ACT 537 SEWAGE FACILITIES PLAN
FOR
ON-LOT SEWAGE SERVICE AREA
NEW BRITAIN TOWNSHIP
BUCKS COUNTY, PENNSYLVANIA

SEPTEMBER 2006

PREPARED FOR:

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ACKNOWLEDGEMENT

Carroll Engineering Corporation, on behalf of New Britain Township, has prepared this revision to New Britain Township's Act 537 Sewage Facilities Plan to address the present and future wastewater facilities needs within the On-Lot Sewage Service Area of the Township. This Plan revision has been prepared in accordance with 25 PA Code, Chapter 71, "Administration of Sewage Facilities Planning Program."

The following consultants have been involved in the preparation of this document for New Britain Township:

Administrative:	Township of New Britain
Legal:	Grim, Biehn & Thatcher in Perkasie, PA
Engineering:	Carroll Engineering Corporation in Warrington, PA

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PART 1.0 - PLAN SUMMARY

Carroll Engineering Corporation, on behalf of New Britain Township, has prepared this Act 537 Sewage Facilities Plan to address the present and future on-lot sewage disposal needs of New Britain Township, Bucks County, Pennsylvania. This report is a stand alone document which addresses only On-Lot Disposal System (OLDS) Area, within New Britain Township and shall be implemented in conjunction with the current Act 537 Plan titled, "Neshaminy Basin Sub-Region II 201 Facilities Plan" prepared by Gilbert Associates, Inc., last amended in 1987 and the "Act 537 Sewage Facilities Plan Update for Chalfont-New Britain Township Joint Sewage Authority Service Area", last amended in March of 2005. The OLDS Area consists of the On-Lot Sewage Service Area specifically identified in this document, as well as other isolated areas within the Township that are not served by public sewers. This report has been prepared in accordance with 25 PA Code, Chapter 71, "Administration of Sewage Facilities Planning Program."

This Act 537 Plan addresses the following issues:

A. Preferential List of On-Lot Sewage Disposal Systems

This Act 537 Plan establishes a Preferential List of Sewage Disposal Systems for Land Development utilizing on-lot sewage disposal. The Preferential List is provided in Table 9 at the end of Part 5.0 - On-Lot Sewage Disposal - Site Suitability and Alternatives Analysis.

B. Township Involvement

This Act 537 Plan also provides a framework and procedure for Township involvement in the site evaluation and planning process. The procedure allows for the proper siting, evaluation, design, installation and maintenance of on-lot sewage disposal systems.

C. Sewage Management Program

This Act 537 Plan establishes a proposed Sewage Maintenance Program that includes the following:

1. Enacting a Sewage Maintenance Ordinance.
2. Establishing a Sewage Hauler Approval Process.
3. Establishing a Waste Hauler Proof of Compliance Program.
4. Establishing an Educational Program.
5. Establishing a procedure for monitoring and implementation of existing On-Lot Sewage System Maintenance Agreements.
6. Appointing a Township Authorized Agent to monitor the Program.

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PART 2.0 - PLANNING

2.1 Background Information

A. Authorization

The Pennsylvania Sewage Facilities Act, enacted in 1966 (Act 537), mandates municipalities within the Commonwealth of Pennsylvania to develop and implement Official Sewage Facilities Plans, which provide for the resolution of existing and future sewage disposal needs of the municipality. Act 537 further requires municipalities to review and revise their official plans whenever the municipality or the Pennsylvania Department of Environmental Protection (PADEP) determines the Plan is out of date, cannot be implemented, is inconsistent with other municipal planning, or does not provide adequate solutions to resolve existing problems or future growth.

New Britain Township has been authorized by the PADEP to update its Act 537 Sewage Facilities Plan for the on-lot sewage disposal areas of the Township. A copy of the letter authorizing this action has been attached in Appendix A. This Plan revision has been prepared in accordance with 25 PA Code, Chapter 71, "Administration of Sewage Facilities Planning Program."

B. Purpose

The purpose of this Plan revision is to provide planning for future on-lot wastewater disposal methods within New Britain Township, while also meeting the goals and objectives established in existing municipal and county planning documents for the region. The primary goal is to ensure the protection of public health from the impacts of improper sewage disposal and provide a sewage management program for both existing and future On-Lot Disposal Systems (OLDS). These goals must be realized while evaluating the social, economic, and environmental impacts of alternatives, to determine a cost effective, viable wastewater treatment program for OLDS within the Township.

2.2 Existing Sewage Facilities Planning - Neshaminy Basin Sub-Region II 201 Facilities Plan

The "Neshaminy Basin Sub-Region II 201 Facilities Plan" was prepared for the Chalfont-New Britain Township Joint Sewer Authority (CNBTJSA) and the Bucks County Water and Sewer Authority (BCW&SA) in January 1982 by Gilbert Associates, Inc. The Plan, hereinafter called the "201 Facilities Plan," currently serves as New Britain Township's official Act 537 plan. The overall planning area encompassed by this Plan includes parts of Doylestown Township, Doylestown Borough, New Britain Township, New Britain Borough, Chalfont Borough, Plumstead Township, Warrington Township and the northwest corner of Buckingham Township.

A. Regional Planning

The Plan identified the three major public wastewater treatment plant service areas within the overall planning area as of 1982:

- Chalfont Wastewater Treatment Plant (now referred to as the Chalfont-New Britain Wastewater Treatment Plant)

- Green Street Wastewater Treatment Plant

- Harvey Avenue Wastewater Treatment Plant

The planning area was then evaluated with regard to existing and future residential, commercial and industrial growth projections. Next, soils and geologic conditions throughout the planning area were presented and evaluated for potential to serve anticipated development. Areas with poor soils and areas with documented failing on-lot sewage systems were identified. Alternative methods of dealing with land development needs were then considered. Regional sewage disposal was considered, including preliminary treatment at the various existing treatment plants and tertiary land treatment via spray irrigation.

Potential soil treatment systems for large flows were limited to spray irrigation systems, which were considered as a potential tertiary treatment methodology that would eliminate stream discharge and encourage groundwater recharge. Interpretation of various soil types within the planning area revealed limited space for any sort of regional land application system. Exclusionary factors which were considered during the evaluation process included no sites smaller than five acres, no sites in excess of 12% slopes and no sites where bedrock and/or seasonal high water tables occurred at less than 20 inches below the ground surface. When faced with these restrictions, few areas were identified with adequate soils to serve as possible spray irrigation sites. Although possible spray irrigation areas were delineated near each treatment plant, total land area was insufficient to treat the necessary flows. Therefore, spray irrigation as a regional soil treatment method was eliminated from further consideration. The reader is referred to the 201 Facilities Plan, Figure 4-3: "Spray Irrigation Sites", for additional information regarding the areas considered.

B. Condition of Existing Individual On-Lot Sewage Disposal Systems

Section 2.5 of the 201 Facilities Plan provides a discussion regarding on-lot sewage disposal in the planning area. The Plan mentions previous planning documents including The Bucks County Sewage Facilities Plan (Albright and Friel, Inc., 1970), the Central Bucks Growth Impact Study (BCPC 1977), and the COWAMP/208 Water Quality Management Plan for Southeastern Pennsylvania (DVRPC 1978). However, these documents were found to be too general in nature and did not identify specific needs to any extent. Therefore, additional research was performed by Gilbert and Associates as part of the 201 Facilities Plan, in order to better determine problem areas. This research included contact with the BCDH, and review of the planning document entitled "Septic Systems Analysis - Bucks County, Pennsylvania, Chalfont-New Britain EIS, Buckingham EIS Volume 1".

Information from the BCDH revealed approximately 107 properties in the planning area had recorded problems with on site sewage systems, which at that time represented approximately 3% of all on lot disposal systems. The majority of the failing systems

were found to occur in Doylestown Township. Failures were attributed to improper installation, improper maintenance, inadequate soils, and system overloading.

Information gathered from the Septic Systems Analysis centered around remote sensing techniques for determining septic system malfunctions and surfacing septic effluent, as documented by The Environmental Protection Agency - Environmental Photographic Interpretation Center (EPIC). This technology takes advantage of infrared aerial photography to detect changes in soil moisture and other signature indicators typical of septic system malfunctions. Reportedly EPIC remote sensing activities were performed by aerial flight on July 3, 1980. Interpretation suggested that 1,665 homes in the regional planning area had septic system problems: 790 surface failures, 510 seasonal failures, and 365 experiencing seasonal stress. According to the account provided in the 201 Facilities Plan, field reconnaissance performed subsequently verified accuracy of the EPIC conclusions. Within this Act 537 planning area, approximately 44 disposal systems were identified with surface failures and 34 disposal systems were identified with seasonal failures. A map excerpt taken from the "EPA Draft Environmental Impact Statement – Wastewater Management Facilities Chalfont-New Britain Area, Pennsylvania", dated September 1981, is enclosed in Appendix B.

C. Alternative Individual On-Lot Disposal Systems

Section 4.2.5.2 of the 201 Facilities Plan provides a detailed discussion of on-lot disposal systems that were permissible at the time of the report (1982). These systems mainly consisted of the following

1. Septic Tank - Soil Absorption Systems (ST-SAS) - A septic tank used for pretreatment, followed by discharge to on-lot subsurface beds or trenches.

2. Septic Tank - Mound Systems (ST-MS) - A septic tank used for pretreatment, followed by an elevated sand mound, which at that time, was considered an "alternative" type of system.

3. Septic Tank - Evapotranspiration Systems (ST-ETS) - A septic tank used for pretreatment, followed by a closed subsurface bed system containing sand from which evapotranspiration occurs through plantings within the bed at a rate exceeding the rate of added wastewater effluent. No net discharge to the groundwater table is permitted, and therefore the entire system depends on plant moisture removal and transfer to the atmosphere.

4. Septic Tank - Sand Filter Systems (ST-SFS) - A septic tank for pretreatment, followed by one of three types of sand filters, then followed by disinfection prior to surface water discharge. The various sand filters considered in the 201 Facilities Plan were as follows:

    a. Buried Sand Filter - Wastewater is filtered through a buried sand filter bed, the bottom of which contains a piped collection system. There is no access to the filter for maintenance purposes and, therefore, the filter is oversized to minimize the need for maintenance (300-400 square feet).

b. Intermittent Sand Filter - Wastewater is filtered through an open sand filter, the bottom of which contains a piped collection system. Periodically at least a portion of the filter media is removed and replaced. Typically the sand filter is constructed with removable insulated covers to prevent freezing in the winter. Many times this system is constructed in multiple large precast concrete tanks, providing approximately 50 to 60 square feet of filter area in each tank.

c. Recirculating Sand Filter - Wastewater is filtered through an open sand filter bed, the bottom of which contains a piped collection system. Effluent from the filter is recycled via a recycle tank and pumping system at a ratio of 4 to 1 filtrate to septic tank effluent. Again, as with the intermittent sand filter, the system is many times built within tanks with insulated covers.

d. Cluster Systems (CS) - This is another term for community systems, which are systems that are shared by several residences, consisting of any combination of the above system types.

Section 4.4.5.2.5 of the 201 Facilities Plan explores the above alternatives and eliminates all but two. The ST-SAS systems are identified as not feasible due to shallow depths to groundwater in most areas. ST-ETS systems are eliminated based again on depths to groundwater and also because of low net annual evapotranspiration rates within the study area. ST-SFS systems are eliminated due to the requirement for multiple surface water discharges into the Neshaminy Creek and the resulting conflict this would create with area-wide water quality management plans and objectives. Ultimately the remaining alternatives considered feasible were ST-MS and CS systems.

D. On-Lot Sewage Management Program

Section 6.1.4 of the Act 201 Facilities Plan addresses the above sewage disposal alternatives for outlying portions of the Central Bucks Study Area, of which this Act 537 planning area is a part. Essentially the approach is to encourage the use of existing on-lot disposal systems in these areas, with implementation of an On-Lot Sewage Management Program. An excerpt from this section of the 201 Facilities Plan is provided below:

"The selected plan recommends the following course of action within the outlying portions of the Central Bucks Study Area. For known, suspected or future failing systems, utilization and optimization of existing on-lot facilities should be performed as follows:

1. *Attempts should be made to rehabilitate improperly functioning systems.*

2. *If rehabilitation measures fail or are inappropriate due to site conditions (i.e., shallow depth to bedrock or groundwater), the existing on-lot system should be replaced with a ST-MS, or other system suitable to existing soil conditions on-site."*

This section of the 201 Facilities Plan also provides the recommendation that the Chalfont-New Britain Township Joint Sewer Authority, the Bucks County Water and Sewer Authority and the Doylestown Township Municipal Sewer Authority become the on-lot system wastewater management agencies for their respective jurisdictional areas. This aspect of the Plan was never implemented.

In development of the On-Lot Wastewater Management Program, each agency would be charged with establishing procedures to ensure the following (as quoted directly out of the 201 Facilities Plan):

1. *Any new on-lot system, system rehabilitation, or system modification is properly designed, constructed, operated and maintained.*

2. *Periodic maintenance checks and pumping is performed.*

3. *Area wells are sampled periodically to detect any potential effects on groundwater.*

4. *User fees are adequate to cover program administration as well as inspection, operation, maintenance, and disposal functions.*

Table 6-1 of the Plan goes on to further suggest an administrative and regulatory framework for a Sewage Management Program. Although, this aspect of the Plan was never implemented on a regional basis by any of the above mentioned Authorities, individual Townships, such as Doylestown Township, have recently implemented their own local Sewage Management Program. This planning document will more specifically identify a proposed administrative and regulatory framework for a local Sewage Management Program, to be implemented by New Britain Township. Although not identical to that recommended within the 201 Facilities Plan, the proposed Sewage Management Program will still attempt to achieve the same objectives listed above.

2.3. Planning Modules - Previous Submissions in The On-Lot Sewage Service Area

Previous planning within the On-Lot Sewage Service Area will be discussed below.

A. Elevated Sand Mounds

Table 1 provides the status of conventional on-lot disposal system (sand mound) projects, which have been approved within the last seven years, utilizing Planning Modules to amend the current Sewage Facilities Plan in the New Britain Township Service Area. The New Britain Township Service Area includes the On-Lot Sewage Service Area identified in this Act 537 Plan, as well as other areas of the Township without public sewer. It should be noted that these systems would be consistent with the original Sewage Facilities Plan, since elevated sand mounds were identified at that time to be the system alternative that would address limiting conditions such as a high ground water table. In fact, based on the soil conditions of the planning area, there have been no standard subsurface systems permitted.

TABLE 1
PLANNING MODULE SUMMARY FOR CONVENTIONAL ON-LOT SYSTEMS WITHIN
NEW BRITAIN TOWNSHIP SERVICE AREA

PROJECT NAME	TYPE OF SYSTEM	STATUS
Carr Tract, Lot #1	Sand Mound	Completed
Schute Minor Subdivision	Sand Mound	Completed
Rosanelli Subdivision (King Road)	Sand Mound	Completed
Rosanelli Subdivision (Naomi Lane)	Sand Mound	Completed
Raab Tract	Sand Mound	Completed
McNichol Tract	Sand Mound	Completed
Calhoun Tract	Sand Mound	Completed
McGowan Tract	Sand Mound	Completed
Gilmore Tract	Sand Mound	Completed
Walters Road Subdivision	Sand Mound	Completed
Hutwelker Tract	Sand Mound	Completed
Neubert Tract	Sand Mound	Completed
Lake View Estates – 5 Lot Subdivision	Sand Mound	Completed
Stone Creek Farm, Lot #5	Sand Mound	Completed
Bittner Tract (Callowhill Road)	Sand Mound	Completed
Garges Subdivision	Sand Mound	Completed
Kochanski Tract	Sand Mound	Completed
Krawtchuck Subdivision	Sand Mound	Completed
Ruoti Tract	Sand Mound	Completed
Stone Creek Farm, Lot #1	Sand Mound	Completed
B&D Custom Builders Minor Subdivision, Lot #2	Sand Mound	Completed
Casadonti Homes	Sand Mound	Completed
Elly Seldon Tract	Sand Mound	Completed
Avallon at Moyers Subdivision, Lot #10	Sand Mound	Completed
Avallon at Moyers Subdivision, Lot #9	Sand Mound	Completed
Stone Creek Farm, Lot #6	Sand Mound	Completed
D'Angelo	Sand Mound	Completed
Sylvan Golf Center Community System	Sand Mound	Completed

B. Spray Irrigation and Alternative Systems

In view of the limiting soil conditions in New Britain Township, as well as in much of the State of Pennsylvania, additional on-lot sewage disposal system alternatives have been explored within the last 20 years by the PADEP. Efforts have focused on soil conditions even more restrictive than would have in the past been considered appropriate for the elevated sand mound disposal system, which is only considered suitable where limiting conditions such as high ground water or rock, occur less than 20 inches below the ground surface. The most prominent alternative now in existence is the Individual Residential Spray Irrigation System (IRSIS), which employs preliminary treatment in the form of either a septic tank or aerobic treatment unit, normally followed

by sand filtration and chlorine disinfection, with final disposal to the land surface via spray irrigation. IRSIS systems allow on-lot disposal in areas where seasonal groundwater levels occur 10 inches or more below the ground surface and where rock occurs 16 inches or more below the ground surface. Although the IRSIS systems are feasible over restrictive soils, the area necessary for these systems still can be prohibitive, based on land suitability.

More recently, other on-lot sewage disposal options have been established by the PADEP, including Drip Irrigation, At-Grade Disposal Systems, A/B Soil Systems, etc. These systems will be more thoroughly discussed later in this planning document. Furthermore, as it was in 1982 at the time of the 201 Facilities Plan, stream discharge systems are still an option that is typically considered a last resort in areas without public sewers. Table 2 identifies land development utilizing IRSIS systems, Drip Irrigation, Alternate At-Grade Systems, Hydraulic Linear Loading Rate (HLLR) Systems, and Stream Discharge Systems, all which have been approved within the last seven years, either as sewage system repairs, or as part of new land development utilizing Planning Modules to amend the current Sewage Facilities Plan in the New Britain Township Service Area.

TABLE 2
SUMMARY OF IRSIS AND OTHER ALTERNATE ON-LOT SYSTEMS
WITHIN NEW BRITAIN TOWNSHIP SERVICE AREA

PROJECT NAME	TYPE OF SYSTEM	STATUS	TAX PARCEL NUMBER
McGrath Property	Spray Irrigation (IRSIS)	Completed	26-11-8-1
Murphy Tract - Lot #2	Spray Irrigation (IRSIS)	Completed	26-4-34-4
Lockwood Tract	Spray Irrigation (IRSIS)	Completed	26-12-15
Herring Property SFTF	Stream Discharge	Not Constructed	26-1-115
Dimmig Minor Subdivision	Drip Irrigation	Not Constructed	26-11-74
Crabtree	At Grade	Constructed	26-3-59
Davies	Drip Irrigation	Constructed	26-11-51
Mackrides	HLLR	Constructed	26-11-24
Simmons	At Grade	Constructed	26-4-74-2
Calhoun Co., Inc.	Drip Irrigation	Constructed	26-3-68
Bauhmer	Spray Irrigation (IRSIS)	Constructed	26-11-36

2.4. Overview of Land Development Planning Process

A. Land Development Subject to Planning

All subdivisions, land developments, and/or increases in uses, which result in wastewater flows of 800 gallons per day (GPD) or more and which are not exempt from planning requirements, require filing of either a request for "revision" to a Township's Official Act 537 Sewage Facilities Plan or a request for "*an exception from the requirement to revise*" the Township's Official Act 537 Plan.

