kilograms per hectare per 365-day period)	Cumulative Pollutant Loading Rate Limits (kilograms per hectare)
Arsenic	2.0	41
Cadmium	1.9	39
Chromium	150	3,000
Copper	75	1,500
Lead	15	300
Mercury	.85	17
Nickel	21	420
Selenium	5.0	100
Zinc	140	2,800

The following formula can be used to convert ppm to Kg/Hectare: ppm X 1.12 = Kg/Hectare
1 Kg = 2.2 lbs
1 Hectare = 2.5 acres

Georgia Department of Human Resources
Division of Public Health
Application for Septage Land Disposal Site Permit
Chapter 290-5-25

County: _____

Land Disposal Site Address: _____

_____

Permit Applicants Name: _____

Address: _____

_____

Phone #: _____

Land Owners Name: _____

Address: _____

_____

Phone #: _____

For Official Use Only

The following in[illegible]n:

Written permissio[illegible] loc[illegible] authority (as applicable): _____

Notarized written permission from Property Owner: _____

Recorded plat of the property: _____ Application area boundaries identified on plat: _____

Soil report and map: _____ Soil fertility test: _____ Soil pH test: _____

Trace metals (pollution) soil test: Levels meet standards_____ Levels do not meet standards _____

Vector attraction reduction method: _____

Method of securing site: Signs posted _____ Access Control _____

Septage Holding Facilities: _____

Septage Removal and Disposal Permit Issued: _____

Septage Application Record submitted as applicable: _____

I hereby apply for a permit for the land application of domestic septage at the above listed location and agree that the operation will conform to the requirements of the Department of Human Resources Rules and Regulations for the Land Disposal of Domestic Septage, Chapter 290-5-25. I understand that receipt of a permit for this land disposal site is for the exclusive use of the applicant company alone and is not transferable to others.

Applicants Signature: _____ Date: _____

Date of Evaluation: _____ By: _____ Approved: _____ Disapproved: _____

Annual Application Rate: _____gallons/acre/year

Fee Amount Paid: _____ Received By: _____ Date: _____

Department of Human Resources
Division of Public Health

SEPTAGE APPLICATION RECORD

NAME OF HAULER: _____

Date/Time	Location	Number of Acres	Crop	Volume Applied	Management/Vector Requirements

For Official Use Only

I certify, under penalty of law, that the pathogen control requirements under 290-5-25-.07 and the vector reduction requirements under 290-5-25-.06 have been met. This determination has been made under my direction and supervision. I am aware that there are significant penalties for false certification, including the possibility of fine and imprisonment.

Signature of Applier: _____ Date: _____

Applier Certification Number: _____

Georgia Department of Human Resources

DOMESTIC SEPTAGE LAND DISPOSAL SITE PERMIT

FROM: _____ **TO:** _____ _____

(DATES OF OPERATION, 12 MONTHS MAX.) **(PERMIT NUMBER)**

A PERMIT IS HEREBY GRANTED TO

_____ to maintain and operate

a land disposal site for the applica[illegible] of _____ gallons /acre/year.

For Official Use Only

Located at _____ GEORGIA

(STREET, HIGHWAY, OR RFD) (CITY OR TOWN) (COUNTY) (ZIP CODE)

This permit signifies compliance on the date of issue with the Rules of the Georgia Department of Human Resources pursuant to the O.C.G.A. 31-2-8 et seq. and is valid for the period of operation, as listed on this permit, or until the permit is suspended or revoked.

DIVISION OF PUBLIC HEALTH

BY: _____

Stuart T. Brown, M.D., Division Director

GEORGIA DEPARTMENT OF HUMAN RESOURCES

_____

B.J. Walker, Commissioner

_____

Issuing Official

DISPLAY FOR PUBLIC VIEW – NOT TRANSFERABLE – PROPERTY OF THE HEALTH AUTHORITY

SEPTIC TANK SYSTEM FAILURE

APRIL 1997

ADE O. OKE, REM
PRINCIPAL ENGINEER
PUBLIC HEALTH DIVISION
GEORGIA DEPARTMENT OF HUMAN RESOURCES

Synopsis

It is a well known fact that wastewater disposal, when done improperly, can pose a threat to the environment and public health. In order to protect people and environment, wastewater must be well disposed of in a manner that controls water-borne diseases and prevents contamination of surface water and underground water. It is the aim of this document to:

- enhance public health protection, and
- provide public health professionals, engineers, scientists, environmentalists, septic tank installers and pumpers, and others with first hand knowledge to make competent decisions whenever a septic tank system fails.

It must be noted that this document is not a panacea for all septic tank system problems. It is only an aid to solving some of the problems.

Acknowledgments

I would like to express my appreciation to LaTonya-Blount for her help in making this document possible. All county environmental health specialists in the State of Georgia are gratefully acknowledged for all their efforts, energy and self-motivation.

Disclaimer!!

Mention of trade names or commercial products do not constitute endorsement by the author. Moreover, the views expressed herein are entirely the author's and do not represent the official policy of the Georgia Department of Human Resources.

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PART I

INTRODUCTION

In the State of Georgia, over 30,000 new septic tank systems are installed each year for new housing, commercial and industrial development adding to over 600,000 systems that are already in use. These systems contribute over 75 million gallons of wastewater into the environment every day.

Most of these systems function satisfactorily, but approximately 10,000 systems are repaired each year because of failure. Accordingly, the system failures and installation of septic tank systems on unsuitable sites can create serious threats to public health and significant economic impact. Properly designed and located septic tank systems are now a permanent means of wastewater disposal that can function reliably with minimum maintenance and cost.

Why Use a Septic Tank System?

The septic tank system is an effective method for collecting, treating and disposing of sewage mostly from rural and suburban homes. In other words, whenever the municipal or community sewage treatment plants are inaccessible, the septic tank system is used. It is an on-site sewage management system designed to safely treat and dispose of wastewater from toilet, shower, bathtub, handwash sink, kitchen, and laundry. This wastewater usually contains disease-causing germs and pollutants that must be treated to protect human health and the environment.

How Does a Septic Tank System Work?

Wastewater from the home is collected in a water-tight tank called a septic tank. Bacterial action takes place in the septic tank where the end products are mainly water (mixed with some other components that are not readily consumed by bacterial action), gases and undigested material called sludge that sinks to the bottom of the tank and scum that floats to the top of the tank.

The septic tank contains a baffle that prevents any scum that floats to the surface and sludge that settles to the bottom from passing out of the tank. The gases that are generated vent to the atmosphere via the plumbing vent.

The segregated and relatively clear liquid in the tank will fill the outlet level, which is located on the opposite side of the tank from the inlet. As wastewater enters the tank, an equal volume of the liquid flows from the septic tank through the outlet into a small distribution box where it is then metered out to several perforated pipes or some other disposal system. These perforated pipes then deliver the liquid to a large subsurface area called the drainfield, nitrification field or soil absorption field.

The major function of the drainfield is to deliver the effluent to the soil. The soil purifies the effluent by removing the germs; solids and chemicals that may be carried along with the effluent before they reach the groundwater.

What Septic Tank System Design Practices Are Improper?

Many of the problems of septic tank system result from improper design procedures which can be avoided. Some of these procedures include:

- relying solely on published soils information from the local county soil survey rather than performing actual field tests at the site,
- poor site evaluations, including failure to assess impacts of surface runoff and internal groundwater movement,
- poor soil profile description made by nonqualified personnel who fail to detect seasonal high water tables and who fail to locate and properly describe restrictive features, e.g., slowly permeable layers and fractured rock,
- failure to design treatment units and absorption system for long-term performance. Systems are designed typically by using State Regulations and Codes as the sole basis of design; these guidelines are often only meant to serve as guidelines for establishing minimum requirements,
- failure to correlate soil characteristics with permeability test results,
- failure of designers to fully adapt a wastewater system to the site. Errors are made with mismatching absorption system geometry with site conditions which often result in localized overloading of the soil and possible groundwater mounding and flooding,
- improper installation of the system in an area not previously tested or with insufficient separation from water supplies such as wells, springs or other water ways,
- designers sometimes fail to understand the impact of soil characteristics relating to installation. Such potential problems during installation include:
  - installation at a less-preferred location than designed (e.g., a location with concave slopes),
  - excessive deep installation of any soil absorption system,
  - high soil moisture during installation,
  - backfilling causing damage to pipes, tanks, or other buried structure,
  - compaction of soil in and around the down slope area, once the pipes or tanks are in place,
  - not adhering to specifications such as placement of coarse material beneath pipes or tanks, or leveling of in-ground facilities,
  - construction which does not follow land contours,
  - site damage following preliminary evaluation and design (e.g., soil removal, compaction),
  - inadequate depths or protection to avoid freezing in-ground facilities,

- lack of field testing following installation but prior to the contractor leaving the site (e.g., pressure testing pumps and siphons or water testing a level distribution box), or
- Insufficient diversion of runoff to avoid infiltration and possible hydraulic overloading.

- failure of designers to consider techniques which can be implemented in the field to make gravity-feed systems perform better (e.g., specifying discharge hole diameters and spacing for wastewater distribution network),
- improper siting (e.g., up slope of a water supply well or within poorly drained soil), or
- failure to project flow inputs for the life of the proposed facility.

What Are the Signs of a Failing Septic Tank System?

Unfortunately, it is not uncommon to find a septic tank system that is failing. In most cases, the failure starts as a small problem and continues growing until the problem is too large to ignore. The signs of a failing system include:

- Surfacing or ponding of the septic tank effluent on the ground surface. This effluent may contain many disease-causing bacteria, viruses, and parasites that can cause water-borne diseases like typhoid fever, cholera, dysentery, hepatitis, giardiasis, cryptosporidosis, hookworm, tapeworm and other diseases that have plagued mankind for years. Children are most likely to play in the pools or wet soil, but adults may have to walk through or work in the area, and once the effluent gets on a person, the germs can spread to the mouth or nose where they are swallowed or inhaled.

- Slow drains or sewage backing up into the house. The cause could be from failure of any part of the system.

- Smell of sewage odor outside the house where drainfield is not saturated and there is no back-up. This may cause fly infestations and isolated outbreaks of water-borne diseases.

PART II

Rehabilitating a Failing Septic Tank System

Source: State of North Carolina On-Site Wastewater Management Guidance Manual

A. Problem Identification

Whenever a septic tank system fails, the key to rehabilitation of the system is to use a systematic approach to identify the problem. The basic idea is to check the easy things first and then go to the more difficult items. The following steps are used to determine why a septic system is failing.

1. Determine the type of failure

The type of failure can indicate, to a large extent, what is causing the problem. To properly determine the type of failure, a field inspection must be done.

- ☐ Surface discharges can indicate which part of the system is failing. Note where the discharge is and appears to be coming from. Is the discharge:
  - over the septic tank?
  - over the pump tank?
  - over the distribution box?
  - over the treatment of disposal field? What part of the field?
- ☐ Are drains backing up into the house?
- ☐ Do fixtures in the house drain slowly?
- ☐ Is the problem occurring only in the wet season, after heavy rains, or throughout the year?
- ☐ Does the problem occur only on weekends, or every day?
- ☐ Is the effluent flowing at the failure site or is it a small wet spot that soaks back into the ground?

- ☐ Has the system operated well for a number of years and failed just recently, or has it been failing for a long time?

2. Check the easy things first

The cause of the septic tank system failure often can be determined easily without complicated tests. Some failures may mean that complicated tests must be done, but many problems can be solved by checking the easy things.

- ☐ If the water is backing up into the house or the toilets are flushing slowly, check for clogged plumbing first. A clog in the drain or house sewer going to the septic tank may be the problem.
- ☐ Plugged plumbing vents, located on the roof of the house, also cause slow drains. Once the vent pipes are cleared, it may be helpful to put a screen over the vent pipe to keep out insects, rodents and birds.
- ☐ If the house drains and roof vents are not plugged, check the septic tank. Uncover the access hatches and check for a clogged inlet or outlet.
- ☐ If the inlet is clogged with solids, the house sewer coming into the tank may need a larger pipe, or may have collapsed and need replacing.
- ☐ A clogged outlet may mean that the outlet has broken or that the solids need to be pumped out.
- ☐ If the tank is completely full of solids and scum, it must be pumped. The residents must be informed that septic tanks should be pumped on a regular schedule. Pumping the tank keeps it from plugging and protects the treatment and disposal field from clogging with solids.
- ☐ Distribution boxes can also be easily checked. Uncover the distribution box and check for clogs and excessive solids in the box and for unequal distribution of flow to the outlets.
- ☐ Check to see if the distribution box is out of level. Re-level as needed.
- ☐ Distribution boxes can help determine which part of the system is having the problem.

- Clear water flowing through the distribution box may indicate leaking fixtures and excessive water use.
- Solids in the distribution box mean that the septic tank outlet is not keeping the solids in the tank or that the tank is too full of solids and needs to be pumped.
- If no effluent is flowing to the distribution box, then there is a clog in the conveyance pipe to the distribution box, in the septic tank, or in the house plumbing.
- If the box is flooded, the effluent is not flowing out of the box to the drainfield, indicating the problem is either in the conveyance pipes going to the drainfield or in the drainfield.

☐ In systems that pump to drainfield, check to see if the pump is working.

If these quick checks do not indicate what the problem is, then the following may help determine why the septic tank system is failing.

3. Determine the sewage volume

The volume or total daily flow of sewage going to a system can cause it to fail if the system was designed for a smaller flow.

☐ Find the original design flow or expected daily flow of sewage. This information should be on the permit or other approval forms.

☐ There are several ways to find the actual flow into the septic tank system. An easy way is to check the water bills for records of water used. This is a good indication of how much water is going into the septic tank system unless there is a leak that drains somewhere else, such as under the house.

☐ If the water bills do not help, keep a record of the water meter reading over a period of time, say a month or two. If you are keeping records of the water meter reading, be sure that the plumbing is not leaking into the ground outside the house. Water from a leak outside the house will not go into the septic tank system.

☐ The water meter should be checked as frequently as possible; once each day may be necessary. If the water meter is a dial or pointer that indicates small volumes, see if it turns when no water is being used. This is a sure sign of a leak.

☐ Study the records of water use to find if there has been an increase in flow to the system. Leaking faucets and toilets can add large

amounts of water to the daily flow of sewage, causing the septic system to fail.

- ☐ Has a water-using appliance been installed or added to the household recently? A system that was not designed for high flows may fail when a washing machine or dishwater is added.

- ☐ Has the water use habits in the home changed? A new baby can greatly increase the amount of water used in washing clothes, or teenagers can spend long amounts of time in showers, which increases the total sewage flow.

- ☐ Have the residents changed the use of the washing machine? Are they washing clothes once per day when they used to wash once per week? Sometimes a septic tank system fails if the residents take in additional washing or if they wash all of their laundry on one day of the week. The residents can try washing one load each day, as opposed to all loads in one day.

- ☐ Has the use of the home changed? For instance, has a business that uses large quantities of water been started? Businesses such as day care centers, beauty shops and hobbies such as photography processing can cause problems.

- ☐ Has water been added to the daily sewage flow in other ways? Examples are:

  - sump pump installation which discharges into sanitary drain,
  - roof runoff from downspouts connected to sanitary drains,
  - foundation drainage flowing into sanitary drain,
  - heat pump discharging ground water into sanitary drain,
  - water softener recharge brine flows into septic tank,
  - swimming pool filter backwash water discharged into septic tank,
  - ice machine adds to daily sewage flow,
  - industrial wastewater added to domestic wastewater flow,
  - commercial wastewater added to domestic wastewater flow, and
  - floor drains adding water to daily sewage flow.

4. Check topographic and landscape factors

A number of features of the land can cause a septic tank system to fail.

- ☐ Study the topographic position of the failing system. Is it at the base of a hill where surface drainage from the hill could flow onto

the drainfield area? On long slopes, water can flow several hundred feet through the soil and flood the drainfield area.

- ☐ Is the drainfield downstream from a large drainage area where water drains onto it?
- ☐ Do roadside ditches, swales, or other channels drain water onto the drainfield?
- ☐ Does groundwater flow into the drainfield or does the water table rise in wet weather, causing a failure?

5. Investigate the septic tank

Determine if the septic tank is causing the problem.

- ☐ Inspect the septic tank inlet. Check the inlet to see if it is clogged and make sure sewage is flowing to the septic tank. A clogged inlet or crushed inlet pipe will cause sewage to back up into the house.
- ☐ Inspect the septic tank outlet. Is the outlet broken or clogged?
- ☐ Is the outlet working properly, holding back the solids, grease, and scum? Measure the depth of the scum layer and the solids to see if either is flowing into the outlet.
- ☐ If the outlet is full of solids and grease because too many solids and too much grease have accumulated in the tank, then the tank must be pumped out.
- ☐ Check the depth to the top of the tank. If the tank is too deep, the effluent may have to flow uphill to reach the drainfield, causing the sewage to back up in the septic tank. This problem occurs only in new systems; if the system has worked for a number of years, this condition should not be present.

6. Find the drainfield trenches and determine the amount of ponding.

Many septic tank system failures occur because the drainfield is not handling the effluent properly.

