TECHNICAL GUIDANCE MANUAL

FOR THE

MAINE SUBSURFACE WASTEWATER DISPOSAL RULES

Maine Department of Health and Human Services,
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TECHNICAL GUIDANCE MANUAL TO THE

MAINE SUBSURFACE WASTE WATER DISPOSAL RULES

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CHAPTER 1 - PURPOSE

GENERAL

This Technical Guidance Manual (Manual) is a supplement to the Maine State Plumbing Code, Subsurface Wastewater Disposal Rules, CMR 241 (Rules) for the purpose of providing interpretations of certain Sections of the Rules, providing suggested methods for preparing applications for onsite sewage disposal systems, and for implementing various aspects of the Rules including the design of systems and their components.

APPLICABILITY

This Manual is applicable only to those onsite sewage disposal systems which are regulated under provisions of the Maine State Plumbing Code, Subsurface Wastewater Disposal Rules. This Manual has no applicability to systems licensed pursuant to the Rules and Statutes administered by the Maine Department of Environmental Protection.

INTERPRETATION

The intent of this manual is to ensure public safety, health, and welfare insofar as they are affected by the installation and maintenance of onsite sewage disposal systems. This manual should be interpreted so as to assure the proper treatment and installation of onsite sewage disposal systems.

CHAPTER 2 – DEFINITIONS

GENERAL

Unless otherwise expressly stated, the following terms shall, for the purpose of this code, have the meanings set forth below.

Interchangeability: Words used in the present tense include the future tense; words in the masculine gender include the feminine and neuter; the singular number includes the plural, and the plural includes the singular.

Terms defined in other codes: Where terms are not defined in the following Sections and are defined in the local building code or 10-144A CMR 238 "State of Maine Internal Plumbing Rules," they shall have the meanings ascribed to them in those codes.

Terms not defined: Terms not defined in the following Sections shall have ascribed to them their ordinarily accepted meanings such as the context may imply.

GENERAL DEFINITIONS

Abutter: One that abuts; specifically, the owner of contiguous property. For purposes of this manual, "abutter" is further defined to include that property, which is separated by a right of way and/or within setback requirements between a subsurface waste water disposal field and a potable water supply; whichever was installed first.

Adjacent wetlands: See definition, "Wetland, great ponds and rivers."

Aerobic: A condition in which molecular oxygen is a part of the environment.

Alteration: Any change in the physical configuration of an existing system or any of its component parts. This includes the replacement, modification, installation, addition, or removal of system components, or increase in size, capacity, type, or number of one or more components. The term "alter" shall be construed accordingly.

Alternative toilet: A device, other than a water closet, designed to treat human waste only. Examples are: privies and compost, chemical, recirculating, incinerating, and vacuum toilets. This definition is not intended to include the use of any portable restrooms, viz. worksites, outdoor functions, etc.

Anaerobic: A condition in which molecular oxygen is absent from the environment.

Applicant: The person who signs and submits an application for permit to construct, install, or alter a system.

Application for disposal system permit: Abbreviation for subsurface waste water disposal system permit application, also known as HHE-200 form.

Aquifer recharge zone: Any porous surface area that allows precipitation to infiltrate into an aquifer.

Backfill: Soil material that is suitable for use in the construction of disposal fields.

Bedrock: A solid and continuous body of rock, with or without fractures, or a weathered or broken body of rock fragments overlying a solid body of rock.

Bedroom: Any room within a dwelling unit that serves primarily as sleeping quarters.

Black waste water: Waste water derived from plumbing fixtures or drains that receive excreta supplemented waste water.

Building drain: That part of the lowest horizontal piping of a drainage system that receives the discharge from soil, waste, and other drainage pipes inside the walls of a building and conveys it to the building sewer. Inside the building, it is considered to be the building drain until it undergoes a change of pitch more than that produced by a 45 degree wye. It extends to a point 8 feet outside the building wall.

Building sewer: That part of the plumbing system that extends from the end of the building drain and conveys its discharge to a public sewer, septic tank and disposal field, or other point of disposal.

Certificate of approval: A certificate signed by the plumbing inspector stating that a system has been installed in compliance with the disposal system permit application and this code.

Cesspool: A covered excavation that receives waste water or other organic wastes from a structure, and is designed to retain the organic matter and solids, but allows liquids to seep through the bottom and sidewalls.

Chroma: The relative purity or strength of color of soil; a quality that decreases with increasing grayness. Chroma is one of the three variables of color as defined in the Munsell system of color classification.

Clay: A particle size category consisting of mineral particles that are smaller than 0.002 millimeter in equivalent spherical diameter; also, a soil texture class having more than 40% clay, less than 45% sand, and less than 40% silt.

Clay loam: A soil texture class having 27 to 40% clay and 20 to 45% sand.

CMR: Abbreviation for Code of Maine Rules. For example, 10- 144A CMR 241.9 identifies Section 9 of Chapter 241 of the Rules of the Bureau of Health within the Department of Human Services, Maine Subsurface Wastewater Disposal Rules.

Coarse soil horizon: A soil horizon in which more than 50% of the volume is comprised of rock fragments: gravel, cobbles, stones, or boulders.

Coastal sand dune: Sand deposit within a marine beach system above high tide including, but not limited to: beach berm, frontal dune ridge, back dune area, and other sand areas deposited by wave or wind action.

Cobble: A rock fragment that is rounded or semi-rounded in shape and is between 3 and 10 inches in diameter.

Code: Code means the "Maine Subsurface Waste water Disposal Rules."

Construct: To build, install, fabricate, or put together on a site one or more components of a system.

Contour: An imaginary line of constant elevation on the ground surface. The corresponding line on a map is called a "contour line."

Curtain drain: A trench to intercept laterally moving ground water and divert it away from a disposal field.

Department: The Maine Department of Human Services.

Design flow: The waste water flow that may reasonably be expected to be discharged from a residential, commercial, or institutional facility on any day of operation, as determined in the Subsurface Wastewater Disposal Rules.

Disposal field: An individual subsurface waste water disposal system component, consisting of a closed excavation made within soil or fill material to contain disposal field stone, or approved proprietary devices, in which distribution pipes have been placed for the disposal of septic tank effluent.

Disposal field, peat: A disposal field in which the disposal field stone has been replaced with peat and is designed and installed in accordance with the Rules.

Disposal field, primitive: See definition, "Primitive disposal field."

Disposal field, separated laundry: See definition, "Separate laundry disposal field."

Disposal field stone: Gravel or crushed stone, that is clean, and free of dust, ashes or clay, and meeting the requirements prescribed in the Subsurface Wastewater Disposal Rules.

Disposal field infiltration area: The total disposal field infiltration area available to accept the septic tank effluent. The infiltration area includes the bottom and side wall below the invert of the distribution piping.

Disposal field infiltration area, effective: The standard stone filled disposal field infiltration area or the equivalent various "approved" proprietary disposal devices.

Disposal system: See definition, "Subsurface waste water disposal system."

Disposal system permit: Written authorization issued by the local plumbing inspector to construct a specific system. This authorization is attached to the application for disposal system permit.

Distribution box: A device that receives septic tank effluent and distributes such effluent in equal portions to two or more disposal fields or distribution pipes within a disposal field.

Distribution pipe: A perforated pipe or one of several perforated pipes used to carry and distribute septic tank effluent throughout the disposal field.

Distribution network: Two or more inter-connected distribution pipes.

Diversion box: A device that permits alternating use of two or more disposal fields or the diversion of septic tank effluent.

Diversion ditch: A ditch to intercept and divert surface water runoff.

Dosing tank: A water-tight receptacle located between the septic tank and disposal field and equipped with a pump or siphon, to store and deliver doses of septic tank effluent to the disposal field.

Drainage area: An area from which the surface runoff is carried away by a single watercourse.

Drainage ditch: A manmade ditch receiving and diverting surface runoff or subsurface water. This does not include diversion of a naturally occurring water body.

Drop box: A waste water distribution device where the elevation of the incoming distribution line is lower than that of the outgoing distribution line.

Drop manhole: A manhole installed in a sewer where the elevation of the incoming sewer is considerably above that of the outgoing sewer.

Dwelling unit: Any structure or portion of a structure, permanent or temporary in nature, used or proposed to be used as a residence seasonally or throughout the year.

Elevation reference point: An easily-identifiable point or object of constant elevation for establishing the relative elevation of observation holes and elevation of the components of the system.

Engineer: See Professional Engineer.

Equivalent spherical diameter: The equivalent spherical diameter of a particle is the diameter of a sphere that has a volume equal to the volume of the particle.

Expansion: The enlargement or change in use of a structure using an existing subsurface waste water disposal system that brings the total structure into classification that requires larger subsurface waste water disposal system components.

Expansion, one time exempted: A one time expansion of a structure where the requirement for meeting the first time system criteria is waived.

Expansion, nonexempted: Expansions of existing structures where the requirement for meeting first time system criteria must be met.

Fill material: Any soil, rock, or other material placed within an excavation or over the surface of the ground. The term "fill" is not equivalent in meaning to the term "back fill."

Finish grade: The surface of the ground after completion of final grading.

Flood plain, coastal and estuary: The land area within the V- Zone indicated by the Federal Insurance Rate Maps (FIRM) or below the 10-year storm surge elevation, whichever is more restrictive. The 10- year storm surge elevation in Maine is approximately the 8-foot National Geodetic Vertical Datum.

Flood plain, riverine: The land area within the 10-year flood zone indicated by Soil Conservation Service Soil Maps or other sources acceptable to the Department in the absence of Soil Conservation Service Maps. Note: Some municipalities restrict new development in the 100-year flood plain.

Gpd: Gallons per day.

Gravel: A rounded or semi-rounded rock fragment that is between 2 millimeters and 3 inches in diameter.

Gray waste water: That portion of the waste water generated within a residential, commercial, or institutional facility that does not include discharges from water closets and urinals.

Grease interceptor: A device in which the grease in waste water leaving a structure is intercepted, congealed by cooling, accumulated, and stored for pump-out and disposal.

Grease trap: A device designed to retain grease from a single plumbing fixture.

Great pond: Any inland body of water that, in a natural state, has a surface area in excess of ten acres and any inland body of water artificially formed or increased that has a surface area in excess of 30 acres.

Ground water: Water below the land surface in a zone of soil saturation.

Ground water aquifer: A rock or gravel formation that contains significant recoverable quantities of water that is likely to provide drinking water supplies.

Ground water table: The upper surface of a zone of saturation.

H-20 wheel load: A wheel loading configuration as defined by the American Association of State Highway Officials for a standardized 10-ton-per-axle truck.

Hazardous waste: Any chemical substance or material, whether gas, solid, or liquid, that is designated as hazardous by the U.S. Environmental Protection Agency pursuant to the United States Resource Recovery and Conservation Act, Public Law 94-580.

Holding tank: A closed, water-tight structure designed and used to receive and store waste water or septic tank effluent. A holding tank does not discharge waste water or septic tank effluent to surface or ground water or onto the surface of the ground. Holding tanks are designed and constructed to facilitate ultimate disposal of waste water at another site.

Horizon, limiting: Any soil horizon or combination of soil horizons, within the soil profile or any parent material below the soil profile, that limits the ability of the soil to provide treatment or disposal of septic tank effluent. Limiting horizons include bedrock, hydraulically restrictive soil horizons and parent material, excessively coarse soil horizons and parent material, and seasonal ground water table.

Horizon, soil: A layer within a soil profile differing from the soil above or below it in one or more soil morphological characteristics. The characteristics of the layer include the color, texture, rock-fragment content, structure, and consistence of each parent soil material.

Horizontal reference point: A stationary, easily identifiable point to which horizontal dimensions can be related.

Hue: The dominant spectral color, one of the three variables of soil color defined within the Munsell system of color classification.

Hydric soil: A soil that in its undrained condition is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation.

Hydrology: The science dealing with the properties, distribution, and circulation of water.

Industrial waste water: For purposes of these rules industrial waste water is any liquid waste not normally considered to be domestic waste water, and normally associated with industry or business, large or small.

Install: To assemble, put in place, or connect components of a system in a manner that permits their use by the occupants of the structure served.

Invert: The floor, bottom, or lowest portion of the internal cross section of a closed conduit, used with reference to pipes or fittings conveying waste water or septic tank effluent.

Lacustrine deposits: Deposits laid down in lake bodies. Lacustrine deposits are usually slightly coarser than marine sediments and may exhibit lenses of fine sand and sandy loam material in lower portions of the soil profile.

Lined disposal field: A filtration layer of backfill placed directly beneath and adjacent to a disposal field.

Local Plumbing Inspector: L.P.I. See definition, "Plumbing inspector."

Malfunctioning system: A system that is not operating or is not functioning properly. Indications of a malfunctioning system include, but are not limited to, any of the following: ponding or outbreak of waste water or septic tank effluent onto the surface of the ground; seepage of waste water or septic tank effluent into parts of buildings below ground; back-up of waste water into the building served that is not caused by a physical blockage of the internal plumbing; or contamination of nearby water wells or surface water bodies.

Marine deposits: Fine sediments deposited on the ocean floor. These deposits are usually silt loam, silty clay loam, or silty clay. These deposits usually become firm and dense with increasing soil depth.

Matrix color: The predominant color of the soil in a particular horizon.

Mineral soil: Any soil consisting primarily of sand, silt, and clay, rather than organic matter. In general, the organic carbon content is less than 20% by weight.

Mottles, drainage: Soil color patterns caused by alternating saturated and unsaturated soil conditions. When saturation occurs while soil temperatures are above biological zero (41°F), iron and manganese will become reduced and exhibit subdued shades such as grays, greens, or blues. When unsaturated conditions occur, oxygen combines with iron and manganese to develop brighter soil colors such as yellow and reddish brown. Soils that experience seasonally fluctuating water tables usually exhibit alternating streaks, spots, or blotches of bright oxidized colors with reduced dull, or subdued, colors. The longer a soil is saturated and in an anaerobic condition, the greater is the percentage of color that will be subdued. Soils that are never or rarely exposed to free oxygen are considered totally reduced or gleyed.

Mottling: A color pattern observed in soil consisting of blotches or spots of contrasting color. The term "mottle" refers to an individual blotch or spot.

Munsell system: A system of classifying soil color consisting of an alpha-numeric designation for hue, value, and chroma, such as "7.5YR 6/2," together with a descriptive color name, such as "strong brown."

No practical alternative: Due to site conditions, lot configuration, or other constraints, the replacement, repair or alteration of an existing system, in full compliance with this code, is not achievable without the employment of extraordinary measures or cost.

Normal high water line - riverine, stream, lake, and pond: That line on the shore or bank that is apparent from visible markings, changes in the character of soil, rock, or vegetation resulting from submersion or the prolonged erosion action of the water.

Normal high water line - coastal, estuary, and tidal: The shoreline at the spring tide elevation, during the maximum spring tide level as identified in tide tables published by the National Ocean Service.

Nuisance: Any source of filth, odor, or probable cause of sickness.

Observation hole: A subsurface exploration hole dug by hand, back-hoe, or auger, or a soil core taken intact and undisturbed using a probe.

Other components: Devices, other than pipe, that receive waste water including lift stations, distribution boxes, sealed vault privies, underdrain pre-filters, grease interceptors, and drop boxes.

Parent material: The unconsolidated and more or less unweathered mineral or organic matter from which the soil profile is developed.

Perched seasonal ground water table: A seasonal ground water table that occurs immediately above a hydraulically restrictive soil horizon.

Permeability: The rate at which water moves through a unit of soil or rock material under a hydraulic gradient of one.

Person: An individual or his heirs, executor, administrator, assign, or agents; a firm, corporation, association, organization, municipal or quasi-municipal corporation, or government agency. Singular includes plural and male includes female.

Pit privy: An alternative toilet placed over an excavation where human waste is deposited.

Plumbing inspector: For the purposes of this code, a local plumbing inspector as defined in Title 30-A M.R.S.A. §4221 and Title 30-A M.R.S.A. §4451.

Potable water: Water that does not contain objectionable pollution, contamination, minerals, or infective agents, is satisfactory for human consumption, and is used for human consumption.

Pre-existing natural ground surface: The former level of the ground surface in an area of disturbed ground.

Primitive disposal field: A minimal disposal field designed specifically to treat gray waste water originating from a non-pressurized water supply.

Primitive system: See definition, "System, primitive."

Professional engineer: A person licensed to practice professional engineering in Maine, pursuant to Title 32 Chapter 19.

Proprietary disposal device: A device utilized in disposal fields as an alternative to a disposal field with a bedding of stone and one or more distribution pipes.

Public sewer: Municipal or quasi-municipal sewerage system.