An *exception from the requirement to revise,* is a process established in 25 PA Code, Chapter 71, Section 71.55 (relating to exceptions to the requirement to revise the official plan for new land development) which describes the criteria under which a revision for new land development is not required.

Exceptions and revisions must be submitted in the form of a completed Sewage Facilities Planning Module provided by the PADEP. A Sewage Facilities Planning Module Mailer is filed with PADEP in order to obtain appropriate planning module forms for plan revisions. If an exception is being sought, then planning modules can be obtained locally through the BCDH.

B. Planning Exemptions

There are situations where exemptions from planning requirements are granted by PADEP. In order to qualify for an exemption, Section 8 of the Sewage Facilities Planning Module Mailer must be completed by the Applicant, as well as the SEO and a Township Municipal Official. Exemptions may be granted for "Minor Subdivisions" (as defined by PADEP) of 10 single family residential lots or less, where sewage disposal is consistent with the Township's Official Act 537 Plan, and Subdivision and Land Development Ordinance. More detail will be provided later in this section.

C. Planning Module Documents

Below, various planning module documents are identified, which apply to the On-Lot Sewage Service Area of New Britain Township.

- Component 1 - "Exception from the Requirement to Revise the Official Plan" (PADEP Form 3800-FM-WSWM0350)
- Component 2 - "Individual and Community On-Lot Disposal" (PADEP Form 3800-FM-WSWM0352)
- Component 3 - "Sewage Collection and Treatment Facilities" (PADEP Form 3800-FM-WSWM0353)
- Component 3s - "Small Flow Treatment Facilities " (PADEP Form 3800-FM-WSWM0353s)
- Component 4A - "Municipal Planning Agency Review" (PADEP Form 3800-FM-WSWM0362A)
- Component 4B - "County Planning Agency Review" (PADEP Form 3800-FM-WSWM0362B)
- Component 4C - "County or Joint Health Department Review" (PADEP Form 3800-FM-WSWM0362C)

A Sewage Facilities Planning Module Mailer must be submitted to PADEP so that they can assign the appropriate planning module number to the Planning Module Component requested for the proposed project. The Applicant and their Consultant must coordinate and complete all required site testing with representatives of the BCDH and/or the PADEP present, prior to completion of the planning module. The above Planning Module Forms and associated instructions for completion are provided in Appendix C, for reference only. A Planning Module Mailer is not required for a Component 1 Module, which can be obtained directly from the BCDH.

D. Participants in the Planning Process

The following persons are involved with completing various sections of Planning Documents at specific stages of the planning process. In some cases these persons are assigned a time limitation as stipulated by PADEP regulations.

1. Applicant

This is the owner or equitable owner of property to be developed or subdivided. The Applicant is responsible for submitting copies of all planning documents to the proper agencies in the proper sequence as dictated in this Act 537 Plan. All completeness checklists are to be completed first by the Applicant, signed and dated, so the Township Secretary can confirm the Applicant has ensured the necessary paper work is provided.

2. Consultant

A hired professional who performs site testing, documents site suitability, develops engineering and survey drawings, and completes planning module documents. There could be one or multiple persons acting as the Consultant for the Applicant, including a Soil Scientist, Professional Surveyor, Professional Engineer, Professional Geologist, and Wetland Scientist.

3. Township

A Township representative who is responsible for receipt and distribution of copies of the Sewage Facilities Planning Module Documents to various other Township officials.

4. Township Planning Commission

Appointed body responsible for review of Sewage Facilities Planning Module Documents to ensure they are consistent with other Township planning documents. Comments and signatures are required in either the Component 1 Planning Modules (Section I) or Planning Module Component 4A - Municipal Planning Agency Review.

5. Township Zoning Officer

Appointed municipal official responsible for review of Sewage Facilities Planning Module Documents to ensure they are consistent with Township zoning regulations. Comments and signatures are required in Component 1 Planning Modules (Section I). Input may also be provided to the Township Planning Commission with regard to questions in Component 4A, Section C (8 through 11).

6. Township Engineer

Appointed engineering professional responsible for reviewing Sewage Facilities Planning Module Documents and design elements of the proposed sewage disposal systems. Provides technical review comments and assists the Township Planning Commission in their review of the Planning Module submission and completion of Component 1, Section I, or Component 4A Planning Modules. Upon Township receipt of the final Planning Module submission, the Township Engineer provides the Township Supervisors with additional review comments and provides recommendations regarding final approval or denial of the Planning Module submission.

7. Township Board of Supervisors

The elected governing body of the Township which reviews the Planning Module Package, including comments from all other agencies, the Township Zoning Officer and the Township Engineer. The Board of Supervisors make the final decision as to whether the Planning Modules are approved or denied. With regard to Component 1 Planning Modules, the Chairman of the Board of Supervisors or the Township Secretary, as authorized by the Board of Supervisors, completes Section J (Municipal Action) of the Planning Module Package. In the case of Component 2 Planning Modules, Section Q (Municipal Actions) and portions of Section O (Public Notification) are completed. In the case of Component 3, Section O (Sewage Management) and portions of Section P (Public Notification) are completed. In the case of Component 3s, Section N (Sewage Management) and portions of Section O (Public Notification) are completed. In the case of Components 2, 3 and 3s Planning Modules, if all aspects of the submission are acceptable to the Township, and a revision to the Township's Official Act 537 Sewage Facilities Plan is necessary, then a Resolution for Plan Revision must be enacted and signed by Chairman of the Board of Supervisors or the Township Secretary, as authorized by the Board of Supervisors. The Township Supervisors have 60 days to review and act upon a complete Planning Module submission.

8. Bucks County Planning Commission

Bucks County Planning Commission Officials responsible for review of Components 2, 3 and 3s of the Sewage Facilities Planning Module Documents to ensure they are consistent with other County planning documents. Comments and signatures are required on Planning Module Component 4B - County Planning Agency Review (60 day maximum comment period for Component 4B).

9. Bucks County Department of Health/Sewage Enforcement Officer

BCDH Officials responsible for review of Sewage Facilities Planning Module Documents with regard to site suitability for On-Lot Sewage Disposal. The BCDH SEO represents the interests of the municipality by ensuring the necessary testing and site location criteria are provided and are in compliance with environmental regulations established in 25 PA Code Chapters 71, 72 and 73. Comments and signatures are required in either the Component 1 Planning Module Section H - "Municipality's Sewage Enforcement Officer", or in the case of Component 2 Planning Modules, Section H "Sewage Enforcement Officer Action". In addition in the case of Components 2, 3, and 3s, the BCDH must complete Component 4C - County or Joint Health Department Review" (30 day review period for Component 1 and 60 day maximum comment period for Component 4C).

10. Pennsylvania Department of Environmental Protection (PADEP)

Agency responsible for approving or disapproving the final Sewage Facilities Planning Module Documents. PADEP must perform their own completeness review within 10 working days of receipt. Final approval or disapproval is required within 30 days of receipt, for Component 1 Planning Modules or such additional time as agreed to by both the Applicant and PADEP. In the case of Plan revisions (Components 2, 3 or 3s), PADEP must perform their own completeness review within 10 days of receipt and grant final approval or disapproval within 120 days of receipt, or such additional time as agreed to by both the Applicant and PADEP.

E. Long Term Sewage Management Options

The Township Board of Supervisors shall consider long term management issues as part of their review of Planning Modules and shall only approve the modules when all Township concerns are addressed. A primary aspect of Long Term Sewage Management is the incorporation of provisions for future replacement systems, should the primary systems fail at some point in the future. The purpose of having a sewage reserve area on each proposed lot is to ensure that there is adequate land to accommodate replacement of a disposal field should the existing field become overloaded hydraulically, or is damaged by heavy equipment or unrelated site construction activities. All lots shall be tested to identify a suitable replacement area (reserve area) in the event the primary sewage disposal system fails. These reserve areas shall be evaluated at the same time as the primary sewage disposal areas. The

reserve area must be approved by both the BCDH SEO and the Township. The reserve area should be at least 25 feet from the primary system, outside of the "drainage window", and should be sized to treat 100% of the proposed flows should the primary system fail. Plans should include survey location of all site work associated with both the primary and reserve areas, including deep test holes, hand auger locations and percolation holes. An easement deed restricting the reserve area from being built upon shall be provided, shown on the record plan and described by a legal description.

F. In New Britain Township, routine operation and maintenance of all on-lot sewage disposal systems shall be the responsibility of the system owner. In the case of a community system, spray irrigation system, or any type of Alternative or Experimental System, an Operation and Maintenance Agreement shall be included with the Planning Module submission and executed with the Township upon approval by PADEP. The property owner shall execute the operation and maintenance agreement with the Township and post the required financial security prior to issuance of the sewage permit by the BCDH.

G. In some instances, subdivision proposals may contain residual tracts of land on which no construction is proposed which would require use of sewage disposal facilities. A residual tract waiver can be requested by the Applicant in these situations, by marking the appropriate blocks in Section G of the Planning Module (General Site Suitability). In order for the request to be granted by PADEP, the request for a waiver must be accepted by the Township Planning Commission in Section I of the Planning Module (Planning Agency Review), and by the Township Supervisors in the Section J of the Planning Module (Municipal Action). When the proposal involves the subdivision of property on which there is an existing building currently served by an on-lot septic system on the residual tract, the BCDH SEO must inspect the system, provide a brief description and sketch of the system components, sign and date a statement attesting to this within Section H of the Planning Module (Municipality's Sewage Enforcement Officer).

In addition, the Planning Module must include a plot plan, deed or deed notice which contains language similar to the following, directed to the residual tracts:

As of the date of this deed/plot plan/deed notice recording, the residual tract of this subdivision is dedicated for the express purpose of _____ use. No portion of the residual tract of this subdivision has been approved by the municipality or the approving agency for the installation of sewage disposal facilities. No sewage permit will be issued for the installation, construction, connection to, or use of any sewage collection, conveyance, treatment or disposal system (except for repairs to existing systems) unless the municipality and approving agency have approved any required sewage facilities planning for the residual tract of the subdivision described herein in accordance with the Sewage Facilities Act (35 P.S. Sections 750.1 et seq.) and regulations promulgated thereunder. Prior to signing, executing, implementing or recording any sales contract or subdivision plan, any purchaser or subdivider of any portion of this residual tract should contact the municipality which is charged with administering the Sewage Facilities Act to determine what sewage facilities planning is required and the procedure and requirements for obtaining appropriate permits or approvals.

Language similar to the above must be recorded on the plot plan or deed or deed notice and a copy of the deed or plot plan or deed notice must be submitted with the Planning Module submission. New Britain Township is not obligated to accept waiver requests and may deny such request if there is concern regarding future violations of the waiver and resulting municipal liability. The Township will not approve a residual tract waiver for a lot that is created as part of a proposed subdivision, but can not be further subdivided.

2.5. Exception to the Requirement to Revise the Official Sewage Facilities Plan (Component 1 Sewage Facilities Planning Modules)

A. Applicability

25 PA Code, Chapter 71, Section 71.55 of the PADEP Rules and Regulations provides for exceptions to the requirement to revise the Official Plan for new land development. A municipality does not have to revise its Official Plan when the PADEP determines that the proposal is for the use of individual on-lot sewage systems serving single-family detached dwelling units in a subdivision of ten (10) lots or less (PADEP defines this as a "Minor Subdivision"). The PADEP determination is based upon a review of a properly completed and submitted Component 1 Sewage Facility Planning Module, along with written documentation that the proposal is consistent with the Official Municipal Plan and has been reviewed and approved by the BCDH SEO. In all cases, a properly completed Sewage Facilities Planning Module must be prepared and submitted to the municipality in which the subdivision is located.

B. Planning Module Submission Process

1. The Planning Module submission process shall be in accordance with 25 PA Code, Chapter 71, "Administration of Sewage Facilities Planning Program" and the Township's submission process outlined in Table 3. No on-lot sewage disposal permit may be issued by the Bucks County Department of Health SEO until the Planning Module is approved by the Township and PADEP.

2. The Applicant and Consultant shall coordinate the necessary surveying, engineering and site testing in the presence of the Bucks County Department of Health SEO. The process of site testing is more fully described in Part 7, Section 7.2.A of this Act 537 Plan. Once site testing is complete, a Sewage Facilities Plan is prepared and submitted together with a Component 1 Sewage Facilities Planning Module, to the Bucks County Department of Health SEO (five copies). The SEO has 20 days to review and comment on the proposed project.

3. The Applicant is responsible for submission of the Planning Module directly to the Township. The Township shall not accept the Planning Module unless all applicable components have been completed and signed by the appropriate outside agencies. The Planning Module submission and review process is more fully described in Table 3.

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TABLE 3
COMPONENT 1 PLANNING MODULE REVIEW PROCESS

Step	SUBMISSION PROCESS (SEQUENTIAL ORDER)	PARTICIPANTS	REVIEW TIME (DAYS)	COMMENTS
1	SITE TESTING	CONSULTANT BCDH SEO		CONSULTANT COORDINATES SITE TESTING WITH BCDH SEO
2	SUBMISSION OF PLANNING MODULE TO BCDH SEO	CONSULTANT BCDH SEO	20	BCDH SEO COMPLETES SECTION H
3	SUBMISSION OF PLANNING MODULE TO TOWNSHIP	APPLICANT CONSULTANT		APPLICANT AND CONSULTANT COMPLETE ALL APPLICABLE SECTIONS OF PLANNING MODULE 6 PLANNING MODULES FORWARDED TO TOWNSHIP
4	RECEIPT OF PLANNING MODULE	TOWNSHIP	10	6 PLANNING MODULES RECEIVED BY TOWNSHIP AND CHECKED FOR ADMINISTRATIVE COMPLETENESS TOWNSHIP SIGNS/DATES COMPLETENESS CHECKLIST AND RETURNS TO APPLICANT/CONSULTANT
5	DISTRIBUTION OF PLANNING MODULE	TOWNSHIP	60	DISTRIBUTE 1 PLANNING MODULE TO THE TOWNSHIP FILE AND 1 TO THE TOWNSHIP ENGINEER DISTRIBUTE 4 PLANNING MODULES TO THE PLANNING COMMISSION ENGINEER AND ZONING OFFICER PROVIDE COMMENTS TO PLANNING COMMISSION
6	TOWNSHIP PLANNING COMMISSION REVIEW OF PLANNING MODULE	TOWNSHIP		REVIEW PLANNING MODULE AND PROVIDE COMMENTS PLANNING COMMISSION CHAIRMAN AND ZONING OFFICER SIGN SECTION I FORWARD 4 PLANNING MODULES TO TOWNSHIP SUPERVISORS
7	TOWNSHIP SUPERVISORS REVIEW OF PLANNING MODULE	TOWNSHIP		TOWNSHIP SUPERVISORS REVIEW PLANNING MODULE TOWNSHIP SECRETARY SIGNS SECTION J
8	PLANNING MODULE RETURNED TO CONSULTANT	TOWNSHIP		DISTRIBUTE 1 PLANNING MODULE TO THE TOWNSHIP FILE AND 1 TO THE TOWNSHIP ENGINEER 2 PLANNING MODULES ARE RETURNED TO CONSULTANT BY CERTIFIED MAIL (COPY OF LETTER TO APPLICANT)
9	SUBMISSION OF PLANNING MODULE TO PADEP	APPLICANT CONSULTANT		APPLICANT TO INCLUDE PADEP FEE FOR PLANNING MODULE REVIEW CONSULTANT FORWARDS PLANNING MODULE TO PADEP
10	PADEP REVIEW	PADEP	30	FINAL REVIEW OF PLANNING MODULE AND ACCEPTANCE OR DENIAL
11	PADEP RETURNS PLANNING MODULE WITH COMMENTS	APPLICANT CONSULTANT TOWNSHIP		REVISED PLANNING MODULE SUBMITTED TO TOWNSHIP AND APPLICABLE AGENCIES FOR RE-APPROVAL

4. The Township Engineer shall provide assistance to the Township during the Planning Module submission and review process. They shall perform a technical review of the Planning Module, as well as the sewage system design if requested by the Township. In addition, they shall provide review comments and recommendations to the Township Planning Commission and Township Board of Supervisors.

5. The Township Board of Supervisors has 60 days to review and act on a complete Planning Module submission by either approving it or disapproving it, unless the Applicant and Township agree to a time extension. If the Township fails to act within the allotted time, the Planning Module is "deemed approved" and can be sent directly by the Applicant to PADEP for review.

6. Once the Planning Module has been approved by the Township Board of Supervisors, the Applicant/Consultant shall be responsible for submitting the Planning Module and associated review fees to PADEP. The PADEP must determine if the Planning Module Package is complete within 10 working days of receipt. If it is complete, PADEP will review the Planning Module and respond within 30 days.

2.6. Planning Module Revisions (Components 2, 3 and 3s Sewage Facilities Planning Modules)

A. Applicability

25 PA Code, Chapter 71, Section 71.52ds of the PADEP Rules and Regulations establishes requirements for submission of Sewage Facilities Planning Modules for new land development revisions. Revisions are required under circumstances defined under Chapter 71, Section 71.51 (a) as follows:

- A new subdivision is proposed, except as provided by Section 71.55 (relating to exceptions to the requirement to revise the Official Plan for new land development) or subsection b relating to sewage facilities planning exemptions.

- The Official Plan, or its parts, is inadequate to meet the sewage needs of the new land development.

- Newly discovered or changed facts, conditions or circumstances make the plan inadequate to meet the sewage needs of new land developments.

- A permit is required from the Department under Section 5 of the Clean Streams Law.

B. Planning Module Components For Plan Revisions

The main Planning Module Component shall be accompanied by all three Component 4 Planning Modules, which incorporate comments from local planning agencies and the Bucks County Department of Health. Each Planning Module Component will be briefly described in this section.

1. Component 2 - "Individual and Community On-Lot Disposal" - This Planning Module Component is submitted for the following land development:

   a. Land development utilizing on-lot sewage disposal associated with subdivisions of more than 10 residential lots or that do not otherwise meet the requirements for an exception for the requirement to revise the Township Official Sewage Facilities Plan (Component 1).

   b. Land development utilizing a proposed on-lot community disposal system serving two or more residential lots, or two or more Equivalent Dwelling Units (EDU). For the On-Lot Service Area, flow per EDU is defined as being 400 gpd, which is the minimum assigned flow allowed per single family home when designing on-lot sewage disposal systems. However, for larger flows associated with a community system, flow per EDU may be defined differently, depending upon type of use.

   c. Land development served by a Large Volume On-Lot Disposal System (greater than 10,000 gallons per day)

   d. Land development to be served by retaining tanks (including holding tanks, privies, chemical, incinerating, recycling or composting toilets.).

2. Component 3 - "Sewage Collection and Treatment Facilities" - This Planning Module Component is submitted for land development that would utilize a large scale community treatment system where a formal public sewage collection and conveyance system would be constructed, directing flow to a treatment facility. The treatment facility could be a conventional treatment plant with stream discharge, or it could be a treatment plant followed by land disposal, such as spray irrigation. Below is a list of types of land development for which completion of the Component 3 Sewage Facilities Planning Module may be appropriate:

   a. Land development utilizing sewage collection, conveyance or treatment facilities.

   b. The construction or modification of wastewater collection, conveyance or treatment facilities that will require PADEP to issue a Clean Streams Law Permit.

   c. A tap-in or a sewer extension to public sewers which will add a flow of 2 Equivalent Dwelling Units (EDUs) or more. For the On-Lot Service Area, flow per EDU is defined as being 400 gpd, which is the minimum assigned flow allowed per single family home when designing on-lot sewage disposal systems. However, for a public sewer system that is designed to serve a community, flow per EDU may be defined differently.