- ☐ Do not dig an open hole in a trench and leave it open. Open holes can spread bacteria and disease.

- ☐ Observation tubes can be installed to check the water level in the trenches. These tubes are vertical, open-ended pipes with one end in the trench and the other end sticking above the ground and covered by a removable cap. By removing the cap and looking or measuring down the observation tube, the water level in the trench can be easily observed and measured. By measuring the depth of water and how long the water stays in the trench, you can get an idea of whether the trenches are clogged.

- ☐ If the water level in the trench rises quickly and drops rapidly, the trenches are not clogged. The drainfield is being overdosed with effluent and some of the effluent is ponding.

- ☐ If the water level rises quickly and drops very slowly or continues to rise, then the trenches are clogged and will need to be repaired or replaced.

- ☐ Use the observation tubes to determine if the trenches are flooded permanently or only temporarily.

- ☐ If effluent is ponding on the ground surface, find out if the ponding is permanent or if it only happens during wet periods, after heavy use, during certain days of the week, etc.

- ☐ Is one part of the drainfield being overloaded? A distribution box that has shifted may direct all the effluent to one trench.

- ☐ Look for changes in the soil across the drainfield especially for soil types that cannot absorb much effluent.

- ☐ Are the trenches too deep? Have the trenches been installed below the seasonal high water table? Is there a perched water table under the drainfield that may restrict the flow of effluent away from the trenches?

- ☐ Have the trenches been installed so that they run up a hill or are not on the contour? Is there too much fall on the trenches so that the effluent runs to the end of the trenches?

- ☐ In areas with very uneven ground, be sure that the trenches have been placed deep enough so that the trench is not too shallow in low spots.

- ☐ If effluent is surfacing somewhere other than over the drainfield , it may mean that an utility trench has been cut across the drainfield. Effluent flows through the loose backfill in underground electrical, cable TV, telephone or water lines, and surfaces in a low spot

along utility trenches. The utility trench should be moved so that it does not cross the drainfield.

7. Determine the rate of absorption of wastewater by the soil.

A method to determine the absorption rate of the soil in the trenches is presented below. This technique is useful because it gives a value of the treatment and disposal rate for the trenches as they really are. Once the treatment and disposal rate has been found, you can better understand why the system is failing.

A. Determine the daily usage of water by reading the water meter. Take readings for at least a week or longer to be sure that you have a good idea of the amount of water being used.

B. Install observation tubes in the trenches.

C. To begin the test, mark the level of water in the trenches as seen through the observation tubes.

D. Use no water in the house for at least eight hours. The water at the meter should be turned off so that the residents will not use the water.

E. Read the water meter after it has been turned off. This reading will be used to find how much water can be absorbed by the system over the eight hour period.

F. Watch the water level in the trenches drop over the eight hour period. At the end of the eight hour period, measure the level of water in the trenches.

G. Turn the water on and let the water flow so that the trenches fill to the same level as at the beginning of the eight-hour period. When the trenches have filled to the level at the beginning of the test, turn off the water at the faucet and read the water meter.

H. Subtract the water meter reading at the beginning of the eight hour test from the meter reading at the end of the test to find the total volume of water used to fill the trench back to the water level at the beginning of the test. This volume of water is also the volume of water absorbed in eight hours.

I. Take the volume of water absorbed in eight hours and multiply it by three to get the volume of wastewater absorbed in one day.

J. If the rate of wastewater treatment and disposal per day, through the soil, is less than the amount of water used per day, then the system is being overloaded. Determine the percentage that the system is overloaded using the following equation:

$$\text{Percent overloaded} = \frac{\text{Average daily water use - Wastewater absorbed per day} \times 100}{\text{Wastewater absorbed per day}}$$

- ☐ If the system is less than 35% overloaded, then the residents may be able to correct the system failure by water conservation. Water conservation includes using low-flow showerheads, low-flush toilets, flow restrictors on all faucets, and other methods to reduce the volume of water flowing to the septic tank system. Installation of these devices is much cheaper than rebuilding a septic tank system.

- ☐ If the plumbing system has a pressure-regulating valve, the pressure in the house can be reduced somewhat, which will help lower water usage. On drinking water well systems, the pressure switch for the well pump can be set to operate over a cycle of 30 to 50 psi rather than the usual 40 to 60 psi setting.

- ☐ The residents can lower their water use by a number of simple actions. Shutting off the water while shaving or brushing teeth, taking short showers, and taking laundry to a laundromat are all ways to decrease water use.

- ☐ For large overloads, the system may have to be expanded or a replacement system installed.

8. Evaluate site and soil properties.

Information from a proper soil evaluation can determine if the site can be used to repair a drainfield that has failed.

- ☐ Determine the types of soil present. Use soil borings, textural determination, and other techniques to determine the type of soil. Complete a soil evaluation and fill out an evaluation sheet.

- ☐ Determine the appropriate loading rate, or acceptance rate, for the soil. This is the volume of effluent the soil can absorb in a day. Check the following items:

- soil depth,
- soil wetness,
- soil characteristics or morphology,
- restrictive horizons,
- changes in soil characteristics either with depth or over the drainfield area,
- loading rate for the trench bottoms,
- loading rate for the entire area of the drainfield, which is the volume of effluent per square foot of the field, and
- loading rate along trench length, volume of effluent per foot of trench.

☐ Determine which type of on-site system will fit the site and soil conditions and the available area.

9. Note cut or excavated areas.

If topsoil has been removed in an area, the septic tank system will not operate properly. Usually, these areas have much less capacity to absorb and treat the effluent once the topsoil is gone.

☐ Try to find out if the system was placed in an area that had been excavated and the soil removed. Subsoils and saprolite are not the best soils for septic tank systems.

☐ Check for cut or excavated areas downslope from the system. Effluent may be coming to the surface in the cut area after it flows downhill from the drainfield.

☐ Old farming terraces upslope can trap rainwater causing the soil downslope to become saturated.

10. Interpret information gathered.

At this stage, you should have most of the information that can be obtained. The information must be interpreted to determine the cause of the problem and whether the problem can be corrected. Some failing systems cannot be corrected.

☐ See if the information points to the cause of the problem. Keep well organized files of the information you have gathered. This information may help decide what is causing the problem.

☐ Discuss the situation and the information you have with your county environmentalists. Environmental health professionals have experience with septic tank systems.

B. Taking Corrective Action

If the problem has been identified, then it is time for corrective action. The following list contains actions that will correct many problems.

- ☐ The best thing to do in any system failure is to start a schedule of regular maintenance and operation checks. Homeowners rarely maintain their septic tank systems properly and maintenance can easily make the difference between a system with problems and one that functions well.
- ☐ If the plumbing or conveyance pipes are clogged, clean them out.
- ☐ If water leaks are overloading the septic tank system, then repair the leaking plumbing fixtures or pipes.
- ☐ If seasonal high water table saturates the soil around the drainfield, use subsurface tile drainage to lower the water table.
- ☐ If the system is being flooded by runoff from roof downspouts, change the downspouts to direct the runoff away from the drainfield.
- ☐ In situations where the tank is plugged with solids or the inlet or outlet is clogged because of solids in the tank, pumping the septic tank will help the system to function properly again.
- ☐ If mechanical or electrical parts have broken, replace the parts.
- ☐ If pipes have collapsed or trenches have filled in, then the pipes should be replaced and reinstalled.
- ☐ Broken conveyance pipes or laterals on pumped systems must be replaced.
- ☐ Leaking septic tanks and pump tanks must be repaired or replaced.

In some cases, nothing can be done to correct the existing septic tank system, which means that the homeowner is in for big changes and probably high costs. Here are some alternatives to consider when whole systems must be repaired.

- ☐ The owner may be able to obtain an easement for use of a neighbor's property for an expanded or additional drainfield. This option depends greatly on the type of neighborhood and how close the houses are to each other.

- ☐ Be certain that smaller corrections will not fix the system before you go to larger system repairs. For instance, if there is only a small failure where water is ponding on the surface, then adding one or two trenches of the same size as the original trenches may be enough.

- ☐ If there is a large failure over most of the drainfield, the entire field will have to be replaced. Sometimes the old field will recover if it is not used for six months or a year, and is then put back into service.

- ☐ Another alternative is to install dual alternating drainfields, alternating the flow between the old field and the new field. The old field may recover in a few months and be ready for use when the flow is turned on again.

- ☐ Another piece of land may be purchased to install another or an expanded drainfield.

- ☐ Alternative wastewater disposal methods that might work on the property can be investigated.

After the system has been rehabilitated, follow-up on how the repaired system is functioning is necessary. Here are a few ideas for follow-up.

- ☐ Inspect the repaired system and review the operation and maintenance of the system. If the system is not being maintained or operated properly, it will fail again.

- ☐ Try to educate the owner and users of the system so that the system is not abused. Education can prevent another failed system.

- ☐ Be sure that the owners and users know what maintenance is necessary for the system. Try to find out if the maintenance is being done.

- ☐ Inspect the system periodically to check for recurring problems.

- ☐ Continue keeping records on the sytem for future needs. Keep well-orginized files of all information. These files may help you or someone else in another situation with a failing system.