Realty improvement: Any new residential, commercial, or industrial structure, or other premises, including but not limited to condominiums, garden apartments, town houses, mobile homes, stores, office buildings, restaurants, and hotels, not served by an approved public sewer, the useful occupancy of which will require the installation or construction of systems. Each dwelling unit in a proposed multiple-family dwelling unit or each commercial unit in a commercial structure shall be construed to be a separate realty improvement.

Repair: Minor repairs or replacements as required for the operation of pumps, siphons, or accessory equipment, for the clearance of a stoppage, or to seal a leak in the septic tank, holding tank, pump tank, or building sewer.

Replacement system: See definition, "System, replacement."

Restricted chemical material: Any chemical material that contains concentrations in excess of one part per hundred, by weight, of any halogenated hydrocarbon chemical, aliphatic or aromatic, including but not limited to trichloroethane, trichloroethylene, methylene chloride, tetrachoroethylene, halogenated benzenes and carbon tetrachloride; any aromatic hydrocarbon chemical, including but not limited to benzene, toluene and naphthalene; any phenol derivative in which a hydroxy group and two or more halogen atoms are bonded directly to a six-carbon aromatic ring, including but not limited to trichlorophenol or pentachloro-phenol; or acrolein, acrylonitrile or benzidine. Restrictive chemical material does not, however, include any chemical material that is biodegradable and is not considered by the Department of Environmental Protection to be a significant source of contamination of the ground waters of the State.

River: A free flowing body of water from that point at which it provides drainage for a watershed of 25 square miles to its mouth.

Rock fragment: A fragment of rock, contained within the soil, that is greater than 2 millimeters in equivalent spherical diameter or that is retained on a 2 millimeter sieve.

Sand: A particle size category consisting of mineral particles that are between 0.05 and 2 millimeters in equivalent spherical diameter. Also a soil textural class having 85% or more sand along with a maximum of 15% silt and clay. The percentage of silt may not be more than 1.5 times the percentage of clay.

Saturated: A condition in which all easily drained voids between the soil particles are temporarily or permanently filled with water.

Scum: A mass of waste water solids floating on the surface of the waste water and buoyed up by entrained gas, grease, or other substances. The term "scum layer" shall be construed accordingly.

Seasonal conversion permit: Written authorization issued by the plumbing inspector to allow the conversion of a seasonal dwelling unit located in a shoreland zone to year-round use.

Seasonal dwelling unit: A dwelling which existed on December 31, 1981, and which was not used as a principal or year-round residence during the period from 1977 to 1981. Evidence of use as a principal or year-round residence includes, but is not limited to: the listing of that dwelling as an occupant's legal residence for the purpose of voting, filing a state tax return, or automobile registration; or the occupancy of that dwelling for a period exceeding 7 months in any calendar year.

Seasonal ground water table: The upper limit of seasonal ground water. This zone may be determined by identification of soil drainage mottling, the MAPSS (Maine Association of Professional Soil Scientists) drainage key, or by monitoring.

Separate laundry disposal field: A separate disposal field sized to handle the laundry waste water from single-family dwelling units.

Septage: All sludge, scum, liquid, or any other material removed from a septic tank or disposal field.

Septic tank: A water-tight receptacle that receives the discharge of untreated waste water. It is designed and installed so as to permit settling of settleable solids from the liquid, retention of the scum, partial digestion of the organic matter, and discharge of the liquid portion into a disposal field.

Septic tank effluent: Primary treated waste water discharged through the outlet of a septic tank and/or an approved sand, peat, or similar filter.

Septic tank filter: A device designed to keep solids and grease in the septic tank.

Serial distribution: A method of distributing septic tank effluent between or within a series of disposal fields so that each successive disposal field receives septic tank effluent only after the preceding disposal fields have become full to the bottom of the invert.

Setback distance: The shortest horizontal distance between a component of a system and certain site features or structures.

Shall: A verb denoting mandatory action under all circumstances (notwithstanding state and local waivers).

Should: A verb denoting recommended action under certain circumstances.

Shoreland zone area: All land area within 250 feet, horizontal distance, of the normal high-water line of any great pond, river or salt water body; or within 250 feet, horizontal distance, of the upland edge of a freshwater or coastal wetland; excluding any forested wetland; or within 75 feet, horizontal distance, of the normal high-water line of a stream.

Silt: A particle size category consisting of mineral particles that are between 0.002 and 0.05 millimeters in equivalent spherical diameter. It also means a soil textural class having 80% or more of silt and 12% or less of clay.

Silt loam: A soil textural class having 50% or more of silt and 12 to 27% clay; or 50 to 80% of silt and less than 12% clay.

Single-family dwelling unit: A structure or realty improvement intended for single-family use.

Site evaluation: The practice of investigating, evaluating, and reporting the basic soil and site conditions that apply to waste water treatment and disposal along with a system design in compliance with the Subsurface Wastewater Disposal Rules.

Site evaluator: A person licensed to practice Site Evaluation under Title 22 M.R.S.A. §42 subsection 3A.

Sludge: A relatively dense accumulation of waste water solids that settle to the bottom of a septic tank. These solids are relatively resistant to biological decomposition and collect in the septic tank over a period of time. The term "sludge layer" shall be construed accordingly.

Soil: The outermost surface layer of the earth. It is made up of individual soil bodies, each with its own individual characteristics. In places, soil has been modified or even made by people. It contains living matter and is capable of supporting plants out-of- doors.

Soil aggregate: A naturally occurring unit of soil structure consisting of particles of sand, silt and clay, organic matter, and rock fragments held together by the natural cohesion of the soil.

Soil color: The soil color and Munsell color designation determined by comparison of the moist soil with color chips contained in a Munsell soil color book.

Soil consistence: The resistance, in place, of a soil horizon to a pocket penetrometer.

Soil horizon: See definition, "Horizon, soil."

Soil material: Soil as well as any naturally occurring unconsolidated mineral deposit that is not bedrock.

Soil profile: A vertical cross section of the undisturbed soil showing the characteristic soil horizontal layers or soil horizons that have formed as a result of the combined effects of parent material, topography, climate, biological activity, and time.

Soil saturation: The state when all the pores in the soil are filled with water. Water will flow from saturated soils into a observation hole.

Soil structural class: One of the shape classes of soil structure described in Chapter 9 of this manual.

Soil structure: The naturally occurring arrangement, within a soil horizon, of sand, silt and clay particles, rock fragments, and organic matter that are held together in clusters or soil aggregates.

Soil texture: The relative proportions of sand, silt, and clay.

Stone: A rock fragment that is rounded or semi-rounded in shape and greater than 10 inches in diameter.

Stratified drift deposits: Deposits laid down by glacial meltwater streams from the last glacier. All stratified drift deposits exhibit some degree of alternating layers of different but well- sorted particles.

Stream: A free-flowing body of water from the outlet of a great pond or the confluence of two perennial streams (as depicted on the most recent edition of a United States Geological Survey 7.5 minute topographical map or, if not available, a 15 minute topographic map) to the point where the body of water becomes a river.

Subsurface waste water disposal system: Any system designed to dispose of waste or waste water on or beneath the surface of the earth; includes, but is not limited to: septic tanks; disposal fields; grandfathered cesspools; holding tanks; pre-treatment filter, piping, or any other fixture, mechanism, or apparatus used for those purposes; does not include: any discharge system licensed under Title 38 M.R.S.A. §414; any surface waste water disposal system; or any municipal or quasi-municipal sewer or waste water treatment system.

System: See definition, "Subsurface waste water disposal system."

System cleaner: Any solid or liquid material intended or used primarily for the purpose of cleaning, treating, degreasing, unclogging, disinfecting, or deodorizing any part of a system. These do not include those liquid or solid products intended or used primarily for manual cleaning, scouring, treating, deodorizing, or disinfecting the surfaces of common plumbing fixtures.

System, engineered: Any subsurface waste water disposal system designed, installed, and operated as a single unit to treat and dispose of 2,000 gallons of waste water per day or more; or any system designed to be capable of treating waste water with significantly higher BOD_5 and total suspended solid concentrations than domestic waste water in the Rules.

System, first time: The first system designed to serve a specific structure; a new system.

System, multi-user: For the purposes of this code, multi-user disposal systems serve or are designed to serve three or more structures under different ownerships.

System, non-conforming: A system that does not conform to the location, design, construction, or installation requirements in the Subsurface Wastewater Disposal Rules.

System, non-engineered: Any system designed, installed, and operated as a single unit to treat and dispose of less than 2,000 gallons of waste water per day.

System, primitive: A system consisting of a primitive disposal field and an alternative toilet.

System, replacement: A system designed to replace an existing system, an overboard discharge, or any ground surface discharge, without any increase in water usage, except as allowed in the Rules.

Temporary Portable Toilet: A prefabricated toilet designed for temporary use, typically at social functions, worksites, outdoor gathering, etc. No plumbing permit nor site evaluation is required.

Till: Deposits of glacial material laid down in place. These deposits are neither sorted nor stratified and consist of a heterogeneous mixture of silt, sand, gravel, cobbles, and stones.

Till, ablation: Till deposited by the settling of soil and rock fragments from the melting glacial ice. It is loose, sandy, and easy to excavate.

Till, basal: Till laid down at the bottom of the glacier. It is fine-grained, compact, and difficult to excavate.

Unit: See dwelling unit.

Unorganized area: An area subject to the jurisdiction of the Maine Land Use Regulation Commission under Title 12, Chapter 206-A.

Variance: Written authorization that permits some act or condition not otherwise permitted by this code.

Value: The relative lightness or intensity of a color, one of the three variables of soil color defined within the Munsell system of classification.

Vault privy: An alternative toilet that retains human waste in a sealed vault.

Waste water: Any liquid waste containing animal or vegetable matter in suspension or solution, or the water-carried wastes from the discharge of water closets, laundry tubs, washing machines, sinks, dishwashers, or other source of water-carried wastes of human origin. This term specifically excludes industrial, hazardous, or toxic wastes and materials.

Waste water discharge license: A waste water discharge license issued by the Maine Department of Environmental Protection under Title 38 M.R.S.A. §414.

Waste water ejector: A device to elevate and/or pump untreated waste water to a public sewer, septic tank, or other means of disposal.

Water body: See definition, "Water course, major and minor."

Water course: A channel created by the action of surface water and characterized by the lack of upland vegetation or the presence of aquatic vegetation and by the presence of a bed devoid of top soil containing waterborne deposits on exposed soil, parent material or bedrock.

Water body/course, major: Any waterbody or water course depicted on a United States Geological Survey (USGS) 7.5 minute map, or a 15 minute map if a 7.5 minute map is not compiled.

Water body/course, minor: Any water body or water course that is not a major water course. This does not include man-made ditches, except where a ditch is dug as a diversion to a natural water course.

Water well: A bored, drilled, or driven shaft or a dug hole, that extends below the seasonal ground water table and is used as the primary drinking water supply. If there is more than one well on a property, it is presumed that one well supplies the structure(s) associated with the property with drinking water and that all other wells have either been abandoned or are spite wells.

Wetland: Area that has a predominance of hydric soils and that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions.

Wetland, coastal: All tidal and sub-tidal lands; all lands below any identifiable debris line left by tidal action; all lands with vegetation present that is tolerant of salt water and occurs primarily in a salt water or estuarine habitat; and any swamp, marsh, bog, beach, or contiguous lowland subject to tidal action during the maximum spring tide level as identified in tide tables published by the National Ocean Service. Coastal wetlands may include portions of coastal dunes.

Wetland, freshwater: Freshwater swamp, marsh, bog, or similar area that is of 10 or more contiguous acres or of less than 10 acres and adjacent to a surface water body (excluding any river, stream, or brook) such that in a natural state, the combined surface area is greater than 10 acres and is not considered part of a great pond, coastal wetland, river, or stream. Such an area is inundated or saturated by surface or ground water at a frequency and for a duration sufficient to support, and normally does support, predominantly wetland vegetation. A freshwater wetland may contain inclusions of land that do not conform to the requirements of this definition.

Wetland, great ponds and rivers: Wetland contiguous with, or adjacent to, a great pond or river and, during normal spring high water, surficially connected to the great pond or river. A wetland associated with a great pond or river is considered to be part of that great pond or river.

Work started: If the permit includes the installation of a disposal field, work has commenced when stone or chambers have been placed as specified on the HHE-200 form. If the permit is for the installation of treatment tank only, work has commenced when the tank is placed and/or connected.

Zone of saturation: A soil horizon within or below the soil profile that is saturated with water during the growing season for a sufficient duration to develop redoxamorphic features.

CHAPTER 3- SOIL PROFILE TERMINOLOGY

GENERAL

This Chapter explains the terminology and methodology used to describe soil conditions and profiles.

This Chapter is designed to provide acceptable methods for evaluating and reporting site/soil conditions. If other methods are used the site evaluator should be able to demonstrate the methods used are equivalent to this Chapter.

DRAINAGE MOTTLING

This Section provides a standard procedure to report mottling observed during a site evaluation.

General: Mottling is a color pattern observed in soil consisting of blotches or spots of contrasting color. The term "mottle" refers to an individual blotch or spot. Mottles can result from soil mixing by man or natural causes, such as tree throws or animal, and because of periodic soil saturation where the soil temperature is above 41°F. Mottles that develop due to periodic soil saturation are called "drainage mottles" and are used as an indication of seasonal or periodic and recurring ground water table.

Reporting drainage mottling: When drainage mottling is observed, the site evaluator should report the abundance and contrast of the mottles using the terminology in Subsection "Abundance," and Subsection "Contrast."

Abundance: Abundance may be estimated visually. Abundance of mottles should be classified as follows:

> **Few:** Abundance is "few" where the mottled color occupies less than 2% of the exposed soil surface;
>
> **Common:** Abundance is "common" where the mottled color occupies from 2 to 20% of the exposed soil surface; or
>
> **Many:** Abundance is "many" where the mottled color occupies more than 20% of the exposed surface.

Contrast: Mottle contrast means the difference in color between the soil mottle and the background color of the soil. It is described as follows:

> **Faint:** Mottles are "faint" when they may be distinguished only on close examination;
>
> **Distinct:** Mottles are "distinct" when they are readily seen but not prominent; or
>
> **Prominent:** Mottles are "prominent" when they are obvious and one of the outstanding features of the soil horizon.

Redoximorphic features (Drainage mottles): Redoximorphic features associated with wetness result from the reduction and oxidation of iron and manganese compounds in soil after saturation with water and desaturation, respectively. The reduced iron and manganese ions are mobile and may be transported by water as it moves through the soil. Certain redox patterns occur as a function of the patterns in which the ion-carrying water moves through the soil, and of the location of aerated zones in the soil. Redox patterns are also effected by the fact that manganese is reduced more rapidly than iron, while iron oxides more rapidly upon aeration. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in the soil. Wherever the iron and manganese is oxidized and precipitated, it forms either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redox process in a soil may result in redoximorphic features that are defined as follows:

Redox concentrations: These are zones of apparent accumulation of Fe-Mn oxides, including:

> **(1)** Nodules and concretions, i.e., firm, irregularly shaped bodies with diffuse boundaries if formed *in situ* or with sharp boundaries in weathered soil horizons;
>
> **(2)** Masses, i.e., soft bodies of variable shapes within the matrix; and
>
> **(3)** Pore linings, i.e., zones of accumulation along pores which may be either coatings on the pore surfaces or impregnations from the matrix adjacent to the pores.

Redox depletions: These are zones of low chroma (2 or less) where either Fe-Mn oxides alone or both Fe-Mn oxides and clay have been stripped out, including:

(1) Iron depletions, i.e., zones which contain low amounts of Fe and Mn oxides but have a clay content similar to that of the adjacent soil matrix.

(2) Clay depletions, i.e., zones which contain low amounts of Fe, Mn and clay.

Reduced matrix: This is a soil matrix that has a low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

SOIL TEXTURE

This Section provides a standard procedure to report soil texture.

General: The relative amounts of the sizes of mineral particles in a soil are referred to as soil texture. All soils are comprised of sand, silt and clay. The soil texture classification prescribed in this Section is based upon the U.S. Department of Agriculture twelve soil textural classes. However, for the purpose of this code, a site evaluator can adequately describe soil texture based upon the eight general soil textural classes described in this Section.

Ribbon test: A ribbon test is one tool used in quantifying the percentage of silt and clay particles present in a soil sample. The ability to form a ribbon and the type of ribbon formed assist the identification of soil textural class. An acceptable ribbon test is as follows:

Moisten and hand knead: Moisten a marble-size portion of the soil and hand knead it until it is the consistency of putty.

Push into ribbon: Then squeeze the ball of soil between thumb and forefinger, pressing the thumb forward over the forefinger to push the soil into a ribbon.

Reporting texture: The site evaluator should report the soil texture using the terminology in Subsections "Sand" through "Silty clay."