3. Component 3s - "Small Flow Treatment Facilities " - This Planning Module Component is submitted for land development that will utilize Small Flow Treatment Facilities (SFTF), which are individual or community sewerage systems designed to adequately treat sewage flows not greater than 2000 gallons per day. For a system serving a residential subdivision, this translates to a subdivision of not more than 5 single family homes, based on the minimum allowed flow per EDU of 400 gallons per day. Final disposal could be to a stream, a dry stream or land application via an on-lot system such as spray irrigation. SFTFs can be used under some circumstances, for repairs to existing malfunctioning systems serving residential or commercial developments.

4. Component 4A - "Municipal Planning Agency Review" - This form is to be completed by the New Britain Township Planning Commission. It is submitted to the Planning Commission, accompanied by one of the other Sewage Facilities Planning Modules previously described (Components 2, 3, or 3s).

5. Component 4B - "County Planning Agency Review" - This form is to be completed by the Bucks County Planning Commission. It is submitted to the Planning Commission, accompanied by one of the other Sewage Facilities Planning Modules previously described (Components 2, 3, or 3s).

6. Component 4C - "County or Joint Health Department Review" - This form is to be completed by the BCDH. It is submitted to the Health Department, accompanied by one of the other Sewage Facilities Planning Modules previously described (Components 2, 3, or 3s).

C. Planning Module Submission Process

1. The Planning Module submission process shall be in accordance with 25 PA Code, Chapter 71, "Administration of Sewage Facilities Planning Program" and the Township's submission process outlined in Table 4. No on-lot sewage disposal permit may be issued by the Bucks County Department of Health SEO until the Planning Module is approved by the Township and PADEP.

2. Initial Contacts with BCDH and PADEP

   The Applicant and Consultant shall coordinate the necessary surveying, engineering and site testing in the presence of the Bucks County Department of Health SEO. The process of site testing is more fully described in Section 4 of this Act 537 Plan. Once site testing is complete, the Main Module Component is completed by the Applicant and Consultant.

3. The Applicant is responsible for submission of the complete Main Module Component Packages, accompanied by a Sewage Facilities Component 4B - "County Planning Agency Review", directly to the Bucks County Planning Commission. The Applicant shall also be responsible for submission of the complete Main Module Component Packages, accompanied by a Sewage Facilities Component 4C - "County or Joint Health Department Review", directly to the BCDH. Both the Bucks County Planning Commission and the BCDH shall have 60 days to comment on the proposed land development and complete their respective Component 4 Planning Module Components, returning them to the Applicant. If no comment is provided by that time, the Applicant may submit the Planning Module Package directly to the Township together with proof that the Planning Module Package was already submitted to these agencies for at least 60 days.

4. Public Notification

In certain instances, public notification in a newspaper of general circulation within New Britain Township will be required. If any of the following check list of questions is answered affirmatively, then publication is required and a 30 day public comment period is necessary in order to allow review and comment by the general public.

- Does the project involve construction of a sewage treatment facility?
- Will the project change the flow at an existing sewage treatment facility by more than 50,000 gallons per day?
- Will the project result in a public expenditure for the sewage facility portion of the project in excess of $100,000?
- Will the project lead to a major modification of the existing municipal administrative organizations within the municipal government?
- Will the project result in a subdivision of 50 lots or more?
- Does the project involve a major change in established growth projections?
- Does the project involve a different land use pattern than that established in the municipality's Official Sewage Facilities Plan?
- Does the project involve the use of large volume onlot sewage disposal systems (flow greater than 10,000 gpd)?
- Does the project require resolution of a conflict between the proposed alternative and consistency requirements contained in Chapter 71.21(a) (5) (i), (ii), (iii)?

- Will sewage facilities discharge into high quality or exceptional value waters as defined by PADEP?

The Applicant shall be responsible for publishing the Public Notice in accordance with PADEP requirements, at least 30 days before submission of the Final Planning Module Package to the Township. The Applicant shall notify the Township of their intent to publish the notice and shall provide one copy of the Planning Module Package to the Township to allow public access to the Module Documents. The Township Secretary shall submit any public comments received from the public, directly to the Applicant so that the Applicant may address the comments with written responses and include these in the submission of the Final Planning Module Package to the Township.

5. The Applicant is responsible for submission of the Planning Module directly to the Township. The Township shall not accept the Planning Module unless all applicable components have been completed and signed by the appropriate outside agencies. The Planning Module submission and review process is more fully described in Table 4.

6. The Township Engineer shall provide assistance to the Township during the Planning Module submission and review process. They shall perform a technical review of the Planning Module, as well as the sewage system design if requested by the Township. In addition, they shall provide review comments and recommendations to the Township Planning Commission and Township Board of Supervisors.

7. The Township Board of Supervisors has 60 days to review and act on a complete Planning Module submission by either approving it or disapproving it, unless the Applicant and Township agree to a time extension. The Board of Supervisors is responsible for making the final decision of approval or denial of the Planning Module. The Board of Supervisors shall make a decision based upon comments and recommendations received from the Township Engineer, Township Planning Commission, Township Zoning Officer, County Planning Commission and Department of Health. The Board shall then take action on the Planning Module in the form of one of the following:

   - Adopt by Resolution - If a decision is made to adopt, the Board must complete the "Resolution for Plan Revision for New Land Development" form included with the Planning Module submission and return it to the Applicant.

   - Adopt with Modifications - The Board may direct the Applicant to make modifications to the Planning Module prior to adoption. The Applicant shall make the necessary modifications and resubmit the Planning Module.

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TABLE 4
COMPONENT 2, 3 & 3s PLANNING MODULE REVIEW PROCESS

Step	SUBMISSION PROCESS (SEQUENTIAL ORDER)	PARTICIPANTS	REVIEW TIME (DAYS)	COMMENTS
1	SITE TESTING	CONSULTANT BCDH SOIL SCIENTIST/SEO PADEP SOIL SCIENTIST/HYDROGEOLOGIST		CONSULTANT COORDINATES SITE TESTING WITH BCDH SEO
2	SUBMISSION OF PLANNING MODULE TO BCDH SOIL SCIENTIST/SEO	CONSULTANT BCDH SEO		
3	BCDH SOIL SCIENTIST/SEO REVIEW OF PLANNING MODULE (COMPONENT 2 ONLY)	BCDH SOIL SCIENTIST/SEO	20	BCDH SOIL SCIENTIST/SEO REVIEW AND COMPLETE SECTION H
4	SUBMISSION OF PLANNING MODULE TO PADEP SOIL SCIENTIST / HYDROGEOLOGIST (IF APPLICABLE)	CONSULTANT PADEP SPECIALIST		PADEP PROVIDE COMMENTS TO CONSULTANT
5	SUBMISSION OF PLANNING MODULE AND COMPONENTS 4A, 4B AND 4C TO TOWNSHIP PLANNING COMMISSION, BUCKS COUNTY PLANNING COMMISSION AND BCDH	APPLICANT CONSULTANT		SUBMIT 1 PLANNING MODULE AND APPLICABLE COMPONENT TO BCPC AND BCDH SUBMIT 4 PLANNING MODULES AND COMPONENT 4A TO TOWNSHIP PLANNING COMMISSION
6	RECEIPT OF PLANNING MODULE WITH COMPONENT 4A AND DISTRIBUTION	TOWNSHIP	60	DISTRIBUTE 1 PLANNING MODULE TO THE TOWNSHIP FILE AND 1 TO THE TOWNSHIP ENGINEER ENGINEER AND ZONING OFFICER PROVIDE COMMENTS TO PLANNING COMMISSION
7	TOWNSHIP PLANNING COMMISSION REVIEW OF PLANNING MODULE AND COMPONENT 4A	TOWNSHIP		REVIEW PLANNING MODULE AND CHAIRMAN SIGNS COMPONENT 4A TOWNSHIP RETURNS 2 PLANNING MODULES TO CONSULTANT BCPC AND BCDH COMPLETE COMPONENTS 4B AND 4C
8	PUBLIC NOTICE (IF REQUIRED)	APPLICANT CONSULTANT		NOTIFY TOWNSHIP OF INTENT TO PUBLISH NOTICE AND SUBMIT 1 PLANNING MODULE FOR PUBLIC DISPLAY PLACE PUBLIC NOTICE AND COPY TOWNSHIP
9	PUBLIC NOTICE RESPONSES RECEIVED AND DOCUMENTED BY TOWNSHIP	APPLICANT/CONSULTANT TOWNSHIP GENERAL PUBLIC	30	TOWNSHIP RECEIVES PUBLIC COMMENT DURING 30 DAY PERIOD TOWNSHIP FORWARDS COMMENTS TO APPLICANT/CONSULTANT APPLICANT/CONSULTANT RESPOND AND INCORPORATE COMMENTS INTO PLANNING MODULE
10	SUBMISSION OF PLANNING MODULE TO TOWNSHIP SUPERVISORS	APPLICANT CONSULTANT		CONSULTANT INCORPORATES COMPONENTS 4A, 4B AND 4C AND ALL OTHER DOCUMENTS INTO PLANNING MODULE FORWARD 6 PLANNING MODULES TO TOWNSHIP
11	RECEIPT OF PLANNING MODULE & DISTRIBUTION	TOWNSHIP	10	6 PLANNING MODULES RECEIVED AND CHECKED FOR ADMINISTRATIVE COMPLETENESS TOWNSHIP SIGNS/DATES COMPLETENESS CHECKLIST AND RETURNS TO APPLICANT/CONSULTANT DISTRIBUTE 1 PLANNING MODULE TO THE TOWNSHIP FILE AND 1 TO THE TOWNSHIP ENGINEER
12	TOWNSHIP SUPERVISORS REVIEW OF PLANNING MODULE	TOWNSHIP	60	TOWNSHIP ENGINEER PROVIDES RECOMMENDATIONS TO TOWNSHIP SUPERVISORS SUPERVISORS ACCEPT OR DENY THE PLANNING MODULE AND COMPLETE APPROPRIATE SECTIONS 2 PLANNING MODULES ARE RETURNED TO CONSULTANT BY CERTIFIED MAIL (COPY OF LETTER TO APPLICANT)
13	SUBMISSION OF PLANNING MODULE TO PADEP	APPLICANT CONSULTANT		APPLICANT TO INCLUDE PADEP FEE FOR PLANNING MODULE REVIEW CONSULTANT FORWARDS PLANNING MODULE TO PADEP
14	RECEIPT OF PLANNING MODULE BY PADEP	PADEP	10	CHECKED FOR ADMINISTRATIVE COMPLETENESS
15	PADEP REVIEW	PADEP	60 (RESIDENTIAL) 120 (ALL OTHERS)	FINAL REVIEW OF PLANNING MODULE AND ACCEPTANCE OR DENIAL
16	PADEP RETURNS PLANNING MODULE WITH COMMENTS	APPLICANT CONSULTANT TOWNSHIP		REVISED PLANNING MODULE SUBMITTED TO TOWNSHIP AND APPLICABLE AGENCIES FOR RE-APPROVAL

- Refuse to Adopt - The Board may refuse to adopt the Planning Module and must provide the Applicant with reasons for refusing the Plan revision.

8. Once the Planning Module has been approved by the Board of Supervisors, the Applicant is responsible for submitting the following to the PADEP for final approval:

   - Original Planning Module signed by a Municipal Official
   - Original signed Component 4A
   - Original signed Component 4B
   - Original signed Component 4C
   - Proof of Public Notification
   - Comments and responses to comments generated by public notification
   - "Resolution for Plan Revision for New Land Development" form signed by the Board of Supervisors
   - Transmittal Letter

   The PADEP must determine if the proposed Official Plan Revision is complete within 10 days of receipt. If it is complete, the Department will review the proposed revision. The Department must approve or disapprove the proposed plan revision within 120-days of receipt of a complete package, unless the proposed revision is for a residential subdivision plan which requires Department action within 60-days of receipt of a complete plan submission.

2.7 Residual Tract Waiver Requests Without Planning Modules

In some cases, Planning Modules may not be required at all when a subdivision is proposed with a residual tract that does not incorporate a present or future need for sewage disposal facilities on a given site. In these situations, although completion of sewage facilities planning is not required, the PADEP still requires a "Request for Planning Waiver & Non-Building Declaration" form (formerly Form B) to be submitted to the Department. Examples of acceptable large and small parcels for this form include:

- Agricultural properties
- Silvicultural properties
- Mineral lease properties
- Division of farmland to settle estates where no building or development is proposed
- Airport runway extensions
- Location of water towers
- Sewage pump stations
- Cellular telephone towers
- Separating an existing dwelling from its farmland for agricultural use
- Where "legally merged" is not a municipal requirement for "side lot additions" (See below)

Neither this declaration nor a Sewage Facilities Planning Module is required to be submitted for a side lot addition when a local ordinance requires such a side lot addition to be legally merged into the tract to which it is being added and any future proposal to subdivide any portion of the merged tracts is to be in accordance with the provision of the Municipalities Planning Code (53 P.S.A § 10101 *et seq.*) This request may be submitted in support of "non-building" subdivision proposals in both sewered and unsewered areas.

The waiver/declaration form must be completed by both the person(s) requesting the subdivision and the person(s) purchasing or receiving the subdivision. In the case in which a proposal involves the subdivision of property on which there is an existing building currently served by an on-lot sewage disposal system, the form must be signed by the municipality's SEO (BCDH SEO). In all cases, the completed waiver/declaration form must be signed by the Township Planning Commission and the Township Supervisor Chairperson or Secretary. The completed form shall be retained by the municipality as part of the permanent record of the subdivision. Following municipal approval, a copy of this form and all attachments must be submitted to the PADEP and to the BCDH SEO.

2.8 Subdivisions Exempt From Planning Under Act 537

In some cases, certain types of subdivisions are no longer subject to planning requirements of the Sewage Facilities Act. In these situations, a request for Planning Exemption is submitted, using a Sewage Facilities Planning Module Application Mailer (DEP Form 3800-CD-WSWM0359). For projects proposing use of on lot disposal systems, all of the following criteria must be met:

- The municipality's Official Sewage Facilities Plan shows that the area planned for the project is to be served by on-lot sewage disposal systems. This is confirmed by a municipal official as verified by signature on the Planning Module Application Mailer.

- The municipality's SEO must personally observe or otherwise confirm site testing on each proposed lot in the subdivision (including remaining land) to determine that separate sites are available for both a permitted primary onlot sewage disposal system and a replacement system (to be used if the original system fails in the future). This is confirmed by the SEO as verified by signature on the Planning Module Application Mailer.

- Each lot in the subdivision should be at least one acre in size. This is confirmed by the Applicant as verified by signature on the Planning Module Application Mailer.

- The geology of the project area must not be conducive to nitrate-nitrogen contamination of groundwater. This is confirmed by PADEP following receipt of Planning Module Application Mailer.

- Elevated levels of nitrate nitrogen are not known to exist within 1/4 mile of the proposed development. This is confirmed by PADEP following receipt of Planning Module Application Mailer.

- The area proposed for development is not within an identified High Quality (HQ) or Exceptional Value (EV) watershed. This is confirmed by PADEP following receipt of Planning Module Application Mailer.

The above information is reviewed by the PADEP Regional Office, which shall respond with a decision on the exemption request within 10 working days of receipt. Both the Applicant and Municipality are to be notified of the decision. If the request is not granted, the reason it cannot be granted will be provided along with the appropriate Planning Module forms and instructions on how to obtain the forms from the PADEP web site.

2.9 Other Township Planning Documents Considered in This Act 537 Plan

A. New Britain Township, Comprehensive Plan

The "New Britain Township Comprehensive Plan" was prepared in 2005. The Plan provides a detailed discussion of the natural features, land use, housing, transportation, energy conservation, growth, and preservation in New Britain Township.

B. New Britain Township, Recreational Facility Plan

The "New Britain Township Recreational Facility Plan" was prepared in 1995. The Plan is a supplement to the New Britain Township Comprehensive Plan and provides a detailed discussion on evaluation and creation of recreational areas and facilities in New Britain Township.

C. Chapter 175 Zoning Code for the Township of New Britain

The "New Britain Township Zoning Ordinance", as adopted, provides the basic development guidelines and permitted uses for all land within the Township, and also protects sensitive areas for conservation and environmental health/safety purposes. Refer to Figure 2: Zoning Map, for the zoning districts within New Britain Township's on-lot disposal system service area.

D. Subdivision and Land Development Ordinance, New Britain Township

The "Subdivision and Land Development Ordinance, New Britain Township" was updated in May, 2002. The Ordinance lists detailed requirements for the construction of on-lot sewage disposal systems along with all other utilities including public (water mains) and private (on-lot wells) water supplies.

E. New Britain Township Ordinance No. 2001-01-01

This Ordinance requires implementation of the Pennsylvania Sewage Facilities Act, establishes standards for On-Lot Sewage Systems, requires maintenance agreements and financial security for specific types of systems, and prescribes penalties for violation.

F. New Britain Township Ordinance No. 2003-04-02

This Ordinance created a new Watershed Zoning District. Much of the On-Lot Sewage Service Area coincides with the Watershed Zoning District. The Ordinance establishes guidelines for development in order to protect water quality, environmental and open space attributes of the Watershed.

G. New Britain Township Open Space Plan

The "New Britain Township Open Space Plan" was prepared in January, 2000. The Plan provides goals and objectives on preserving open space areas within the Township including but not limited to recreational areas, historic sites, public rights of way, flood plains, marshes, conservation sites, and open space between subdivisions.

Consistency of this Act 537 Sewage Facilities Plan with the above Township Planning Documents will be explored in detail under Part 8.0, Section 8.3.

PART 3.0 - PHYSICAL AND DEMOGRAPHIC CONDITIONS

3.1 Physical Conditions

A. Regional Setting

New Britain Township is located in central Bucks County. The Township consists of 14.7 square miles and is bordered by six townships and two boroughs. As shown in Figure 1 - Regional Map, the Township, which almost completely surrounds Chalfont Borough, is bordered by Plumstead Township to the north, Doylestown Township and New Britain Borough to the east, Hilltown Township to the west, Hatfield Township and Montgomery Township to the south, and Warrington Township to the southeast. The Township is approximately 35 miles north of downtown Philadelphia. Primary roadways traversing the Township include State Routes 202, 313 and 152. This highway system makes employment centers in the City of Philadelphia, Bucks and Montgomery Counties, and New Jersey accessible from New Britain Township.

B. Service Area

New Britain Township lies entirely within the Neshaminy Creek watershed area. Much of the south, southwest and southeast portions of the Township are serviced by public sewer with future development in this area to be serviced by public sewers as well. The remainder of the Township, which includes most of the area around Lake Galena, is serviced by On-Lot Sewage Disposal Systems (OLDS).

Figure 2 - Service Area Map delineates the On-Lot Sewage Service Area within the Township. From Figure 2, it can be seen that the western corner of the service area is denoted to be a "Transition Zone". This notation reflects the possibility of public sewer service to one or more properties west of Limekiln Pike, depending upon individual need and availability. In addition, one should note the presence of public sewers to a few select commercial and institutional properties along Ferry Road, bordering Doylestown Township. These are the only areas within the overall On-Lot Sewage Service Area that are excluded from on-lot sewage disposal service due to special circumstances predating this Act 537 Plan, including high wastewater flows and high wastewater strength due to presence of food service facilities.