PART III

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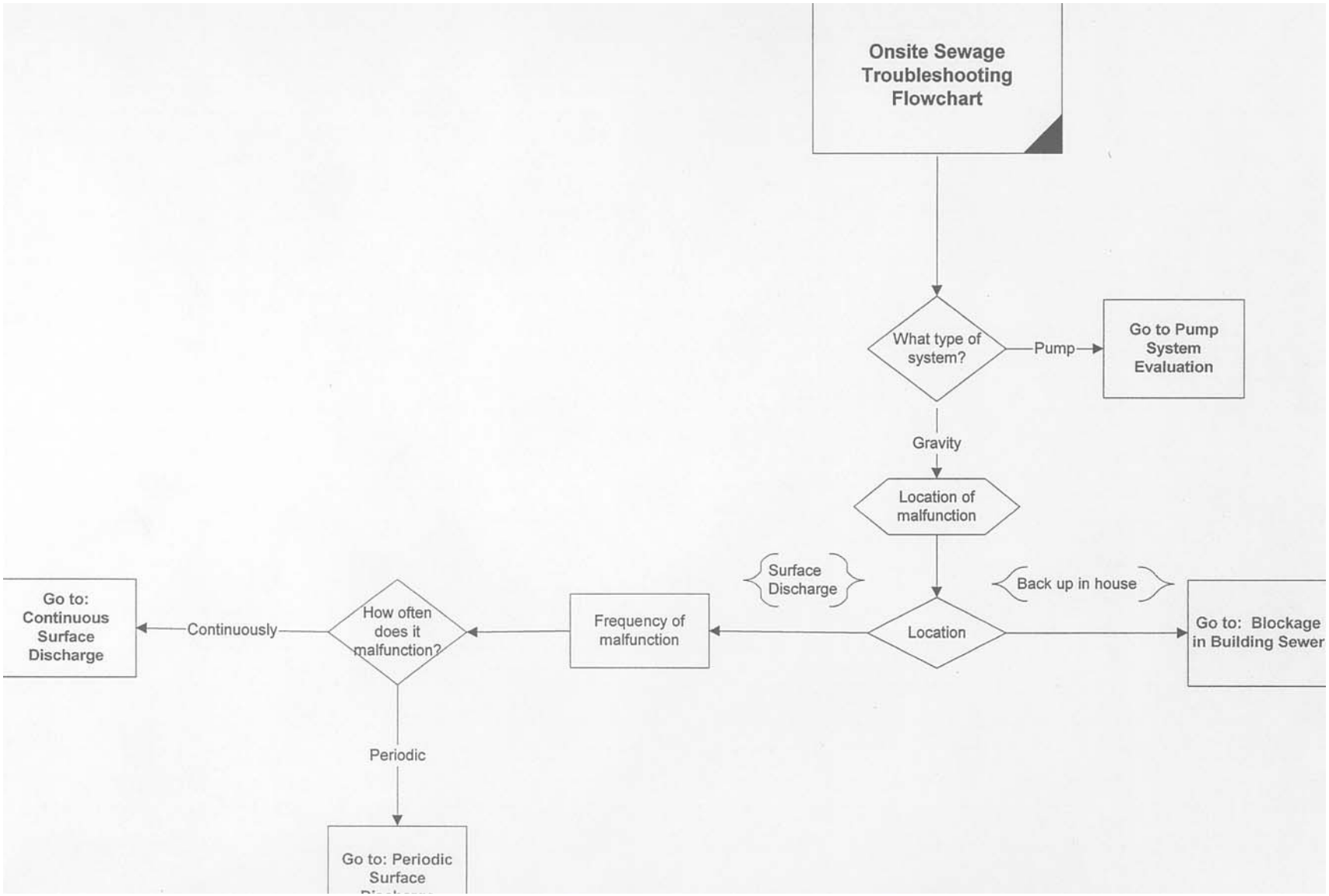
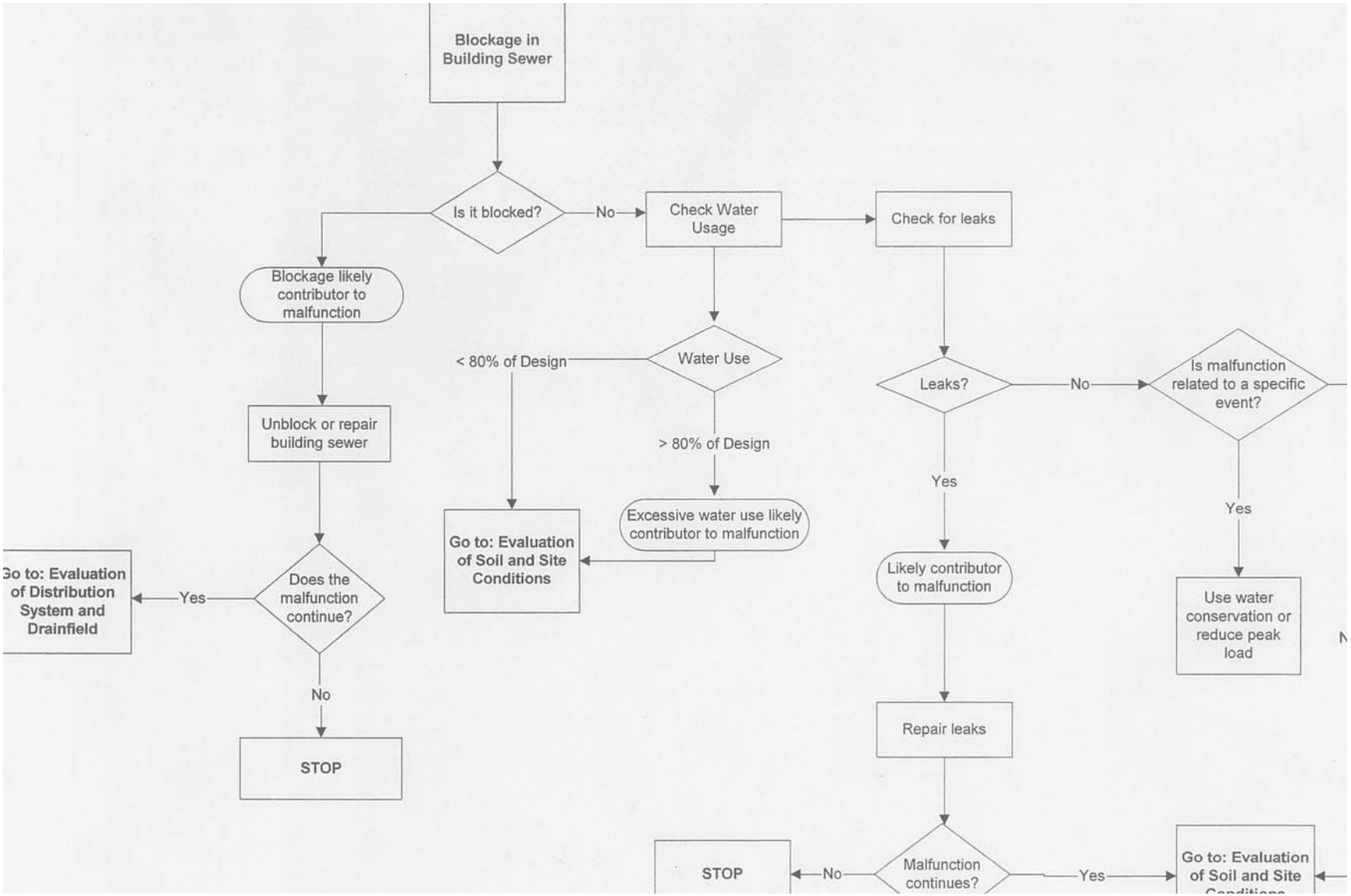
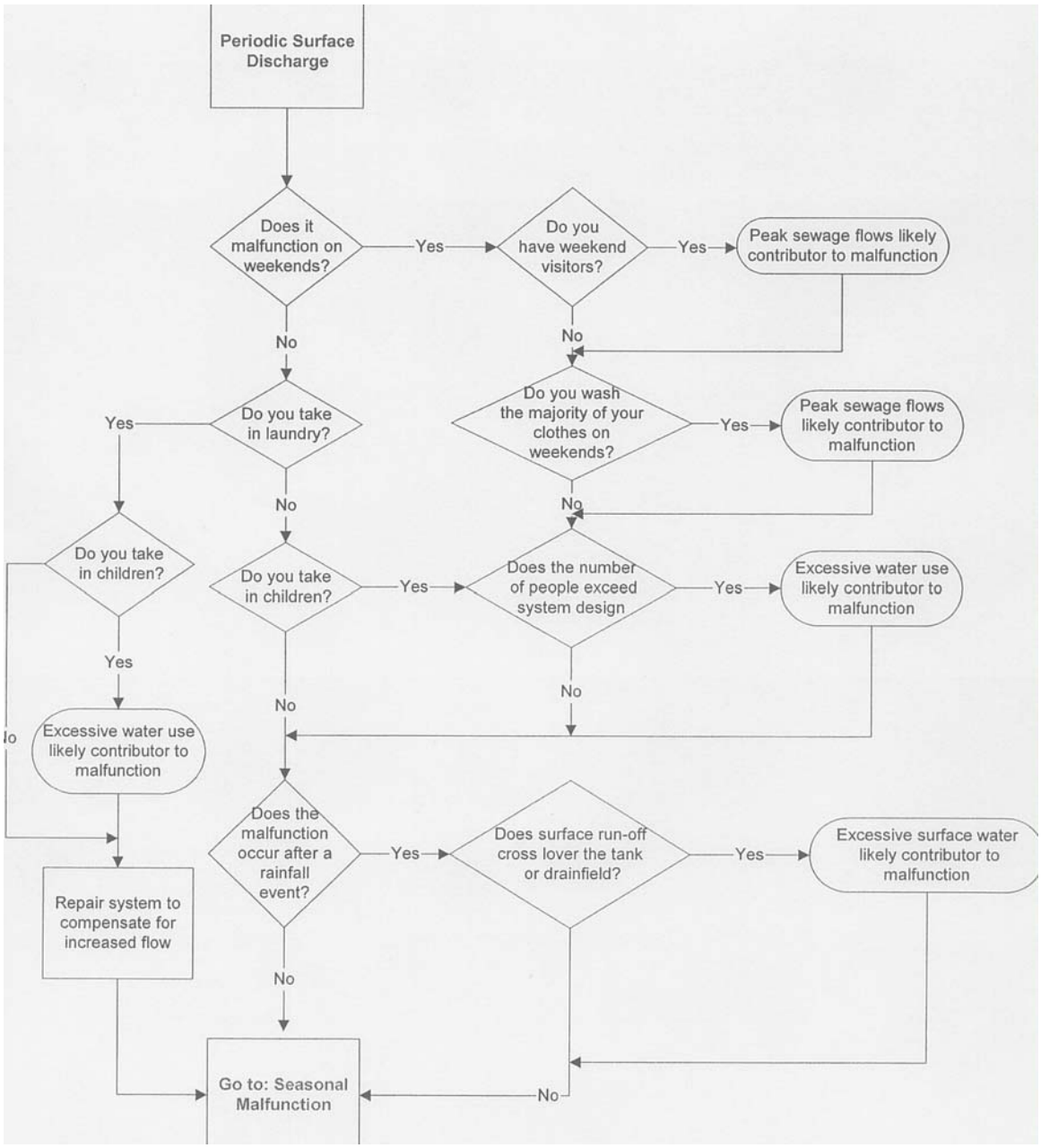
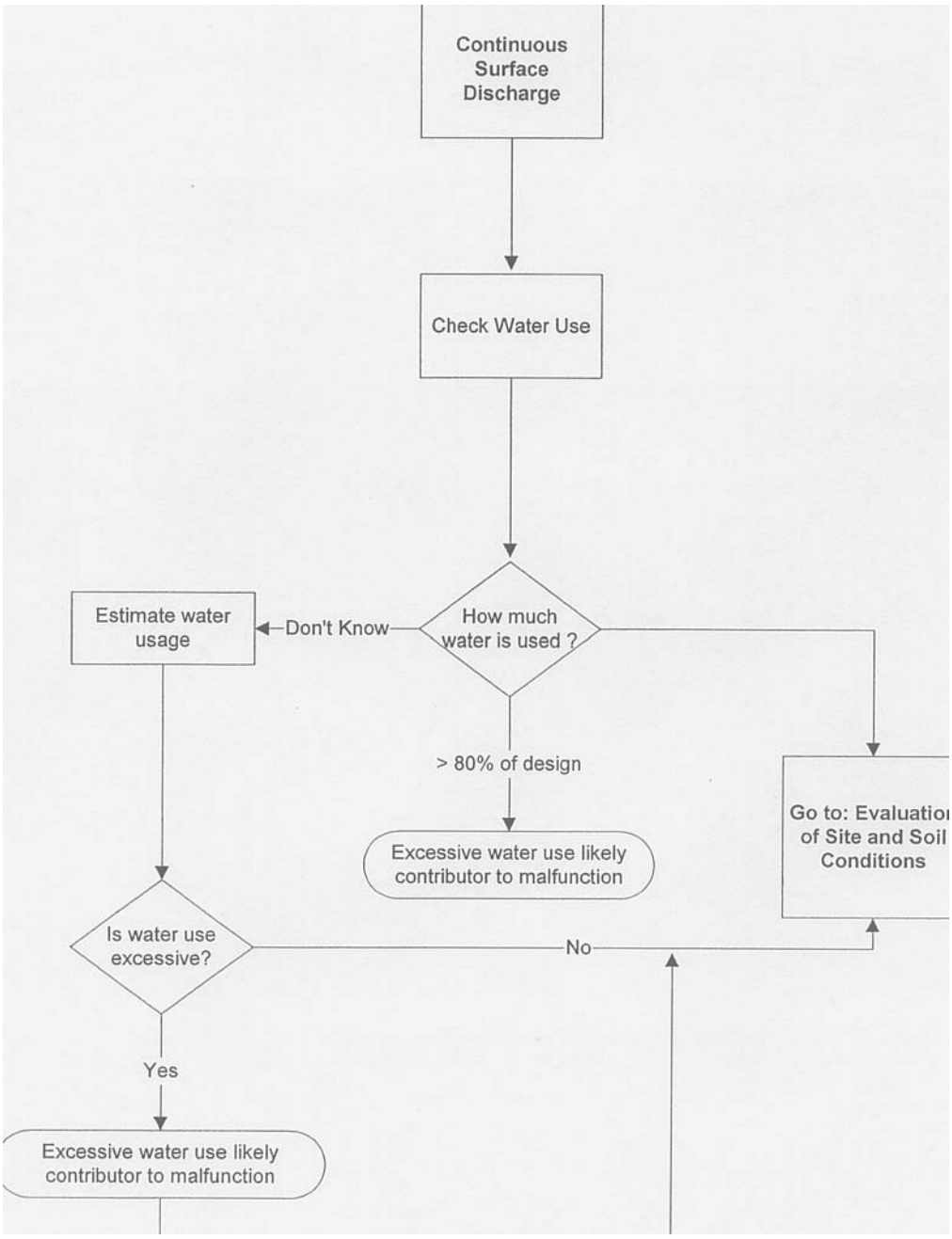
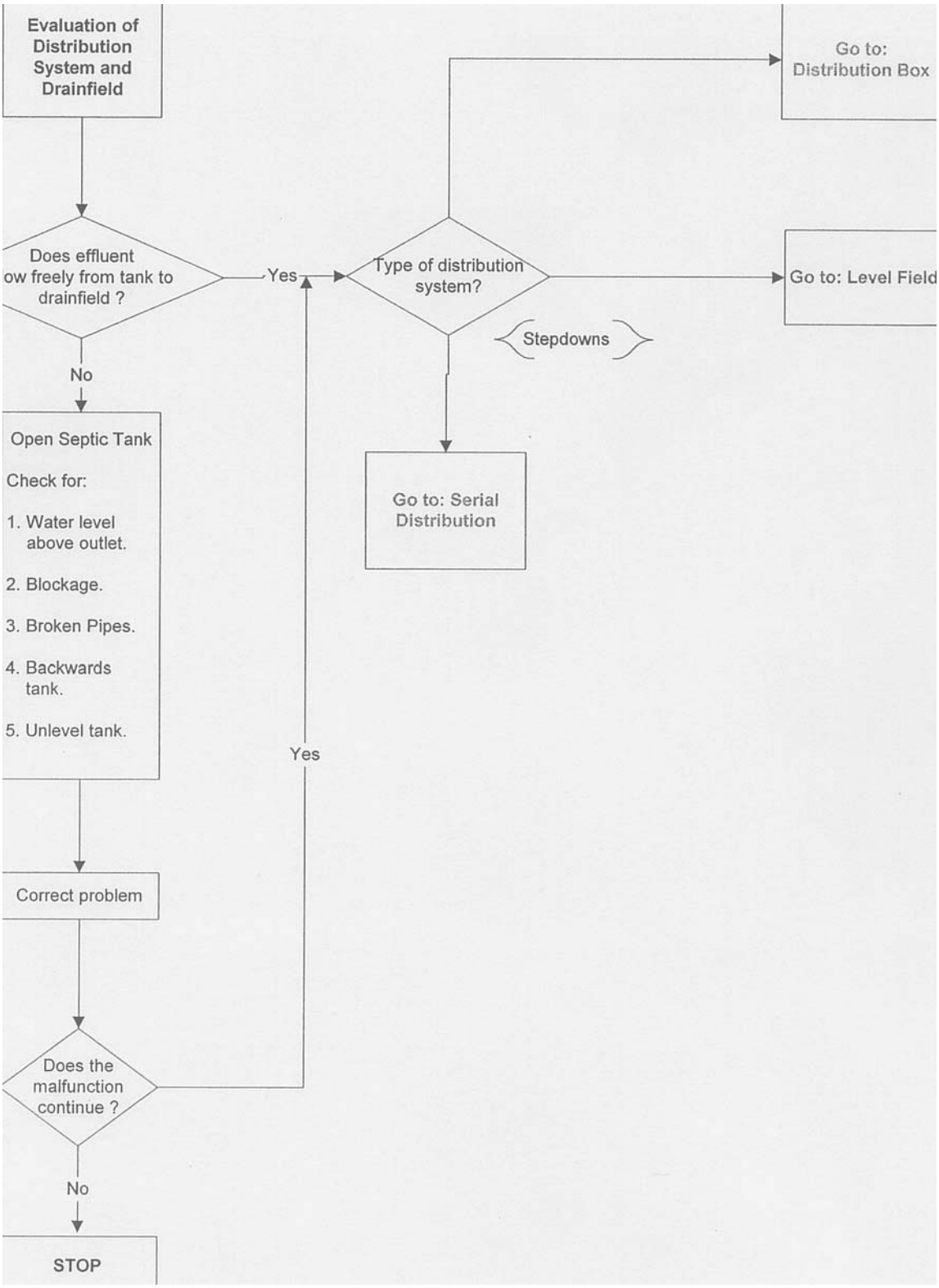
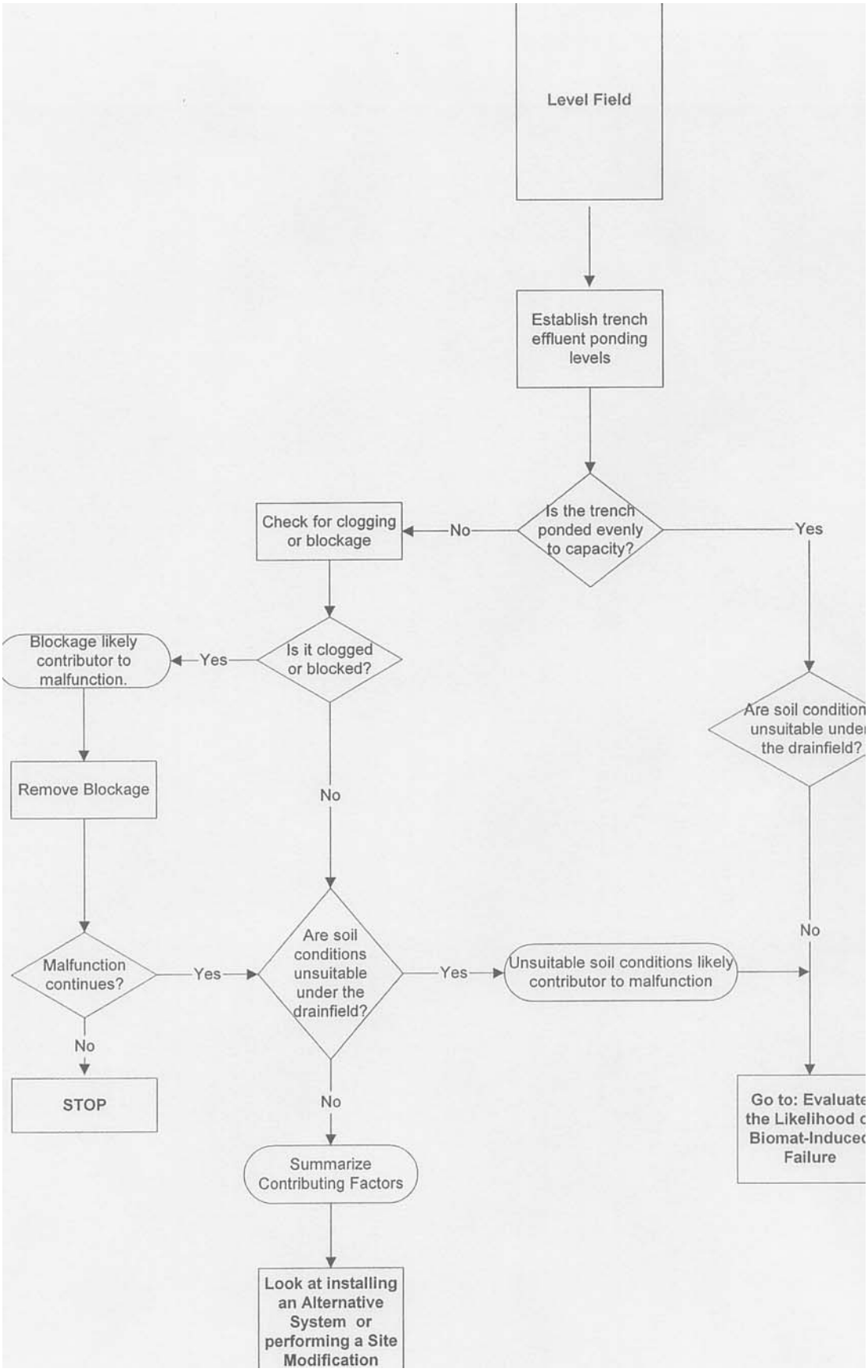

Onsite Sewage Troubleshooting Flowchart
What type of system?
Pump
Go to Pump System Evaluation
Gravity
Location of malfunction
Surface Discharge
Back up in house
Location
Frequency of malfunction
How often does it malfunction?
Continuously
Go to: Continuous Surface Discharge
Periodic
Go to: Periodic Surface
Go to: Blockage in Building Sewer