Sand: The texture is "sand" where the soil is loose, single grains. The individual grains can be readily seen and felt.

Dry: Squeezed in the hand when dry, it will fall apart when the pressure is released and does not have enough fines to stain the lines in the palm of the hand.

Moist: Squeezed when moist, it will form a cast or lump that will crumble when lightly touched. Sand does not form a ribbon between the thumb and forefinger.

Loamy sand: The texture is "loamy sand" where the soil is loose, single grains. The individual grains can be readily seen and felt and has enough fines to stain the lines in the palm of the hand.

Dry: Squeezed in the hand when dry, it will fall apart when the pressure is released but has enough fines to stain the lines in the palm of the hand.

Moist: Squeezed when moist, it will form a cast that will crumble when touched and bears very careful handling. Loamy sand does not form a ribbon between the thumb and forefinger but has enough fines to stain the lines in the palm of the hand.

Sandy loam: The texture is "sandy loam" where the soil contains much sand, but has enough silt and clay to make it somewhat sticky. Individual sand grains can be readily seen and felt.

Dry: Dry soil aggregates are easily crushed. Squeezed when dry, it will form a cast that will fall apart. Sandy loam has a very faint velvety feeling initially, but as rubbing is continued, the gritty feeling of sand dominates.

Moist: If squeezed when moist, a cast can be formed that will bear careful handing without falling apart. This soil does not form a ribbon between the thumb and forefinger.

Loam: The texture is "loam" where the soil has a relatively even mixture of sand, silt, and clay. A loam feels somewhat gritty, yet fairly smooth and highly plastic.

Dry: Dry soil aggregates are crushed under moderate pressure; clods or lumps can be quite firm. When pulverized, loam has a velvety feel that becomes gritty with continued rubbing.

Moist: Squeezed when moist, it will form a cast that can be handled quite freely without breaking. Loam has a very slight tendency to ribbon between the thumb and forefinger. The ribbon surface is rough.

Silt loam: The texture is "silt loam" where the soil is medium-textured soil.

Dry: Dry soil aggregates are firm but may be crushed under moderate pressure. Clods are firm to hard. Silt loam may appear cloddy, but the clods are readily broken. It will form casts that can be handled freely without breaking. When pulverized, a smooth, flour-like feel dominates.

Moist: Squeezed when moist, it will form casts that can be handled freely without breaking. Silt loam has a slight tendency to ribbon between the thumb and forefinger. The ribbon has a broken effect or rippled appearance.

Silt: The texture is "silt" where the soil is medium textured and feels floury when dry and nonsticky when moist.

Silty clay loam: The texture is "silty clay loam" when the soil is a fine-textured soil.

Dry: Dry soil aggregates are very firm. Silty clay loam usually breaks into clods or lumps that are hard when dry.

Moist: Squeezed when moist, it will form a thin ribbon that will break readily, barely sustaining its own weight. The moist soil is plastic and will form a cast that will stand considerable handling. When hand kneaded it does not crumble readily, but tends to become a heavy, compact mass. It is sticky when moist.

Silty clay: The texture is "silty clay" where the soil is fine-textured.

Dry: Silty clay usually forms very hard clods or lumps when dry.

Moist: Squeezed when moist, it will form a long flexible ribbon. A silty clay soil leaves a "slick" surface when rubbed with a long stroke and firm pressure. Silty clay tends to hold the thumb and forefingers together, due to its stickiness. When placed between the teeth silty clay has a smooth slick feeling.

Wet: Silty clay is quite plastic and can be very sticky when wet.

ROCK FRAGMENTS

This Section provides a standard procedure to modify the soil texture description based upon the size and abundance of rock fragments in the soil profile and on the surface of the site.

General: Where the soil profile contains 15 to 35% (by volume) of rock fragments, the soil texture description should be modified using the appropriate adjectives prescribed in Subsection "Rock fragment size," and Subsection "Abundance of rock fragments."

Rock fragment size: The rock-fragment-size terms for modifying the soil texture description are as follows:

Gravelly: The adjective "gravelly" is used where the rock fragments range from 0.1 to 3 inches in diameter (i.e., gravelly sandy loam, gravelly loam, etc.).

Cobbly: The adjective "cobbly" is used where the rock fragments range from 3 to 10 inches in diameter (i.e., cobbly sandy loam, cobbly loam, etc.).

Stony: The adjective "stony" is used where the rock fragments are greater than 10 inches in diameter (i.e., stony sandy loam, stony loam, etc.).

Abundance of rock fragments: Abundance should be estimated visually, by using the volume percentage charts in Table 10-1. Abundance of rocks should be classified as follows:

Very: Where the soil profile contains 36 to 60% by volume of rock fragments, the word "very" is used along with the appropriate rock fragment size term. Both are then used with the textural name (i.e., very gravelly sandy loam, very cobbly sandy loam, very stony sandy loam, etc.).

Extremely: Where the soil profile contains 61 to 90% by volume of rock fragments, the word "extremely" is used along with the appropriate rock fragment size term. Both are then used with the textural name (i.e., extremely gravelly sandy loam, extremely cobbly sandy loam, extremely stony sandy loam, etc.).

Excessive surface stones: Where the surface of the site contains more than 50% by area of large stones (and when these stones are not going to be removed), the site should be considered excessively coarse. Under such conditions the disposal field should be above the stones.

SOIL CONSISTENCE

This Section provides a standard procedure to report soil consistence during site evaluations.

Soil consistence: For the purposes of this code, consistence is described as "consistence in place." It is not unusual for a soil to be described as "firm in place" but to be friable when crushed between the thumb and forefinger. The soil that is firm in place will restrict the downward movement of septic tank effluent, even though it may be friable when removed. It is important to note that dry soils may exhibit greater resistance to a pocket penetrometer than when moist. If possible, soil consistence should be measured in a moist state.

Reporting consistence: The site evaluator should report the soil consistence using the terminology in Subsections "Loose," through "Cemented."

Loose: The consistence is "loose" where a soil horizon has a single grain structure and offers resistance to a pocket penetrometer of less than 0.25 tons/square foot. Soil does not stick to itself when pressed together.

Friable: The consistence is "friable" where a soil horizon has a granular or crumb structure but may include weak blocky or weak platy structure. Resistance to a pocket penetrometer is 0.25 to 0.75 tons/square foot. Soil sticks to itself when pressed together.

Firm: The consistence is "firm" where a soil horizon has a platy, prismatic, or massive structure. Resistance to a pocket penetrometer is 0.75 to 1.5 tons/square foot.

Very firm: The consistence is "very firm" where a soil horizon has a platy, prismatic, or massive structure. Resistance to a pocket penetrometer is greater than 1.50 tons/square foot.

Cemented: The consistence is "cemented" where a soil horizon has a hardness caused by some cementing substance other than clay minerals. Among these substances are carbonate, silica, oxide, salts, or iron and aluminum. Cementation is usually altered very little by wetting.

SOIL STRUCTURE

This Section provides a standard procedure to report soil structure. Soil structure refers to the shape of the natural soil aggregates. The structure of the soil has a major impact on the ability of the site to handle waste water. Soil structures are listed here in order of their relative permeability.

Reporting structure: The site evaluator should report the soil structure using the terminology in Subsections "Single grain," through "Massive."

Single grain: The structure is "single grain" where the soil consists of loose individual sand grains that will not bind together into recognizable soil aggregates.

Spherical: The structure is "spherical" where the soil aggregates have more or less equal dimensions and lack sharp corners, sharp edges, or well defined faces. This term includes crumb and granular structure as defined by the U.S. Department of Agriculture.

Subangular blocky: The structure is "subangular blocky" where soil aggregates have more or less equal dimensions and possess well defined flat or somewhat curved faces, but lack sharp corners and sharp edges.

Blocky: The structure is "blocky" where soil aggregates have more or less equal dimensions and have well defined flat or somewhat curved faces, sharp corners and sharp edges.

Prismatic: The structure is "prismatic" where soil aggregates have one axis distinctly longer than the other two and are oriented with the long axis in an upright vertical position.

Platy: The structure is "platy" where soil aggregates have one axis distinctly shorter than other two and are oriented with the short axis in an upright vertical position.

Massive: The structure is "massive" where the soil consists of a dense, compact mass and shows no recognizable natural soil aggregates or structural faces.

BEDROCK

This Section provides a standard procedure to report the presence of bedrock. Bedrock affects the ability of a system to treat septic tank effluent. It thus plays a significant role in the performance of a system.

Reporting bedrock: The site evaluator should report any bedrock which includes, but is not limited to, any solid and continuous body of rock, with or without fractures.

EXCESSIVELY COARSE SOIL HORIZONS IN SHORELAND ZONES

This Section provides a standard procedure to report excessively coarse soil horizons within shoreland zone areas. Excessively coarse soil horizons provide less opportunity for the treatment of septic tank effluent. Thus these soil horizons play a significant role in the performance of a system.

Reporting excessively coarse soil horizons: The site evaluator should report the presence of excessively coarse soil horizons when any of the following conditions are found:

Greater than 50% rock fragments: Soil horizons with a rock fragment greater than 3 inches diameter, content greater than 50% by volume;

Coarse to very coarse sands: Sandy textured soil horizons that are composed primarily of coarse to very coarse sand, from 0.5 to 2 millimeters in diameter with less than 2% clay or silt as defined by the U.S. Department of Agriculture.

HYDRAULICALLY RESTRICTIVE SOIL HORIZONS

This Section provides a standard procedure to report hydraulically restrictive soil horizons. Hydraulically restrictive soil horizons slow down the vertical movement of septic tank effluent. In this way, these soil horizons play a significant role in the performance of a system.

Reporting hydraulically restrictive soil horizons: A site evaluator should report the presence of a hydraulically restrictive soil horizon if any of the following conditions exist:

Silty clay loam: A soil horizon having a silty clay loam or finer texture;

Massive or platy silt loam: A soil horizon having a silt loam texture together with a massive or platy structure;

Firm or very firm silt loam: A soil horizon having a silt loam texture together with a firm or very firm consistence;

Cemented horizons: A cemented soil horizon that remains hard when soaked in water;

Basal tills: A basal till laid down at the bottom of the glacier; or

Firm platy sandy loam to loamy sand: Sandy loam to loamy sands with platy structures that are firm to very firm.

SEASONAL GROUND WATER TABLE

This Section provides a standard procedure to recognize seasonal ground water tables.

General: The two most widely recognized features that reflect prolonged wetness in soils when soil temperatures are above biologic zero are gleying and mottling. Simply described, gleyed soils are predominantly neutral gray in color and occasionally greenish or bluish gray.

Continuously saturated soils: In gleyed soils, the distinctive colors result from a process known as gleization. Prolonged saturation of mineral soil converts iron from its oxidized form to its reduced state. Soils that are always saturated are uniformly gleyed throughout the saturated zone. These soils often show evidence of oxidizing conditions only along root channels.

Alternately saturated and aerated: Soils that are alternately saturated and aerated during the year are usually mottled in the part of the soil that is seasonally wet. Mottles are spots or blotches of different colors or shades of colors interspersed with the dominant matrix color. The abundance, size, and color of the mottles usually reflect the duration of the saturation period. Mineral soils that are predominantly grayish with brown or yellow mottles are usually saturated for long periods. Soils that are predominantly brown or yellow with gray mottles are saturated for shorter periods. Mineral soils that are never saturated are usually bright colored and are not usually mottled.

Recognition criteria: The upper limit of the seasonal ground water table should be determined by one of the following means:

> **Common mottling:** The highest level at which common drainage mottling is observed; or
>
> **MAPSS:** The Maine Association of Professional Soil Scientists (MAPSS) Drainage Key. See Table 10-1.
>
> **Seasonal ground water monitoring:** Seasonal ground water monitoring complying with Section "Seasonal ground water table verification for disposal systems," and Section "Seasonal ground water limiting factor."

Problem soils: Soils at high elevations or along the coast, glacial tills on long slopes, soils that have been plowed or disturbed or sandy soils may not exhibit drainage mottles at depths consistent with the seasonal high water table. For these soils, other indicators of seasonal wetness shall often be used, such as thickness of the surface organic horizon (thicker horizons usually mean wetter soils), matrix of color of soil horizons (darker and deeper surface mineral soil horizons also usually indicate wetter soils), variable shades of color in the "B" horizon, dusky colored "B" horizons, and organic streaking in the "B" horizon. Some of the problems soils are:

Cool climate soils: Soils along the coast or at high elevations are much cooler than soils inland or at lower elevations. Therefore, the biological activity within the soil is reduced, limiting the amount of time that mottles can form.

Glacial tills on long slopes: These soils may be saturated but, because the groundwater is moving within them and is not stagnant, reducing conditions may not be present. In such instances, drainage mottles will not form, because microorganisms can get oxygen from the water. Free air is still lacking, however, resulting in reduced microbial activity.

Soils that have been plowed or disturbed: Soils that have been plowed or have a thick "A" horizon may not exhibit drainage mottles in the "A" or 'Ap" horizons due to masking. On the other hand, plowed or disturbed soils that are not wet may exhibit mottles that are a result of mixing, not periodic soil saturation.

Sandy soils: Sandy soils lack fine soil particles which most readily exhibit effects of reduction (low chroma mottles). Therefore, these soils may not appear to be mottled when, in fact, they are seasonally saturated. Also, coarse textured soils may develop reddish or blackish cemented layers that are the result of iron, aluminum, organic matter, etc., precipitating out at the depth of the seasonal water table. These layers, which may create a perched water table above them, should not be mistaken for well drained oxidized colors.

Suspected poorly drained (hydric) soils: On any potential poorly drained site or where the "A" or "Ap" horizon is 7 inches thick or thicker, the Maine Association of Professional Soil Scientists (MAPSS) Drainage Key shall be used. See Table 10-1.

DISTURBED GROUND

This Section provides a standard procedure to recognize disturbed ground.

General: When placement of a disposal field is proposed for an area of disturbed ground, the type and depth to the most limiting soil horizons (as well as a variety of additional factors) should be considered when determining the Design Classes. This determination will depend on the nature of the soil disturbance, as outlined in Subsection "Recognition criteria." Types of soil disturbance include, but are not limited to, filled areas, excavated areas, re-graded areas, artificially drained areas, and pre-existing disposal fields.

Recognition criteria: A site should be considered disturbed ground when any of the following conditions are present:

> **Displaced or human-made objects:** Displaced or human-made objects, such as tree stumps, branches, plant stems, leaves, building debris, or trash of human-made origin, are observed below the ground surface in the profile pits;
>
> **Unexplained soil horizons:** Soil horizons are absent or mixed in a manner that cannot be explained as a result of natural processes;
>
> **Buried A or O horizons:** Observation holes reveal A- horizons or O-horizons that are buried by layers of soil or other material (Note that natural buried soil horizons may occur);
>
> **Mounds or depressions:** Mounded areas or depressions in the land surface are observed that do not conform with the surrounding topography and that show signs of recent disturbance, such as lack of vegetation, weedy vegetation, severe erosion, wheel ruts, etc.;
>
> **Subsurface drains:** Subsurface drains or their remnants are observed in profile pits or the outlets of drains are observed at the surface; or
>
> **Abandoned systems:** Components of an existing system or remnants of an abandoned system are present.
>
> **Determination of the pre-existing natural ground surface:** When evidence is found that the surface of the ground may have been modified by a disturbance such as addition of fill material, removal of soil horizons, or regrading, the pre-existing natural ground surface should be identified using the following criteria:
>
> **Buried A or O horizons:** When a buried A-horizon or O- horizon is present, the

pre-existing natural ground surface should be assumed to be the top of the A-horizon or the bottom of the O-horizon.

Extrapolation: When a buried A-horizon or O-horizon is not present, the level of the pre-existing natural ground surface should be determined by extrapolation from adjacent areas beyond the limit of soil disturbance. When this method is relied upon, the nature of the pre-existing topography as well as the nature of the ground disturbance should be described, using topographic contour maps and soil profiles where appropriate.

Suitability of disturbed ground: Where disturbed soil or other fill material is present at the site, the suitability of this material should be evaluated based upon the following criteria and characteristics. Fill material or disturbed soils should be relatively free of foreign materials and should have soil texture of sandy loam or coarser and have some soil structure. That is, to be considered suitable, fill material or disturbed soils may contain only trace amounts of the following materials or any other materials that are subject to disintegration or change in volume: tree stumps, plant stems, leaves, food or animal remains or wastes, wood chips, sawdust or any organic materials that may be subject to decay; trash, discarded furniture, buildings, demolition debris, or any bulky objects that contain large voids or are subject to collapse or reorientation; or cans, bottles, drums, or any containers that are empty or filled with liquids.

Soil Profile to be used: Where the surface of the ground has been raised by the addition of fill material over original soil, the Design Class should be determined based upon the Soil Profile that best describes the pre-existing ground.