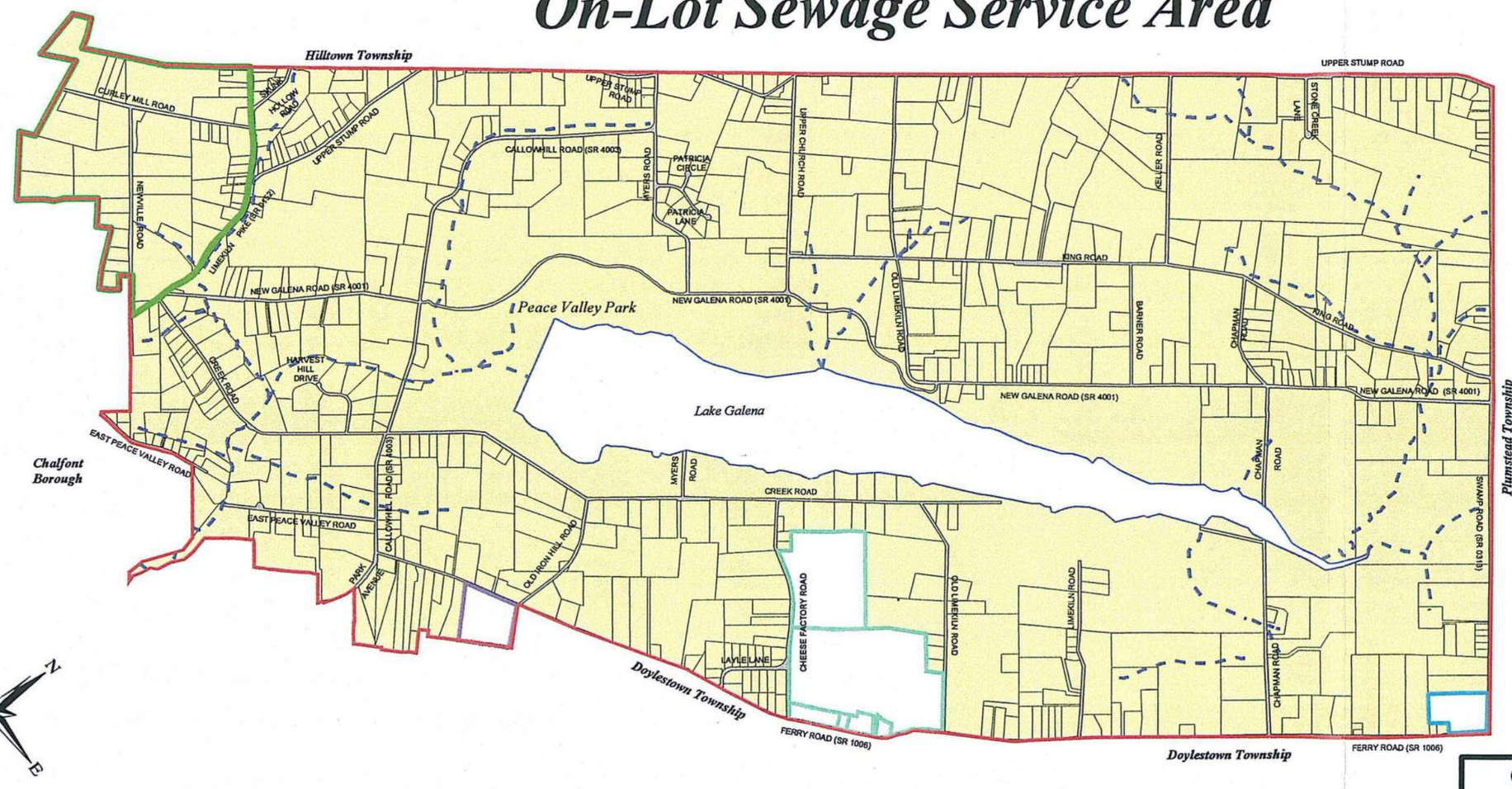
In addition to the On-Lot Sewage Service Area, there are other isolated areas within the Township not presently served by public sewer. Unless specifically excluded, this Act 537 Plan shall be considered to also address all other areas not served by public sewer.

C. Soils

The soils in the Township have been classified according to the updated 2002 Bucks County Soil Survey which was obtained through the United States Department of Agriculture (USDA). Figure 3 - Soils Map indicates the soil types in the On-Lot Sewage Service Area. Soil characteristics of the soil types located within the service area are provided in Table 6. Classification of soil types found in the On-Lot Sewage Service Area, On-Lot Disposal System selection, and alternatives analysis based upon soil characteristics are discussed in detail in Part 5.0.

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New Britain Township
Act 537 Plan
On-Lot Sewage Service Area







New Britain Township

Legend

- On-Lot Sewage Service Area
- Parcels
- Lakes
- Watercourses
- Road Rights-of-Way
- Transition Zone

Existing Public Sewer

- Commercial Property
- Shrine of Czestochowa
- Wordsworth Academy

3-2

FIGURE 1

ON-LOT SEWAGE SERVICE AREA

Prepared For:

NEW BRITAIN TOWNSHIP
BUCKS COUNTY, PENNSYLVANIA

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New Britain Township
Act 537 Plan
On-Lot Sewage Service Area

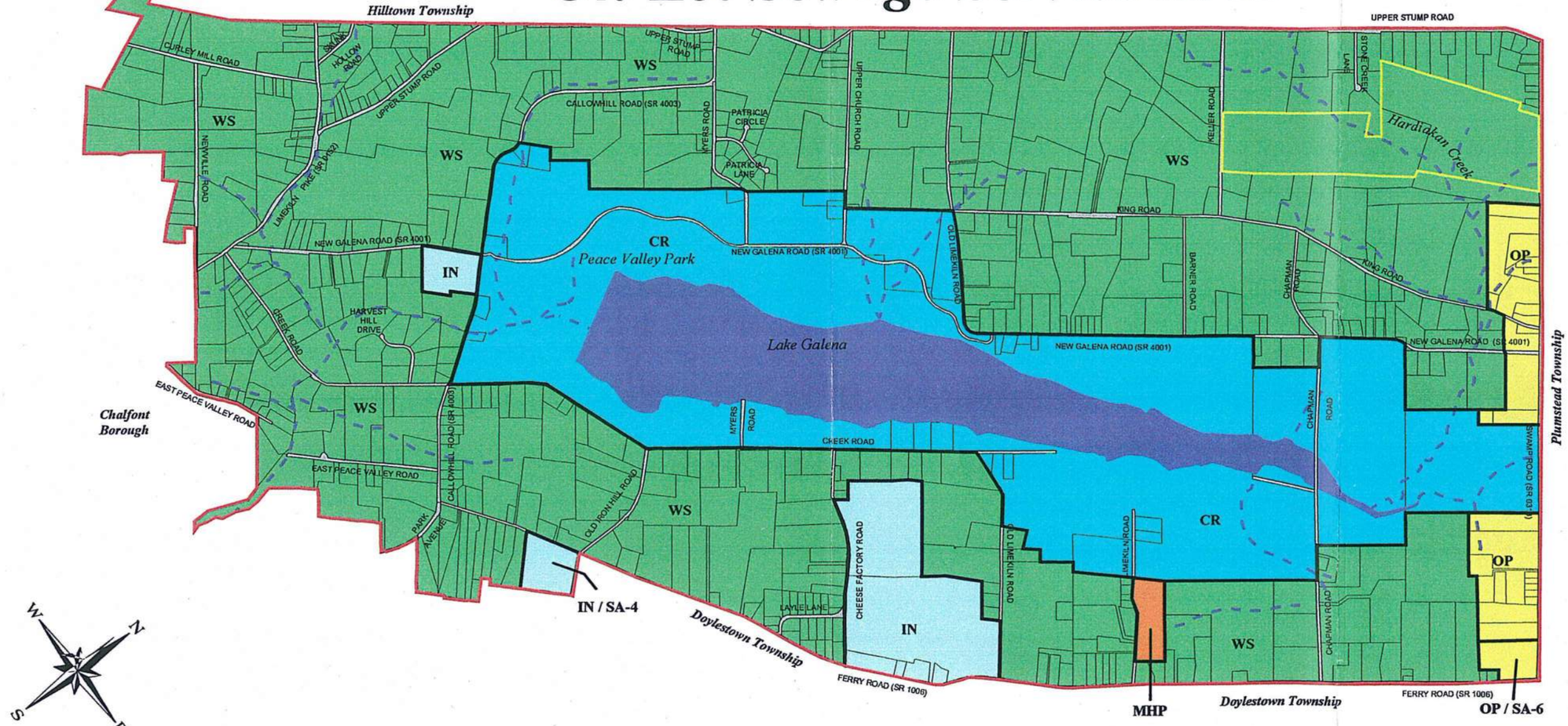
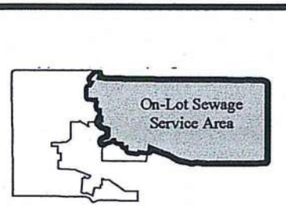


FIGURE 2



New Britain Township

Legend

Zoning
- CR - Conservation and Recreation District
- IN - Institutional District
- IN/ SA-4
- MHP - Manufactured Home Park District
- OP - Office Park District
- OP/SA-6
- WS - Watershed District

- Lakes
- Watercourses
- Road Rights-of-Way
- Parcels
- Agricultural Security District

Data Source

Road Rights-of-Way: Bucks County Tax Assessment Data - February 2003

Parcels: Bucks County Tax Assessment Data - February 2003

Lakes & Watercourses: The National Hydrography Dataset, USGS-April 1999
Information Ortho Rectify by Carroll Engineering Corporation- February 2003

Zoning: New Britain Township, Bucks County, Pennsylvania - 1995, As Amended

ZONING

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New Britain Township
Act 537 Plan
On-Lot Sewage Service Area

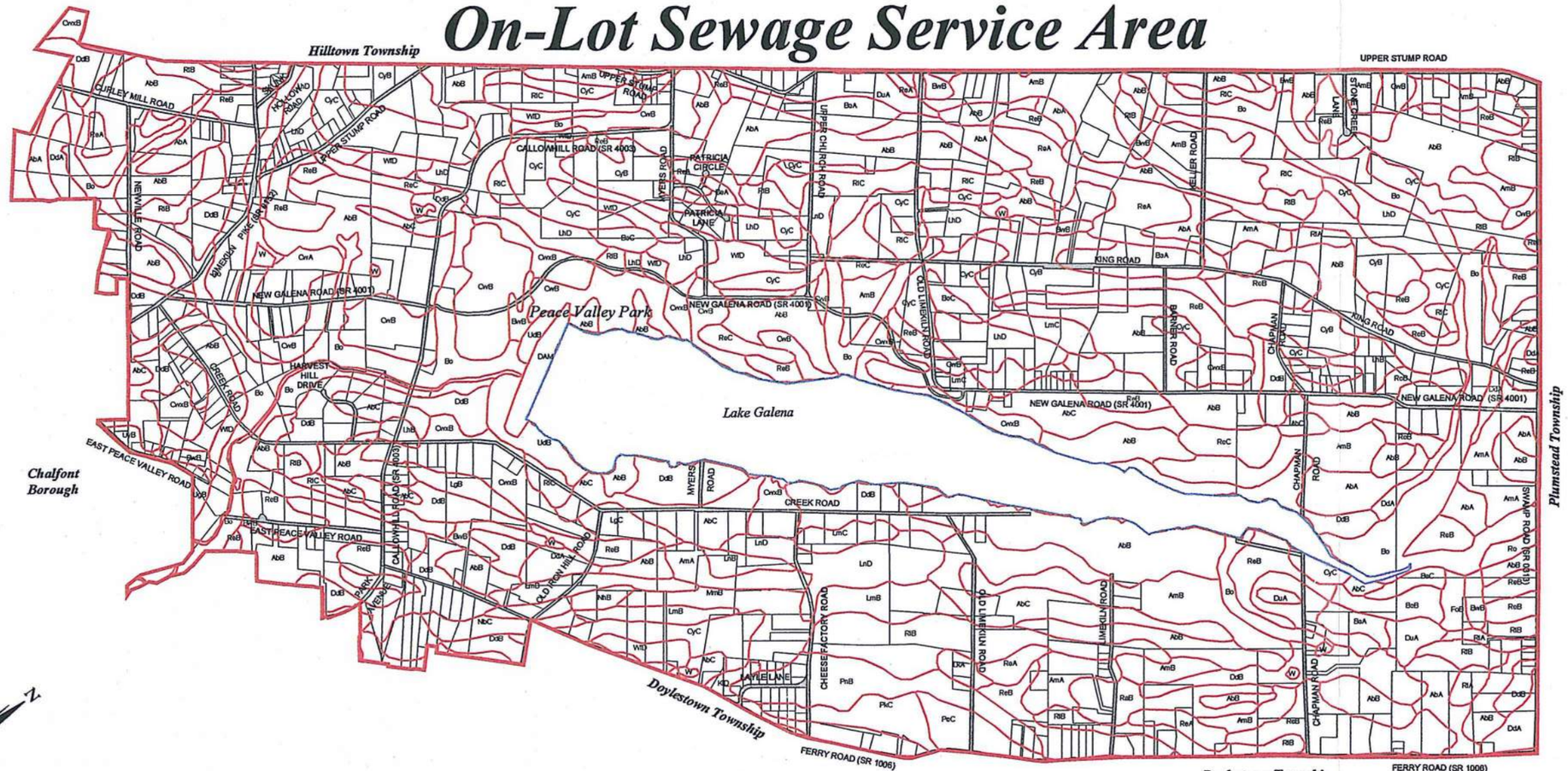
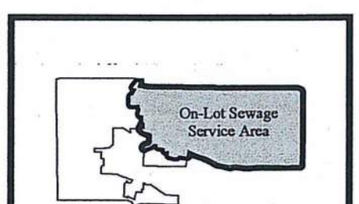


FIGURE 3



Legend

- Parcels
- Road Rights-of-Way
- Lakes
- Soils Boundary

Data Source

Soils: USDA, Natural Resources Conservation Service
Soil Survey of Bucks County, Pennsylvania - September 2002

Road Rights-of-Way: Bucks County Tax Assessment Data - February 2003

Parcels: Bucks County Tax Assessment Data - February 2003

Lakes: The National Hydrography Dataset, USGS-April 1999
Information Ortho Rectify by Carroll Engineering Corporation- February 2003

SOILS

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D. Geology and Hydrogeology

The geological formations represented in the Township all derive from the Triassic system, and are mostly sedimentary rock strata. The formations lie within the Piedmont Physiographic Province, Gettysburg-Newark Lowland Section, which occupies 2,050 square miles of south-central and southeastern Pennsylvania. It consists of parts of two basins that are joined by a narrow band of Triassic sediments; the Gettysburg basin in the west and the Newark Basin in the east. The Gettysburg-Newark Lowland Section is generally well drained by a dendritic drainage pattern, but because of relatively low storage and groundwater recharge rates, flood flows tend to be higher and low flows tend to be lower in comparison with streams of other areas. The water table surface generally follows surface topography, with ground water levels closest to the surface in valleys (discharge areas) and deepest on hilltops (recharge areas). The shallow ground water systems generally discharge groundwater into local streams and springs, whereas deeper regional ground water flow is directed toward the major rivers, such as Susquehanna, Delaware and Schuylkill Rivers.

Three major formations occupy the Gettysburg-Newark Lowland; from oldest to most recent they are the Stockton Formation (TRs), the Lockatong Formation (TRl) and the Brunswick Formation (TRb). The majority of the planning area is comprised of the sedimentary Lockatong formation, with infrequent "fingers" of the related overlying Brunswick and underlying Stockton formations interspersed across the planning area, generally reaching in a northeasterly to southwesterly direction. Of particular note in reviewing the geology of this area is that of the State Geologic Map of Pennsylvania, dated 1980, disagrees somewhat with the more detailed but older Geologic Map of Bucks County, Pennsylvania, dated 1950, in that the Map of Bucks County shows an additional "finger" of the Brunswick Formation along the northwesterly side of Lake Galena.

Other geologic features in the planning area include a diabase dike, and a geologic fault line. The diabase dike extends from Old Limekiln Road, halfway between Ferry Road and Creek Road, through Old Iron Hill Road, a few hundred feet northwest of Ferry Road and continues in a southerly direction across Ferry Road, running adjacent to, and parallel with Park Avenue, terminating at or near the intersection of Indian Creek Way and Forest Park Drive. The geologic fault is shown extending from Fountainville, at the intersection of Route 313 and Ferry Road, in a southwesterly direction, entering Lake Galena approximately 400 feet northwest of the intersection of Old Limekiln Pike and Creek Road, terminating beneath the lake 7/8 of a mile further southwest. The origin of the fault appears to be in Carversville, Plumstead Township.

A geologic map of the planning area is provided in Figure 4 - Geology. Hydrogeologic characteristics of each formation will be discussed briefly below. Information will include a description of rock materials, typical well depths, well yields, well casing depths, well water levels and hydraulic conductivity. Information available with regard to typical chemical constituents found in groundwater sampled from wells within the various formations will also be documented as the basis for future reference in comparison with those constituents of concern when disposing of wastewater in on lot soil absorption systems. This information was obtained from four sources:

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New Britain Township
Act 537 Plan
On-Lot Sewage Service Area

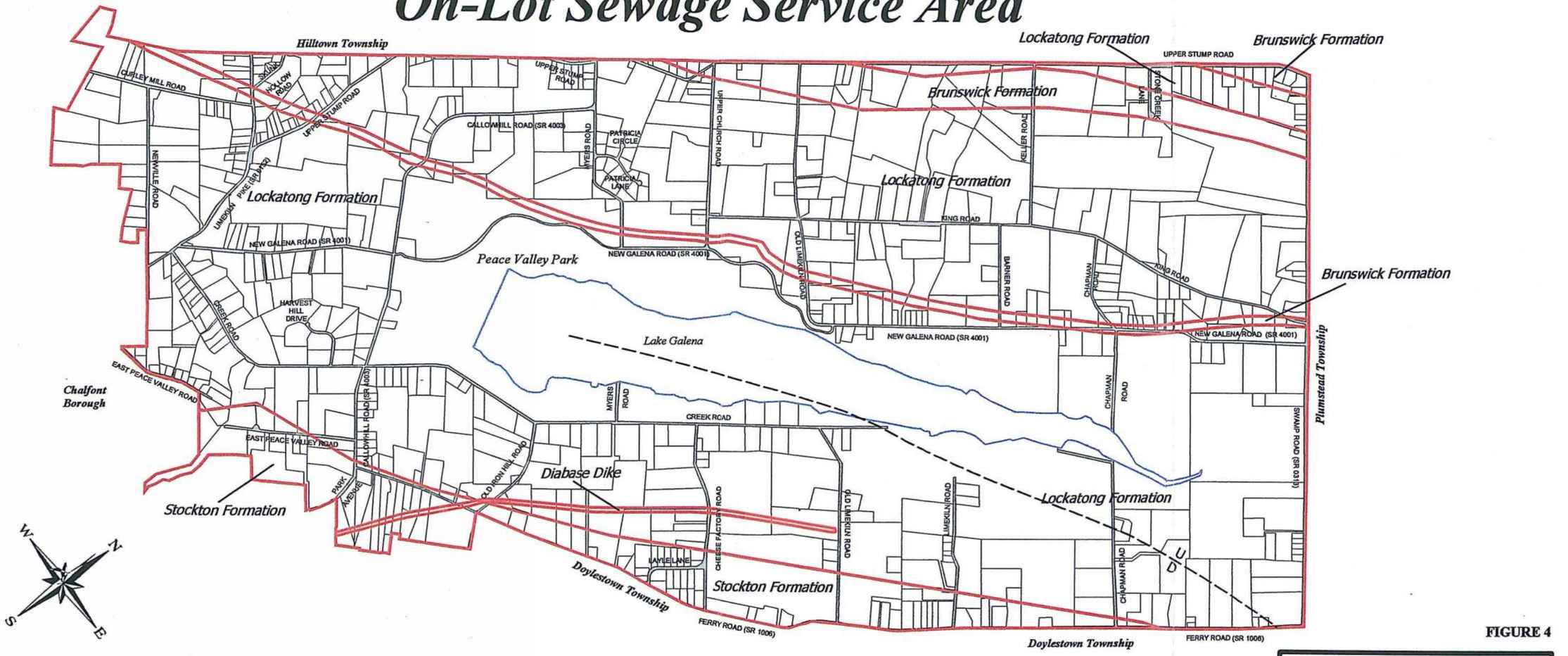
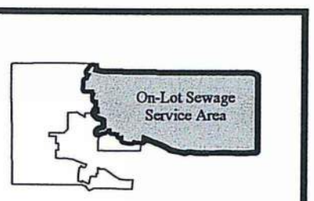


FIGURE 4



New Britain Township

Legend

- Fault
- Geological Formation
- Road Rights-of-Way
- Parcels
- Lakes

Data Source

Geology: PA Bureau of Topographic & Geological Survey, Department of Conservation & Natural Resources - 2001
PA Department of Internal Affairs, Geologic Map of Bucks County, Pennsylvania - 1950
Road Rights-of-Way: Bucks County Tax Assessment Data - February 2003
Parcels: Bucks County Tax Assessment Data - February 2003
Lakes: The National Hydrography Dataset, USGS-April 1999
Information Ortho Rectify by Carroll Engineering Corporation- February 2003

GEOLOGY

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- A report by Mercuri and Associates, Inc., of Southampton, PA, entitled "Hydrogeologic Analysis of Pumping Tests, Test Wells TW-1 and TW-2, Land Preservation Development, New Britain Township, Bucks County, PA", dated December 2001.