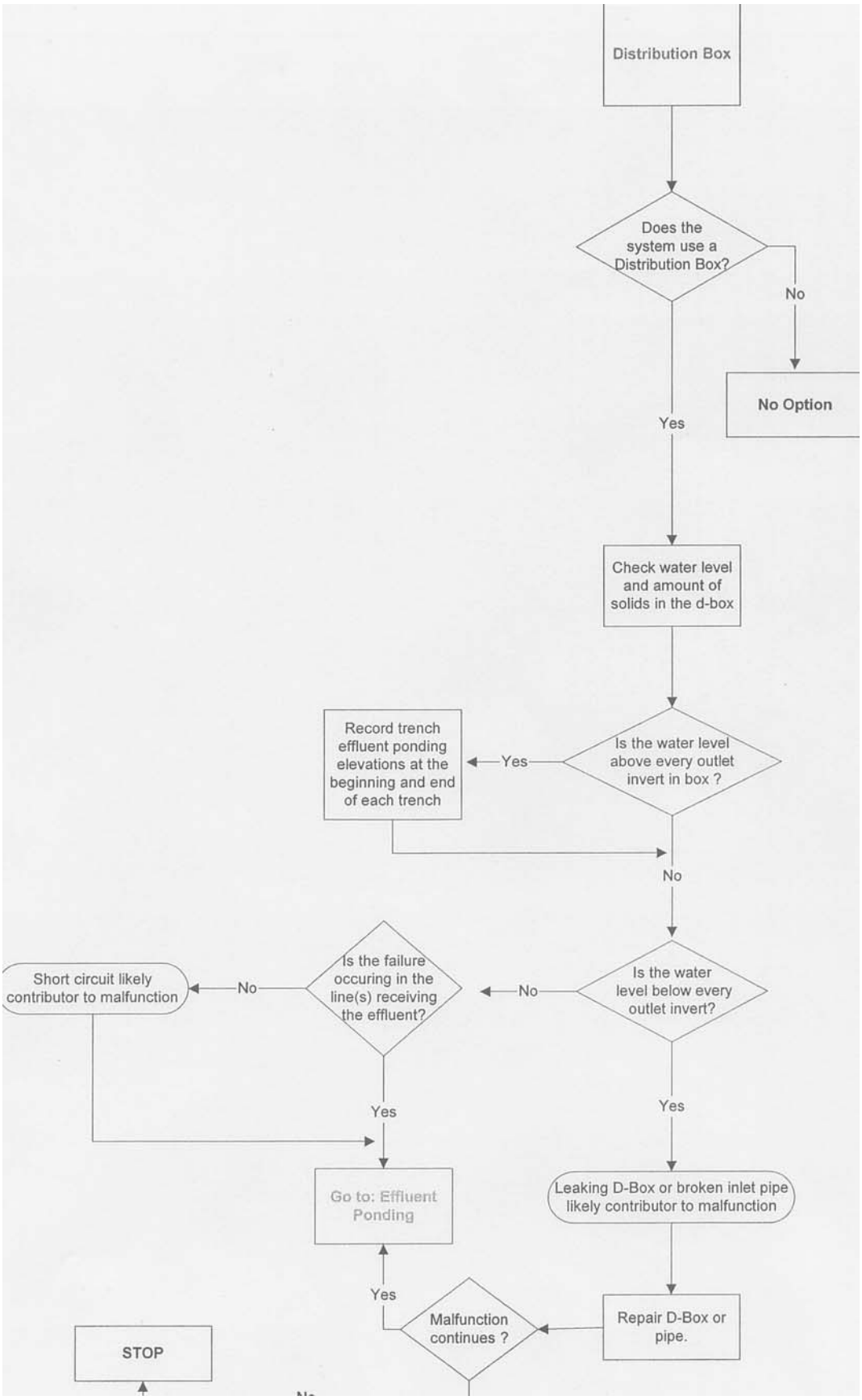

Blockage in Building Sewer
Is it blocked?
No
Check Water Usage
Check for leaks
Blockage likely contributor to malfunction
Water Use
< 80% of Design
> 80% of Design
Leaks?
No
Is malfunction related to a specific event?
Unblock or repair building sewer
Yes
Yes
Go to: Evaluation of Soil and Site Conditions
Excessive water use likely contributor to malfunction
Go to: Evaluation of Distribution System and Drainfield
Does the malfunction continue?
Yes
Likely contributor to malfunction
Use water conservation or reduce peak load
No
Repair leaks
STOP
STOP
No
Malfunction continues?
Yes
Go to: Evaluation of Soil and Site

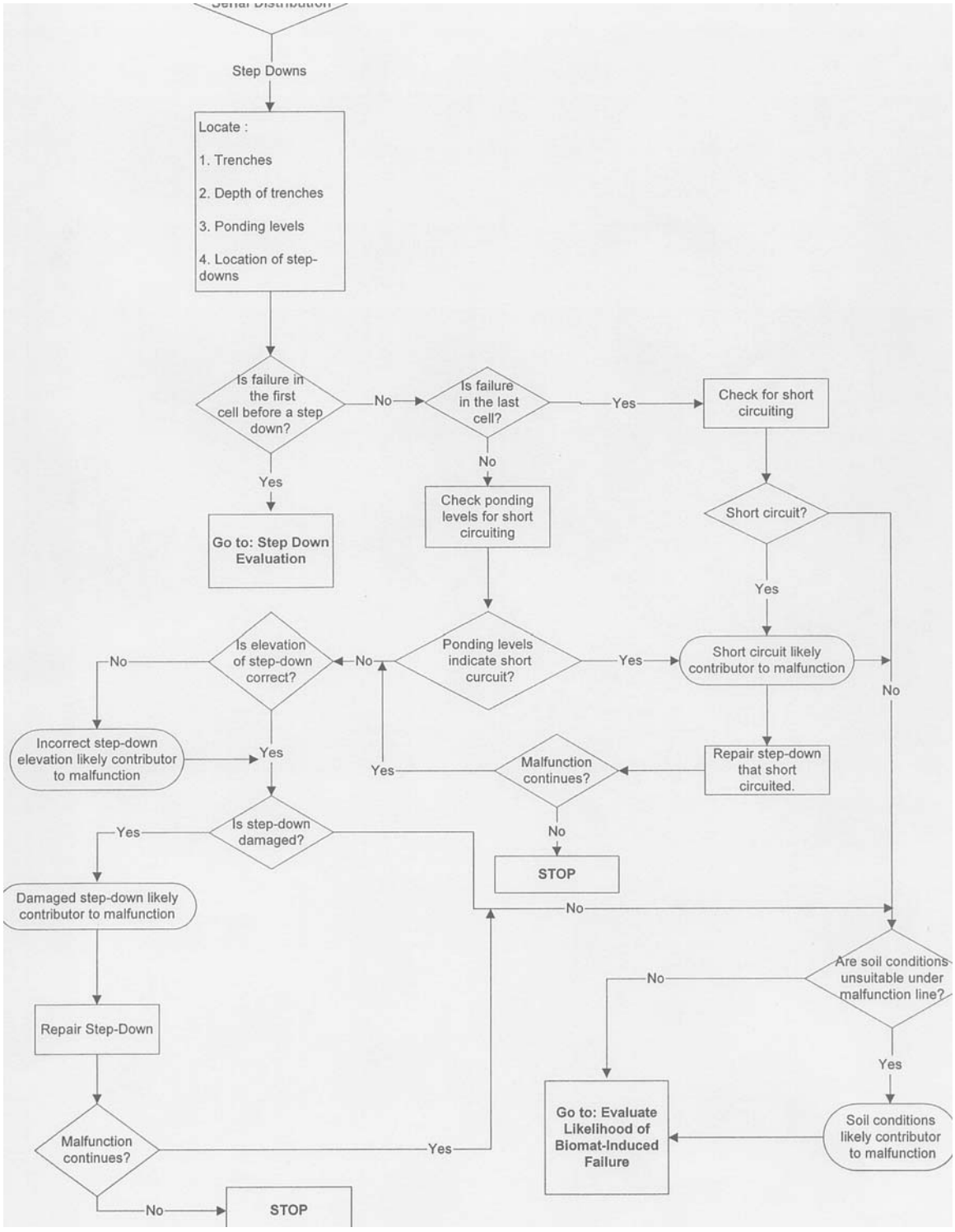

Periodic Surface Discharge
Does it malfunction on weekends?
Yes
Do you have weekend visitors?
Yes
Peak sewage flows likely contributor to malfunction
No
No
Do you take in laundry?
Yes
Do you wash the majority of your clothes on weekends?
Yes
Peak sewage flows likely contributor to malfunction
No
No
Do you take in children?
Do you take in children?
Yes
Does the number of people exceed system design
Yes
Excessive water use likely contributor to malfunction
Yes
No
No
Excessive water use likely contributor to malfunction
Does the malfunction occur after a rainfall event?
Yes
Does surface run-off cross lover the tank or drainfield?
Yes
Excessive surface water likely contributor to malfunction
Repair system to compensate for increased flow
No
Go to: Seasonal Malfunction
No

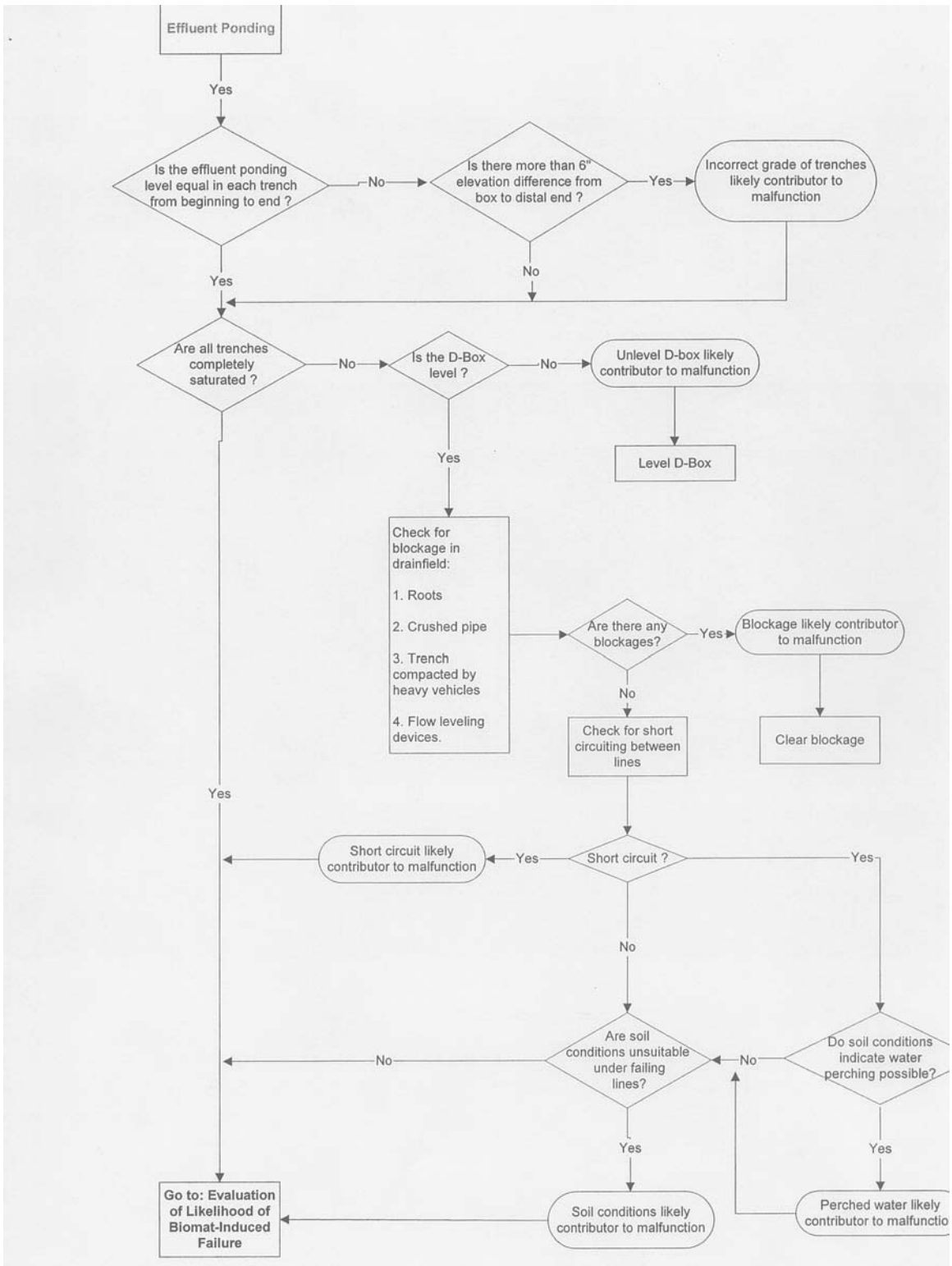

Continuous Surface Discharge
Check Water Use
How much water is used ?
Don't Know
Estimate water usage
> 80% of design
Excessive water use likely contributor to malfunction
Go to: Evaluation of Site and Soil Conditions
Is water use excessive?
No
Yes
Excessive water use likely contributor to malfunction

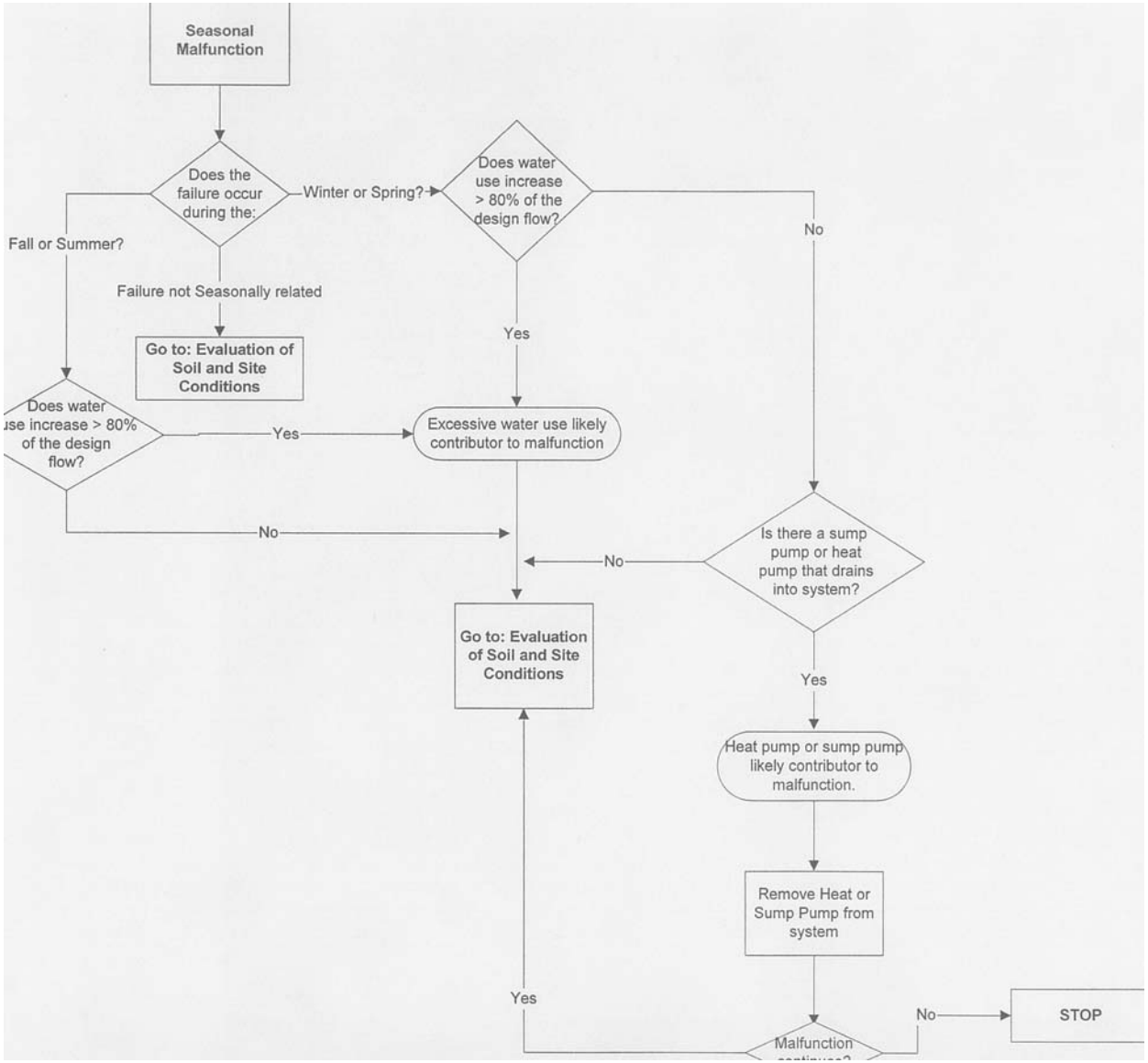

Evaluation of Distribution System and Drainfield
Does effluent ow freely from tank to drainfield ?
Yes
No
Type of distribution system?
Stepdowns
Go to: Distribution Box
Go to: Level Field
Go to: Serial Distribution
Open Septic Tank
Check for:
1. Water level above outlet.
2. Blockage.
3. Broken Pipes.
4. Backwards tank.
5. Unlevel tank.
Correct problem
Does the malfunction continue ?
Yes
No
STOP