Bedrock and soil drainage conditions to be used: Where the surface of the ground has been raised by the addition of fill material over original soil, the Design Class should be determined based upon the depth to the most limiting soil horizon. Measurement should be from the pre-existing ground surface determined as prescribed in Subsection "Determination of the pre-existing natural ground surface," or from the existing ground surface, whichever is the shallowest, except for fill over 48" where measurements may be from the surface of the fill.

Fill considered equivalent to original soil: The plumbing inspector may approve the use of existing fill soil as the equivalent to original soil for design purposes when the site evaluator demonstrates that:

- The fill material is of suitable texture, consistency, depth, extent and structure to be equivalent of original soil for design purposes.
- The fill has been in placed since July 1, 1974;
- The area of the fill soils include, at a minimum, the disposal field and it's extensions; and
- The texture of fill is sandy loam or coarser, and the fill is relatively free of foreign material including organic material.

SOIL COLOR

This Section provides a standard procedure to evaluate soil colors.

General: Soil colors often reveal much about a soil's wetness. Site evaluators examining the soil should report the approximate soil color in accordance with the Munsell soil color chart. The standardized Munsell soil colors are identified by three components: hue, value, and chroma. Hue is related to one of the main spectral colors: red, yellow, green, blue, or purple, or various mixtures of these principal colors. Value refers to the degree of lightness, while chroma indicates the color strength or purity. In the Munsell soil color book, each hue has its own page and the color is further subdivided into units of value (on the vertical axis) and chroma (on the horizontal axis). Because accurate reproductions of soil colors are expensive, the Munsell soil color book contains a limited number of hues, values and chromas. The soil matrix or mottle colors are determined by comparing the soil with individual color chips in the soil color book.

Recognition criteria: Colors are best determined in soils that are, or have been, moistened. The colors of the topsoil are valuable in determining the drainage condition of a site.

Gleying: Gleying (bluish, greenish, or grayish colors) immediately below the A-horizon is an indication of a saturated soil. Gleying can occur in both mottled and unmottled soils. Gleyed soil conditions can be determined by using the gley page of the Munsell Soil Color Charts. Caution: Gleyed conditions normally extend throughout saturated soils. Beware of soils with gray E-horizons due to drainage and not to saturation.

These latter soils can often be recognized by bright-colored layers below the E-horizon.

Matrix chromas of 2 or less: When the soil is moist, matrix chromas of 2 or less are considered low chromas and are often diagnostic of soils saturated for long periods.

Iron and manganese concretions: During the oxidation-reduction process, iron and manganese in suspension are sometimes segregated as oxides into concretions or soft masses. Manganese concretions are usually black or dark brown. Iron concretions are usually yellow, orange, or reddish brown.

Sandy soils: Soil color in saturated sandy soils may not be as pronounced.

Bright colored mottles and a low chroma matrix: Soils that have brightly colored mottles and a low chroma matrix are indicative of alternating saturated and unsaturated soil conditions.

SOIL PROFILE CLASSES

This Section provides the procedure to determine the most appropriate soil profile to be cited from Table 700.1.

Reporting soil profiles associated with basal glacial till: Basal till, also known as "lower or lodgement till," is a unique soil because in many cases it supported the weight of the glacial ice and often is very dense and compact. As the last ice sheet advanced across Maine, it pushed before it, and mixed together, mounds of soils deposited by previous glaciers. The ice sheet had no ability to sort out or grade the soil and it ground up rock fragments as it moved. Therefore, the soil and ground up rock debris pushed by the ice was deposited in a dense, unsorted mixture of angular rock fragments and sandy silts and clay. Basal till generally overlies the bedrock surface. It is usually identified because of its position in relation to bedrock and its unsorted appearance and density. Soil profiles associated with basal tills have the following characteristics:

> **Soil profile 1:** These are loam to silt loam textured soils throughout the entire profile. The lower soil horizons usually have prismatic or platy structures. This profile tends to become more firm, dense, and impervious with depth. Therefore, this profile may have a hydraulically restrictive soil horizon. Angular rock fragments are present. Occasionally, cobbles and stones are present.

> **Soil profile 3:** These are loam to loamy sand textured soils throughout the entire profile. The lower soil horizons usually have well defined prismatic or platy structures that are very compact and difficult to excavate. These lower horizons are considered hydraulically restrictive. Angular rock fragments are present. Occasionally, cobbles and stones are present.

Reporting soil profiles associated with ablation till: Ablation till, also known as "upper till," is a loose, permeable till deposited during the final melting of the glacial ice. Ablation till generally overlies basal till. Lenses of crudely sorted sands and gravels are common. Prior to the establishment of vegetation, the glacial melt waters washed away much of the sands and silts. In this way, cobbles and stones became concentrated at or on the land surface. Soil profiles associated with ablation tills have the following characteristics:

> **Soil profile 2:** These are loam to sandy loam textured soils throughout the entire profile. This profile does not have a hydraulically restrictive horizon. Angular rock fragments are present. Occasionally, cobbles and stones are present.

> **Soil profile 4:** These are sandy loam to loamy sand textured upper soil horizons overlying loamy sand textured lower horizons. This profile tends to be loose and easy to excavate. Lower soil horizons tend not to be firm and are not considered hydraulically restrictive. Angular rock fragments are present along with partially water-worn cobbles and stones.

Reporting soil profiles associated with stratified glacial drift: As the ice sheet thinned and became stagnant, melt water flowed off the eroded channels and hill sides. Silt, sand, gravel, cobbles, and stones were carried away by the melt waters. Materials carried by the melt waters and deposited near or adjacent to the ice sheet are called ice contact deposits (Soil profile 6). Materials carried by the melt waters and deposited some distance from the ice sheet are called outwash deposits (Soil profile 5). When these streams and rivers reached the ocean, they lost their velocity. As the velocity decreased, the gravel size fragments settled out first. Further on, the sands settled out. Last of all, the silt-clays settled to the bottom in calm, deeper waters. Soil profiles associated with stratified glacial drift have the following characteristics:

> **Soil profile 5:** These are loam to loamy sand textured upper horizons overlying fine and medium sand parent materials. Stratified soil horizons of water-sorted materials may be present. The lower soil horizons tend to be granular or massive. The entire profile tends to be loose except that saturated horizons may be cemented (and therefore firm) and are considered hydraulically restrictive. Soil horizons with over 25% water-worn rock fragments are common. Some soil horizons may have many water-worn cobbles and stones. These deposits may display an extreme range, and frequent and abrupt changes, in grain size.

> **Soil profile 6:** These are loamy sand to sandy textured soil horizons overlying stratified coarse sands and gravel parent material. Stratified soil horizons of very-well-water-sorted materials are present. The entire profile tends to be very loose, except that saturated horizons may be cemented (and therefore firm) and are considered hydraulically restrictive. Soil horizons with over 25% water-worn rock fragments are common. Some soil horizons may have many water-worn cobbles and stones. There is a wide range of grain size. The average grain size of the outwash diminishes as the distance from the glacier increases.

Reporting soil profiles associated with mixed geological origins: This profile typically occurs in areas where outwash deposits were deposited over marine silt and clay deposits. Soil profiles associated with mixed geological origins have the following characteristics:

> **Soil profile 7:** These are 15 or more inches of sandy loam to loamy sand glacial till or loamy sand to medium sand stratified drift parent material overlying marine or lacustrine deposited silt to silty clay or 15 or more inches of loamy sand to medium sand stratified drift parent material overlying firm basal till. The upper soil horizons tend to be granular in structure. The lower soil horizons tend to be firm and massive in structure and are considered to be hydraulically restrictive. Rock fragments may be present in the upper soil horizons, but they are usually absent in lower soil horizons.

Reporting soil profiles associated with lacustrine deposits: As the melt water flowed over the ice sheet, temporary fresh-water lake basins were formed in the ice. In these basins, thick deposits of well-sorted silt and clay particles settled out in the very quiet waters. This resulted in thin or thick alternating layers of well-sorted silts and clayey silts, or silts and fine sands. The soil profile associated with lacustrine and marine deposits have the following characteristics:

> **Soil profile 8:** These are loam to fine sandy loam textured upper soil horizons overlying firm silt loam to silt textured lower soil horizons. The upper horizons tend to be granular in structure. The lower horizons tend to be firm and massive in structure and are considered to be hydraulically restrictive. Stratified lenses of fine sand and sandy loam may be present in the lower horizons. Rock fragments are usually absent throughout the entire profile.

Reporting soil profiles associated with marine deposits: Our current coastal wetlands and coastal river basins were covered by the ocean at the time the ice sheet started to retreat. As the melt water flowed from the ice sheet and reached the ocean, thick deposits of well-sorted silt and clay particles settled out. The building of the tidal flats at the mouth of the Presumpscot River is an example of a similar type of deposition in action today. The soil profiles associated with lacustrine and marine deposits have the following characteristics:

> **Soil profile 9:** These are silt loam textured upper soil horizons overlying silt loams to clay textured lower soil horizons. The lower soil horizons tend to be very firm and are considered to be hydraulically restrictive. Rock fragments are usually absent throughout the entire profile. Thin lenses of very fine sand to silt may be present in the lower horizons.

Reporting soil profiles associated with organic deposits: Since the ice sheets retreated, organic materials have been accumulating in tidal marshes and other wetlands, swamps, bogs, and marshes. Organic matter also accumulates on higher elevations and some coastal locations where year-round cold air temperatures retard biological breakdown. Soil profiles associated with organic deposits have the following characteristics:

Soil profile 10: These are partially decomposed organic materials.

Reporting soil profiles associated with alluvial, dune, and beach deposits: These soils are very young geologically and exhibit very little weathering. The alluvial soils are formed by repeated flooding. Each flood deposits a new thin layer of silt, sand, or other soil. Alluvial soils tend to be associated with flood plains and terraces along present rivers. The beaches and dunes are very unstable and consist of very clean uniformly sorted sands with no weathering or developed soil horizons. Soil profiles associated with alluvial deposits should be reported as follows:

Soil profile 11: These soils have no typical profile. Thus, the soil profile 1 to 9 that best describes the observed profile should be used for disposal field sizing.

Non-conforming soil profiles: In situations where the observed soil conditions do not exactly fit one of the 11 general soil profile classes, use the soil profile class that best describes the observed soil texture and most limiting soil horizons.

SOIL CONDITION CLASSES

This Section provides a standard procedure to report a soil condition class to be used.

General: Soil condition classes describe drainage and bedrock conditions. Maine soils should be placed into classes AI, AII, AIII, B, C, D, and E.

Reporting bedrock conditions: Site conditions associated with bedrock should be reported as follows:

Bedrock condition AI: Soils that have less than 12 inches of natural undisturbed soil over bedrock are classified as bedrock condition "AI."

Bedrock condition AII: Soils that have 12 inches to 15 inches of natural undisturbed soil over bedrock are classified as bedrock condition "AII."

Bedrock condition AIII: Soils that have 15 to 48 inches of natural undisturbed soil over bedrock are classified as bedrock condition "AIII."

Reporting soil drainage conditions: Site conditions associated with a soil drainage should be reported as follows:

Drainage condition B: Soil drainage condition B soils are well, somewhat excessively, or excessively drained. Water is easily removed from the soil. These soils usually have the following characteristics: they occupy gently sloping to very steep sites; they usually have bright colors in the upper horizons of the soil profile; and soil mottles indicative of seasonal ground water tables begin at depths greater than 48 inches below the mineral soil surface.

Drainage condition C: Soil drainage condition C soils are moderately well drained. Water is removed from soil somewhat slowly. Moderately well drained soils usually have the following characteristics: these soils occupy gently sloping to moderately steep slopes; they have bright uniform colors in the upper soil horizons; and soil mottles indicative of seasonal ground water tables begin at depths of 15 to 48 inches below the mineral soil surface.

Drainage condition D: Soil drainage condition D soils are somewhat poorly to poorly drained. Water is removed from the soil so slowly that the seasonal ground water table is 7 to less than 15 inches below the mineral soil surface. These soils usually have the following characteristics: they occupy nearly level to sloping sites; they may have a dark-colored surface soil horizon with grayish colored sub-horizons; and soil mottles indicative of seasonal ground water tables begin at depths of 7 to less than 15 inches below the mineral soil surface. However, mottles may be masked, due to organic matter accumulations, and may not be evident until the base of the A or Ap horizon. These soils may be ponded for short periods of time and have a dark-colored surface soil horizon with grayish-colored sub-horizons. On any potential poorly drained site or where the "A" or "Ap" horizon is 6 inches thick or thicker, the Maine Association of Professional Soil Scientists (MAPSS) Drainage Key should be used. See Table 10-1.

Drainage condition E: Soil drainage condition E soils are poorly to very poorly drained. Water is removed from the soil so slowly that the seasonal ground water table remains at or near the mineral soil surface for a significant period of the year. Poorly and very poorly drained soils are classified as hydric soils and often indicate the presence of a wetland. They have the following characteristics: these soils occupy level or depressed sites and are frequently ponded; they have a thick black or dark gray surface horizon with gray lower soil horizons; and soil mottles indicative of seasonal ground water tables may not be evident above 7 inches due to masking organic matter or thick A-horizons.

Caution: Beware of poorly or very poorly drained problem soils that may not reflect these color patterns. On any potential poorly drained site or where the "A" or "Ap" horizon is 6 inches thick or thicker, the Maine Association of Professional Soil Scientists (MAPSS) Drainage Key should be used. See Table 10-1.

Reporting soil profiles with both bedrock and soil drainage limitations: Soil profiles with both bedrock and seasonal ground water table limitations should be reported, using both of the soil conditions describing bedrock and seasonal ground water table (i.e., AI/D, AII/B, etc.).

TABLE 3-1 KEY TO DRAINAGE CLASSES

Maine Association of Professional Soil Scientists

Use this key starting at the first drainage class listed (very poorly drained). If the soil being evaluated does not exhibit the soil morphological features for that drainage class, go to the next drainage class. Continue through each drainage class until the soil being evaluated meets the soil morphological features for a particular drainage class.

DRAINAGE CLASS AND MOISTURE REGIME	DRAINAGE CRITERIA OPTIONS
Very Poorly Drained	1) Has organic soil materials that extend from the surface[1] to a depth of 16 inches or more. (Histosols)[2] or, 2) Has organic soil materials that extend from the surface to a depth of 8 to 16 inches. (Histic Epipedon)[3] or, 3) Has organic soil materials that extend from the surface to a depth of 4 to 8 inches and the cambic horizon has a low chroma matrix[4]or; 4) Mineral soils with sulfidic materials within 20 inches of the mineral soil surface; Alluvial soils with an umbric epipedon, or,
Poorly Drained	1) Has an albic horizon that has texture of loamy fine sand or coarser that lies just above an illuvial horizon having a texture of loamy fine sand or coarser; and has redoximorphic features in the albic horizon or in the upper part of an illuvial horizon that is less than 7 inches below the mineral soil surface. or, 2) Has an Ap horizon that is 7 inches thick or greater with a value of 3 or less and chroma of 2 or less and a texture in all subhorizons within 20 inches of the mineral soil surface of loamy fine sand or coarser and have redoximorphic features directly beneath the Ap horizon. or, 3) Has a low chroma matrix within 20 inches of the mineral soil surface and redoximorphic features that are less than 7 inches below the mineral soil surface. or, 4) Has an "Ap" horizon that is 7 inches thick or greater with value of 3 or less and chroma 2 or less and has a low chroma matrix within 20 inches of the mineral soil surface and has redoximorphic features or a low chroma matrix directly beneath the Ap horizon. or,
Somewhat poorly drained	1) Has redoximorphic features at a depth of 7 inches to less than 16 inches below the mineral soil surface. or
Moderately well drained	Has redoximorphic features at a depth of 16 inches to less than 40 inches below the mineral soil surface. or,
Well drained	Soil depth is at least 20 inches to bedrock and has a texture of loamy very fine sand or finer and redoximorphic features, if present, are greater than 40 inches below the mineral soil surface.[5] or
Somewhat excessively drained	1) Soil depth is 10 to 20 inches to bedrock with a loamy or loamy-skeletal particle-size class. 2) Soil depth is 20 inches or greater to bedrock with a sandy or sandy-skeletal particle-size class with a loamy cap 10 inches thick or greater.
Excessively well drained	1) Soil depth is less than 10 inches to bedrock. 2) Sandy or sandy-skeletal particle-size class with a loamy cap less than 10 inches thick.