- A report provided in Appendix A of the 201 Facilities Plan, prepared by WAPORA, Inc. of Berwyn, PA, entitled "An Environmental Inventory of the Chalfont-New Britain Wastewater Facility Planning Area, Bucks County, Pennsylvania", dated November 30, 1979.

- Ground Water in Southeastern Pennsylvania, by George M. Hall, Pennsylvania Geological Survey, 1934.

- Geohydrology of Southeastern Pennsylvania, USGS / Water Resources Investigations Report 00-4166, by Dennis J. Low, Daniel J. Hippe, and Dawna Yannacci. 2002.

1. Lockatong Formation

As noted above, this is the most common formation within the planning area. The Lockatong Formation is primarily composed of fine grained gray to black shale and argillite. According to Mercuri, "Lockatong sediments were deposited in a lacustrine or swampy environment under reducing conditions, as evidenced by the dark color of the rocks and the presence of pyrite. .... The Lockatong rock is generally more resistant to weathering than the adjacent Brunswick Shales and generally form low ridges parallel to the strike of the beds." This formation is reported to be approximately 4,000 feet thick. The rock type in this formation is usually gray brown in color, but can also be red brown to red as well.

The Lockatong Formation has poor hydraulic characteristics and as reported by Mercuri, nearly all of the water in this formation occurs and moves in joints and fractures. It is considered the poorest of the Triassic aquifers. Well yields are reported to be quite variable, depending on the extent of fracturing. According to the WAPORA report, well yields are generally low, ranging from 4 to 40 gpm and averaging 10 gpm. Well yields generally do not increase with the depth of the well. Hall reports well yields ranging from 0 to 60 gpm and averaging 13 gpm.

Low, Hippe and Yannacci note the following additional data for the Lockatong formation, based on wells sampled throughout Berks, Bucks, Chester, and Montgomery Counties:

- Median domestic well produces 9 gpm (68 wells sampled).
- Median hydraulic conductivity is 0.78 ft/day (24 wells sampled).
- Median domestic well depth is 135 feet (88 wells sampled).
- Median well casing depth is 27 feet (35 wells sampled).
- Median water level is 12 feet in valleys (17 wells sampled).
- Median water level is 38 feet on hilltops (15 wells sampled).

According to the WAPORA report, water from the Lockatong Formation is moderately to highly mineralized and hard (median levels of 187 mg/l hardness). Iron concentrations are generally low (median levels of 0.01 mg/l), but high levels have been recorded as well (up to 17 mg/l).

Low, Hippe and Yannacci note the median level of nitrate-nitrogen (NO_3-N) as measured from 18 wells sampled, was 1.9 mg/l, with the 75th percentile at 3.1 mg/l. Other chemical constituents of concern with respect to water quality include the following:

- Total dissolved solids (19 wells sampled): Median level = 246 mg/l
- Chloride (19 wells sampled) : Median level = 7.4 mg/l
- Sulfate (20 wells sampled): Median level = 36 mg/l
- Radon (5 wells sampled): Median level = 420 pCi/l
- Iron (20 wells sampled): Median level = 0.01 mg/l

2. Brunswick Formation

The Brunswick Formation occurs as "fingers" within the Lockatong Formation. In this planning area, these fingers occur in the north, near Upper Stump Road. However, as noted above, another "finger" has been identified on the 1950 Geologic Map of Bucks County, running parallel to northwest shore of Lake Galena and extending westerly through Limekiln Pike (Route 152), between Skunk Hollow and Curly Mill Road. The Brunswick Formation is typically soft red shale, with subordinate local sandstones. Because the Brunswick shale weathers more quickly than the underlying formations, these areas form smooth valleys adjacent to the more hilly terrain produced from the more resistant Lockatong and Stockton Formations. The Brunswick sediments occurred in shallow water areas, which were at times exposed to sub-aerial conditions.

Again, as with the Lockatong Formation, groundwater movement through the Brunswick Formation occurs mainly through bedding plane fractures and vertical joints. However, groundwater yield is better in the Brunswick Formation than in the Lockatong Formation. According to Hall, the range in well yield is from 0 to 300 gpm with the average yield at 41 gpm.

Low, Hippe and Yannacci note the following additional data for the Brunswick formation, based on wells sampled throughout Berks, Bucks, Chester, Lehigh and Montgomery Counties:

- Median domestic well produces 15 gpm (157 wells sampled).
- Median hydraulic conductivity is 1.3 ft/day (150 wells sampled).
- Median domestic well depth is 110 feet (247 wells sampled).
- Median well casing depth is 35 feet (142 wells sampled).
- Median water level is 20 feet in valleys (188 wells sampled).
- Median water level is 44 feet on hilltops (60 wells sampled).

According to WAPORA, water from the Brunswick Formation exhibits moderate levels of mineralization and moderate hardness (median levels of 218 mg/l hardness). The water is also typically low in iron. The water quality is generally suitable for domestic uses.

Low, Hippe and Yannacci note the median level of nitrate-nitrogen (NO_3-N) as measured from 90 wells sampled, was 1.6 mg/l, with the 75th percentile at 3.9 mg/l. Other chemical constituents of concern with respect to water quality include the following:

- Total dissolved solids (87 wells sampled): Median level = 272 mg/l
- Chloride (94 wells sampled) : Median level = 10 mg/l
- Sulfate (91 wells sampled): Median level = 30 mg/l
- Radon (7 wells sampled): Median level = 1300 pCi/l
- Iron (95 wells sampled): Median level = 0.1 mg/l

3. Stockton Formation

The Stockton Formation occurs along the southeastern edge of the planning area, with its boundary to the Lockatong Formation beginning at Ferry Road just northeast of Chapman Road, extending southwest through Cheese Factory Road northwest of its intersection with Layle Lane, then through the intersection of Ferry and Callowhill Roads, ultimately extending to the north side of East Peace Valley Road at the southern boundary of the planning area. The Stockton Formation consists of mostly course, disintegrated arkosic conglomerate, yellow micaceous felspathic sandstone, brownish red sandstone and soft red shale and siltstone. The red beds provide the predominant color tone to the rocks. As with the Brunswick Shale, this sedimentary rock formed in shallow water conditions. This formation has a well developed system of joints and many faults. The sandstone, shale and siltstone are not very resistant to weathering and therefore this formation generally forms in undulating valleys and hills of low relief.

Hydrogeologic characteristics of the Stockton Formation vary with grain size. The Upper Shale Member of the formation has the finest grain size and is the poorest aquifer. The Middle Arkose Member contains the highest percentage of medium grained sandstone. The Lower Arkose Member has a slightly lower well yield than the Middle Arkose Member. Abrupt changes in rock type make it difficult to estimate expected groundwater yields. Hall notes a range in well yields from 0 to 349 gpm, with average yield at 57 gpm.

Low, Hippe and Yannacci note the following additional data for the Stockton formation, based on wells sampled throughout Berks, Bucks, Chester and Montgomery Counties:

- Median domestic well produces 15 gpm (203 wells sampled).
- Median hydraulic conductivity is 1.2 ft/day (174 wells sampled).
- Median domestic well depth is 110 feet (336 wells sampled).
- Median well casing depth is 39 feet (169 wells sampled).
- Median water level is 15 feet in valleys (127 wells sampled).
- Median water level is 40 feet on hilltops (73 wells sampled).

Groundwater from the Stockton formation generally exhibits moderate to high levels of mineralization and hardness (median levels of 130 mg/l hardness), with low iron concentrations. Hall observed that groundwater samples obtained from this formation averaged distinctly lower in total dissolved solids, hardness and iron content than those obtained from either the Lockatong or Brunswick Formations.

Low, Hippe and Yannacci note the median level of nitrate-nitrogen (NO_3-N) as measured from 165 wells sampled, was 2.1 mg/l, with the 75th percentile at 3.8 mg/l. Other chemical constituents of concern with respect to water quality include the following:

- Total dissolved solids (157 wells sampled): Median level = 230 mg/l
- Chloride (171 wells sampled) : Median level = 13 mg/l
- Sulfate (164 wells sampled): Median level = 29 mg/l
- Radon (30 wells sampled): Median level = 1400 pCi/l
- Iron (155 wells sampled): Median level = 0.05 mg/l

4. Diabase Dike

A Diabase dike occurs within the southeastern portion of the planning area, the specific location of which has already been described. Diabase is a dark gray to black igneous rock and is relatively resistant to weathering. Diabase dikes, also referred to as "trap rock", are nearly vertical intrusive formations that cut across the sedimentary strata. Dikes can vary in width from a few inches to 100 hundred feet or more, but typically don't exceed 100 feet. The length of the dikes can vary, extending up to 30 miles. Because of their resistance to weathering, Dikes typically stand out as forested ridges, because the residual

boulders of diabase are so numerous that the land can't usually be used for any other purpose. Adjacent rock to the diabase is usually baked by the heat of the intrusive diabase, adding to the weather resistance of this surrounding rock, which contributes additional width to the resulting dike ridges.

Diabase weathers into boulders which commonly have a rusty yellow, oxidized coat and greenish-gray interior. The size of the mineral grains in diabase can be variable, depending on the rate at which the rock was cooled. When cooling is rapid, the rock is dense and very fine grained; but in thicker formations, the texture is course and resembles granite, due to slower cooling. Diabase mainly consists of plagioclase and augite in nearly equal amounts. Smaller amounts of cholorite, calcite, epidote and some biotite also develops during the weathering process.

Hall notes that diabase dikes do not greatly affect groundwater movement, since most of the existing rocks intruded are dense, with groundwater movement in these strata limited already to fissures, joints and crevices. An exception is where Triassic sandstone formations exist; but even then, the water can to a certain extent, escape through the joints by which they are broken. Diabase, although generally a poor producer of water, does still provide sufficient yield for domestic purposes. The average reported yield of the 12 wells monitored by Hall, ranged from 3 to 13 gpm, with average yield of 6 gpm.

Low, Hippe and Yannacci note the following data for Diabase, based on wells sampled throughout the Piedmont Physiographic Province, Gettysburg-Newark Lowland Section, which covers parts of Adams, York, Cumberland, Dauphin, Lebanon, Lancaster, Chester, Montgomery, Berks, Bucks and Lehigh Counties:

- Median domestic well produces 6.0 gpm (154 wells sampled).
- Median hydraulic conductivity is 0.23 ft/day (44 wells sampled).
- Median domestic well depth is 119 feet (184 wells sampled).
- Median domestic well casing depth is 27 feet (155 wells sampled).
- Median water level is 10 feet in valleys (41 wells sampled).
- Median water level is 15 feet on Hilltops (27 wells sampled).

Water quality in Diabase is low to moderately mineralized and tends to be lower in hardness (average hardness at 114 mg/l, based on limited data). High iron and sulfate concentrations can occur locally.

Low, Hippe and Yannacci note the median level of nitrate-nitrogen (NO_3-N) as measured from 46 wells sampled, was 2.1 mg/l, with the 75th percentile at 4.7 mg/l. Other chemical constituents of concern with respect to water quality include the following:

- Total dissolved solids (38 wells sampled): Median level = 231 mg/l
- Chloride (45 wells sampled) : Median level = 9.9 mg/l
- Sulfate (44 wells sampled): Median level = 35 mg/l
- Iron (39 wells sampled): Median level = 0.11 mg/l

E. Topography

The U.S.D.A. Soil Survey of Bucks County, Pennsylvania (September 2002), incorporates slope classifications into their soils mapping units, as evidenced by the final capital letter abbreviation at the end of the soil mapping symbol (A through F). The following are the various slope classifications, with associated letter symbol in parentheses, followed by a general suitability statement:

0 to 3 Percent (A): Level land is generally well suited for agricultural purposes, because much of this type land is derived from alluvial deposits. Level land is economically feasible to develop for uses such as industrial, residential, and commercial, provided the land is not within a floodplain or subject to periodic flooding because of a high water table.

3 to 8 Percent (B): Gentle slopes are ideally suited for all forms of development and are the most economically feasible to develop. Because they do not need extensive reworking for drainage, these slopes can be used for either urban or rural development, including industrial, commercial, and residential.

8 to 15 Percent (C): Moderate slopes provide excellent sites for residential development. It is generally wise to exclude commercial and industrial development in these areas because of problems encountered with accessibility and road improvements.

15 Percent or More (D through F): Steep slopes are expensive to improve because of problems with access roads and soil erosion; therefore, they are best suited for large lot residential development, recreation, or other specialized uses.

New Britain Township is situated in the Piedmont Province of gentle hills and slopes. The highest elevation within the planning area (640 feet above mean sea level) is located near the northwest boundary of the municipality at near the intersection of Upper Stump and Upper Church Roads. The lowest elevation within the planning area occurs near the south end of East Peace Valley Road (260 feet above mean sea level). The area is characterized by low, northeast-southwest trending ridges. The topography of the area is shown in Figure 5 - Steep Slopes.

New Britain Township provides for the protection of steep slopes in their subdivision/land development ordinances by limiting woodland destruction, protecting floodplains and wetlands and restricting disturbance of steep slopes for erosion control.

New Britain Township
Act 537 Plan
On-Lot Sewage Service Area

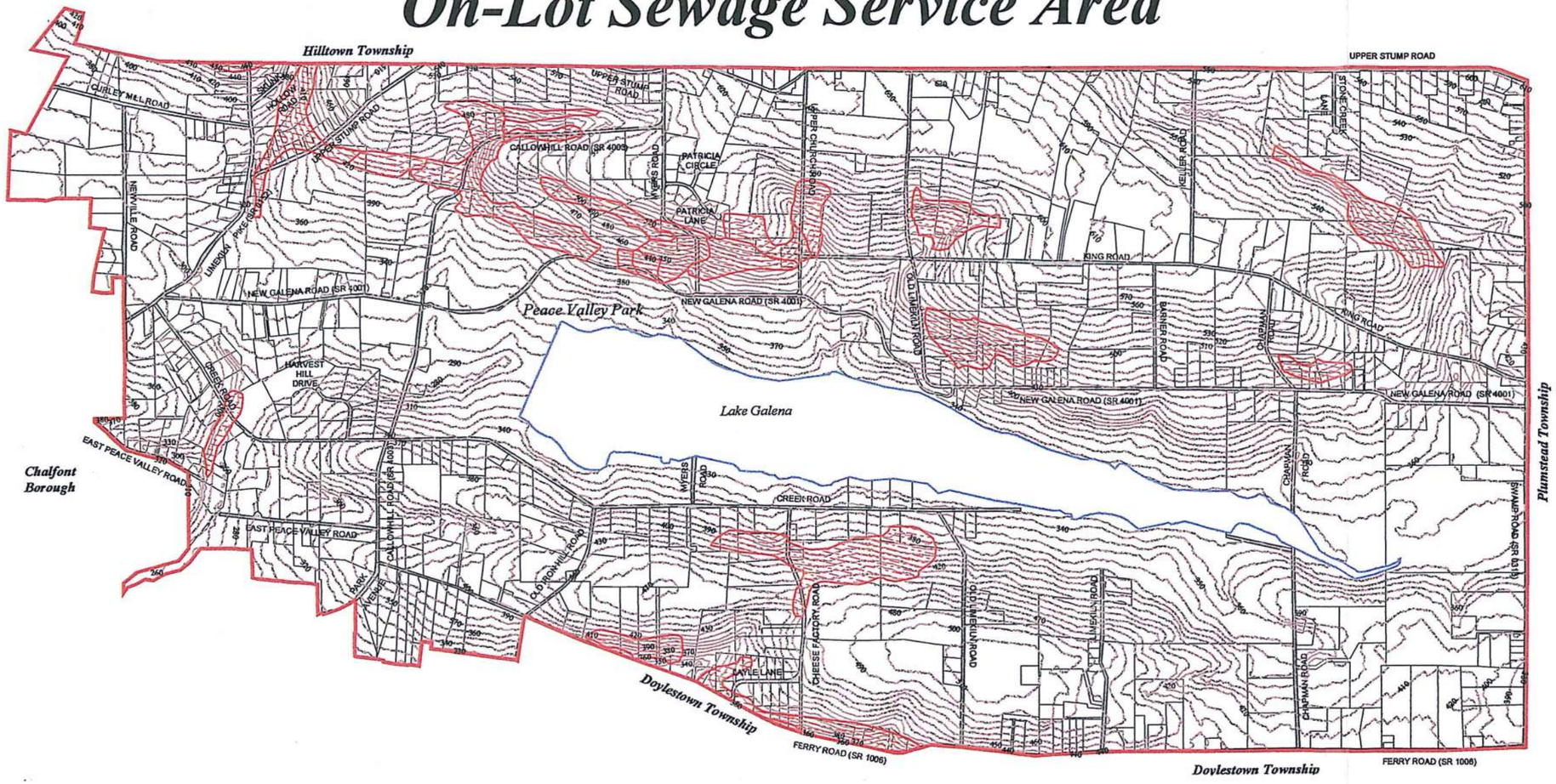
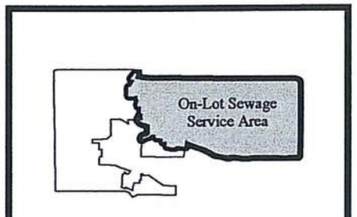




FIGURE 5



New Britain Township

Legend

- Slope 15-25%
- Contours
- Road Rights-of-Way
- Parcels
- Lakes

Note: Steep Slopes are delineated based on USDA Soil Survey Slope Classification.