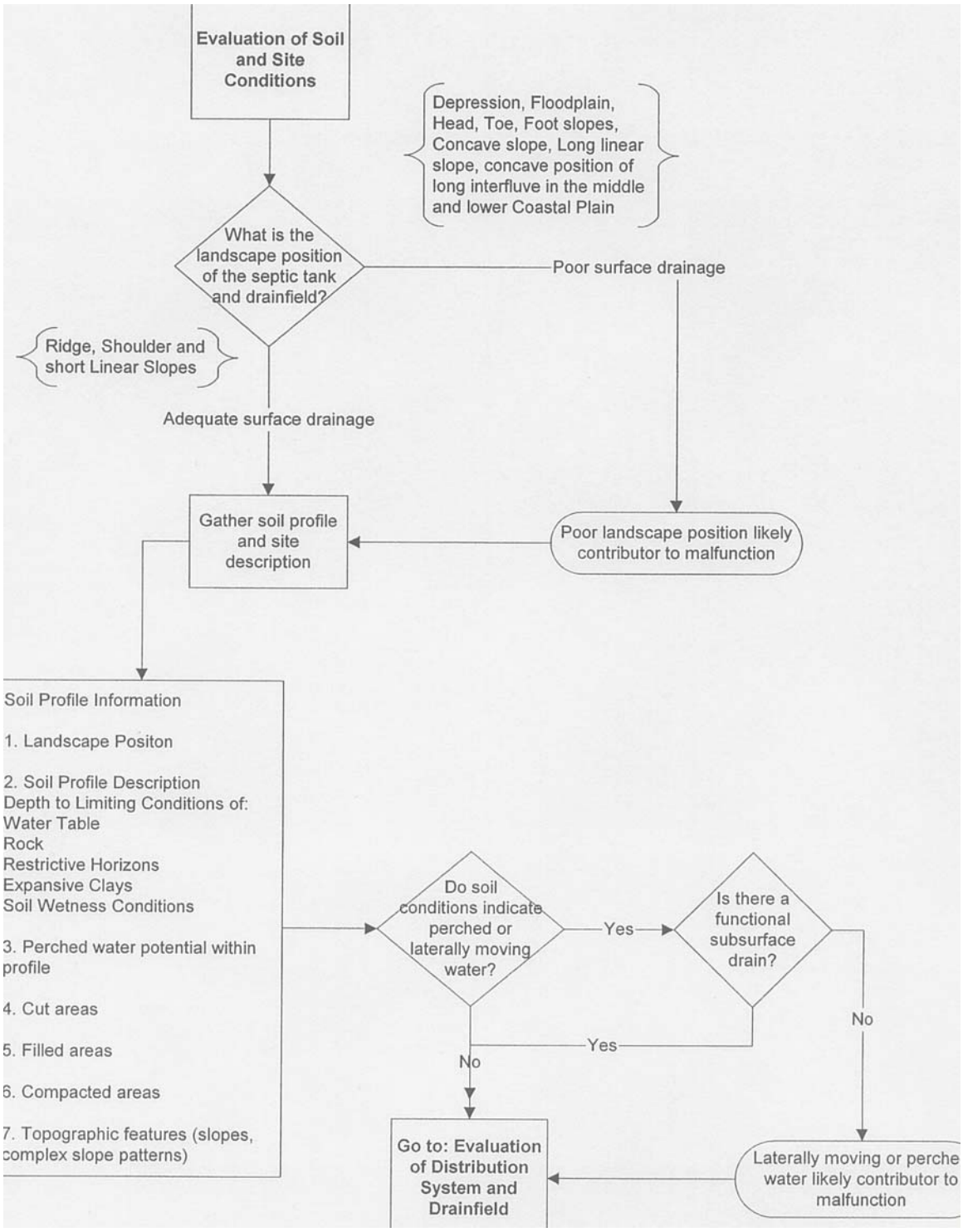

Level Field
Establish trench effluent ponding levels
Is the trench ponded evenly to capacity?
No
Yes
Check for clogging or blockage
Is it clogged or blocked?
Yes
Blockage likely contributor to malfunction.
Remove Blockage
Malfunction continues?
Yes
No
STOP
No
Are soil conditions unsuitable under the drainfield?
Yes
Unsuitable soil conditions likely contributor to malfunction
No
Summarize Contributing Factors
Look at installing an Alternative System or performing a Site Modification
Are soil condition unsuitable unde the drainfield?
No
Go to: Evaluate the Likelihood o Biomat-Induce Failure

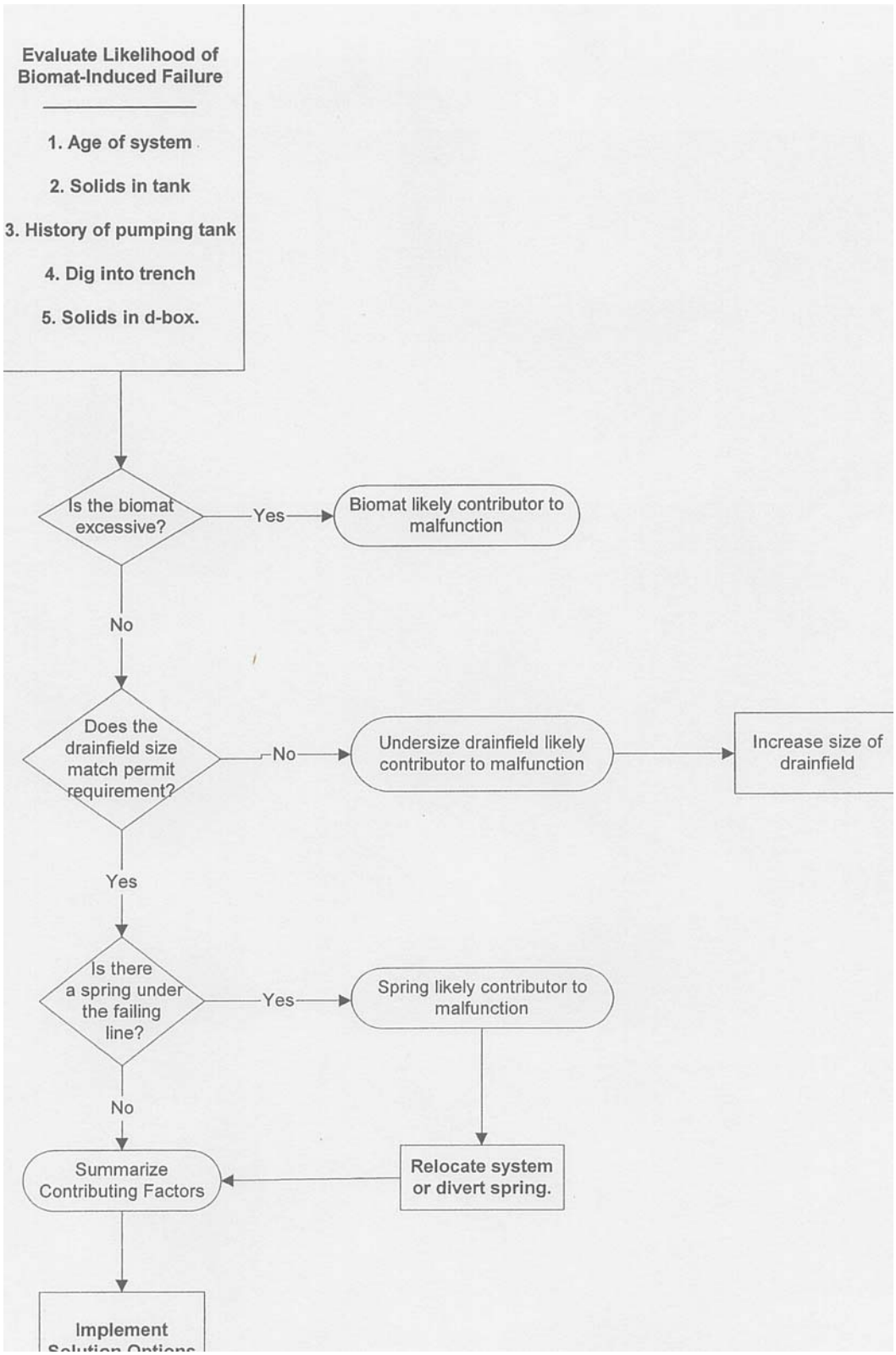

Distribution Box
Does the system use a Distribution Box?
No
No Option
Yes
Check water level and amount of solids in the d-box
Is the water level above every outlet invert in box ?
Yes
Record trench effluent ponding elevations at the beginning and end of each trench
No
Is the water level below every outlet invert?
No
Is the failure occuring in the line(s) receiving the effluent?
No
Short circuit likely contributor to malfunction
Yes
Yes
Leaking D-Box or broken inlet pipe likely contributor to malfunction
Go to: Effluent Ponding
Repair D-Box or pipe.
Malfunction continues ?
Yes
STOP

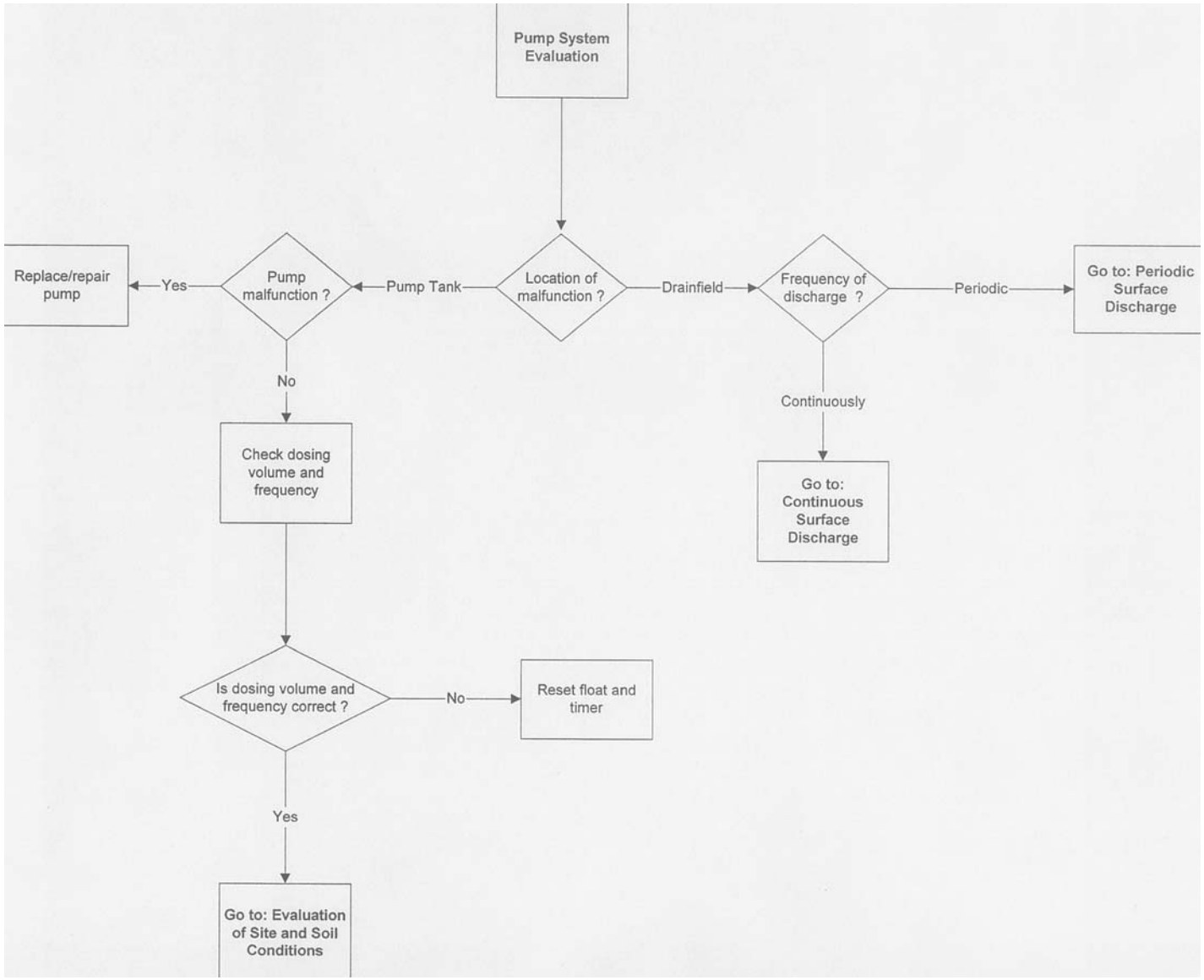

Step Downs
Locate :
1. Trenches
2. Depth of trenches
3. Ponding levels
4. Location of step-downs
Is failure in the first cell before a step down?
No
Is failure in the last cell?
Yes
Check for short circuiting
Yes
Go to: Step Down Evaluation
No
Check ponding levels for short circuiting
Short circuit?
Yes
Is elevation of step-down correct?
No
Ponding levels indicate short curcuit?
Yes
Short circuit likely contributor to malfunction
No
No
Incorrect step-down elevation likely contributor to malfunction
Yes
Yes
Malfunction continues?
Repair step-down that short circuited.
No
Is step-down damaged?
Yes
STOP
Damaged step-down likely contributor to malfunction
No
Are soil conditions unsuitable under malfunction line?
No
Repair Step-Down
Yes
Malfunction continues?
Yes
Go to: Evaluate Likelihood of Biomat-Induced Failure
Soil conditions likely contributor to malfunction
No
STOP


Effluent Ponding
Yes
Is the effluent ponding level equal in each trench from beginning to end ?
No
Is there more than 6" elevation difference from box to distal end ?
Yes
Incorrect grade of trenches likely contributor to malfunction
No
Yes
Are all trenches completely saturated ?
No
Is the D-Box level ?
No
Unlevel D-box likely contributor to malfunction
Level D-Box
Yes
Check for blockage in drainfield:
1. Roots
2. Crushed pipe
3. Trench compacted by heavy vehicles
4. Flow leveling devices.
Are there any blockages?
Yes
Blockage likely contributor to malfunction
Clear blockage
No
Check for short circuiting between lines
Yes
Short circuit likely contributor to malfunction
Yes
Short circuit ?
Yes
No
Are soil conditions unsuitable under failing lines?
No
Do soil conditions indicate water perching possible?
No
Yes
Yes
Go to: Evaluation of Likelihood of Biomat-Induced Failure
Soil conditions likely contributor to malfunction
Perched water likely contributor to malfunctio


Seasonal Malfunction
Does the failure occur during the:
Winter or Spring?
Does water use increase > 80% of the design flow?
Fall or Summer?
Failure not Seasonally related
Go to: Evaluation of Soil and Site Conditions
Yes
No
Does water use increase > 80% of the design flow?
Yes
Excessive water use likely contributor to malfunction
No
Is there a sump pump or heat pump that drains into system?
No
Go to: Evaluation of Soil and Site Conditions
Yes
Heat pump or sump pump likely contributor to malfunction.
Remove Heat or Sump Pump from system
Yes
No
STOP
Malfunction


Evaluation of Soil and Site Conditions
Depression, Floodplain, Head, Toe, Foot slopes, Concave slope, Long linear slope, concave position of long interfluve in the middle and lower Coastal Plain
What is the landscape position of the septic tank and drainfield?
Poor surface drainage
Ridge, Shoulder and short Linear Slopes
Adequate surface drainage
Gather soil profile and site description
Poor landscape position likely contributor to malfunction
Soil Profile Information
1. Landscape Positon
2. Soil Profile Description
Depth to Limiting Conditions of:
Water Table
Rock
Restrictive Horizons
Expansive Clays
Soil Wetness Conditions
3. Perched water potential within profile
4. Cut areas
5. Filled areas
6. Compacted areas
7. Topographic features (slopes, complex slope patterns)
Do soil conditions indicate perched or laterally moving water?
Yes
Is there a functional subsurface drain?
No
Yes
No
Go to: Evaluation of Distribution System and Drainfield
Laterally moving or perche water likely contributor to malfunction


Evaluate Likelihood of Biomat-Induced Failure
1. Age of system
2. Solids in tank
3. History of pumping tank
4. Dig into trench
5. Solids in d-box.
Is the biomat excessive?
Yes
Biomat likely contributor to malfunction
No
Does the drainfield size match permit requirement?
No
Undersize drainfield likely contributor to malfunction
Increase size of drainfield
Yes
Is there a spring under the failing line?
Yes
Spring likely contributor to malfunction
No
Summarize Contributing Factors
Relocate system or divert spring.
Implement


Pump System Evaluation
Location of malfunction ?
Pump Tank
Pump malfunction ?
Yes
Replace/repair pump
No
Check dosing volume and frequency
Is dosing volume and frequency correct ?
No
Reset float and timer
Yes
Go to: Evaluation of Site and Soil Conditions
Drainfield
Frequency of discharge ?
Periodic
Go to: Periodic Surface Discharge
Continuously
Go to: Continuous Surface Discharge

Environmental Health Section
On-Site Sewage Failure Report Definitions and Instructions

Header Section:

County – county of failure.
District – provide the district number.
Property Owner – current property owner reporting failure.
Report Date – date that the failure investigation was started.
Subdivision – if applicable or known.
Lot # - lot and block number if applicable or known.
Property Address – address of the home with failure.
Soil Type – provide **only** if Level 3 soils survey was performed for the original installation.
Classifier – check appropriate box and provide name and certification number **only** if Level 3 soils survey was performed for the original installation.
Perc Rate/HLR – provide the percolation rate or the HLR (hydraulic loading rate) **only** if Level 3 or 4 soils survey was performed for the original installation.
Date of Installation – original system installation date (if known).
Date of Repair(s) – date of any repairs other than current failure repair.
Installer/Cert # - original system installer's name (if known). Provide certification number (if known).
Bedrooms/GPD – number of bedrooms used to size original system or gpd (gallons per day) if the original system is for non-residential or commercial use.

1. **Facility Type** – check box for:
   Commercial ≤2000 gals – non-residential system with a sewage flow less than or equal to 2000 gallons per day excluding restaurants.
   Commercial >2000 gals – non-residential system with a sewage flow of greater than 2000 gallons per day excluding restaurants.
   Multi-Family – duplexes, mobile home parks, apartments, etc.
   Restaurant – as defined by Georgia Food Service Regulations
   Single-Family – house, individual mobile home, pre-manufactured home, etc.
   Other – write in blank if other than specified.

2. **Age of System (years)** – check box as appropriate for the age of the original system in years.

3. **Primary and Pretreatment** – check all boxes that apply to the original system.
   If you check **Septic Tank**, provide the size and manufacturer if known from the original permit or inspection report.
   If you check **ATU**, provide the treatment capacity of the unit if known from the original permit or inspection report.
   If you check **Bio-Peat**, provide the treatment capacity or the number of units if known from the original permit or inspection report.