TABLE 3-1 KEY TO DRAINAGE CLASSES, CONTINUED

POSITION IN THE LANDSCAPE	COMMON PLANT SPECIES
Level or nearly level; occupies lowest position in the landscape. Commonly in depressions and is seasonally ponded or flooded..	Rushes, cattails, sedges, sphagnum moss, tamarack, willow, black spruce, northern white cedar, and red maple.
Level to gently sloping; side slopes, toe slopes, depressions and seepage areas.	Sedges, alder, willow, red maple, gray birch and aspen
Level to strongly sloping; long smooth side slopes, broad depressions and seepage areas.	Red osier dogwood, alders, willow, spruce, balsam fir, red maple, elm, aspen, grey and yellow birch.
Level to steep; crests and upper part of long smooth slopes and broad terraces.	Northern hardwoods, white and red pine, hemlock and grasses.
Level to very steep; knolls, complex slopes and terraces.	Northern hardwoods, white and red pine, hemlock and grasses.
Level to very steep; knolls, convex slopes and terraces.	Northern hardwoods, white and red pine, white and red spruce, hemlock, and grasses.
Level to very steep; knolls, convex slopes and terraces.	Northern hardwoods, white and red pine, white and red spruce, hemlock and grasses. Vegetation also includes shrubs, ferns, mosses, and lichens.

1 Surface excludes loose leaves, needles, and twigs.
2 Twenty-four inches or more if 75 percent or more of the volume is sphagnum fibers. Organic soil excludes Folists in this key.
3. Eight to 24 inches if 75 percent or more of the volume is sphagnum fibers.
4. Low chroma matrix is defined as matrix with chroma of 2 or less.
5. Soils that are coarse-loamy over sandy or sandy-skeletal and lack redoximorphic features within 40 inches of the mineral soil surface also are well drained.
Note: Folists soils need on-site evaluation for drainage class determination.

Chapter 4 - DISPOSAL FIELD DESIGN THEORY

GENERAL

The purpose of a system: The effluent from a septic tank is delivered to a disposal field where it leaches into the soil under unsaturated flow conditions. The purpose of a disposal field is to remove pollutants from the septic tank effluent. The removal processes include physical filtration of bacteria, absorption of virus and bacteria by clay and organic matter, biological destruction of pathogens by soil microorganisms, chemical fixation or precipitation of phosphorous, biochemical transformations of nitrogen compounds, and biological assimilation of nitrogen and phosphorous.

Clogging mat: Continuous or frequent ponding of septic tank effluent on the bottom of the disposal field results in the growth of a biological layer that filters out more and more solid particles and dissolved pollutants from the septic tank effluent. A clogging mat is formed at the point of infiltration into the soil. This mat normally penetrates 1/2 to 6 centimeters into the soil. It consists of a slimy mass of septic tank effluent solids, mineral precipitates, microorganisms, and the by-products of decomposition. Microorganisms in the mat feed on septic tank effluent nutrients to produce slimes, polysaccharides, carbon dioxide, etc. Filtered-out cellulose, undigested food residues, etc., hydrolyze and biodegrade slowly. Mineral precipitates, such as ferrous sulfide, etc., also contribute to the clogging mat.

The clogging mat is in constant flux, that is, building, degrading, and creeping downward into the soil as a viscous fluid where it is dispersed. The process is self-cleaning; otherwise, disposal fields could not last more than a few years. This self-cleaning property, along with a constant septic tank effluent load, allows a properly designed disposal field to be passive and function without maintenance. The clogging mat develops at a rate dependent upon the septic tank effluent load. As the clogging mat matures, the septic tank effluent infiltration rate through the clogging mat decreases. A clogging mat's average infiltration rate, or disposal field application rate, is usually reached after a period of 3 to 36 months.

Disposal field application rate: The clogging mat acts as a hydraulically restrictive soil horizon. Its limited permeability is accounted for in the disposal field application rates used for designing systems. The acceptance rate of the clogging mat is dependent on the texture, structure, and consistence of the soil. This rate typically ranges somewhere between 0.2 to 0.8 gallons per day per square foot of bottom and sidewall area.

Treatment in the clogging mats: Once the clogging mat is established, the organisms in the mat are extremely effective in stabilizing organic waste, removing particulates, and removing pathogenic organisms. Bacterial indicators of pathogenic contamination are total coliforms, fecal coliforms, and fecal strepotococci. Total coliforms concentrations of 57,000 colonies per milliliter within the disposal field are typically reduced to less than 200 colonies per milliliter at or beyond a foot of the clogging mat. Fecal coliforms concentrations of 19,000 colonies per milliliter within the disposal field are typically reduced to less than 2 colonies per milliliter at or beyond a foot of the clogging mat. Fecal streptococci concentrations of 1,600 colonies per milliliter within the disposal field are typically reduced to less than 2 colonies per milliliter at or beyond a foot of the clogging mat. The clogging mat typically removes approximately 10% of the nitrogen but is less effective in removing phosphates.

Zone of treatment: This code requires a minimum 12 inch zone of treatment in the soil column below the bottom of the disposal field. This allows a reaction time as the partially treated septic tank effluent passes through the soil under unsaturated conditions and assures adequate treatment. This 1 foot of suitable soil, or fill material, below the level of the bottom of the disposal field removes pollutants from the septic tank effluent by physical filtration and biological activity.

Movement through the clogging mat: The movement of septic tank effluent through the clogging mat is due to the hydrostatic or gravity head pushing the septic tank effluent down through the clogging mat, and the capillary tension force or matrix potential pulling the septic tank effluent through the clogging mat.

Maximize the sidewall area: In many soils the capillary potential of the soil itself is more effective than the small hydrostatic heads in forcing the septic tank effluent through the clogging mat. Therefore, an effort should be made to design disposal fields with as much sidewall possible for any given bottom area, such as found in a trench system. This type of design takes maximum advantage of the capillary rise in the soil and evapotranspiration.

Shallow disposal fields: All disposal fields should be installed as shallowly as practical to; take advantage of seasonal evapotranspiration potentials; stay in the generally more permeable upper soil horizons; and stay as far as possible above the seasonal ground water table.

Disposal field configuration: Long, narrow disposal fields should be used whenever possible. Such designs increase the sidewall area to bottom area ratio. This reduces the potential for water mounding under the disposal field and, by spreading out the septic tank effluent plume, increases the potential for dilution as the plume travels down slope.

Vehicular traffic: Except where site limitations make it unavoidable, no driveway, or parking or turning area, should be located over any disposal field. Disposal fields located under vehicular traffic tend to be compacted by the traffic and in many cases are paved. The paving essentially eliminates all upward capillary and evapotranspiration potential.

Bottom of the disposal field: The bottom of each disposal field should be excavated and/or maintained to a level grade. In both stone and proprietary disposal fields, the bottom of the disposal field serves as an integral part of and is the final stage of the distribution network within a disposal field.

Infiltration: Rain, surface, and subsurface water should not be drained into any component of a system or the disposal field will become overloaded and fail.

SEPTIC TANK TREATMENT

Primary treatment: The primary function of a septic tank is to retain fats, grease, and other solids. Primary treatment of sewage takes place within the tank, where anaerobic bacteria digest these materials. The undigestible portion remains in the tank and is disposed of when the tank is pumped. The effluent which leaves the tank for secondary treatment in the disposal field is, ideally, free of suspended fats, grease, and other solids. However, it does contain organic materials, bacteria, and viruses.

Those solids that are stabilized settle to the bottom of the septic tank where they form a sludge blanket. Fats and greases rise to the to of the septic tank forming a scum blanket. The sludge and scum blankets shall be removed periodically to preserve the liquid capacity necessary for satisfactory solids removal.

These are further broken down and deactivated in the disposal field. Septic tank cleaners or degreasers are designed to liquefy or emulsify the fats, grease, and solids in the septic tank in order to reduce or eliminate the need for pumping the tank. These preparations defeat the septic tank's purpose. Instead of remaining in the tank, the liquefied or emulsified fats, grease, and solids leave the tank in the effluent and enter the field. Much of this material now entering the field is not subject to bacterial breakdown and can significantly shorten the life of the field by reducing soil permeability. Furthermore, some of these cleaners and degreasers themselves have the potential to pollute the ground water.

Typical treatment: A typical septic tank removes about 40 to 50% of the 5-day biochemical oxygen demand, 50 to 70% of the total suspended solids, 20 to 30% of the nitrogen, and up to 30% of the phosphates. Disease organisms do not multiply in the septic tank; they can only survive or be reduced.

CHAPTER 5 - SLOPE MODIFICATIONS

GENERAL

Scope: This chapter provides guidance on altering slopes only for replacement disposal fields when there is no practical alternative.

Limitations: Disposal fields should not be located in an area having a slope greater than 20%. Disposal fields should be located a minimum of 10 feet from the crown of land having a slope greater than 20% except when the top of the disposal field stone or proprietary disposal devices are at or below the bottom of an adjacent roadside ditch.

Altering slopes: Areas with slopes exceeding 20% may be graded and reshaped to provide disposal field sites. Care should be taken when altering natural landscapes. Any disposal field installed on an altered slope should comply with the following:

Adequate soil depth: A complete site evaluation should be performed after the alteration of the site. Observation hole data should show that a sufficient depth of suitable soil material is present to provide the required amount of soil over bedrock and the seasonal ground water table;

Altered site: The disposal field should be installed in the cut of an altered site. The area of fill on an altered site may be used as a portion of the required 10 foot separating distance from the crown of a critical slope. There should be a minimum of 5 feet of natural soil between the edge of the disposal field and the down-slope side of the altered area; and

Surface water drainage: All altered slope areas should be altered such that surface water drainage will be diverted away from the disposal field. In some cases, this may require the use of grassed waterways or other means of diverting surface waters. All disturbed areas should be seeded or sodded with grass and appropriate steps should be taken to control erosion.

CHAPTER 6 – BACKFILL CALCUALTIONS

GENERAL

The number of inches of fill required from the top of the final grade to the existing grade is calculated and reported on page 3 of the HHE-200 Form. The depth of fill required is determined using the slope gradient, size of disposal area, depth of disposal area, soil profile description (i.e. limiting factor, restrictive layers, ground water table) and the minimum separation distances from bottom of bed to limiting factor.

EXAMPLE:

10% **=** Slope

12' = Width of proposed disposal bed

24' = Depth of proposed disposal bed

5C = Soil Conditions

42" = Depth to limiting factor (seasonal high groundwater table)

Depth of fill on uphill side of bed can be calculated using the following formula:

F(up) = D + S- L

F(up) = Depth of fill uphill side

D = Depth of Disposal System (24 inches)

L = Depth to limiting factor (ground water table, restrictive layer, bedrock)

S = Separation Distance (12 or 24 inches)

For Sample Calculation

F(up) = 24' + 24' – 42"

F(up) = 6 "

Depth of fill downhill side of bed can also be calculated using the following:

F(dn) = (12' x W x S) + F(up)

F(dn) = Depth of fill downhill side

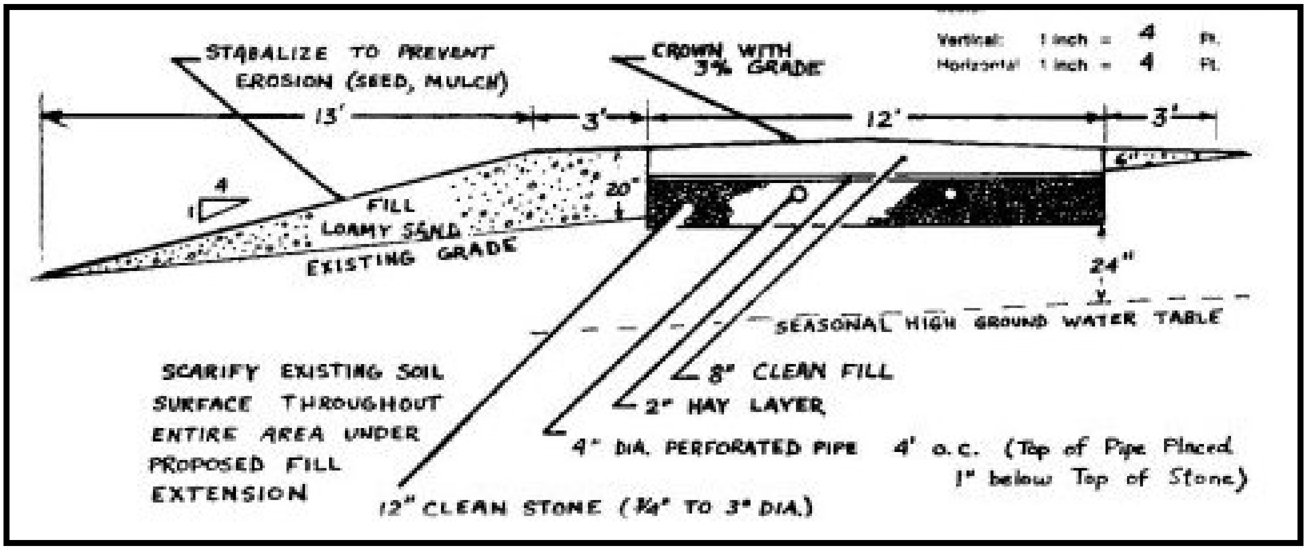
W = Width of Disposal System (feet)

G = Gradient .00 to .20 (0 to 20%)

For Sample Calculation

F (dn) = (12' x 12 x .10) + 16'

F(dn) = 20'



Vertical: 1 inch = 4 Ft.
Horizontal: 1 inch = 4 Ft.
STABALIZE TO PREVENT EROSION (SEED, MULCH)
CROWN WITH 3% GRADE
13'
3'
12'
3'
4
1
20"
FILL
LOAMY SAND
EXISTING GRADE
24"
SEASONAL HIGH GROUND WATER TABLE
SCARIFY EXISTING SOIL SURFACE THROUGHOUT ENTIRE AREA UNDER PROPOSED FILL EXTENSION
8" CLEAN FILL
2" HAY LAYER
4" DIA. PERFORATED PIPE 4' o.c. (Top of Pipe Placed 1" below Top of Stone)
12" CLEAN STONE (3/4" TO 3" DIA.)

Figure 6-1

CHAPTER 7- MALFUNCTIONING DISPOSAL SYSTEMS

GENERAL

This chapter provides guidance and methods for identifying, inspecting, diagnosing, and correcting malfunctioning systems.

IDENTIFICATION OF MALFUNCTIONS

Indicators: Indications that a system is malfunctioning include, but are not limited to, the following:

Bacterial contamination: Contamination of nearby water wells or surface water bodies by waste water or septic tank effluent.

Surface ponding: Ponding or breakout of waste water or septic tank effluent onto the surface of the ground;

Seepage into structures: Seepage of waste water or septic tank effluent into portions of structures below ground; or

Backup into structure: Back-up of waste water into the structure served, when the backup is not caused by a physical blockage of the plumbing within the structure.

INFORMATION TO BE RECORDED

General: The extent of an investigation of a malfunctioning system is dependant upon factors such as the age of a system, the type of system, and the amount of information already available about the system. The investigator needs to gather and record as much of the information requested in this Section as possible.

Symptoms: Symptoms of system failure such as: discharge to the surface of the ground; a polluted water well, based on bacteriological samples and dye testing; and/or a backup of waste water in the building sewer.

Type and age of system: Type of system in use and when it was installed. (The original application for a subsurface waste water disposal system on file with the municipality can be very useful.)

Type of maintenance: Last time the septic tank was cleaned or serviced.

Frequency of problems: Frequency of the malfunction: continuous; increases in wet weather; decreases in dry weather; and/or gradual increase over several years.

Previous repairs: Any previous repairs to the system.

Years the system functioned satisfactorily: Years of use without a malfunction.

Type of use: System usage information: family size; major waste water generating appliances - dishwashers, water softeners, garbage grinders, clothes washers; daily flow pattern - periods of high water use may cause peak flows that can drastically overload system components and cause failure; use of chemicals to "clean" or "improve" system performance; addition of other water into the system - sump pumps, rain spouts, surface diversion ditches, foundation drains; and abrupt increases in water consumption - leaking plumbing fixtures, weekend guests, new water-using appliances.

Plot plan: Draw a layout of the lot and all surface features that may have caused or contributed to the malfunction.

Conditions during construction: Conditions during the installation of the system: type of equipment used - back-hoe, bulldozer, and front end loader; weather conditions that may have allowed compaction or smearing of the soil; construction completion date; and installer's name for more specific information.

SEPTIC TANK AND BUILDING DRAIN

Diagnosis steps: After the on-site investigation of the problem, all the information gathered should be reviewed. The following is an outline of recommended diagnosis procedures and suggested actions.

Step 1: If the septic tank was not pumped and checked as part of the initial investigation, it should be pumped and cleaned for inspection. Never enter the tank.

Step 2: If the malfunction is a backup in the building sewer or a discharge from the septic tank, the building sewer or dosing tank may be the source of the problem. Check the septic tank size, baffles, slope of building sewer, and outlet line.