3-13

Data Source

Slope: USDA Natural Resources Conservation Service - Soil Survey of Bucks County, Pennsylvania - September 2002
Road Rights-of-Way: Bucks County Tax Assessment Data - February 2003
Parcels: Bucks County Tax Assessment Data - February 2003
Contours: U.S. Geological Survey -1996
Lakes: The National Hydrography Dataset, USGS-April 1999
Information Ortho Rectify by Carroll Engineering Corporation- February 2003

STEEP SLOPES

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DATE 10/11/05 JOB NO 03-0185-00 SCALE 1" = 2000'

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F. Potable Water Supplies

As indicated from Census data obtained from the Bucks County Planning Commission and water supply data obtained from the BCDH, 32.2% of the Township is supplied by individual on-lot wells. The remaining portion of the Township is supplied by public water from the North Penn Water Authority. With a few exceptions, all of the homeowners in the On-Lot Sewage Service Area receive their water from on-lot wells.

The BCDH monitors water quality of community and non-community public water supply systems in Bucks County. A community public water system serves at least 15 connections used by year-round residents or regularly serves 25 year-around residents. A non-community public water supply has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. A brief discussion of selected public water supplies in this planning area is provided below.

1. Lake Ridge Mobile Home Park

The Lake Ridge Mobile Home Park is serviced by a community well, referred to as Well No. 5 (Permit No. 109009). A summary of the water quality test results taken from Well No. 5 are shown in Table 5.

TABLE 5
WATER QUALITY TEST RESULTS FROM WELL NO. 5

Nitrate (ppm as N)	0.10
Odor	N/R
Turbidity (NTU)	<1
TDS (mg/L)	230
pH	6.3
Alkalinity	140
Ca (mg/L)	155
Fe (mg/L)	<0.01
Mn (mg/L)	<0.05
Water Quality Evaluation	Slightly Corrosive

Source: "Bucks County Water Supply and Wellhead Protection Study"

In addition to the chemical constituents listed in Table 5, BCDH representatives have indicated that bacteriological contamination is occurring, most likely as a result of septic system malfunctions at the Mobile Home Park. Therefore, an Iodine Disinfection System is provided to disinfect the water supply. The Bucks County Wastewater Facilities Inventory - 1999 (Bucks County Planning Commission) identifies 21 homes served by On-Lot Sewage Disposal Systems within the Mobile Home Park.

2. Windmill Day Care Center

Based on previous testing performed by the BCDH, the water supply serving this establishment has experienced previous bacterial contamination. A Chlorine Disinfection System is maintained in order to ensure safe drinking water. Detailed analytical data is on file at the BCDH.

3. Our Lady of Czestochowa

Based on previous testing performed by the BCDH, the water supply serving the Shrine is in compliance with current safe drinking water regulations. Detailed analytical data is on file at the BCDH.

Bucks County has taken steps in addressing problem areas within the entire County by developing the "Bucks County Water Supply Plan and Wellhead Protection Study". The Water Supply Plan portion of the report contains information on the various water systems and wells within the County and recommendations for addressing possible problems. The Model Wellhead Protection Study portion of the report follows a step-by-step approach to completing a wellhead protection program for various municipal wells within the County. The New Britain Township Subdivision/Land Development Ordinance protects potable water supplies by repeating and enforcing the DEP separation requirements between wastewater facilities and public or private wells.

General information regarding ground water wells and typical hydraulic conductivities within various geologic formations of the planning area was provided in Section 3.1 D.

G. Floodplains and Wetlands

The Neshaminy Creek Watershed encompasses the entire Township, with its primary tributaries: North Branch Neshaminy, West Branch Neshaminy, Neshaminy Mainstream, and Pine Run Creek. Smaller tributaries of note, but unnamed except by local custom, are Reading Creek and Hardiakan Creek. Within the planning area, land in the northern portion drains into Hardiakan Creek, which ultimately flows into the North Branch of the Neshaminy Creek upstream of Lake Galena. With the exception of the southeastern portion of the planning area, the remaining land drains into Lake Galena, the North Branch Neshaminy Creek or its unnamed tributaries. The southeastern portion of the planning area, near Ferry Road, drains into the Pine Run Creek Watershed, which ultimately enters the North Branch of the Neshaminy Creek approximately ½ mile upstream of its confluence with the Neshaminy Main Stream. The entire planning area watershed serves as a partial water source for the Forest Park Water Treatment Plant, which is located near the confluence of the North Branch Neshaminy Creek and Pine Run Creek.

Floodplains are associated with each of the streams mentioned above, varying in width of a few hundred feet to over 1,000 feet on the Neshaminy Mainstream. In addition, two dams have been constructed in the Township for flood control. These are known as PA 617 (North Branch Neshaminy Creek) that forms Lake Galena, and PA 615 (unnamed tributary of West Branch Neshaminy Creek) locally referred to as Reading Creek. Nearby, in Doylestown Township, PA 616 forms Pine Run Reservoir, and thence flows into New Britain Township. PA 617 is the only Dam located within the planning area.

Typically wetlands occur as marshes, swamps, and bogs. Often, they are saturated lands or areas that display a seasonal high water table. Most of the wetlands in the planning area are along or coincide with the North Branch Neshaminy Creek and its tributaries. The National Wetlands Inventory Map indicates the presence of wetland areas (larger than two acres) in conjunction with these stream corridors as well as numerous sites along both ridges bordering Peace Valley Park (Lake Galena). Numerous smaller wetland areas also exist that are not mapped on the NWI maps. Clues to their possible locations include mapping of flood plains, alluvial soils and hydric soils. Alluvial soils are soils which have formed as a result of water transport and redeposition at some time in the past. Hydric soils are soils which develop in response to seasonal saturation from a high water table, at or near the ground surface, for sufficient duration during the growing season to support hydrophytic (water loving) vegetation. It is important to note that although mapping of alluvial soils and hydric soils suggests the possible existence of additional wetland areas, site specific field determinations must be performed by a trained wetland scientist to confirm the location and boundary limits of wetland areas.

Wetlands are considered important resources, for they act as filters and recharge zones. They also act as natural retention basins, allowing water to pool and release after a storm at a much lower rate, thus reducing the frequency and severity of flooding. These drainage areas, waterways, floodplains, wetlands and wetland indicators (hydric soils) are represented in Figure 6 - Hydrologic Features.

Not to be confused with Constructed Wetland Treatment Systems, which will be discussed later in this section, natural wetland areas are not suitable for on-lot sewage disposal due to saturation of soils at or near the ground surface. Alternative disposal methods, such as composting toilets, evapotranspiration systems and similar types of non-discharge systems should be explored in these locations. Finally, if these alternatives are not sufficient, a biological nutrient removal system affording a high degree of tertiary treatment would be the final alternative, followed by disinfection and surface water discharge.

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New Britain Township
Act 537 Plan
On-Lot Sewage Service Area

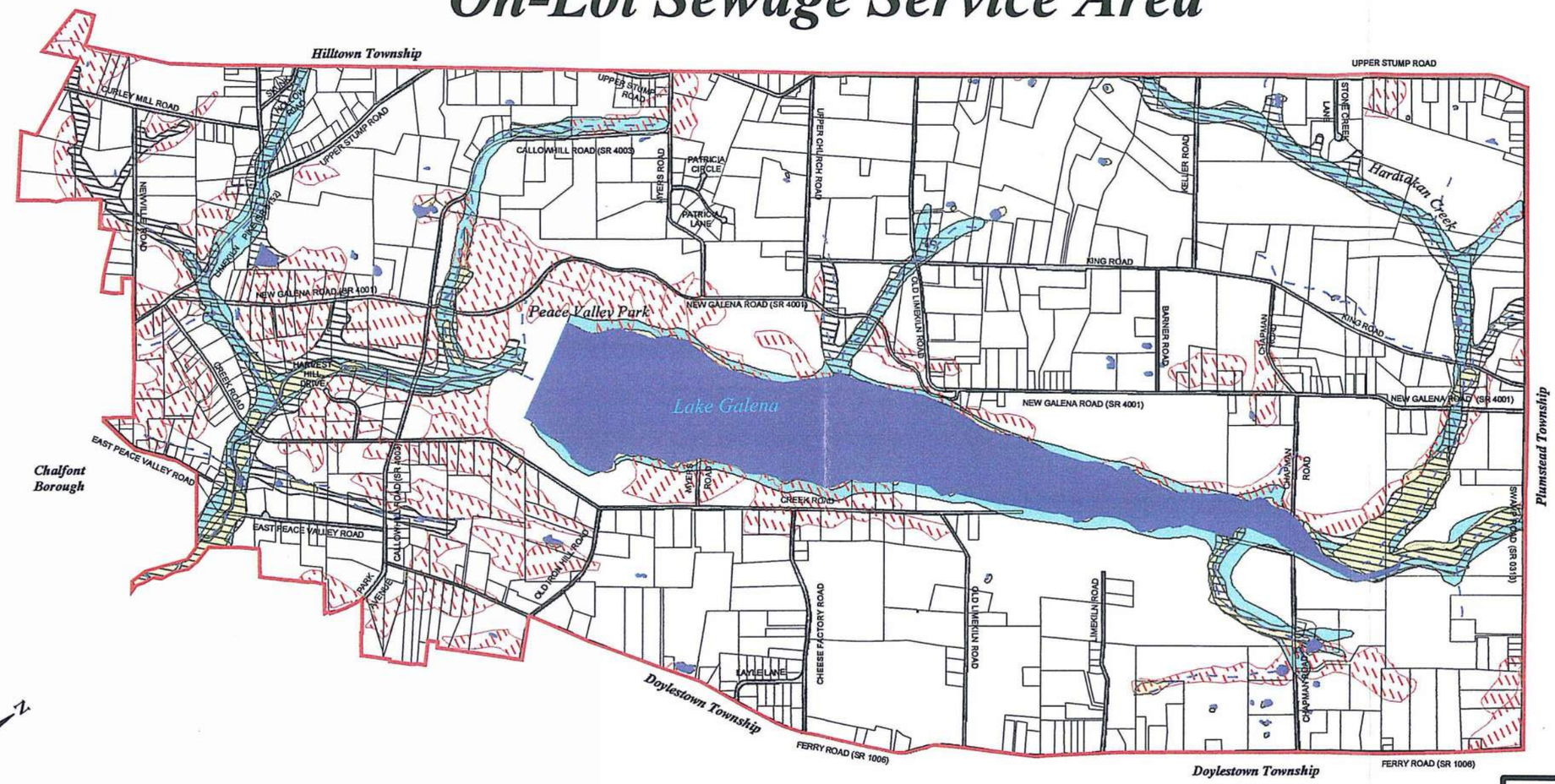


FIGURE 6

Legend

- Lakes & Ponds
- Watercourses
- Hydric Soils
- Alluvial Soils
- Floodplains
- Parcels
- Road Rights-of-Way
- Wetlands



New Britain Township

3-17

Data Source

Soils: USDA, Natural Resources Conservation District
Soil Survey of Bucks County, Pennsylvania - September 2002
Road Rights-of-Way: Bucks County Tax Assessment Data - February 2003
Parcels: Bucks County Tax Assessment Data - February 2003
Lakes: The National Hydrography Dataset, USGS-April 1999
Information Ortho Rectify by Carroll Engineering Corporation- February 2003
Wetlands: U.S. Fish and Wildlife Service, National Wetlands Inventory - 1985

HYDROLOGIC FEATURES

Prepared For:
NEW BRITAIN TOWNSHIP
BUCKS COUNTY, PENNSYLVANIA

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H. Agricultural Areas

While there are no agricultural security districts in the Township, agricultural security districts serving Hilltown and Plumstead Townships also include lands that are located within the On-Lot Sewage Service Area of New Britain Township. One farm currently is party to the County agricultural preservation program. Other farmland owners have shown an interest and are being encouraged by the Township to actively participate. There are few owner-operated farms remaining. Most actively farmed lands are rented to one of three farmers in the area, and are economically marginal. Most farmers in the Township are nearing or past retirement age, which places the Township's agricultural lands in a position of threat from development. Lands within agricultural security districts that are also located within the On-Lot Sewage Service Area of New Britain Township, are shown in Figure 2 - Zoning.

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PART 4.0 - EXISTING SEWAGE DISPOSAL AND WATER SUPPLY FACILITIES

4.1 Existing On-Lot Disposal Systems

Various types of on-lot sewage disposal systems are in use within the Planning Area. These include cesspools, seepage pits, seepage beds, trenches, elevated sand mounds and Individual Residential Spray Irrigation Systems (IRSIS). Each system type will be more fully explored in the following sections. Reference will be made to several articles taken from "Pipeline", a quarterly publication by the National Small Flows Clearinghouse.

A. Cesspools and Seepage Pits

Older homes and commercial properties constructed prior to the mid to late 1960s were served by on lot sewage disposal systems consisting of cesspools or septic tanks followed by either seepage pits or a shallow type of installation in the form of a seepage bed or trenches.

A Cesspool is a lined and covered excavation in the ground which receives the discharge of domestic sewage or other organic wastes from a drainage system, so designed as to retain the organic matter and solids, but permitting the liquids to seep through the bottom and sides. Generally the cesspool would be a cylindrical, block lined structure, approximately 6 feet or more in diameter and up to 10 feet deep. Since the majority of soils in Pennsylvania exhibit rock and groundwater conditions less than 6 feet below the ground surface, and most soils in this planning area exhibit these conditions less than 4 feet below the ground surface, cesspools are no longer permitted under State regulations. Groundwater contamination from cesspools remains a concern.

A seepage pit is a structure similar in construction to a cesspool, distinguished from a cesspool by the presence of a septic tank upstream of the seepage pit, which partially treats wastewater and retains solids. Therefore, while the wastewater entering a seepage pit is somewhat better in quality, it is not treated to the extent necessary for eliminating a threat of groundwater contamination. Therefore, these systems are also no longer permitted in Pennsylvania.

A Sewage Facilities Planning Survey was conducted in the Spring of 2004, as will be further described in Section 4.2. Out of 239 Sewer Survey Questionnaires returned by residents within the Planning Area, 13% of responses identified either cesspools or seepage pit systems as their method of wastewater disposal and treatment.

B. Seepage Beds and Trenches

Another type of older system is the installation of either a seepage bed or trenches. These installations are preceded by a septic tank. Seepage beds are generally rectangular excavations, 10 to 30 feet in width and 30 to 50 feet or more in length, 12 to 36 inches in depth, in which 12 inches of stone is placed; perforated piping is placed within the stone bed, spaced 3 to 6 feet apart, to encourage even distribution of the septic tank effluent.

The piping is either fed by a "distribution box" which will be explained further below, or it is interconnected by a distribution manifold pipe that acts as a flow splitting device. Seepage beds are generally limited to gently sloping land (slopes less than 8%). Trenches are narrow stone lined excavations between 3 and 5 feet in width, 12 to 36 inches in depth, spaced 5 feet or more apart, which are constructed on steeper sloping lands, on contour. Septic tank effluent generally discharges to a "distribution box" upstream of the highest trench elevation; solid piping enters the distribution box from each trench, all at the same elevation, such that wastewater feeds each trench equally, regardless of its elevation in relation to other trenches. General information can be found regarding these types of systems in Appendix E. ("Septic Systems - A Practical Alternative for Small Communities"- Pipeline, Summer 1995"; Also "Alternative Dispersal Options - page 2 "Trenches" - Pipeline, Fall 2002).

Older installations of these types of systems were not consistently regulated with regard to installation depth as it relates to groundwater and rock conditions. So although these older systems are a clear improvement over cesspools, which have no pretreatment, and in many cases an improvement over seepage pits, because they are installed at shallower depths, the threat of groundwater contamination is still a possibility where they are installed with an insufficient soil treatment layer between the bottom of the excavation and bedrock or seasonal high groundwater table.

More recent installations of seepage beds and trenches (from the mid 1970s through today), are based on more thorough, site specific testing and evaluation of soils, bedrock and groundwater conditions. Therefore, soil renovation of wastewater effluent prior to reaching the groundwater table is ensured to a greater extent with more recent installations of these types of systems. In Pennsylvania, PADEP requires a 48-inch depth of suitable soil between the bottom of the bed or trench installation and the limiting conditions of groundwater or rock. This thickness of soil is considered adequate for renovation of wastewater prior to entering the groundwater table. Since seepage beds and trenches must be excavated between 12 and 36 inches below the ground surface, at least 60" of suitable soil must be confirmed to exist from the ground surface down to the seasonal high water table or rock.

Site suitability for seepage beds and trenches is determined in Pennsylvania by performing two tests within the proposed sewage disposal system area, in the presence of a Sewage Enforcement Officer (SEO). These are referred to as the deep hole test and the percolation test. The deep hole test is performed with a backhoe; two to four test pits are excavated per system area, approximately 2 feet in width, 6 feet or more in length and 6 to 8 feet in depth. Soils are examined for evidence of a seasonal high water table and depth to rock, both of which are considered a "limiting zone", which is a vertical zone in the soil profile at which point rock or groundwater is expected to limit any further renovation of percolating wastewater. If the area is considered suitable with regard to adequate soil depths, and if set back requirements to property lines, right of ways, structures, driveways, surface waters, and wells are met, then a percolation test is performed. This testing is performed by excavating at least six (qty) 6" diameter holes, lined at the bottom with fine gravel, within the proposed absorption area. Water is poured into the holes the day before the test is begun, which is considered a presoak. The test is then run on the following day, with water poured into each hole at specific

time intervals to a fixed reference point; the water level drop is measured after each time interval and recorded. After a period of approximately four hours, or sooner if the drop stabilizes to a consistent value, the test is ended and the average rate of drop is recorded for the site. This percolation rate, as measured in minutes per inch of water drop (mpi) determines final suitability of a site, the size of the seepage bed or trench which is required to treat the proposed wastewater flow, and the type of wastewater distribution required (gravity vs. low pressure). The slower the percolation rate, the greater the required absorption area. If the percolation rate is too fast (6 mpi), where inadequate treatment might result, or too slow (90 mpi), where future ponding and surface malfunction might occur, then the site would fail the test and a seepage bed and/or trench system would not be permitted in that location. If the average percolation rate was acceptable, but slower than a specified rate (60 mpi), then additional precautions would be necessary to enhance treatment, via a pressurized distribution system. With pressurized distribution, in lieu of 4" diameter perforated gravity discharge pipe, small diameter piping (1.5 to 2") is installed, with small distribution holes (1/4 inch diameter) drilled every six feet or so along the pipe. Effluent is dispersed to the gravel bed or trench under a low pressure, such that each evenly space hole is discharging an approximately even amount of wastewater. Additional information regarding site evaluations can be found in Appendix E ("Site Evaluations", Pipeline, Spring 2000).

There is a variation of the seepage bed, known as a subsurface sand filter, which also deserves mention. This system is possible in areas where soils are considered sufficiently deep to permit an in-ground system, but the percolation rate performed at the proposed depth of installation is too slow (greater than 90 mpi). In these areas, a deep percolation test may be performed between 3 and 6 feet below the ground surface, and if the rate is acceptable (3-90 mpi), then the unsuitable overlying soil can be removed and replaced with special certified sand material.

A Sewage Facilities Planning Survey was conducted in the Spring of 2004, as will be further described in Part 4, Section 4.2. Out of 239 Sewer Survey Questionnaires returned by residents within the Planning Area, 62% of responses identified "Septic Tank - Drainfield", which is either a seepage bed or trenches, as their method of wastewater disposal and treatment.