4. **Absorption Field Size** – provide (if known) from the original permit or inspection report.
   Check the appropriate **Reduction Factor** for the product used or specify if **other**.

5. **Symptom(s) of System** – check all that apply to the failing septic system.
   Backing up into the home
   Plumber/pumper referral – check if the plumber/pumper told the client they had a failure without any observable "normal" symptoms.
   Odor
   Slow draining plumbing
   Surfacing at absorption field
   Surfacing at tank
   Other – specify if not listed above in the blank.

6. Pretreatment Manufacturer – check the appropriate box for the aerobic treatment unit or bio-peat system (**original system only**). Check **N/A or Unknown** if not applicable. If **Other** is checked, list product and manufacturer in blank.

7. Absorption Field Design – check the appropriate box for the **original** drain field layout. If **Other** is checked, specify in the provided blank.

8. Absorption Field Type – check the appropriate box for the product type used in the **original** drain field. If **Other** is checked, specify in the provided blank.

9. Absorption Field Products – check the appropriate box for the **original** drain field manufactured product.

For: **EZflow/Ring Industries –** print the product number/style in the adjacent blank.
Infiltrator – print the chamber type in the adjacent blank.
Multi-Pipe/Plastic Tubing, Inc – print the product number/style in the adjacent blank.

10. Type of Failure – check the appropriate box(s) for the **original** sytem.

N/A or Unknown
Absorption Field – sewage surfacing from the drain lines.
Conveyance piping – sewage surfacing from the serial dam or step-down, crushed dam, clogged outlet pipe, etc.
Equipment (mechanical/electric) – pump failure, ATU blower failure, etc.
Equipment (abs. field product) – faulty, flawed design, undersized, etc. drain line product.
Tank (structural) – crushed tank, broken tees, etc.

11. Cause(s) of Failure – check all boxes that apply.

N/A or Unknown
Additions to home/property – structural additions to home, decks, carports, storage sheds, pools, etc.
Biomat formation – drain line sludging as a function of age.
Groundwater – subsurface water flow, water table (chroma 2 mottles), etc.
Equipment/machinery traffic – system was "run over" by vehicles, tractors, etc.
Excess water use – too much water for typically sized system.
Lack of maintenance – not pumping tank, clogged tees, clogged filter, etc.
Landscape alterations – cut and/or fill in area of system, berming, road cuts, etc.
Over-strength waste – usually associated with commercial, restaurant, multi-family waste, etc. Lines have grease buildup from heavy use.
Plumbing problems (leaky/clogs) – fixtures in home leaking, pipe from home clogged, etc.
Poor installation – improper or poor original installation
Restrictive rock horizon – system installed in rock.
Root intrusion – tree roots clogging up drain lines, step-downs, distribution box, tank, etc.
Soil permeability – soil has high percolation rate.
Surface water/runoff – up-gradient water flowing over system during rain events, gutters directed over system, poor landscape position, etc.
Undersized system – system not designed for current use, extra bedroom added, etc.

12. Additional Comments – provide any additional pertinent information.

13. Reporting Environmentalist – print inspector's name.

Environmental Health Section On-Site Sewage Failure Report

County	District #	Property Owner	Report Date

Subdivision:	Lot #:	Property Address:
Soil Type (if known):	☐Engineer ☐Geologist ☐Soil Classifier ☐Other Name and Certification/License #:	Perc Rate/HLR:
Date of Installation (if known):	Date of Repair(s):	Installer/Cert #: / Bedrooms/GPD:

1. Facility Type:
- ☐ Commercial ≤2000 gals
- ☐ Commercial >2000 gals
- ☐ Multi-Family
- ☐ Restaurant
- ☐ Single-Family
- ☐ Other:_____

2. Age of System (years):
- ☐ <1
- ☐ 1 – 5
- ☐ 6 – 10
- ☐ 11 – 20
- ☐ 21 – 30
- ☐ 31 – 40
- ☐ >40
- ☐ Unknown

3. Primary and Pretreatmen
- ☐ Septic Tank S
- Manf:_____
- ☐ ATU Size:_____
- ☐ Bio-Peat Unit(s):_____

4. Absorption Field Size:

Square feet:_____

Linear feet: _____

Reduction factor:
☐ 0% ☐ 25% ☐ 50%

☐ Other:_____

5. Symptom(s) of System:
- ☐ Backing up into home
- ☐ Plumber/pumper referral
- ☐ Odor
- ☐ Slow draining plumbing
- ☐ Surfacing at absorption field
- ☐ Surfacing at tank
- ☐ Other:_____

6. Pretreatment Manufacturer:
- ☐ N/A or Unknown
- ☐ AquaKlear
- ☐ Aquarobic International
- ☐ Bio-Microbics
- ☐ Clearstream Wastewater
- ☐ Consolidated Treatment
- ☐ Delta Env/Whitewater
- ☐ EcoFlow/Premier Tech
- ☐ Ecological Tanks
- ☐ H.E. McGrew
- ☐ Hydro-Action
- ☐ MicroSeptec
- ☐ Mo-Dad
- ☐ National Wastewater
- ☐ NORWECO
- ☐ PURAFLO/Bord Na Mona
- ☐ Other:

8. Absorption Field Type:
- ☐ N/A or Unknown
- ☐ Chamber
- ☐ Conventional/Gravel
- ☐ Drip emitter
- ☐ Gravelless pipe
- ☐ Multi-pipe
- ☐ Polystyrene
- ☐ Tire chips
- ☐ Other:_____

9. Absorption Field Products:
- ☐ N/A or Unknown
- ☐ BioDiffusor/PSA
- ☐ Clearwater drip line
- ☐ Corr-A-Guard
- ☐ Crumpler pipe
- ☐ Contactor/Cultec
- ☐ EnviroChamber/Hancor
- ☐ EZflow/Ring Industries:_____
- ☐ Geoflow drip line
- ☐ Infiltrator:_____
- ☐ Multi-Pipe/Plastic Tubing,Inc: _____
- ☐ Other:_____

10. Type of Failure:
- ☐ N/A or Unknown
- ☐ orption field
- ☐ veyance piping
- ☐ ipment (mechanical/electric)
- ☐ ipment (abspt. field product)
- ☐ k (structural)
- ☐ Other:_____

11. Cause(s) of Failure:
- ☐ N/A or Unknown
- ☐ Addition(s) to home/property
- ☐ Bio-mat formation (age)
- ☐ Equipment/machinery traffic
- ☐ Excess water use
- ☐ Groundwater
- ☐ Lack of maintenance
- ☐ Landscape alterations
- ☐ Over-strength waste
- ☐ Plumbing problems (leaky/clogs)
- ☐ Poor installation
- ☐ Restrictive rock horizon
- ☐ Root intrusion
- ☐ Soil permeability
- ☐ Surface water/runoff
- ☐ Undersized system
- ☐ Other:_____

12. Additional Comments: _____

_____

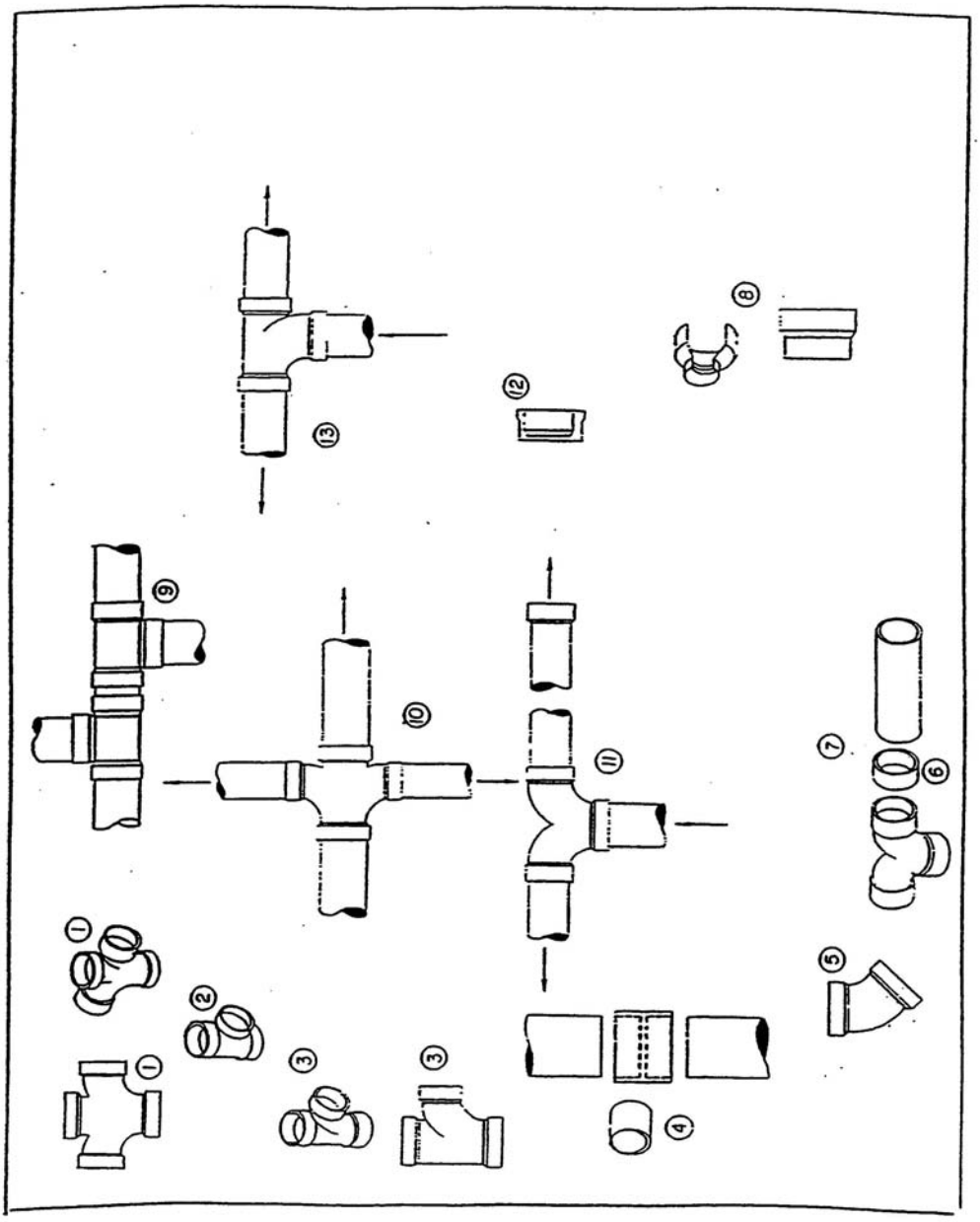
_____

13. Reporting Environmentalist:

For Official Use Only

APPENDIX O-VI

SOME EXAMPLES OF COMMONLY USED PIPE FITTINGS



Pipe Fittings (refer to diagrams on previous page)

Double sanitary tee or sanitary cross - used to extend laterals from the manifold as shown in diagrams (1) and (10). Available with all hubs equal or with side hubs reduced- Example: 2" x 1 1/2" (reduced from 2 inches to 1 1/2 inches).

(2) and (9) Standard tee or vent tee - used to connect delivery pipe to manifold, to connect the first or last pair of laterals to the manifold, or to connect opposing laterals to the manifold, as shown in diagram (9). When opposing tees are used to connect laterals to the manifold, laterals will be slightly offset. Available with all hubs equal or with side hub reduced - example: 3" x 2".

(3) Sanitary tee - appears to have a "Y" type of configuration; has the same use as the standard tee.

(4) Coupling - used to connect sections of pipe. The standard coupling has a "lip" inside (shown by dotted lines) so that each pipe extends into the coupling an equal distance. Also available is a "repair coupling" which has not lip inside. The repair coupling is placed over one piece of pipe, back from the end; solvent is applied to the two pipe ends, the pipes are aligned, and the repair coupling is slid forward and centered over the joint. The coupling is especially useful to repair pipes which are already in place.

(5) Elbows or bends - available in 90° (or quarter turn), 60° (or one-sixth bend), 45° (or one-eighth bend), and 22 ½° (or one-sixteenth bend).

(6) Bushing, sleeve, or adaptor - used to reduce the inside diameter of a fitting hub to match a smaller pipe. The most common use would be to reduce manifold fittings to lateral sizes. Example: four inches. A typical bushing installation is shown in diagram (7).

(8) Reducer or increaser coupling - used to increase or decrease pipe diameter in delivery pipes, manifolds; or can be used in the same manner as a bushing although not as practical.

(11) Double 90° elbow or long sweep tee - can be used in the same manner as a standard tee or sanitary tee; shown in diagram (11) as the connection of the last laterals to the manifold.

(12) End cap - cemented in place, used to cap the ends of the laterals. A fitting and threaded cap may also be used.

(13) Sanitary tee manifold connection - typical method of connection of the delivery pipe to the manifold, or laterals to manifold. A standard tee or double 90° elbow serves as the same purpose.

Use of fittings is not restricted to the fittings shown or the design of each fitting. The diagrams are provided only as examples.

APPENDIX O-VII

PRESSURE DISTRIBUTION NETWORK DESIGN

Septic tank effluent or other pretreated effluent can be distributed in the soil absorption unit either by trickle, dosing, or uniform distribution. Trickle flow, known as gravity flow, through the 4" perforated pipe does not distribute the effluent uniformly but concentrates it in several areas of the absorption unit. Dosing is defined as pumping or siphoning a large quantity of effluent into the 4" perforated pipe for distribution within the soil absorption area. It does not give uniform distribution but does spread the effluent over a larger area than does gravity flow. Uniform distribution, known also as pressure distribution, distributes the effluent somewhat uniformly throughout the absorption area. This is accomplished by pressurizing relatively small diameter pipes containing small diameter perforations spaced uniformly throughout the network and matching a pump or siphon to the network.

This material has been extracted and modified from a paper entitled "Design of Pressure Distribution Networks for Septic Tank - Soil Absorption Systems" by Otis, 1981.

The orifice equation and the Hazen-Williams friction relationships were used to size the network. A sharp-edged orifice coefficient of 0.6 and a Hazen-Williams friction factor of 150 for plastic pipe was used.

DESIGN PROCEDURE

The design procedure is divided into two sections. The first part consists of sizing the distribution network which distributes the effluent in the aggregate and consists of the laterals, perforations and manifold. The second part consists of sizing the force main, pressurization unit and dose chamber and selecting the controls.

A. Design of the Distribution Network.

Steps:

1. Configuration of the network.

   The configuration and size of the soil absorption system must meet the soil site criteria. Once that is established, the distribution network can be designed.

2. Determine the length of the laterals.

   Laterals are defined as the length from the manifold to the end of the lateral. For a center manifold it is approximately one half the length of the absorption area. For end manifolds it is approximately the length of the absorption area.

3. Determine the perforation spacing and size.

The size of perforations, spacing of perforations and thus the number of perforations must be matched with the flow rate to the network. For small systems, typical perforation spacing is 30 to 36" while in larger systems spacing may be from 5 to 7 ft. Lateral spacing is somewhat arbitrary but generally equal to the perforation spacing. It is recommended to place the perforations in an equilateral triangle among the adjacent laterals. A typical perforation diameter is 1/4" but other sizes are used.

4. Determine the lateral pipe diameter.

Based on the selected perforation size and spacing, use Figures A-1 thru A-6 to select the lateral diameter.

5. Determine the number of perforations per lateral.

Use $n = (p/x) + 0.5$ for center feed/center manifold or $n = (p/x) + 1$ for end feed/end manifold where n = number of perforations, p = lateral length in feet and x = perforation spacing in feet. If not a whole number round off to nearest whole number.

6. Determine the lateral discharge rate.

Based on the distal pressure selected, Table A-1 gives the perforation discharge rate. Typical distal pressure is 2.5 ft. Multiply the number of perforations per lateral by the discharge rate to yield the lateral flow rate.

7. Determine the number of laterals and the spacing between the laterals.

For absorption areas less than 5 ft wide, one distribution pipe along the length of the absorption area is sufficient. For absorption areas 5 to 10 ft wide, two parallel distribution pipes may be appropriate. For absorption areas wider than 10 ft wide, two to three parallel distribution pipes may be appropriate. A balance must exist between the perforation size, spacing and number and pump size. Absorption areas wider than 10 - 15 ft are not recommended.

8. Calculate the manifold size.

Use Table A-2 to determine the diameter of the manifold for both end and center manifolds. Manifold length is the distance between the outside laterals. For two parallel laterals, it is the distance between the laterals. For a single distribution pipe with end or center feed, there is no manifold.

9. Determine the network discharge rate.

This value is used to size the pump or siphon. Take the lateral discharge rate and multiply it by the number of laterals or take the perforation discharge rate and multiply it by the number of perforations.

3. Determine the perforation spacing and size.

The size of perforations, spacing of perforations and thus the number of perforations must be matched with the flow rate to the network. For small systems, typical perforation spacing is 30 to 36" while in larger systems spacing may be from 5 to 7 ft. Lateral spacing is somewhat arbitrary but generally equal to the perforation spacing. It is recommended to place the perforations in an equilateral triangle among the adjacent laterals. A typical perforation diameter is 1/4" but other sizes are used.