Step 3: If the problem is contamination of ground water, check the septic tank closely for cracks, leaks, and loose inlet or outlet connections. Check for breaks in lines outside the tank or breaks in the building sewer with the discharge running to and down the outside of the septic tank.

Step 4: If there is no septic tank, or if an undersized septic tank is in use, a new tank should be installed.

Step 5: If an aerobic tank is in use, check the tank for proper operation and maintenance. Contact the manufacturer or distributor for operation and maintenance requirements.

Step 6: In some cases, it is likely that solids have been discharged into the distribution box, header pipe, or disposal field due to an inadequate or improperly maintained septic tank.

Suggested corrective actions: Once the septic tanks and/or lines have been repaired, either wait for a period of time to see if these repairs were sufficient to stop the malfunction, or continue immediately with an evaluation of the rest of the system if no problems were observed in the tank or lines. The problem may be in the distribution network or the disposal field.

Suggested septic tank pumping criteria: The contents of the septic tank should be removed by pumping whenever either of the following conditions is noted during the course of inspection:

Scum layer: The bottom of the scum layer is within 3 inches of the bottom of the outlet baffle; or

Sludge layer: The top of the sludge layer is within 8 inches of the bottom of the outlet baffle.

Measuring the bottom of the scum layer: The bottom of the scum layer and the bottom of the outlet baffle can be measured using a stick to which a weighted flap has been hinged. When the end of the stick with the hinged flap is forced down through the scum level, the hinged flap falls into a horizontal position. Raise the stick gently until the flap hooks on the bottom of the outlet baffle. Hold the stick in place and make a mark on the stick at the point where it comes out of the tank. Lower the stick so that it unhooks from the baffle. Move it away from the baffle and raise the stick slowly until the hinged flap touches the bottom of the scum layer (the scum layer will resist the flap a little). Again, hold the stick in place and make a mark on it where it comes out of the tank. The distance between the two marks shows how close the bottom of the scum layer is to the bottom of the outlet baffle.

Measuring the depth of the sludge layer: Wrap a long stick with rough, white toweling. Lowered to the bottom of the tank, the stick will show the depth of the sludge and the liquid in the tank. The stick should be lowered behind the outlet baffle to avoid scum particles. After several minutes, remove the stick carefully. The sludge line can be distinguished by sludge particles clinging to the toweling.

Frequency: Septic tanks should be checked after the first year. The pumper can advise how often the septic tank needs to be pumped based upon what he finds at this inspection (typically a septic tank will need to be pumped every two to five years. Keep in mind pumping frequency may need to be adjusted to coincide with changes in use of the system.

GREASE INTERCEPTOR

Suggested inspection frequency: Grease interceptors should be inspected and cleaned often to prevent the volume of grease from exceeding the grease interceptor's retention capacity. Grease should be removed whenever 75% of the grease retention capacity has been reached. Grease interceptors serving restaurants may require pumping as often as once a week or once every two or three months.

Suggested dosing tank maintenance: Dosing tanks and associated pumps, siphons, switches, alarms, electrical connections, and wiring should be maintained in proper working order. Any solids that accumulate in the dosing tank should be removed and disposed of in a sanitary manner.

DISTRIBUTION NETWORK

General: Proper installation of individual system components determines whether the system operates at its maximum potential. Improperly-leveled distribution pipes and distribution boxes may cause unequal loading of the disposal field, resulting in premature failure. A soil auger is useful for probing the gravel or gravel-less disposal field in several places to determine whether the entire system is being loaded evenly or whether a portion of the system is not receiving septic tank effluent and, thus, the other portions are overloaded.

Diagnosis: If such a problem is noted, the distribution box or header should be checked. Distribution boxes that are not level, have clogged or broken outlets, or have missing or broken baffles may cause such system malfunctions. Headers that are not level or have been partially clogged can also cause unequal distribution.

Suggested actions: Once repairs have been made to improve distribution, either wait for a period of time to see if the repairs were sufficient to stop the malfunction, or continue immediately with an evaluation of the disposal field.

DISPOSAL FIELD

General: The disposal field depends mostly upon the movement of septic tank effluent downward into the soil, along with the movement through the distribution pipes. Subsurface water competes with the disposal field for the hydraulic capability of the soil. Bedrock and hydraulically restrictive soil horizons severely restrict drainage and may cause perched zones of saturation. Fractured bedrock presents a potential for ground water contamination.

Suggested actions: Using the information obtained during the soils testing, determine if the site evaluated can be used or if another site should be found.

Suggested maintenance: The following suggestions will help maintain a disposal field so it operates at its maximum potential.

Free of encroachments: The area of the disposal field should be kept free of encroachments from driveways, patios, accessory buildings, additions to the main building, and trees or shrubbery whose roots may cause clogging of any part of the system.

Surface grading: Grading should be maintained in a condition that will promote run-off of rainwater and prevent ponding.

Other water: Drainage from roofs, footing drains, ditches, or swales should be diverted away from the disposal field.

Erosion control: Mulching or vegetation should be maintained to prevent soil erosion, except in driveways.

Vehicular traffic: Vehicular traffic should be kept away from the area of the disposal field unless the field is designed for vehicular traffic.

OTHER FACTORS THAT MAY CAUSE MALFUNCTIONS

Ground and surface water: It is important that the disposal field be located in an area of unrestricted drainage. Location of a disposal field near the base of a hill, down the hydraulic gradient of a drainage area, or in a swale frequently results in overloading of the soil's hydraulic capacity. Locating the system adjacent to a barrier to subsurface water movement, such as a road, also results in soil saturation. These types of sites are frequently characterized by periodic malfunctions during the wet season of the year, with relief occurring in dry periods.

Improperly sized disposal fields: Disposal field design should take into consideration the volume of waste water, soil characteristics, and site limitations. If the soil evaluation shows suitable soil, the system should be closely checked for design problems. Under-sized septic tanks and disposal fields will lead to system overload and malfunction. Properly-sized disposal fields that are abused, through either peak daily overloads or continual overloads, will malfunction. Check the usage information to determine if the disposal field is being overloaded.

Improper installation: Disposal field failures are commonly due to poor construction techniques. Of particular concern are disposal field excavation, installation, and covering. Excavation during periods of high soil moisture may result in unnatural soil compaction and smearing. This reduces the hydraulic capacity of the disposal field's bottom and sidewalls. The installation of dirty stone in a disposal field can reduce the application rate of the soil below the field.

Age of the system: While there is rarely an established design life for a system, most standards and site evaluators consider 10 years to be a minimum life expectancy. System malfunction in fewer than 10 years generally reflects a failure in the site selection, system design, or construction methods, or it reflects unplanned system usage. Systems that have functioned properly for longer than 10 years may be considered to be successful, and failures occurring in such systems are usually due to natural processes. Although the initial process of soil pore clogging equalizes after the first few months, over a long period of time additional soil clogging is inevitable. This clogging is accelerated by high total suspended solids and biochemical oxygen demand of the septic tank effluent combined with saturated anaerobic conditions in the disposal field.

CORRECTION ALTERNATIVES

Options: A large number of options are available for the repair of malfunctioning systems. Each alternative is dependent upon the specific problems observed at the site and should be considered in light of its chances of success. If more than one alternative exists, or if a major decision should be made between a number of alternatives, the property owner should be provided with all the options and should decide which option to use. This CHAPTER discusses a number of options and the conditions under which those options can be used.

Disposal field enlargement: Additional square footage can be added to an existing disposal field if:

> **An inadequate design is found:** The volume of waste water being generated is greater than the design flow used for the original design; and/or
>
> **Improper soil profile identification:** The investigation discloses that the soils are slower than originally reported but they still demonstrate acceptable levels of permeability.

The distribution box: If the investigation reveals unequal waste water distribution, the distribution box or header can be leveled or replaced.

Septic tank: If an undersized or improperly designed septic tank is discovered, it can be replaced.

System restoration: Recent studies and experiences have shown that the normal soil clogging process that occurs in all systems can be reversed by natural and artificial oxidation of the inhibiting clogging mat. This can be done by:

Allowing the disposal field to rest: Allow the disposal field to rest by pumping out the disposal field and keeping the septic tank pumped as long as possible (with a minimum of one to three months) to permit restoration of aerobic conditions and to allow oxidation of the biological slime layer on the disposal field's bottom and sidewalls.

Chemical oxidants not recommended: The use of hydrogen peroxide-type chemicals to provide oxidation of an impermeable slime layer is not recommended.

Reduction of hydraulic loading: There is a variety of readily available water reduction devices (such as low-volume shower heads) which can be used in an existing plumbing system. These are capable of reducing waste water volume by approximately 20%.

Water conservation devices: In severe cases, more extreme water conversation devices, such as alternative toilets, can be used to reduce water consumption by as much as 50%.

Reduction of organic loading: The addition of a second septic tank has been shown to provide superior treatment compared to that of a single compartment septic tank. Most of the sludge is trapped in the first compartment or tank. This results in a significantly reduced scum and sludge layer in the second tank or compartment. The resulting "cleaner" septic tank effluent has less biochemical oxygen demand and total suspended solids. Thus less food is available for the bacteria in the clogging zone to feed on.

Significant amounts of solids are raised from the septic tank sludge when anaerobic bacteria form gas bubbles. Deflection of the bubbles by the use of a gas baffle results in significant reductions of total suspended solids in the septic tank effluent.

Replace the disposal field: If all else fails, the final alternative is to install a replacement disposal field.

CHAPTER 8 - CURTAIN DRAINS

GENERAL

The provisions of this chapter provide guidance on the design and installation of curtain drains. A site evaluator may otherwise choose to use this chapter if it seems applicable.

Background: Seasonal high ground water tables that can severely limit the proper functioning of system may be effectively lowered by the installation of curtain drains in certain situations. Curtain drains are particularly effective at intercepting perched seasonal ground water tables on sites with large contributing drainage areas.

SITE LAYOUT

Requirements: Curtain drains shall be up-slope of the disposal field, approximately perpendicular to the flow of ground water, intercepting and diverting ground water away from the disposal field.

Setbacks: The minimum distance between the disposal field and a curtain drain shall be as follows:

Setback up-slope: A minimum setback distance of 10 feet shall be maintained between a curtain drain and the up-slope edge of a disposal field. The curtain drain shall be located beyond the toe of the uphill fill extension if the uphill extension is greater than 10 feet and constructed so that the curtain drain is located to prevent any underdrain of the disposal field.

Setback cross slope: A minimum setback distance of 15 feet shall be maintained between a curtain drain and the ends of a disposal field and constructed so that the curtain drain is located to prevent any underdrain of the disposal field.

CONDITIONS WHERE CURTAIN DRAINS MAY WORK

General: For curtain drains to function properly, certain site and soil conditions shall be present. These include a friable, permeable top soil underlain by a firm, impervious subsoil on a sloping site where the contributing up-slope drainage area is sufficient to create a seasonal perched water table. Soils that are saturated for prolonged periods or that have very slow permeabilities and sites that are level or that have artesian aquifers are not practical to drain.

Soil profiles 1, 3, and 7: Soil profiles that are the most practical to drain are those having shallow perched ground water tables with lateral ground water flow on moderate slopes.

Soil profile 8: Curtain drains may also be used effectively on soil profile 8 soils in cases where the topsoil layer contrasts sufficiently with the subsoils to create a laterally flowing perched seasonal ground water table.

Soil profile 5: Curtain drains can be used on soil profile 5 soils with a cemented soil horizon located on sloping sites. For a curtain drain to be effective on profile 5 soils, the cemented layer shall be continuous, have created a perched seasonal ground water table above it, and the excavation for the curtain drain shall not extend below the cemented soil horizon.

EXCAVATION

Requirements: The curtain drain excavation shall be carried out as follows:

Minimum depth: The excavation for the curtain drain shall extend into, but not through, the entire thickness of the hydraulically restrictive soil horizon.

Minimum width: The excavation for the curtain drains shall be a minimum of 2 feet wide for the entire length of the curtain drain.

Drain discharge extensions: To accommodate the drain discharge pipes the excavation shall extend, on each end of the disposal field, beyond the extent of the curtain drain; it shall go from the down-slope side of the disposal field to free-flowing, stabilized outlets.

CHAPTER 9-DRAINAGE PIPE

GENERAL

Drainage pipe shall be laid throughout the entire length of the excavation and shall be placed immediately above the barrier fabric at the bottom of the excavation and midway between the sides.

Curtain drain piping: Up-slope of the up-slope side and on the cross slope ends of the disposal field, where the excavation is filled with curtain drain stone, the pipe shall be perforated.

Curtain drain extension piping: Down-slope of the down- slope side of the disposal field, and beyond the extent of the curtain drain stone, the pipe shall be non-perforated.

Minimum pipe size: The size of the pipe shall be large enough to handle the expected volume and in no case shall the pipe diameter be less than 6 inches.

Type of pipes: The following materials are acceptable for the drainage pipe in curtain drains:

Acrylonitrite-Butadiene-Styrene (ASTM D-2751);
Polyvinyl Chloride (ASTM D-2729, D-3034);
Styrene-Rubber (ASTM D-2852, D-3298); or
Polyethylene, straight wall (ASTM D-1248).

CURTAIN DRAIN STONE

Requirements: That portion of the curtain drain excavation that will accommodate the drain pipe shall be filled with stone to a depth that is a minimum of 12 inches higher than the top of the perched seasonal ground water table that is to be drained. Stone used for this purpose shall:

Cleanliness: Be washed gravel or crushed stone, free of fines, dust, ashes, or clay; and

Size: No smaller than 3/4 inch and no larger than 2 1/2 inches in size.

Specifications: A site evaluator may define a more stringent standard for stone size for any particular system.

BARRIER MATERIAL

Hay barrier: A minimum of two (2) inches of compressed hay shall be placed immediately above stone if hay is used; or

Filter fabric barrier Filter fabric shall consist of continuous layers of non-woven fabric and should be placed throughout the entire length of the curtain drain, above, below, and along the sides of the curtain drain stone. The following requirements shall be met:

Overlapping fabric: The edges of adjacent sheets of non-woven fabric shall be overlapped by a minimum of 6 inches.

Type of fabric: The type of non-woven fabric used shall be specified in the system design. It shall have adequate tensile strength to prevent ripping during installation and back- filling, adequate permeability to allow unimpeded passage of water, and adequate particle retention to prevent migration of soil particles into the curtain drain stone. The minimum physical properties for the fabric shall be 1.5 ounces per square yard (per ASTM D-3776) and a flux (or rate or transfer of water) of 100 gallon per square foot per minute. (per ASTM D-4491).

FREE-FLOWING OUTLETS

Requirements: Free-flowing outlets shall be provided down-slope of the curtain drain extensions. Outlets shall meet the following requirements:

Discharge point: Outlets may empty into a drainage swale discharging to a surface water body, a ground water recharge basin, or a gravel bed;

Outlet design: Outlets shall be designed, installed, located, and maintained in a manner that does not cause soil erosion, surface flooding, or damage to adjacent properties, does not create a public nuisance, and does not violate any applicable Federal, State, or local laws or regulations; and

Rodent control: Adequate measures shall be taken to protect each outlet from the entry of rodents or other small animals.

FILL

Requirements: Fill material over the curtain drain discharge pipes shall be of earth of a texture that is similar to or coarser than that found at the site and free of large stones, stumps, broken masonry, or other waste construction material.

CHAPTER 10 - LOW PRESSURE DOSING

BACKGROUND

This Chapter is one suggested way of sizing the distribution pipe and manifold diameters for various hole diameters, hole spacing, distribution pipe lengths, and manifold lengths.

This Chapter is based upon plastic pipe with a Hazen-Williams coefficient of C = 150. The orifice equation for shape-edged orifices (discharge coefficient = 0.6) was used to compute discharge rates through each orifice. The maximum distribution pipe length for a given hole size and spacing was defined as that length at which the difference between the rates of discharge from the distal end and the supply end orifices reach 10% of the distal orifice rate.

DESIGN PROCEDURE

Fields with the same elevation: Use the appropriate tables in the EPA's Onsite Wastewater Treatment System Manual.

Fields at different elevations: If a multiple disposal field system is proposed where the bottoms of the disposal fields will not be at the same elevation in all fields, the site evaluator should demonstrate by means of appropriate calculations, that all portions of all disposal fields will receive equal hydraulic loading. One way of accomplishing this would be to divide the disposal system into sections consisting of individual disposal fields or groups of disposal fields that are at the same elevation and that are dosed individually in conformance with the requirements of the Subsurface Wastewater Disposal Rules

CHAPTER 11- PRE-TREATMENT, POST-TREATMENT, AND SEPTIC TANK FILTERS

PRE-TANK TREATMENT

Sand filters: Pre-treatment sand filters should be designed, installed and maintained in conformance with the guidelines set forth in the United States Environmental Protection Agency's Design Manual ***On-site Wastewater Treatment and Disposal Systems***, EPA-625/1-80-012.