C. Elevated Sand Mound Systems

Most of the more recently installed On-Lot Disposal Systems (OLDS) in New Britain Township are individual elevated sand mound systems. These types of systems are installed above the original ground surface in order to take advantage of limited depths of suitable soil. Once considered an "Alternate" type of disposal system in Pennsylvania, since much of the Commonwealth encompasses relatively shallow soils, elevated sand mound systems have become a standard conventional system. As long as the soil depth to seasonal water table or rock is 20" or more below the ground surface, then an elevated sand mound could be considered. Percolation test requirements are less restrictive for elevated sand mound systems, allowing installations for faster (3 minutes per inch) and for slower rates (180 minutes per inch) than that allowed for standard seepage beds and trenches. This is because additional certified sand material is

added to the disposal area in order to achieve the prerequisite 48" of vertical soil/sand material for renovation. Wastewater must be evenly distributed into an elevated gravel bed, placed above the sand, using a small diameter low pressure piping distribution system as previously described in subsection 4.1.B. The entire sand mound and gravel bed is encapsulated within a soil berm and covered with a soil cap. Final height of these systems may vary from a minimum of 34" to 46" on the high side and substantially higher on the downslope side, if slopes are steep. Generally, a conventional elevated sand mound is not permitted on slopes exceeding 12 percent.

Similar to seepage beds and trench systems, elevated sand mound systems include pretreatment with a septic tank. The septic tank effluent then flows to a pump station (or in unusual circumstances to a siphon tank), which doses the distribution system under low pressure via a small effluent pump (or siphon) controlled by a float system. Additional general information on elevated sand mounds can be found in Appendix E ("Mounds: A Septic System Alternative", Pipeline, Summer 1999).

A Sewage Facilities Planning Survey was conducted in the Spring of 2004, as will be further described in Part 4, Section 4.2. Out of 239 Sewer Survey Questionnaires returned by residents within the Planning Area, 18% of responses identified elevated sand mound systems as their method of wastewater disposal and treatment.

D. Individual Residential Spray Irrigation Systems (IRSIS)

Spray Irrigation is an available technology for individual homes as well as for community systems. If it is used for homes, the system is called an "Individual Residential Spray Irrigation System" (IRSIS) and is classified as a conventional type of disposal system.

However, as seen in Table 2 (Part 2.0, Section 2.3.B.), they are less common than all other on-lot disposal systems that have been permitted within the planning area. These systems are more maintenance intensive and expensive to permit and construct than all other on-lot systems. Site suitability testing is different from that described for seepage beds, trenches and elevated sand mounds, in that the absorption area is quite large, filtration and disinfection is typically provided, and final land application is via above ground sprinklers under relatively high pressure (35-40 psi). The McGrath property, Murphy tract - Lot #2, Lockwood tract, and Bauhmer subdivision utilize Individual Residential Spray Irrigation Systems (IRSIS). The McGrath property, Lockwood tract and Bauhmer subdivision IRSIS utilize aerobic pretreatment methodology while the Murphy tract - Lot #2 utilizes an IRSIS with septic tank pretreatment.

IRSIS systems will be discussed in greater detail in Part 5.0, Section 5.3.E.

E. Other On-Lot Disposal Systems Approved By BCDH

Sylvan Golf Center (referenced in Table 1 - Part 2.0) utilizes a large "community" sand mound system. The term "community" references use of a system on a larger scale than single family residential. In this case the community system for the Sylvan Golf Center is a commercial use at 800 gallons per day (GPD). Peace Valley Church (referenced in

Table 2 - Part 2.0) has been approved for a community sand mound system rated for 1,500 GPD, but has not constructed the system.

Alternate Systems approved in New Britain Township include Dimmig Minor Subdivision Drip Irrigation (approved but not installed), Davies Drip Irrigation, Calhoun Drip Irrigation, Simmons At-Grade System, Crabtree At-Grade System, and Mackrides Hydraulic Linear Loading Rate (HLLR) System.

There is one Small Flow Treatment Facility (SFTF) approved within the Township: Herring property SFTF. The Herring property SFTF is designed as a Bio-Microbics Fast™ package treatment plant with free access sand filter, chlorination tank and pump tank. The SFTF is rated for 500 GPD and has been issued an NPDES Permit (Permit #0054824) from the PADEP to discharge to an Unnamed Tributary to Neshaminy Creek. The system has not yet been constructed.

Small Flow Treatment Facilities and Drip irrigation systems will be described in more detail in Part 5.0 of this Act 537 Plan.

Refer to Figure 7 - Spray Irrigation and Non-Conventional On-Lot Systems, for an inventory of these various sewage disposal systems within the On-Lot Service Area.

4.2 Sanitary Sewer and Water Survey

A. Sanitary Sewer Survey

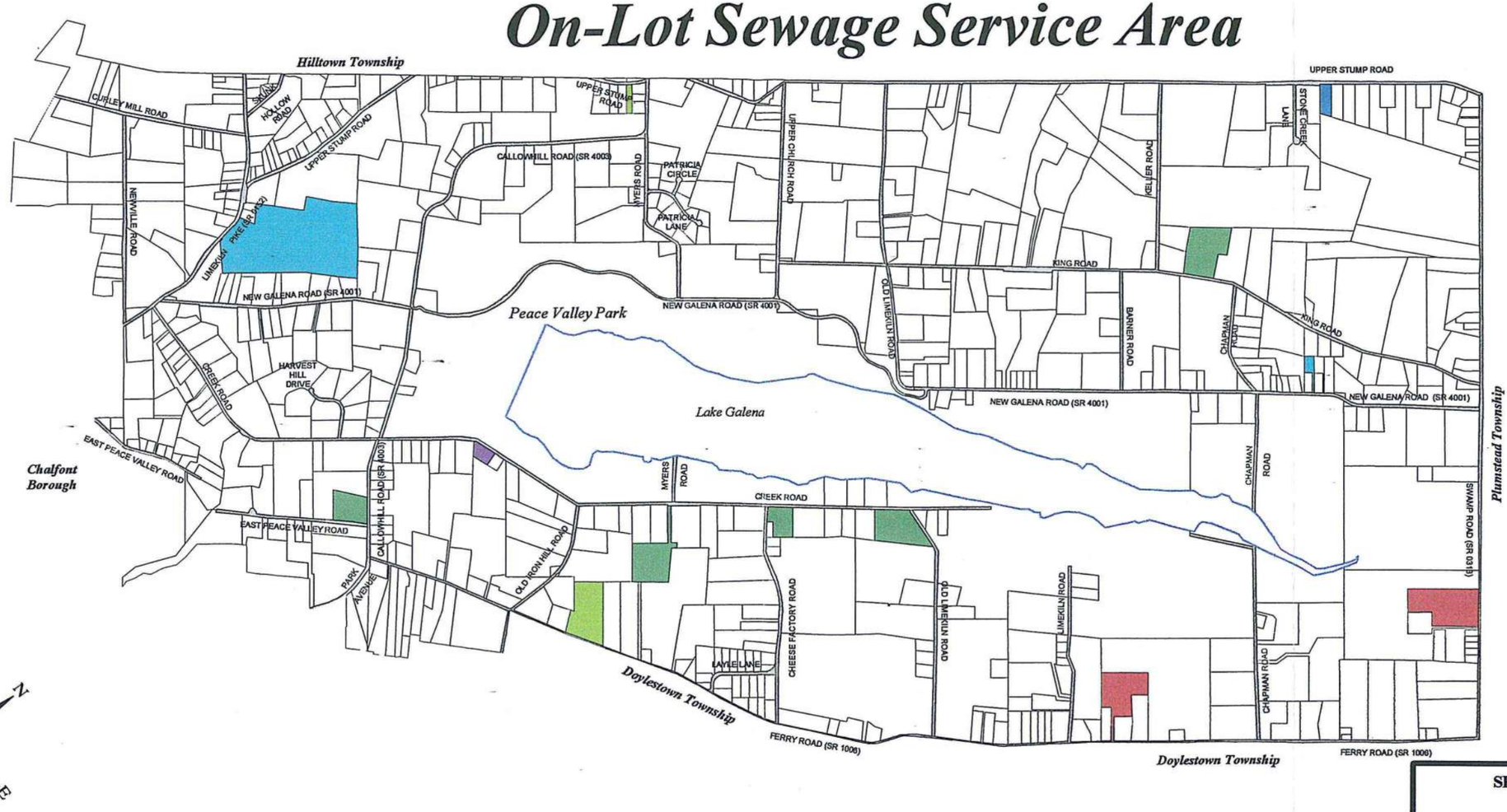
In the Spring of 2004, a water and sewage survey was conducted to investigate whether problem areas exist within the Planning Area. A questionnaire was developed and sent to 594 residences located within the Planning Area. The questionnaire included questions which covered water, sewage and land use. A copy of the water and sewage questionnaire along with a tabulation summary of responses is provided in Appendix D. For general reference purposes, a Sewage Facilities Planning Survey Map is presented in Figure 8.

Of the 594 questionnaires that were mailed, 289 (48.7%) of the residences responded and 48 (16.6%) of the residences that responded were randomly selected for field verification. Table D-1 in Appendix D contains a summary of the responses gathered from the survey while Table D-2 also in Appendix D contains a summary of the percentage of affirmative responses to key questions of the survey.

As concluded from the survey, almost all of the properties located within the OLDS service area are comprised of single family residences. There are a small percentage of multiple family residential properties and commercial properties in the service area as well. Of these single family properties, most (greater than 60%) have conventional septic tank/drainfield disposal systems. The remaining are comprised of septic tank-sand mound systems (approximately 18%), followed by septic tank-seepage pits (approximately 8%) and cesspools (approximately 4%). The survey reflected a small percentage (less than 1%) of non-conventional OLDS in the service area, although more exist than are suggested by the questionnaire responses, as noted in Table 2, Part 2.0.

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New Britain Township
Act 537 Plan
On-Lot Sewage Service Area



On-Lot Sewage Service Area

New Britain Township

Legend

- Parcels
- Road Rights-of-Way
- Lakes

System Legend

- Individual Residential Spray Irrigation System (IRSIS)
- Alternate At-Grade System
- Drip Irrigation System
- Hydraulic Linear Loading Rate (HLLR) System
- Stream Discharge
- Community Sand Mound

4-6

FIGURE 7

SPRAY IRRIGATION & NON-CONVENTIONAL ON-LOT SYSTEMS

Prepared For:

NEW BRITAIN TOWNSHIP
BUCKS COUNTY, PENNSYLVANIA

Carroll Engineering Corporation

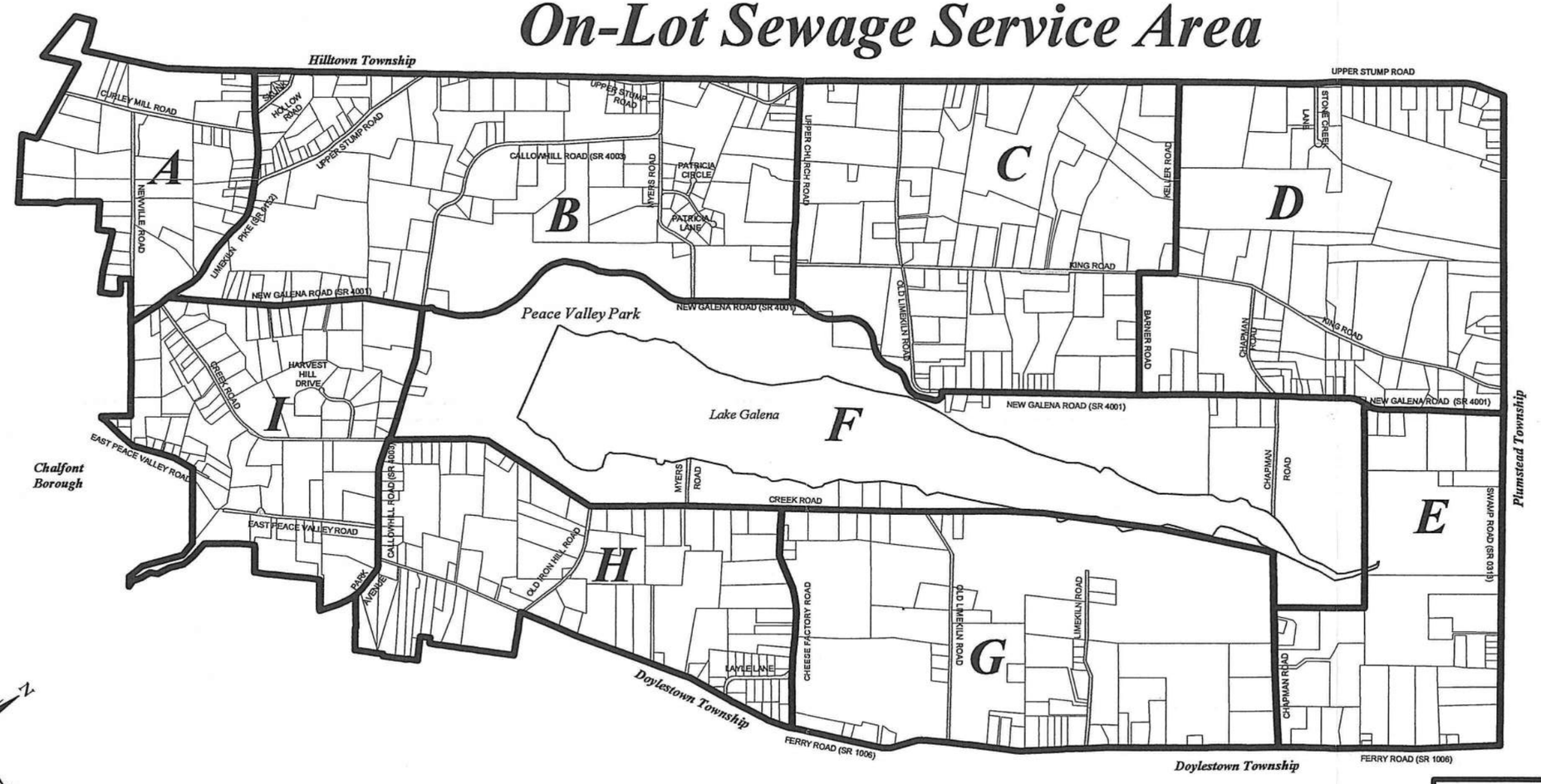
555 Second Avenue Suite G-101, Collegeville, PA 19426, Phone: 610-489-5100, Fax: 610-489-3674
949 Easton Road, Warrington, PA 18976, Phone: 215-343-5700, Fax: 215-343-0875
128 East Lincoln Highway, Coatesville, PA 19320, Phone: 610-466-1630, Fax: 610-466-1632
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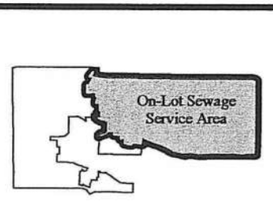
DATE 10/11/05 JOB NO 03-0485-00 SCALE 1" = 2000'

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W:\Projects\NBT\ArcMap\Act 537 Maps\Act 537 Spray Irrigation & Non-Convential 11x17.mxd

New Britain Township
Act 537 Plan
On-Lot Sewage Service Area





Legend

- Property Location Area
- Parcels
- Road Rights-of-Way
- Lakes

FIGURE 8

SEWAGE FACILITIES PLANNING SURVEY

Prepared For:

NEW BRITAIN TOWNSHIP
BUCKS COUNTY, PENNSYLVANIA

Carroll Engineering Corporation

555 Second Avenue Suite G-101, Collegeville, PA 19426, Phone: 610-489-5100, Fax: 610-489-2674
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DATE 10/11/05 JOB NO 03-0485-00 SCALE 1" = 2000'

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W:\Projects\NBT\ArcMap\Act 537 Maps\Act 537 Planning Survey Area_11x17.mxd

Most of the residents who responded to the questionnaire have on-lot disposal systems between eleven and forty years old. Most of the residents who responded have their systems pumped out within 5 years, with almost half indicating that they have their systems pumped out every 2 to 3 years. Most of the residents indicate in the questionnaire that their on-lot disposal systems are functioning properly; only a small percentage (approximately 8%) of the residents indicate they have experienced problems with their system, and less than 20% of the residents indicate they have had their OLDS repaired. Most of these repairs noted were associated with routine maintenance of their system (replacement of drain piping, pump replacement, etc.).

As indicated in the survey and as discovered through meetings with the Health Department, some of the original existing OLDS located in the service area have been repaired or replaced. The BCDH is responsible for issuing repair permits on any repair or replacement of an existing sewage disposal system.

Overall, based on the survey responses received and subsequent field verification, most of the OLDS in the service area are functioning properly. Most residents responding have indicated that they properly maintain their systems by having their septic tanks pumped out regularly and performing routine maintenance. As can be seen from Table D-1, the small percentage of systems that currently are indicating they have problems are pumped out with a frequency of 3 years or more. Many of these problems might be alleviated further by increasing the frequency of pumping their systems. These easily preventable problems could also be addressed through a properly administered Sewage Management Program as outlined in Part 7.0.

B. Water Supply Survey

The results from the Water and Sewer Survey indicate that nearly all of the residents in the OLDS service area have private wells. A great majority of the residents (73%) have had their wells tested for contamination and only a small percentage (less than 6%) have had contamination in their wells. The small percentage of wells that were contaminated can be directly attributed to those residents with malfunctioning septic systems. Some of the residents that have had contamination in their wells have installed UV disinfection systems to alleviate the problem.

Less than 25% of the residents surveyed have experienced low water tables which have restricted their well water usage. In conducting the field verifications of the survey responses, most residents indicated that restrictions on well water usage were self-imposed. The residents limit their own water usage based upon weather conditions. Some of the residents have also had their wells hydrofracted in order to increase water yields.

Overall, the private wells located in the OLDS service area are functioning properly with no contamination. Most residents are very conscious of their well water levels and limit their usage accordingly.

4.3 Repairs to Existing On-Lot Disposal Systems

Table D-3 in Appendix D provides information regarding previous BCDH permitted repairs to on-lot sewage disposal systems within the New Britain Township Service Area, which includes the On-Lot Sewage Service Area, as well as other non-sewered areas of the Township. A total of 27 repair permits were issued within the last 10 years. The majority of these repairs were issued for disposal systems within somewhat poorly drained (seasonal water table between 10"-20" below grade) and poorly drained (seasonal water table between 0-10" below grade) soils. The majority of repairs consisted of a combination septic tank-elevated sand mound disposal system.

PART 5.0 ON-LOT SEWAGE DISPOSAL
SITE SUITABILITY AND ALTERNATIVES ANALYSIS

5.1 Flow and Land Use

In this section, sewage disposal alternatives will be explored. But first, it is important to classify flow and land use categories associated with various types of proposed land development. This information then helps to establish the types of system options available and the specific sewage facilities planning and permitting activities required of the applicant as described in Part 2.0 of this planning document.

The following definitions are provided below to clarify terminology used in this section, as taken from 25 PA Code Chapters 71 and 73:

Lot:	A part of a subdivision or a parcel of land used as a building site or intended to be used for building purposes, whether immediate or future, which would not be further subdivided. Whenever a lot is used for a multiple family dwelling or for commercial, institutional or industrial purposes, the lot shall be deemed to have been subdivided into an equivalent number of single family residential lots as determined by estimated sewage flows.
Equivalent Dwelling Unit:	For the purpose of determining the number of lots in a subdivision only as it relates to the determination of planning exemptions and fees for planning module reviews under this chapter, that part of a multiple family dwelling or commercial or industrial establishment with flows equal to 400 gpd. These flow figures are not intended to be used for the calculation of flows for the design of a community sewerage system or for the allocation of flows related to community sewerage systems. Community sewerage system flows for design and permitting purposes shall be calculated using the procedures established in the Department's Domestic Wastewater Facilities Manual.
Individual Sewage System:	A system of piping, tanks or other facilities serving a single lot and collection and disposing of sewage in whole or in part into the soil or into waters of this Commonwealth or by means of conveyance to another site for final disposal. There are two types of Individual Sewage Systems as further defined below.