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Based on the distal pressure selected, Table A-1 gives the perforation discharge rate. Typical distal pressure is 2.5 ft. Multiply the number of perforations per lateral by the discharge rate to yield the lateral flow rate.

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9. Determine the network discharge rate.

This value is used to size the pump or siphon. Take the lateral discharge rate and multiply it by the number of laterals or take the perforation discharge rate and multiply it by the number of perforations.

B. Design of the Force Main, Pressurization Unit, Dose Chamber and Controls.

Steps:

1. Develop a system performance curve.

The effluent pumps that are typically used for pressurizing distribution networks are centrifugal pumps. The flow rate is a function of the total head that the pump works against. As the head becomes larger, the flow rate decreases but the flow rate determines the network pressure and thus the relative uniformity of discharge throughout the distribution network. The best way to select the pump is to evaluate the system performance curve and the pump performance.

The total head, that the pump must work against, is the 1) network losses, 2) friction losses in the force main, and 3) elevation lift. The network loss is assumed equal to the distal pressure selected, which is 2.5 ft in most cases. This assumes that the manifold and laterals were sized according to the above procedure. The friction loss in the force main is determined using Table A-3, the total length of the force main and the diameter selected. The elevation or lift is the elevation difference between the pump shut-off level and the invert of the laterals.

2. Determine the force main diameter.

A force main size must be determined in step 1, part B.

3. Select the pressurization unit.

Pumps

Using pump performance curves, select the pump that best matches the required flow rate at the operating head. Plot the pump performance curve on the system curve. Then determine if the pump will produce the flow rate at the required head. Do not undersize the pump. It can be oversized but will add to the expense of the system. Effluent pumps have been designed for septic tank effluent and must be used. Clear water sump pumps will not last very long.

Siphons

Care must be taken in sizing siphons. The head that the network operates against has to be developed in the force main. If the discharge rate out the perforations is greater than the siphon flow rate, the distal pressure in the network will not be sufficient. Some manufacturers recommend that the force main be one size larger than the siphon diameter to allow the air in the force main to escape. However this will reduce the distal pressure in the network which may be below the design distal pressure. Falkowski and Converse, 1988, discuss siphon performance and design.

4. Determine the dose volume required.

The lateral pipe volume determines the minimum dose volume. The recommended dose volume is 5 to 10 times the pipe volume. Use Fig A-7 to estimate the pipe volume and then multiply it by the appropriate value to determine the dose volume.

5. Size the dose chamber.

The dose chamber (Fig. A-1) must be large enough to provide:

a. the dose volume.
b. the average daily volume if a single pump is used.
c. the dead space resulting from placement of the pump on a concrete block.
d. a few inches of head space.

6. Select controls and alarm.

Select quality controls and alarm. Mercury control floats are superior to all other type of switches. All electrical connections must be outside the dose chamber.

DESIGN EXAMPLE

Design a pressure distribution network for the mound system described in the main text of this publication. The absorption area is 150 ft long and 4 ft wide. The force main is 150 ft long and the elevation lift is 9 ft.

A. Design of the Distribution Network.

Steps:

1. Configuration of the network.

This is a narrow absorption unit on a sloping site (Fig 4).

2. Determine the lateral length.

Using a center feed, the lateral length is:

Lateral length = (Absorption length (B) / 2) - 0.5 ft

= (150 ft / 2) - 0.5 ft

= 74.5 ft

3. Determine the perforation spacing and size.

Select 1/4 in. dia. Perforations with a 3 ft spacing.

4. Determine the lateral diameter.

Using Fig A-1 with a perforation spacing of 3 ft and lateral length of 74.5 ft, the lateral diameter is 2" (Schedule 40 PVC).

5. Determine the number of perforations per lateral.

Using 3.0 ft spacing in 74.5 ft yields 25 perforations per lateral. ($n = (p/x) + 0.5$; $n = (55.5/3.0) + 0.5 = 25.3$ or 25)

6. Determine lateral discharge rate (LDR).

Using a distal pressure of 2.5 psi, Table A-1 gives a discharge rate of 1.2 gpm (1.17 rounded off to 1.2) for the 1/4" dia. perforation. Thus:

LDR = No. perforations/lat. x discharge rate/perforation

LDR = 25 perforations x 1.2 gpm/perforation

= 30 gpm/lateral

7. Determine the number of laterals and the spacing between the laterals.

Since this is a narrow absorption area (4.0 ft), a single distribution is sufficient to distribute the effluent.

8. Calculate manifold size.

Since there is only a single distribution line along the length of the absorption unit with a center feed (2 laterals), there is no manifold in this system.

However, assuming there were 2 parallel lines (4 laterals) spaced 5 ft apart with a center manifold with each lateral having a discharge rate of 26.4 gpm, Table A-2 gives a manifold diameter of 3". (Proceed down left column to 30 gpm/center manifold, then right to column 5. It shows for a 5 ft lateral spacing and 3" dia. manifold a maximum length of 10 ft which is greater than the 5 ft for this unit).

As a rule of thumb for smaller systems, the diameter of the manifold can be the same as the force main.

9. Determine network discharge rate (NDR).

NRD = No. of laterals x Lateral Discharge Rate

= 2 laterals x 30 gpm/lat.

= 60 gpm

B. Design of the Force Main, Pressurization Unit, Dose Chamber and Controls.

Steps:

1. Calculate the system performance curve.

Use the following table to develop a system performance curve. Follow procedures (a) through (g) which are listed below the table. Orifice is synonymous to perforation.

Total Flow	Orifice Flow	Elevation Difference	Force Main	Orifice	Total
Flow Rate (gpm)			Head (ft)		
20	0.40	9.0	0.18	0.29	9.5
40	0.80	9.0	0.59	1.17	10.8
60	1.20	9.0	1.22	2.65	12.9
80	1.60	9.0	2.07	4.71	15.8
100	2.00	9.0	3.14	7.36	19.5

Procedure:

a. Select 5 flow rates above and below the network discharge rate (60 gpm).

b. Calculate the orifice (perforation) flow rate for each of the flows. This is done by dividing the flow rate by the number of orifices in the network. For 20 gpm and 50 orifices, the orifice flow rate is 0.40 gpm.

c. The elevation head is the height that the effluent is lifted.

d. The force main head is the head loss in the force main for the given flow rate. Table A-3 gives the friction loss.

e. The orifice head is calculated by $H = (Q/(11.79*d^2))^2$. H is head in ft, Q is orifice flow rate in gpm, and d is orifice diameter in inches. For 1/4 in. diameter orifice, the equation is $H = (Q/0.737)^2$.

f. The total head is the sum of the elevation, force main and orifice heads.

g. Plot the flow rates vs. total head (Fig. A-8).

2. Determine the force main diameter.

A force main of 3 in. was selected in step 1 of Part B.

3. Select a pressurization unit.

Plot the pump performance curves of several effluent pumps on the system performance curve (Fig. A-8). Select a pump that will provide at least 60 gpm (X on the curve). The system will operate at the intersection of the pump performance curve and the system curve. Select pump B or C as Pump A will not provide sufficient volume and pressure. Pump C may be oversized for the system and result in extra cost and operating at a lower pump efficiency.

4. Determine dose volume.

Fig. A-7 gives a total pipe volume of 23 gallons for the two 2" dia. by 74.5 ft laterals. Use a dose volume of 5 to 10 times the lateral pipe volume which is 115 to 230 gallons per dose.

(Using a straight edge, place it on the left column at 74.5 ft and also on the 2 in. dia. point of the 2nd column. Mark the point of intersection of the straight edge and column 3. On column 3 pivot to the 2 mark on column 4 and read the total volume on the right hand column which is 10 gal/lateral).

5. Size the dose chamber.

Based on the dose volume, storage volume and room for a block beneath the pump and control space, a 750 to 1000 gallon chamber will be sufficient (Fig. A-9).

6. Select controls and alarm.

Use mercury control floats and a quality alarm with a mercury control float.

CONSTRUCTION AND MAINTENANCE

Good common sense should prevail when constructing and maintaining these systems. Good quality components should be used. Water tight construction practices should be employed. All electrical controls must be outside the dose chamber as the interior environment is very humid and corrosive. Regular maintenance and pumping of the septic tank should be employed to minimize solids carry-over. Screens and filters may be installed to minimize solids carried to the distribution network. Seeds of all shapes and sizes along with toilettes have been found in the laterals. Proper baffle maintenance in the septic tank is essential. Surface runoff should be diverted away from the septic tank and dose chamber. Any settling after construction should be filled in so that the ground surface slopes away from the tanks and chambers. DO NOT ENTER THESE TANKS WITHOUT PROPER SAFETY EQUIPMENT INCLUDING A SELF CONTAINED BREATHING APPARATUS.

Table A-1 Perforation Discharge Rates in Gallons per Minute Versus Perforation Diameter and In-Line Pressure (Otis, 1981)

In-Line Pressure (ft)	Perforation Diameter (in)						
	1/4	5/16	3/8	7/16	1/2	9/16	5/8
	gpm						
1.0	0.74	1.15	1.66	2.26	2.95	3.73	4.60
1.5	0.90	1.41	2.03	2.76	3.61	4.57	5.64
2.0	1.04	1.63	2.34	3.19	4.17	5.27	6.51
2.5	1.17	1.82	2.62	3.57	4.66	5.90	7.28
3.0	1.28	1.99	2.87	3.91	5.10	6.46	7.97
3.5	1.38	2.15	3.10	4.22	5.51	6.98	8.61
4.0	1.47	2.30	3.31	4.51	5.89	7.46	9.21
4.5	1.56	2.44	3.52	4.79	6.25	7.91	9.77
5.0	1.65	2.57	3.71	5.04	6.59	8.34	10.29

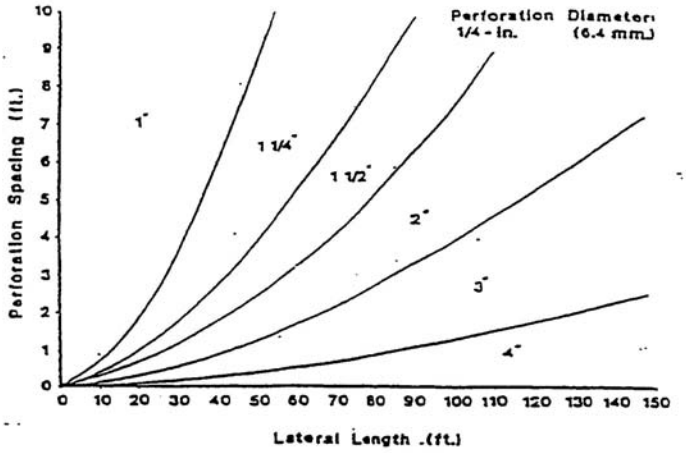

Fig. A-1. Minimum Lateral diameter for Plastic Pipe (C=150) Versus Perforation Spacing and Lateral Length for 1/4" Diameter Perforations (Otis, 1981)

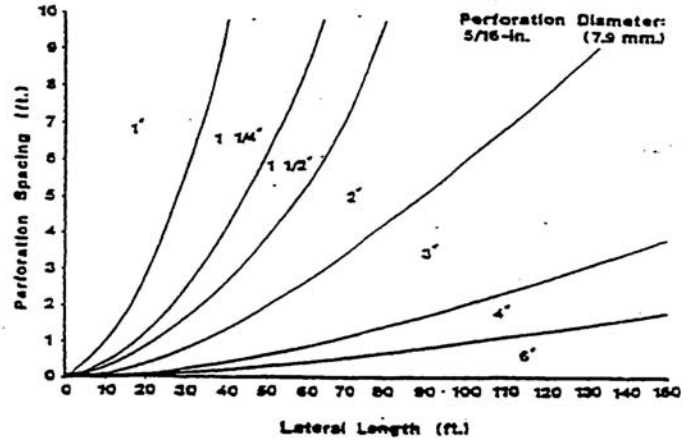

Fig. A-2. Minimum Lateral Diameter for Plastic Pipe (C=150) Versus Perforation Spacing and Lateral Length for 5/16" Diameter Perforations (Otis, 1981)

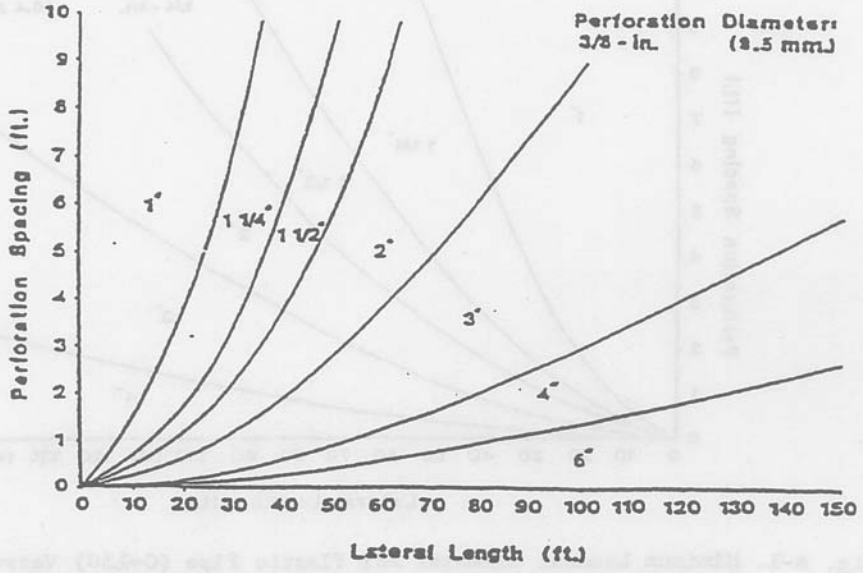

Fig. A-3. Minimum Lateral Diameter for Plastic Pipe (C=150) Versus Perforation Spacing and Lateral Length for 3/8" Diameter Perforations (Otis, 1981)

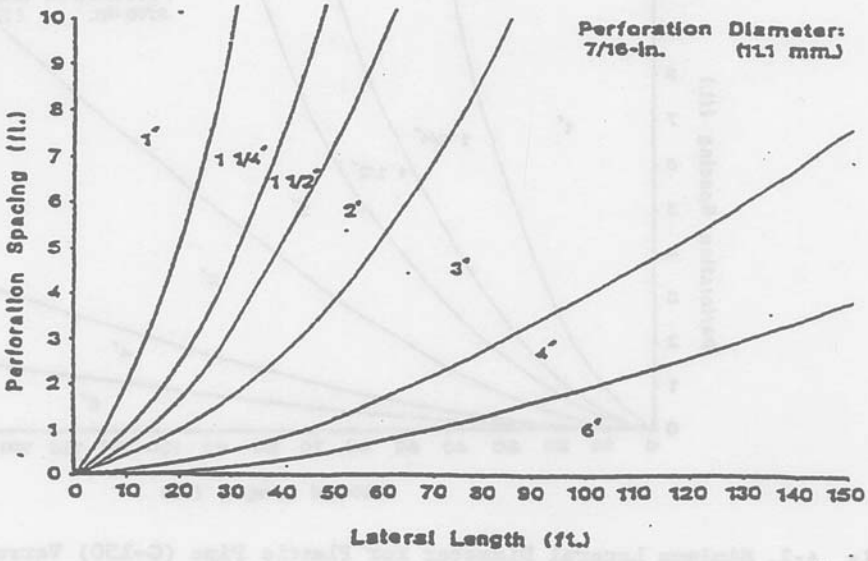

Fig. A-4. Minimum Lateral Diameter for Plastic Pipe (C=150) Versus Perforation Spacing and Lateral Length for 7/16" Diameter Perforations (Otis, 1981)

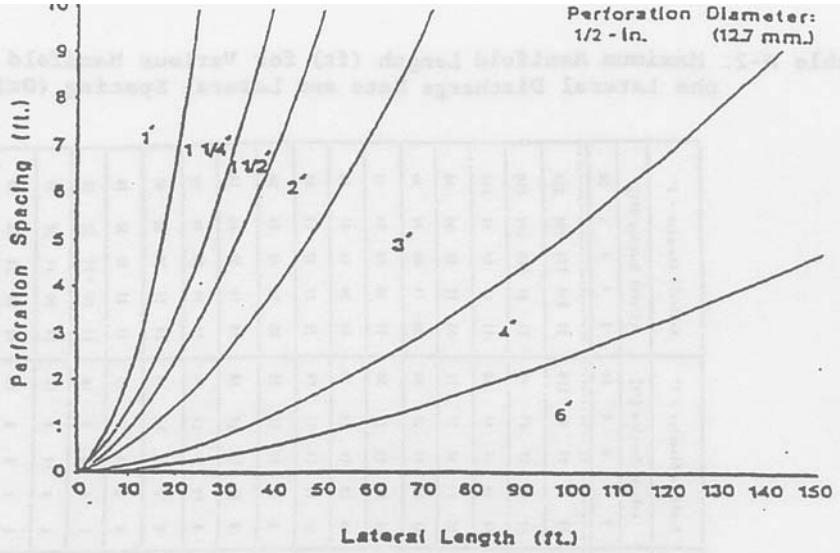

Fig. A-5. Minimum Lateral Diameter for Plastic Pipe (C=150) Versus Perforation Spacing and Lateral Length for 1/2" Diameter Perforation (Otis, 1981)