The specific guidance Sections are:

Intermittent sand filters:EPA-625/1-80-012 Section 6.3.

Buried sand filters:EPA-625/1-80-012 Section 6.3.

Free Access sand filters (Non-recirculating):EPA-625/1- 80-012 Section 6.3.

Recirculating sand filter:EPA-625/1-80-012 Section 6.3.

POST-TANK TREATMENT

Post septic tank filters perform two basic functions; retention of the solids in the effluent and lowering the BOD^5, TSS, and other parameters. Post-tank filters are comprised of two major types: peat modules and filter media devices. A potential purchaser is advised to obtain information pertaining to the recommended model, relative cost, availability, installation and maintenance procedures and flow rates from the manufacturer or distributor.

IN-TANK SEPTIC TANK FILTERS

In-tank septic tank filters perform two primary functions; retention of the solids in the tank and lowering of the BOD and TSS. A potential purchaser is advised to obtain information pertaining to the recommended model, relative cost, availability, installation and maintenance procedures and flow rates from the manufacturer or distributor.

DESIGN AND INSTALLATION

The filters should be designed, installed and maintained per the manufacturer's department - approved instructions or EPA specifications, as appropriate.

CHAPTER 12 - WORK ADJACENT TO WETLANDS AND WATER BODIES

GENERAL

In order to prevent runoff which may carry sediment from the disturbance activity from directly entering water bodies the standards in this Chapter apply to all ground disturbance occurring within 100 feet of a coastal wetland,

Permits required: Soil disturbance activities that cannot meet all of the following standards are subject to permit requirements under the Natural Resources Protection Act administered by the Maine Department of Environmental Protection.

REQUIRED BUFFER STRIPS AND RUNOFF DIVERSION

Sites with slopes of less than 20%: Where sustained slopes are less than 20%, a 25 foot setback should be maintained between the normal high water line or upland edge of a coastal wetland, freshwater wetland, great pond, or water course (whichever is more restrictive) and any soil disturbance activity; and

Sites with slopes exceeding 20%: Where sustained slopes exceed 20%, a 100 foot setback should be maintained between the normal high water line or upland edge of the coastal wetland, freshwater wetland, great pond, or water course (whichever is more restrictive) and any soil disturbance activity; and

Runoff diverted: Upland surface water runoff should be diverted around the soil disturbance activity.

Replacement systems: The setback requirements for removal, replacement or maintenance of waste water disposal systems, authorized by this code, can be waived when no practical alternative exists and the LPI agrees.

BUFFER STANDARDS

Buffers with vegetation: Existing vegetation within the 25 foot setback zone should remain undisturbed except when removal is required for the maintenance, repair or installation of a replacement system.

Buffers with no vegetation: For soil disturbance activities where the setback from the protected natural resource is not vegetated and the slope between the activity and the protected natural resource is 3% or greater, a row of hay bales or silt fencing should be installed between the activity and the edge of the setback. The hay bales or silt fencing should be maintained until the activity area is fully stabilized.

Wetland disturbance: Wetlands vegetation should not be destroyed or permanently removed. If wetlands vegetation should be disturbed during the project, it should be reestablished immediately upon completion of the work and should be maintained. This standard should not apply to fill or disposal areas required for replacement of waste water disposal systems.

Wet soils: No soil should be disturbed during any period when soils are saturated due to rain or snow melt, except for repair or installation of a replacement system in accordance with the Subsurface Wastewater Disposal Rules.

Erosion control barriers: Prior to the start of a soil disturbance activity, erosion control measures such as staked hay bales, or silt fence should be properly installed and adequately maintained for the duration of the project, to prevent the wash of materials into the resource.

Time limit: All soil disturbance activities should start and finish within a one month time frame.

SITE STABILIZATION

Disturbed soil should be immediately stabilized, upon activity completion or if the area is not to be actively worked for more than one week, using temporary or permanent measures such as placement of riprap (in accordance with this code), sod, mulch or erosion control blankets, or other comparable measures.

Mulch: Hay or straw mulch, where used, should be applied at a rate of at least one bale per 500 square feet (1 1/2 to 2 tons per acre)

Mulch anchoring: Mulch should be anchored with netting, peg and twine, or other suitable method and should be maintained until a catch of vegetation is established over the entire disturbed area.

Additional: In addition to placement of riprap, sod, erosion control blankets or mulch, additional steps should be taken where necessary, in order to prevent sedimentation of the water. Evidence of sedimentation includes visible gully erosion, discoloration of water by suspended particles and slumping of banks. Silt fences, staked hay bales and other sedimentation control measures, where planned for, should be in place prior to commencement of work, but should also be installed whenever necessary due to sedimentation.

Note: The discharge of sediment to a water body violates Title 38 M.R.S.A. § 413.

Duration of temporary erosion control: Mulch or other temporary erosion control measures should be maintained until the site is permanently stabilized with vegetation or other permanent control measures.

Final vegetative cover: Permanent revegetation or seeding of all disturbed areas should occur, immediately upon project completion or, if temporary stabilization measures were used, within 30 days from the time the areas were last actively worked except where precluded by the type of activity (e.g. riprap, road surfaces, etc.). For fall or winter activities, in addition to other temporary erosion controls, all disturbed areas should be covered with a layer of mulch. A row of hay bales or silt fence should also be installed between the activity and the upland edge of the wetland or normal high water line (whichever applies). Permanent revegetation measures should be undertaken by June 15th. Temporary erosion and sedimentation controls (e.g. mulch, hay bale barriers, etc.) should be maintained in the interim. The vegetative cover should be maintained.

Lime and fertilizer: Lime and fertilizer may be applied based on requirements determined through a soil test; or in lieu of a soil test, application rates should not exceed the following:

Ground limestone: 3 tons/acre (130 lbs./1000 Sqft.)

Fertilizer, 10-10-10 or equivalent: 600 lbs./acre (14 lbs./1000 Sqft.)

Fertilizer should not be applied before the start of the growing season, nor after September 30th. Fertilized areas should be mulched to reduce off-site transport of nutrients until used by vegetative growth.

Note: Erosion and sedimentation control measures should comply with Soil Conservation Service/Soil and Water Conservation District specifications.

CHAPTER 13 - STABILIZATION OF DISTURBED SOIL AREAS BY PERMANENT SEEDING OF GRASS

Furnished by the Maine Soil and Water Conservation Commission

GENERAL

The following steps are presented as a guide for protecting bare soil areas that do not have severe limitations for erosion and sedimentation by establishing permanent seedings of grass. This does not imply that grass is the only or the best method of stabilizing disturbed soil areas (other vegetative and non-vegetative measures may be equally or, in some cases, more effective) but it is the most commonly used and is generally quite effective. For sites that have severe limitations, such as very poorly drained soil areas or very steep slopes, you should contact an expert in this field. Your local Soil and Water Conservation District may be of help.

Final grades: Shape all disturbed areas which are to be revegetated to final design grade, including installation of all measures to provide surface and subsurface drainage and need erosion and sediment control measures.

Topsoil placement: On those sites where the exposed and underlying soil material will not support vegetation apply a minimum of 4-6 inches of topsoil as part of construction.

Clean topsoil: Topsoil should be friable loamy material and should be free of debris, trash, stumps, rocks, roots, noxious weeds, etc. Topsoil material may be created by mixing compost with subsoils which would not otherwise support vegetation.

Site preparation: The surface of areas to be top soiled should be loosened to a depth of two inches and the topsoil mixed within this depth to insure bonding of the topsoil and subsoil.

Site condition: Topsoil should not be placed which in a frozen or muddy condition, when subgrade is excessively wet, or in a condition that may otherwise be detrimental to proper grading or seeding.

Topsoil compaction: Compact the topsoil enough to insure good contact with underlying soil and smooth to allow seedbed preparation. Avoid compaction that will increase runoff and erosion, deter seed germination or prevent proper anchoring of mulch.

Seedbed Preparation

Scarification: After construction is completed, the seedbed should be worked or loosened to a depth of 4". For those areas that are not accessible by equipment or where the use of equipment should be avoided (such as subsurface waste water disposal fields) scarification should be done by hand.

Repack the seedbed: Pack the seedbed, which has been loosened by equipment, prior to seeding to break up large clods and firm the seedbed. The entire prepared seedbed shall be soft enough to permit covering the seed and anchoring mulch, yet firm enough to prevent burying seeds too deep. For example, the soil should be firm enough to support the weight of a person without sinking into the soil more than one-half inch.

Lime and Fertilizer: Ideally, soil tests should be used and recommendations for lime and fertilizer followed. However, this is not usually practical due to the length of time it takes to get results.

In lieu of soil tests:

Type of fertilizer: Apply 900 lbs of 5-10-10 or 10-10-10 (N-P205-k20) fertilizer or equivalent per acre (20 lbs. per 1000 Sqft.). In sensitive lake watersheds, use low phosphorous fertilizer such as 10-5-10.

Application rate: Apply ground limestone at a rate of three tons per acre, or 140 lbs. per 1000 square foot. As practical, work lime and fertilizer into the soil, either before or during final seedbed preparation. Raking is a good way of doing this.

PLANT SELECTION, SEEDING RATES AND SEEDING DATES

General: Select vegetative mixture for the purpose and site conditions. Listed below are a few general purpose examples of permanent grass seed mixes which, when applied to a properly prepared seed bed, will provide for permanent stabilization of disturbed soil areas (temporary stabilization measures may also be necessary, especially in sensitive lake watersheds). There are other equally effective mixes available. However, care should be taken when selecting a mix to avoid high percentages of annual grasses and high percentages of weeds. The user should also be sure to select a mix which is well suited for the intended use; do you want a lawn or are you simply interested in stabilizing the area? Is the area wet or droughty, shaded or sunny?

Lawn mixes:

For well drained and full sun areas: Species, lbs of seed/acre, lbs of seed/1000 Sqft.

Kentucky Bluegrass, 30, 0.94

Creeping Red Fescue, 40, 0.94

Red Top, 5, 0.12

Total, 85, 2.0

For moist and shaded areas: Species, lbs of seed/acre, lbs of seed/1000 Sqft.

Creeping Red Fescue, 40, 0.94

Roughstalk Bluegrass, 40, 0.94

Redtop, 5, 0.12

Total 85, 2.0

Non-lawn mixes:

For moist to well drained and full sun areas: Species, lbs of seed/acre, lbs of seed/1000 Sqft.

Tall Fescue (ky.31), 20, 0.50

Creeping Red Fescue, 20, 0.45

Red Top, 20, 0.05

Total, 42, 1.0

For moist to well drained and shaded areas:

Tall Fescue (KY.31), 30, 0.70

Creeping Red Fescue, 50, 1.30

Total, 80, 2.0

Application: Seed should be uniformly broadcast over the surface and soil rolled or packed where slope conditions permit. Where rolling or packing is not feasible, the seed should be raked into the top one-quarter inch of soil.

Dates: Seed may be applied as dormant seeding if not applied in time to germinate before the first killing frost. If applied as dormant seeding, increase recommended rate 25%.

MULCHING

General: Mulching is an important step in establishing vegetation. Properly applied, mulch will help hold moisture, protect soil from erosion, hold seed in place, keep soil temperature more constant, prevent surface compaction or crusting, control weeds and prevent birds from eating the seed.

Hay or straw: The most commonly used and readily available mulch material is hay or straw. When using this mulch material, care should be taken to avoid using sources which have high amounts of weed seeds.

Application rate: Apply at a rate of 90-100 bales per acre or 2 bales per 1000 sq. feet so that 75%-90% of the surface is lightly covered.

Anchoring: Since hay and straw are subject to wind blowing, unless kept moist, anchoring may be necessary. This is especially true for: areas prone to high velocity winds; areas which are environmentally sensitive, such as lake watersheds, and 3.) areas which were not seeded in time to establish vegetative cover before the first killing frost and would otherwise be bare until the next growing season. Mulch should cover 100% of the surface for these areas and be at least 2" thick. Suitable methods of anchoring hay or straw mulch include:

Peg and twine: After mulching, divide area into blocks approximately one square yard in size. Drive 4-6 pegs per block to within 2" - 3" of the soil surface. Secure mulch to surface by stretching twine between pegs in a crisscross pattern on each block. Secure around each peg with two or more turns. Drive pegs flush with soil where mowing is planned.

Staples: Use the same procedure as described above in peg and twine to divide area after mulching. Insert 4-6 staples over twine in each block. Twine should be placed in a crisscross pattern.

Soil: Cut hay or straw mulch into soil surface with square edged shovel. Make cuts in contour rows spaced 18" apart.

Jute mats: Jute mats or mulch netting may also be used. It can be purchased in rolls and anchored by stapling.

Hydroseeding: Hydroseeding is another alternative mulch which includes seed, fertilizer and lime in a sprayed-on slurry.

MAINTENANCE

General: While the vegetation is becoming established, it will be necessary to periodically inspect disturbed soil sites and re-stabilize any areas which show evidence of erosion, or where vegetation fails to catch. Areas where heavy mulch applications were used for late fall and winter stabilization will need to be raked so that mulch lightly covers 75% - 90% of the surface, as described in the previous Section on mulching. If mulch is too thick, vegetation will have difficulty becoming established.

New lawns: New seedlings should be treated chemically or mowed to control weeds. Mowers should be set to cut no closer than 2" above ground level.

Older lawns: To maintain a healthy lawn, soil tests should be periodically taken and recommendations followed. This is particularly important in sensitive watersheds where excess fertilizer may end up in surface water bodies or over sole source aquifers where groundwaters may be impacted. In lieu of soil tests, annual applications of at least 45 pounds of elemental nitrogen (N) per acre or one pound per 1000 sq. feet, 25 pounds of phosphate (P205) per acre or one-half pound per 1000 sq. feet and 25 pounds pf potash (K20) per acre or one-half pound per 1000 sq. feet. Ground limestone should be applied periodically to maintain a soil pH of at least 6.0.

For additional information: For information on how to take soil samples for soil fertility tests, contact your local Soil and Water Conservation District or Cooperative Extension Service or write to:

Maine Soil Testing Service, 25 Deering Hall, University of Maine, Orono, Maine 04473

CHAPTER 14 - NITRATE-NITROGEN IMPACT ANALYSIS FOR ENGINEERED SYSTEMS

GENERAL

Nitrogen contamination of ground and surface waters, due to on-site disposal of waste water, may be a public health and environmental problem in some areas. A public health problem of particular concern is nitrate contamination of drinking water supplies. Ingestion of water containing concentrations greater than 10 milligrams per liter of nitrate-nitrogen can be a cause of oxygen deficiency in young children and infants. Of environmental concern is the fact that nitrogen may be the limiting nutrient that controls eutrophication in coastal marine waters, estuaries, and some fresh water lakes and ponds. Therefore, excess nitrogen added to a water body may enhance eutrophication resulting in algal growth and other undesirable effects.

Intent: The intent of this chapter is to provide a simple screening method for determining whether a more site-specific modeling of the nitrogen impact should be considered for those systems handling 2,000 gpd or more. The function of the nitrogen screening analysis is to show that nitrogen leaving the disposal field should not cause nearby domestic water supplies to exceed the acceptable nitrate-nitrogen limit of 10 milligrams per liter.

NITROGEN SCREENING ANALYSIS

Procedure: The following procedure provides a simple method of determining whether a more site-specific modeling of nitrogen impact is needed.

Step 1: Determine the overall size of the property in square feet;

Step 2: Determine the design flow from the Subsurface Wastewater Disposal Rules; and

Step 3: Using the most prominent soil profile condition, multiply the design flow by figure given in Table 14-1. For example, assume a property has a soil profile 6, a soil condition C, and a system design flow of 3000 gpd. Reading down the left-hand column of Table 14-1 to soil profile 6 and across to soil condition C gives the figure of 78 square feet needed to dilute each gallon of waste water. Now, multiplying the design flow of 3,000 gpd by the 78 square feet gives an answer of 234,000 square feet.

This answer gives the minimum square footage of land area needed to reduce nitrate-nitrogen to an acceptable level.

TABLE 14-1 Minimum square feet needed to dilute each gallon of waste water with 40 mg/l NO_3-N

Soil profile	Soil conditions						
	AI	**AII**	**AIII**	**B**	**C**	**D**	**E**
1	112	82	82	78	82	82	112
2	112	82	78	78	78	82	112
3	112	82	82	82	82	82	112
4	112	82	78	78	78	82	112
5	112	82	78	78	78	82	112
6	112	82	78	62	78	82	112
7	112	82	82	82	82	82	112
8	112	82	82	78	82	82	112
9	112	82	82	82	82	82	112
11	112	82	78	78	78	82	112

Waste water with 20 mg/l NO_3-N.