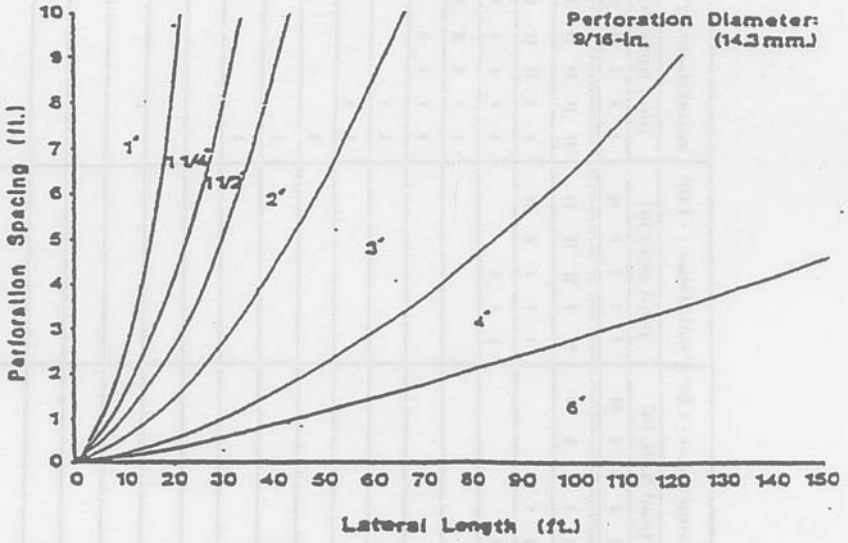

Fig. A-6. Minimum Lateral Diameter for Plastic Pipe (C=150) Versus Perforation Spacing and Lateral Length for 9/16" diameter Perforations (Otis, 1981)

Table A-2. Maximum Manifold Length (ft) for Various Manifold Diameters Given the Lateral Discharge Rate and Lateral Spacing (Otis, 1981)

Lateral Discharge Rate (gpm)	Manifold Diameter = 1 1/2"					Manifold Diameter = 2"					Manifold Diameter = 3"					Manifold Diameter = 4"				
Lateral / Manifold	Lateral Spacing (ft)					Lateral Spacing (ft)					Lateral Spacing (ft)					Lateral Spacing (ft)				
	2	4	6	8	10	2	4	6	8	10	2	4	6	8	10	2	4	6	8	10
10 / 10	10	8	12	11	20	11	16	21	11	30	21	10	31	38	20	81	134	111	208	210
20 / 10	2	1	4	8	10	4	8	12	16	20	11	21	30	32	40	54	100	134	154	
30 / 10	2	1	4			1	4	8	8	10	12	16	21	26	30	42	61	84	114	
40 / 10						1	1	4	8	10	10	12	16	18	20	31	51	65	85	90
50 / 10						2	1	4	4		8	12	12	16	20	30	41	60	72	80
60 / 10						2	1				8	12	8	12	20	22	30	40	71	70
70 / 10						2	1				6	8	8	10	20	21	24	32	42	60
80 / 10						2	1				4	6	8	10		18	22	32	42	50
90 / 10						2					4	6	8	10		20	20	30	40	50
100 / 10						2					4	6	8	10		15	20	30	40	50
110 / 10											4	6	8	10		12	21	24	40	40
120 / 10											4	6	8	10		12	21	30	32	40
130 / 10											4	6	8	10		12	22	30	32	40
140 / 10											4	6	8	10		12	22	30	32	40
150 / 10											4	6	8	10		11	20	24	32	40
160 / 10											4	6	8	10		11	20	24	32	40
170 / 10											4	6	8	10		11	20	24	32	40
180 / 10											4	6	8	10		11	20	24	32	40
190 / 10											4	6	8	10		11	20	24	32	40
200 / 10											4	6	8	10		11	20	24	32	40
210 / 10											4	6	8	10		11	20	24	32	40
220 / 10											4	6	8	10		11	20	24	32	40
230 / 10											4	6	8	10		11	20	24	32	40
240 / 10											4	6	8	10		11	20	24	32	40
250 / 10											4	6	8	10		11	20	24	32	40
300 / 10																10	18	24	32	40

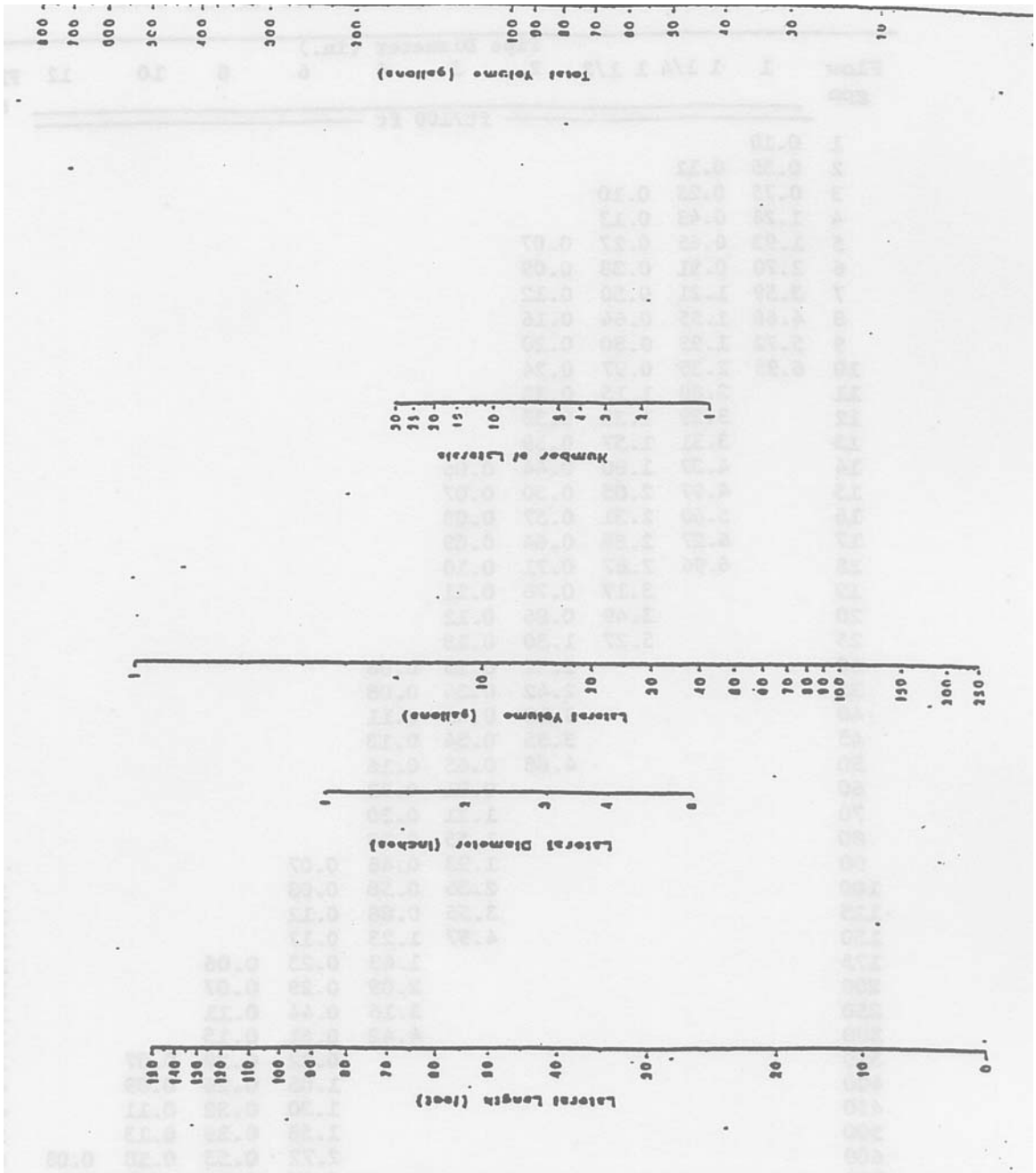

Fig. A-7 Nomograph for Determining the Total Pipe Volume Given the Diameter, Length and Number of Laterals (Otis, 1981).

Table A-3. Friction Losses in Schedule 40 PVC Plastic Pipe (C-150) Versus Flow Rate and Pipe Diameter (Otis, 1981)

Flow gpm	Pipe Diameter (in.) 1	1 1/4	1 1/2	2	3	4	6	8	10	12	Flow gpm
	ft/100 ft										
1	0.10										1
2	0.35	0.12									2
3	0.75	0.25	0.10								3
4	1.28	0.43	0.13								4
5	1.93	0.65	0.27	0.07							5
6	2.70	0.91	0.38	0.09							6
7	3.59	1.21	0.50	0.12							7
8	4.60	1.55	0.64	0.16							8
9	5.72	1.93	0.80	0.20							9
10	6.95	2.35	0.97	0.24							10
11		2.80	1.15	0.28							11
12		3.29	1.35	0.33							12
13		3.31	1.57	0.39							13
14		4.37	1.80	0.44	0.06						14
15		4.97	2.05	0.50	0.07						15
16		5.60	2.31	0.57	0.08						16
17		6.27	2.58	0.64	0.09						17
18		6.96	2.87	0.71	0.10						18
19			3.17	0.78	0.11						19
20			3.49	0.86	0.12						20
25			5.27	1.30	0.18						25
30				1.32	0.25	0.06					30
35				2.42	0.34	0.08					35
40				3.10	0.43	0.11					40
45				3.35	0.54	0.13					45
50				4.68	0.65	0.16					50
60					0.91	0.23					60
70					1.21	0.30					70
80					1.55	0.38					80
90					1.93	0.46	0.07				90
100					2.35	0.58	0.08				100
125					3.55	0.88	0.12				125
150					4.97	1.23	0.17				150
175						1.63	0.23	0.06			175
200						2.09	0.29	0.07			200
250						3.16	0.44	0.11			250
300						4.42	0.61	0.15			300
350							0.82	0.20	0.07		350
400							1.05	0.26	0.09		400
450							1.30	0.32	0.11		450
500							1.58	0.39	0.13		500
600							2.72	0.55	0.18	0.08	600
700							2.95	0.73	0.25	0.10	700
800							3.77	0.93	0.31	0.13	800
900							4.69	1.16	0.39	0.16	900
1000								1.41	0.47	0.20	1000

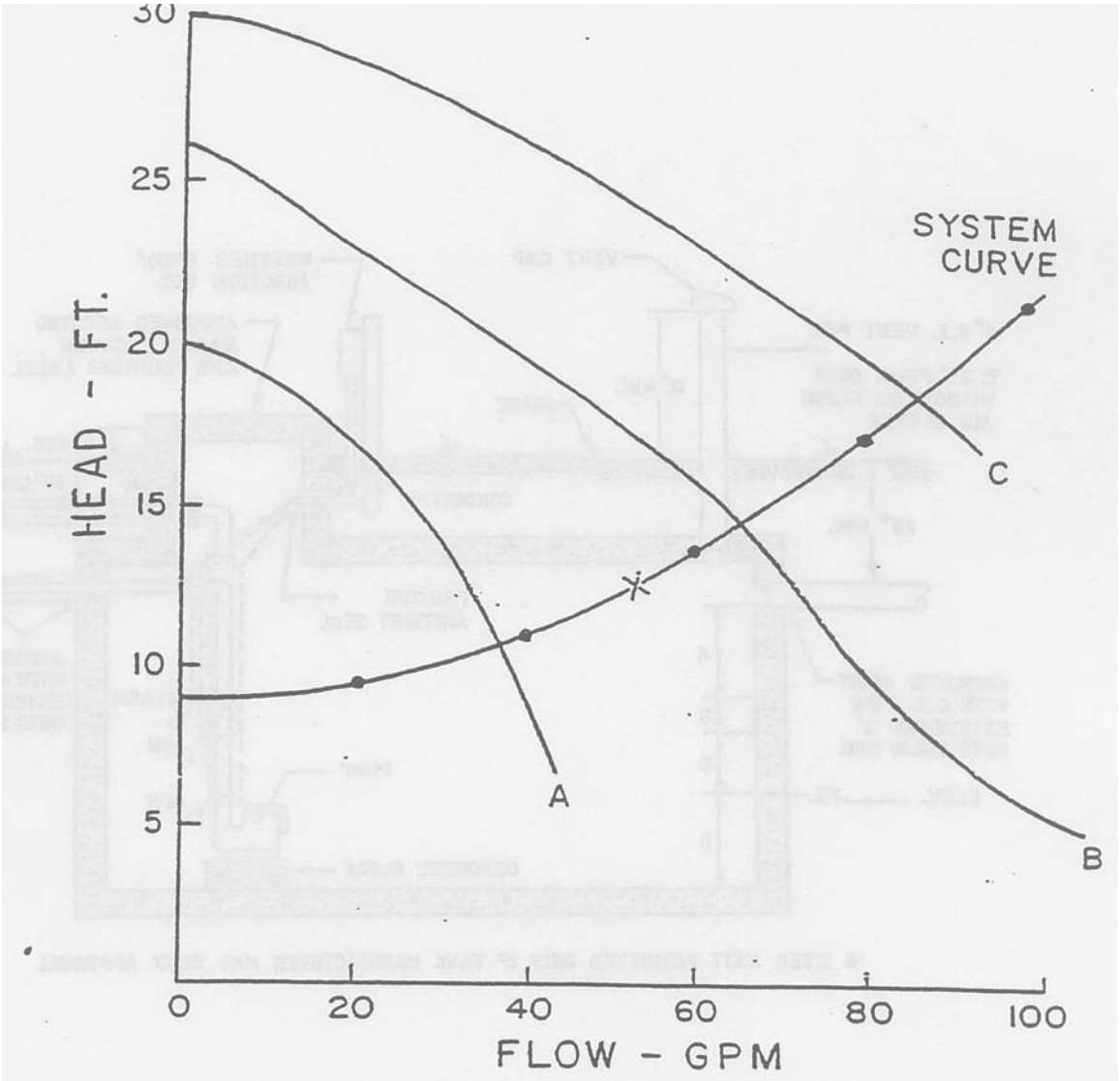

Fig. A-8. System Performance Curve and Several Pump Performance Curves for the Example Problem. For this example, the pump must provide a flow of at least 53 gpm (represented by X on the system performance curve. Pump A, represented by performance curve A, will not provide it. Pump C exceeds the requirement considerably and the curves intersect near the end of the pump curve. Pump B is the correct pump to select as it is just slightly above the desired point (X) and it is toward the middle of the pump curve.

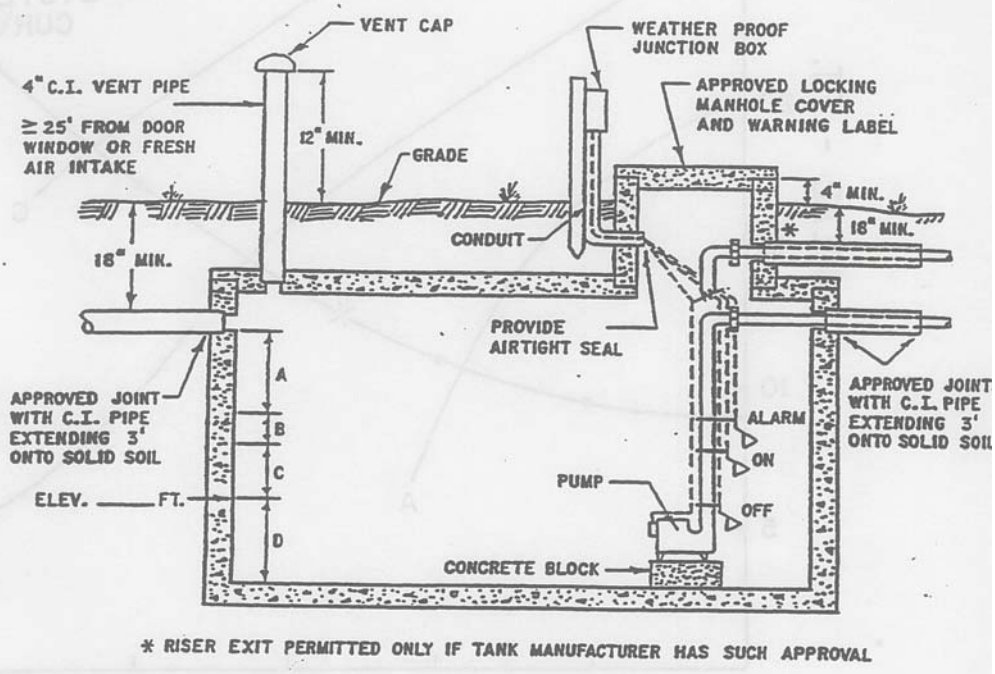

Fig. A-9. Cross Section of a Dose Chamber with a Pump and Control Unit as Required in Wisconsin (Wisc. Adm. Code, 1985)

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