Soil profile	Soil conditions						
	AI	AII	AIII	B	C	D	E
1	37	27	27	26	27	27	37
2	37	27	26	26	26	27	37
3	37	27	27	27	27	27	37
4	37	27	26	26	26	27	37
5	37	27	26	26	26	27	37
6	37	27	26	21	26	27	37
7	37	27	27	27	27	27	37
8	37	27	27	26	27	27	37
9	37	27	27	27	27	27	37
11	37	27	26	26	26	27	37

Questionable sites: If the square footage calculated in "Step 3," is larger than the actual square footage on the property, suggested that a site-specific nitrate impact analysis may be needed.

ASSUMPTIONS USED

General: The NO_3-N impact screening analysis is based on the assumptions in this Section.

Assumption 1: The approach is a simple mass balance model assuming shallow ground water in the "interflow" and "throughflow" regime.

Assumption 2: All the nitrogen is converted to nitrate ions in the soil within the boundaries of the property.

Assumption 3: The nitrate-nitrogen concentration of the treated waste water leaving the disposal field is assumed to be in compliance with Table 14-2.

Assumption 4: No allowance is made for nitrogen removal by vegetation.

Assumption 5: No allowance is made for nitrogen removal by soil sorption.

Assumption 6: No allowance is made for dilution by subsurface water moving onto the site.

Assumption 7: A fraction of the annual precipitation will infiltrate the soil and be available to mix with and dilute the nitrogen in the treated waste water. That fraction depends on ground cover, land usage, hydrologic soil group, and the amount and duration of precipitation. Most of these factors will vary on any given site.

TABLE 14-2

NO_3-N concentration of effluent leaving the disposal field

Disposal system type	Initial NO_3-N concentrations
Disposal field	40 mg/l
Peat-bed or filter	20 mg/l
Denitrification (e.g. "RUCK" system)	See note below

Note: Initial NO_3-N concentration is to be determined on a case-by-case basis from valid field-test data provided by the designer and/or manufacturer of the proposed denitrification system.

Assumption 8: Dependent on site and soil conditions, varying percentages of the treated waste water and the infiltrated precipitation are able to move down to ground water used for water supplies. The remaining portions of the infiltrating precipitation and the treated waste water tend to move down slope, parallel to the ground surface, as perched water.

Assumption 9: The annual precipitation rate is 25.2 inches per year. (This figure is 60% of the 42 inches per year average annual precipitation rate to adjust for drought years.)

Assumption 10: To dilute each gallon of waste water containing 40 milligrams of nitrate-nitrogen per liter to a desired 10 milligrams of nitrate-nitrogen per liter requires 3 gallons of infiltrating precipitation for each gallon of waste water. For a peat disposal field the assumption is that 1 gallon of infiltrating precipitation is needed for each gallon of waste water for peat disposal field effluent containing 20 milligrams of nitrate-nitrogen per liter.

Assumption 11: A certain amount of background NO_3-N exists in the ground water being evaluated. This parameter is not considered in these calculations because of the conservatism built into assumptions 4, 5, and 6.

Assumption 12: NO_3-N is contained in the precipitation that falls and infiltrates the site at an average concentration of 0.5 mg/l. This parameter is not considered because of the conservatism built into assumptions 4, 5, and 6.

Assumption 13: A certain amount of NO_3-N may be contributed by the development itself or from post-development activity (e.g., lawn fertilizer). This parameter is not considered because of the conservatism built into assumptions 4, 5, and 6.

Assumption 14: Since the nitrate plume may or may not disperse and its width and direction are difficult to predict therefore it is assumed that any precipitation falling on the property may be available for diluting the waste water.

Assumption 15: A certain percentage of the annual precipitation will infiltrate and recharge the soil. This will be available to mix with and dilute NO_3-N as determined by the type of surficial geologic deposits, or by the hydrologic soil group as defined by the U.S. Soil Conservation Service. Used together, Table 14-3 and Table 14-4 give the percentage of infiltration for each soil group. Note: The percentage of the infiltrating water that reaches the permanent ground water table is in the range of 5% to 20%.

First, read down the side of Table 14-3 and find the appropriate soil profile. Then read across to the column for the appropriate soil condition. For example, for a soil profile 4 and a soil condition C, the hydrologic soil group is "B."

Now, using Table 14-4, find the slope of the land down the left- hand column. Then read across to the hydrologic soil group to find the annual infiltration rate. For example, for a slope of 8-15% and a hydrologic soil group "B," the annual infiltration rate is 0.024 gallons per day for each square foot of area.

TABLE 14-3

Hydrologic soil groups vs soil profile and soil conditions

Soil profile	Soil Conditions						
	AI	**AII**	**AIII**	**B**	**C**	**D**	**E**
1	D	D	C	C	C	C	D
2	D	D	C	B	B	C	D
3	D	D	C	C	C	C	D
4	D	C	C	B	B	C	D
5	D	C	C	B	B	C	D
6	D	C	C	A	B	C	D
7	-	C	C	C	C	C	D
8	D	D	C	C	C	D	D
9	D	D	C	C	C	D	D
11	D	C	C	B	B	C	D

Note: Recharge rates for shallow upland soils that are underlain by fractured bedrock and that are designated in hydrologic soil group D, should be determined according to geologic properties, rather than by the hydrologic soil group.

Some profile conditions have dual designations (C/D,A/B,etc.) The most restrictive hydrologic group was used in preparation of this chart. (Source - Maine Soil and Water Conservation Commission with the assistance by the U.S.D.A. Soil Conservation Service)

TABLE 14-4

Annual average infiltration vs hydrologic soil group

Slope	Average infiltration			
	Hydrologic soil group			
	A	**B**	**C**	**D**
0-8%	.036	.030	.024	.018
8-15%	.029	.024	.022	.016
16-25%	.023	.019	.019	.014
>25%	.016	.016	.016	.012

CHAPTER 15 - WASTEWATER MOUNDING IMPACT ANALYSIS

GENERAL

The intent of this chapter is to provide a simple screening method for determining whether a site-specific modeling of waste water mounding is required. **These processes apply to systems with design flows of 2,000 gpd or greater.** Site evaluators may otherwise choose to use this chapter if it seems applicable. Care must be taken when applying this chapter to assure that test holes used are truly representative of the site. Results should be compared to textbook values for permeability. Much of this information was adapted from **Healy & May** *Seepage and Pollutant Renovation Analysis for Land Treatment, Sewage Disposal Systems (1982).*

SLOPING SITES

General: It should be shown that the waste water effluent will not mound under the disposal field and surface within 50 feet down slope of disposal field(s) using the screening analysis in this Section.

Step 1: Determine the approximate location of the proposed disposal field(s).

Step 2: Locate the top of the watershed or the property line up slope of the proposed disposal field, whichever is closer to the disposal field. Dig an observation hole. Call this hole, "U."

Step 3: Based on mottling or standing groundwater, determine the depth in inches of perched seasonal water above any hydraulically restrictive horizon present in pit "U." Call this depth, "Tu."

Step 4: Dig an observation hole down slope from the disposal field, at 50 feet away or at the property line, whichever is closer to the disposal field. Call this pit, "D."

Step 5: Based on mottling or standing groundwater, determine the depth in inches of perched seasonal water above any hydraulically restrictive horizon present in pit "D." Call this depth, "Td."

Step 6: At observation hole "D," determine the depth of the seasonal water below the surface of the ground. Call this depth, "BG."

Step 7: Determine the distance in feet between the up-slope observation hole, "U," and the down slope observation hole, "D." Call this distance, "X."

Step 8: Compare "Tu" and "Td." If "Tu" is greater than or equal to "Td," the site passes the screening. If "Tu" is less than "Td," there is an increase in the perched seasonal water table (SWTI). Continue with the following steps.

Step 9: Using TABLE 15-1 determine the hydrologic soil group that best represents the soils near the proposed disposal field. (See "Assumption 15," for an explanation of how to use TABLE 15-1.)

Step 10: Using the hydrologic soil group determined in Step 9 above the average slope between observation holes "U" and "D," and TABLE 15-3 determine the wet season infiltration rate in gpd/sqft. Call the infiltration rate, "RI." Thus, for a hydrologic soil group B on a 10% slope, RI = 0.38 gpd/sqft.

Step 11: Using Equation 15-1, calculate the number of gallons per day falling on a one-foot-wide strip from hole "U" to hole "D." Call the result of the calculation, "Qp."

<u>**Equation 15-1**</u>

Qp = (X ft)(RI)

Step 12: Use Equation 15-2 to calculate how much additional waste water, in gpd/linear foot across the slope, the site can be expected to handle. Call the additional waste water, "WWf."

TABLE 15-1

Hydrologic soil groups vs soil profile and soil conditions

Soil Profile	**Soil Conditions**					
	AI	**AII**	**B**	**C**	**D**	**E**
1	D	C	B	C	C	D
2	D	C	B	B	C	D
3	D	C	C	C	C	D
4	D	C	B	B	C	D
5	D	C	B	B	C	D
6	D	C	A	B	C	D
7	D	C	C	C	C	D
8	D	C	B	C	C	D
9	D	C	C	C	C	D
11	D	C	B	B	C	D

Equation 15-2

WWf = (BG)(Qp)/(SWTI)

Step 13: Using the waste water loading rate, determine the linear feet (L) of disposal field, parallel to the topological contour, that will be needed to handle the design flow (DF) in gallons per day, using Equation 15-3.

Equation 15-3

L = DF/WWf

Questionable sites: If the design flow exceeds the waste water loading rate determined in the screening procedure, a site- specific hydrological study is needed.

FLAT SITE

General: A flat site shall have the capacity to transmit the septic tank effluent for an adequate distance without surfacing or mounding. On flat sites, there is a greater tendency toward effluent mounding. Most health agencies agree that travel through 50 feet of most soils will provide adequate treatment.

Screening procedure: It should be shown that the waste water effluent will not mound under the disposal field(s) using the flat-site screening analysis in this Section.

Step 1: Determine the approximate location of the disposal field.

Step 2: Locate the center of the proposed disposal field. Dig an observation hole and call this hole, "C."

Step 3: Determine the length and width of the disposal field in feet. Call the length, "L," and the width, "W."

Step 4: Use Equation 15-4 to determine the area immediately under and within 50 feet of the disposal field (A) in square feet.

Equation 15-4

A=(L+100)(W+100)

Step 5: Based on mottling or on standing groundwater, determine the depth of perched seasonal water in inches above any hydraulically restrictive horizon present in observation hole "C." Call the depth of perched seasonal water, "PSW."

Step 6: Also at observation hole "C," determine the depth in inches of the seasonal water below the surface of the ground. Call the depth of the seasonal water table, "BG."

Step 7: Using TABLE 15-1 determine the hydrologic soil group that best represents the soils near the proposed disposal field. (See "Assumption 15" in CHAPTER F for an explanation of how to use TABLE 15-1.)

Step 8: Using the hydrologic soil group determined in Step 7 above and TABLE 15-2 determine the wet-season infiltration rate in gpd/sqft. Call the infiltration rate, "RI." For example, a hydrologic soil group B has a wet-season infiltration rate of 0.50 gpd/sqft.

TABLE 15-2

Wet season infiltration vs hydrologic soil groups on flat sites

Hydrologic soil group	**Wet season infiltration**
A	0.060 gpd/sqft
B	0.050 gpd/sqft
C	0.040 gpd/sqft
D	0.030 gpd/sqft

Step 9: Using the wet season infiltration rate (RI) from TABLE 15-2 above, calculate the number of gallons per day (Qp) falling on and within 50 feet of the disposal field, using Equation 15-5.

Equation 15-5

Qp=(A)(RI)

Step 10: Use Equation 15-6 to calculate the additional waste water, "WW," in gallons per day that the disposal field and the site can be expected to handle.

Equation 15-6

WW=(BG)(Qp)/(PSW)

Questionable sites: If the proposed design flow exceeds WW determined in this screening procedure, a site-specific hydrological study is needed.

ASSUMPTIONS USED

General: These mounding screening analysis are based on the assumptions in this Section.

Assumption 1: The approach is a simple mass balance model assuming shallow ground water in the "interflow" and "throughflow" regime.

Assumption 2: A fraction of the annual precipitation infiltrates the soil and creates temporary perched water tables. That fraction depends on ground cover, land usage, hydrologic soil group, and the amount and duration of precipitation. Most of these factors will vary on any given site.

Assumption 3: Sloping sites with hydraulically restrictive horizons shall have the capacity to transmit the septic tank effluent for an adequate distance without surfacing or breaking out. Most health agencies agree that travel through 50 to 100 feet of most soils will provide adequate treatment.

Assumption 4: The observed differences in the depths of perched zones of saturation over hydraulically restrictive horizons are directly proportional to the volume of precipitation infiltrating the site and the ability of the zones to handle and transport the infiltrating precipitation.

Assumption 5: The model assumes that the maximum elevation in the perched zones of saturation occur in early spring.

Assumption 6: The percentage of springtime precipitation that infiltrates the soil can be used as a gauge to evaluate how a specific site handles water. The percentage of precipitation is determined by the types of surficial geologic deposits, or by the hydrologic soil group as defined by the U.S. Soil Conservation Service. These percentages are prescribed in Tables 8-2 and TABLE 15-3.

Assumption 7: The average annual precipitation rate is 42 inches per year.

Assumption 8: This model assumes that 100% of the precipitation falling on the entire site infiltrates into the soil, resulting in an elevation of the seasonal zone of perched saturation.

Assumption 9: The average daily infiltration resulting in an elevation of the perched zone of saturation during wet seasons of the year is determined from Tables 8-2 and 8-3 .

TABLE 15-3

Wet season infiltration (gpd/sqft) vs hydrologic soil group on sloped sites

Slope	**Hydrologic soil group**			
	A	**B**	**C**	**D**
0-8%	.060	.050	.040	.030
8-15%	.048	.038	.037	.027
15-25%	.038	.032	.032	.023
>25%	.028	.027	.027	.020

CHAPTER 16 - EXPERIMENTAL AND INNOVATIVE/ALTERNATIVE TECHNOLOGY

GENERAL

Under provisions of the Maine State Plumbing Code, Subsurface Wastewater Disposal Rules (Rules), experimental or innovative/alternative onsite sewage disposal system technology (collectively, I/A systems) may be installed in Maine for evaluation purposes, provided that all such technology minimally shall be capable of operating at the same degree of efficacy and reliability as a conventional onsite sewage disposal system. For the purposes of this discussion, a conventional onsite sewage disposal system is defined as a septic tank, and a disposal area comprised of a stone absorption bed or proprietary disposal devices as allowed under the Rules at the time of application for I/A system approval.

Approvals

There are three (3) levels of approval for I/A systems: **Pilot**, **Provisional**, and **General Use**. All **Pilot** and **Provisional** I/A system designs shall be approved by the Maine Department of Human Services, Bureau of Health, Division of Health Engineering (Division) prior to installation.

Pilot: Pilot approval is intended to allow an applicant to demonstrate the general ability of a proposed I/A system to treat wastewater as defined in the Rules. No more than 15 installations of a specific I/A system shall be granted Pilot system approval by the Division. Pilot approvals shall be limited to sites which do not otherwise require any variance or waiver to the Rules. On no less than a weekly basis for a period of not less than one year, the applicant shall test the influent and effluent of each system for the following parameters: five day Biochemical Oxygen Demand (BOD^5), Total Suspended Solids (TSS), Nitrate Nitrogen (N03), and coliform bacteria. The results of these tests shall be submitted to the Division on no less than a quarterly basis.

Provisional: Provisional approval is intended to allow an applicant to demonstrate ability of a proposed I/A system to operate under a broader range of site conditions and to provide a larger number of data sources for such demonstration. No more than 50 installations of a specific I/A system shall be granted Provisional system approval by the Division, of which 15 may be Pilot systems previously approved by the Division. Provisional approvals shall not be granted until the Pilot systems have been in operation for at least one year. Provisional approvals may include sites which require a variance or waiver to the Rules, with the provision that such variances or waivers are also subject to the standard variance requirements of the Rules. On no less than a monthly basis for a period of not less than one year, the applicant shall test the influent and effluent of each system for the following parameters: five day Biochemical Oxygen Demand (BOD^5), Total Suspended Solids (TSS), Nitrate Nitrogen (N03), and coliform bacteria. The results of these tests shall be submitted to the Division on no less than a semi-annual basis.

General Use: To receive General Use approval for an I/A system, the applicant must demonstrate that the 50 systems installed under Provisional approval have operated as designed and intended. Upon such demonstration, the I/A system under consideration shall be granted written General Use status approval for use in Maine, and shall be included in the next revision of the Rules.

Application for I/A Approval: Applications for I/A system approval shall be as specified in the Rules