Individual On Lot Sewage System:	An individual sewage system which uses a system of piping , tanks or other facilities for collecting, treating and disposing of sewage into a soil absorption area or spray field or by retention in a retaining tank.
Individual Sewerage System:	An individual sewage system which uses a method of sewage collection, conveyance, treatment and disposal other than renovation in a soil absorption area, or retention in a retaining tank.
Community Sewage System:	A sewage facility, whether publicly or privately owned, for the collection of sewage from two or more lots, or two or more *equivalent dwelling units* and the treatment or disposal, or both, of the sewage on one or more of the lots or at another site. There are two types of Community Sewage Systems as further defined below.
Community Onlot Sewage System:	A system of piping, tanks or other facilities serving two or more lots and collecting, treating and disposing of sewage into a soil absorption area or retaining tank located on one or more of the lots or at another site.
Community Sewerage System:	A publicly or privately-owned community sewage system which uses a method of sewage collection, conveyance, treatment and disposal other than renovation in a soil absorption area, or retention in a retaining tank.
Large Volume On Lot Sewage System:	An individual or community on lot sewage system with a design capacity to discharge subsurface sewage flows which are in excess of 10,000 gpd. These systems are required to obtain a Clean Streams Law Part II Water Quality Management Permit. Although the definition provided by PADEP includes an individual sewage system, flow classification would appear to automatically exclude individual systems.

Individual on lot sewage systems (flows less than 800 gpd, or two equivalent dwelling units) include any of the following land use classifications:

- Single Family Residential
- Commercial
- Industrial
- Institutional

Community on lot sewage systems (flows 800 gpd or more) can include any of the following land use classifications:

- Residential
- Commercial
- Industrial
- Institutional

5.2 Classifying Community, Commercial, Industrial and Institutional Sewage Systems

As noted above, Community On Lot Sewage Systems are not exclusionary to a particular land development use. The only criterion is the number of lots (or wastewater flow equivalent) which the system will serve. Therefore, if a commercial, industrial or institutional land development is anticipated to generate less than 800 gallons per day, it is considered an Individual On Lot Sewage System, not a Community On Lot Sewage System. Conversely, if a residential land development is proposed on a single tax parcel with no physical intent to subdivide the property, should proposed flows equal or exceed 800 gpd (i.e. a 5 bedroom home with in-law suite), then the parcel is "deemed to be subdivided" into and equivalent number of lots and the on lot sewage system would be classified as a Community On Lot Sewage System.

As noted in Part 2.0 of this Act 537 Plan, Community and non-residential Individual On Lot Sewage Systems are treated differently during the sewage facilities planning stage. PADEP Sewage Facilities Planning Modules submitted for these types of systems are described below.

- Component 2 Planning Modules are used where the land development will utilize any of the following:

  a. Community on lot systems
  b. Large volume on lot systems
  c. Retaining tank proposals

  Although not specifically addressed in this section, this planning module component is also used for single family residential land development of greater than 10 lots, utilizing on-lot sewage disposal systems, including IRSIS. Essentially any land development proposal other than single family residential developments of 10 lots or less, which will utilize on-lot systems as described in 25 PA Code Chapter 73, including Alternate and Experimental Systems up to a flow of 10,000 gallons per day, would fall under Component 2 Planning Modules.

- Component 3 Planning Modules are used where the land development will utilize a community spray irrigation or stream discharge system as the method of disposal, either of which require a Clean Streams Law Permit (NPDES Part 1 or BWQM Part II Permit). This planning module is also used for public sewer extensions and tap-ins.

- Component 3s Planning Modules are used where the land development will utilize Small Flow Treatment Facilities (flows less than 2000 gallons per day), with final disposal via spray irrigation or stream discharge either of which require a Clean Streams Law Permit. This is a special sub classification of land development proposals that will require a Clean Streams Law Permit; its intent

is to simplify the review and approval process for projects with small flows that will not require a special Certified Sewage Treatment Plant Operator to operate and maintain the sewage system.

5.3 Soil Suitability for On-Lot Disposal

In Section 4.1.B and 4.1C, a general description is provided regarding site suitability determinations for common conventional on-lot seepage beds, trenches and elevated sand mound systems. As explained in these sections, site suitability was based on adequate soil depth and drainage, as determined by excavation of deep test holes, and also on permeability, as roughly estimated through percolation testing. In this section, additional detail will be provided regarding these soil criteria, as it relates to suitability for not just the conventional sewage disposal systems described earlier, but also for the less common conventional Individual Residential Spray Irrigation Systems (IRSIS), as well as alternative and experimental types of on-lot disposal systems. Additional information regarding soil suitability determinations for on-lot sewage disposal can be found in Appendix E ("Soil Characteristics – Demystifying Dirt" Pipeline, Spring 2002; also "Site Evaluations", Pipeline, Spring 2000).

A. Soil Depth, Drainage and Permeability Criteria

Selection of the appropriate type of on-lot disposal system is primarily evaluated based upon three soil criteria: soil depth, soil drainage, and soil permeability. These characteristics will be generally described in this section using simple, non-scientific definitions for the purpose of discussing soil suitability for on-lot disposal.

1. Soil Depth - Classification of soils according to depth to bedrock. Soil depth classifications are listed below.

Soil Depth Classification

Classification	Depth to Bedrock (Inches)
Very Deep	>60
Deep	40 - 60
Moderately Deep	20 - 40
Shallow	10 - 20
Very Shallow	<10

2. Soil Drainage - Soils are classified according to seasonal high water table depth as directly observed, or as indirectly interpreted from soil mottling (spots or shades of different soil color which in the case of a seasonal high water table, are caused by iron bacteria that are deprived of oxygen). Soil drainage classifications are presented below.

Soil Drainage Classification

Classification	Seasonal High Water Table (Inches)
Well Drained	>40
Moderately Well Drained	20 - 40
Somewhat Poorly Drained	10 - 20
Poorly Drained	<10

3. Soil Permeability - Classification of soils according to their most restrictive permeability in inches per hour. (EPA Process Design Manual for Land Treatment of Municipal Wastewater, pg. 2-12). Soil Permeability Classification is presented below.

Soil Permeability Classification

Classification	Rate (Inches/Hour)
Very Rapid	> 20
Rapid	6.0 - 20.0
Moderately Rapid	2.0 - 6.0
Moderate	0.6 - 2.0
Moderately Slow	0.2 - 0.6
Slow	0.06 - 0.2
Very Slow	< 0.06

B. U.S.D.A. Soil Survey Classification for Soils in the Planning Area

The U.S.D.A. Soil Survey of Bucks County (2002) identifies for each soil type, depth, drainage and permeability characteristics, which are all useful in determining potential suitability for on-lot sewage disposal. The information available is general in nature and cannot be relied upon in forming a final decision regarding site suitability. Soils can differ from that mapped by the USDA Soil Survey. Inclusions of other soil types may exist within the main soil mapping unit that are not identified due to the scale of the mapping effort. Furthermore, soil characteristics gradually change with landscape position, geology, hydrology, etc, which are not conducive to exact soil boundaries suggested by the mapping. Therefore, this information should be considered a preliminary planning guide that can be helpful in locating areas with greater potential for on-lot disposal suitability. Confirmation of suitability is necessary by the Sewage Enforcement Officer or Soil Scientist representing the appropriate Regulatory Authority (Bucks County Department of Health, Pennsylvania Department of Environmental Protection).

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TABLE 6
CLASSIFICATION OF SOIL TYPES FOUND IN THE ON-LOT SEWAGE SERVICE AREA

Abbreviation	Soil Class	Slope (%)	Depth to Rock (in)	Depth Class	Depth to Seasonal High Water Table (ft)	Drainage Class	Permeability	Hydric Soil
*AbA** [1]	Abbottstown Silt Loam	0 to 3	40 to 60	Deep	0.5 to 1.5	Somewhat poorly drained	Slow to moderately rapid	No
*AbB**		3 to 8						
*AbC**		8 to 15						
*AmA**	Amwell Silt Loam	0 to 3	> 60	Very Deep	1.0 to 2.5	Somewhat poorly drained	Slow to rapid	No
*AmB**		3 to 8						
BeA	Bedington Channery Silt Loam	0 to 3	> 60	Deep	Greater than 6	Well drained	Moderate to moderately rapid	No
BeB		3 to 8						
*BeC**		8 to 15						
Bo	Bowmansville-Knauers Silt Loams [2]	Nearly Level	> 72	Very Deep	0.0 to 1.5	Somewhat poorly to poorly drained	Moderately slow to rapid	No/Yes
*BwB**	Buckingham Silt Loam	3 to 8	> 80	Very Deep	0.5 to 1.5	Somewhat poorly drained	Slow to moderately rapid	No
CwA	Croton Silt Loam	0 to 3	40 to 60	Very Deep	0.0 to 0.5	Poorly drained	Impermeable to moderately rapid	Yes
CwB		3 to 8					Slow to moderately rapid	
CwxB	Croton Silt Loam - Extremely Stony	0 to 8					Impermeable to moderately rapid	
*CyB**	Culleoka-Weikert Channery Silt Loams (65/25)	3 to 8	20 to 40	Mod. Deep	Greater than 6	Somewhat excessively drained to well drained	Moderately rapid to rapid	No
*CyC**		8 to 15						
DdA	Doylestown Silt Loam	0 to 3	42 to 72	Deep	0.0 to 0.5	Poorly drained	Slow to moderately rapid	Yes
DdB		3 to 8						
DuA	Duncannon Silt Loam	0 to 3	> 60	Very Deep	Greater than 6	Well drained	Moderate to moderately rapid	No
FoB	Fountainville Silt Loam	3 to 8	40 to 60	Deep	1.5 to 2.5	Moderately well drained	Slow to moderately rapid	No
KlD	Klinesville Very Channery Silt Loam	15 to 25	10 to 20	Shallow	Greater than 6	Somewhat excessively drained	Moderately rapid to rapid	No
LgB	Lansdale Loam	3 to 8	40 to 60	Deep	Greater than 6	Well drained	Moderate to rapid	No
*LgC**		8 to 15						
LhB	Lansdale Loam - Extremely Stony	0 to 8						
LhD		8 to 25						
LkA	Lawrenceville Silt Loam	0 to 3	> 48	Very Deep	1.5 to 3.0	Moderately well drained	Moderately slow to moderately rapid	No
LmB	Lehigh Channery Silt Loam	3 to 8	40 to 60	Deep	1.0 to 2.0	Moderately well drained	Slow to moderately rapid	No
*LmC**		8 to 15						
LnB	Lehigh Channery Silt Loam - Extremely Stony	0 to 8						
LnD		8 to 25						
MlB	Mount Lucas Silt Loam	3 to 8	> 60	Very Deep	0.5 to 3.0	Moderately well drained	Slow to rapid	No
MmB	Mount Lucas Silt Loam - Extremely Stony	0 to 8						
NbB	Neshaminy Silt Loam	3 to 8	48 to 60	Deep	Greater than 6	Well drained	Moderately slow to moderately rapid	No
*NbC**		8 to 15						
NhB	Neshaminy Gravelly Silt Loam Extremely Bouldery	0 to 8	48 to 60	Deep	Greater than 6	Well drained	Moderately slow to moderately rapid	No
*PeC**	Penn Channery Silt Loam	8 to 15	20 to 40	Mod. Deep	Greater than 6	Well drained	Moderately slow to rapid	No
*PkC**	Penn-Klinesville Channery Silt Loams (70/20)	8 to 15	20 to 40	Mod. Deep	Greater than 6	Well drained	Moderately slow to rapid	No
PnB	Penn-Lansdale Complex (55/35)	3 to 8	20 to 40	Mod. Deep	Greater than 6	Well drained	Moderately slow to rapid	No
RaB	Raritan Silt Loam	3 to 8	> 60	Very Deep	0.5 to 3.0	Moderately well drained	Moderately slow to rapid	No

TABLE 6
CLASSIFICATION OF SOIL TYPES FOUND IN THE ON-LOT SEWAGE SERVICE AREA

Abbreviation	Soil Class	Slope (%)	Depth to Rock (in)	Depth Class	Depth to Seasonal High Water Table (ft)	Drainage Class	Permeability	Hydric Soil
ReA	Readington Silt Loam	0 to 3	40 to 70	Deep and Very Deep	1.5 to 3.0	Moderately well drained	Moderately slow to moderately rapid	No
*ReB**		3 to 8						
ReC		8 to 15						
*RIA**	Reaville Channery Silt Loam	0 to 3	20 to 40	Mod. Deep	0.5 to 3.0	Somewhat poorly drained	Slow to moderately rapid	No
*RIB**		3 to 8						
*RIC**		8 to 15						
Ro	Rowland Silt Loam	Nearly Level	> 60	Very Deep	1.0 to 3.0	Moderately well drained	Moderately slow to rapid	No
UdB	Udorthents, Shale and Sandstone	0 to 15	12 to 60+	Shallow to Very Deep	No Data Given	Moderately well drained to well drained	Moderately slow to slow	No
UgB	Urban Land-Abbottstown Complex (65/25)	0 to 8	40 to 60	Deep	0.5 to 1.5	Somewhat poorly drained	Slow to moderately rapid	No
UmB	Urban Land-Doylestown Complex (65/25)	0 to 8	42 to 72	Deep to Very Deep	0.0 to 0.5	Poorly drained	Slow to moderately rapid	No/Yes
UrC	Urban Land-Lansdale Complex (50/40)	8 to 15	40 to 60	Deep	Greater than 6	Well drained	Moderate to rapid	No
UyB	Urban Land-Reaville Complex (65/25)	0 to 8	20 to 40	Mod. Deep	0.5 to 3.0	Somewhat poorly drained	Slow to moderately rapid	No
WfD	Weikert-Culleoka Complex (60/30)	15 to 25	10 to 20	Shallow	Greater than 6	Somewhat excessively drained	Moderately rapid to rapid	No

Notes

1 Soils designated as Prime Farmland are shaded. Soils of Statewide Importance are labeled with an asterisk.
2 Bowmansville-Knauers Silt Loams are 40% Bowmansville Soils & 40% Knauers soils. Both are deep soils, but Bowmansville is somewhat poorly drained (not hydric) and Knauers is poorly drained (hydric).
3 Complex Soils are mixes of two soil series. General percentage that each occupies within the overall land area is designated in parentheses after the title, in the same order listed in the title.
4 Urban Land Soils are disturbed soils that are so variable that they cannot by charactorized by the soil survey.

Soils within the planning area are identified in Figure 3 - Soils, and cross referenced in Table 6. Soils can be categorized according to various combinations of depth and drainage characteristics which are useful in interpreting site suitability for various conventional, alternate and experimental on-lot sewage disposal system designs. Soils falling within these various categories of depth and drainage are presented below, along with additional soil permeability information. For ease of future reference, each soils category has been numbered; the numbering system is not to be confused with USDA Classification, it is simply a means for identifying sewage system suitability specific to this Planning Area. As noted above, the accuracy limitations of the soils mapping should always be kept in mind.

SEWAGE DISPOSAL CATEGORY 1 SOILS

Deep or Very Deep, Well Drained Soils
(>40" to Rock, >40" to Seasonal High Water Table)

Bedington Channery Silt Loam	(moderate to moderately rapid permeability)
Duncannon Silt Loam	(moderate to moderately rapid permeability)
Lansdale Loam	(moderate to rapid permeability)
Neshaminy Silt Loam	(moderately slow to moderately rapid permeability)
Neshaminy Gravelly Silt Loam	(moderately slow to moderately rapid permeability)
Urban Land-Lansdale Complex	(moderate to rapid permeability)

SEWAGE DISPOSAL CATEGORY 2 SOILS

Deep or Very Deep, Moderately Well Drained Soils
(> 40" to Rock, 20-40" to Seasonal High Water Table)

Fountainville Silt Loam	(slow to moderately rapid permeability)
Lawrenceville Silt Loam	(moderately slow to moderately rapid permeability)
Lehigh Channery Silt Loam	(slow to moderately rapid permeability)
Raritan Silt Loam	(moderately slow to rapid permeability)
Readington Silt Loam	(moderately slow to moderately rapid permeability)
Rowland Silt Loam	(moderately slow to rapid)

SEWAGE DISPOSAL CATEGORY 3 SOILS

Deep or Very Deep, Somewhat Poorly Drained Soils
(> 40" to Rock, 10-20" to Seasonal High Water Table)

Abbottstown Silt Loam	(slow to moderately rapid permeability)
Amwell Silt Loam	(slow to rapid permeability)
Bowmansville Silt Loam	(moderately slow to rapid)
Buckingham Silt Loam	(slow to moderately rapid)
Urban Land-Abbottstown Complex	(slow to moderately rapid)

SEWAGE DISPOSAL CATEGORY 4 SOILS

Deep or Very Deep, Poorly Drained Soils
(>40" to Rock, <10" to Seasonal High Water Table)

Croton Silt Loam	(impermeable to moderately rapid)
Doylestown Silt Loam	(slow to moderately rapid permeability)
Knauers Silt Loam	(moderately slow to very rapid permeability)
Urban Land-Doylestown Complex	(slow to moderately rapid permeability)

SEWAGE DISPOSAL CATEGORY 5 SOILS

Moderately Deep, Well Drained Soils
(20-40" to Rock, >40" to Seasonal High Water Table)

Culleoka-Weikert Channery Silt Loams	(moderately rapid to rapid permeability)
Penn Channery Silt Loam	(moderately slow to rapid permeability)
Penn-Klinesville Channery Silt Loams	(moderately slow to rapid permeability)
Penn-Lansdale Complex	(moderately slow to rapid permeability)

SEWAGE DISPOSAL CATEGORY 6 SOILS

Moderately Deep, Somewhat Poorly Drained Soils
(20-40" to Rock, 10-20" to Seasonal High Water Table)

Reaville Channery Silt Loam	(slow to moderately rapid permeability)
Urban Land-Reaville Complex	(slow to moderately rapid permeability)

SEWAGE DISPOSAL CATEGORY 7 SOILS

Shallow, Somewhat Excessively Drained Soils
(10-20" to Rock, Rapid Water Removal, No Water Table)

Klinesville Very Channery Silt Loam	(moderately rapid to rapid permeability)
Weikert-Culleoka Complex	(moderately rapid to rapid permeability)

The above soil depth, drainage and permeability terms will be incorporated into future discussions of on-lot sewage disposal alternatives. As noted above, depth, drainage and permeability help to define relative degrees of soil suitability for on-lot disposal. Soils are more suitable for on-lot disposal with increasing soil depth, with better drainage and with better permeability (to a degree). However, when comparing the various general categories of soil depth and drainage with the ranges of values for depth to Rock and Depth to Seasonal High Water Table in Table 6, they do not always exactly correlate. For instance, Abbottstown Silt Loam is identified in Table 6 to have a depth to seasonal high water table ranging from 6" to 18", which deviates to a slight degree from the typical depth range for somewhat poorly drained soils of 10" to 20". Therefore, as noted earlier, review of soils mapping and categorization of the mapped soils according to depth and drainage characteristics should be considered as an approximate indicator of site suitability, with final confirmation provided through site specific soil testing.

5.4 Conventional On-Lot Sewage Disposal Systems

The standard on-lot disposal system types, with exception of cesspools and seepage pits, are still permitted, but only on very deep, well drained soil types with suitable permeability that is not too fast or too slow. Conditions for seepage beds and trenches were discussed in Part 4.0, Section 4.1.B. Only very deep, well drained soils with moderate permeability are suitable for these types of conventional systems (Category 1 Soils).

In areas with restrictive depth to rock or seasonal water table, the elevated sand mound system is the conventional on-lot treatment system of choice, based on 25 PA Code Chapter 73, Standards for Sewage Disposal Facilities. Conditions for elevated sand mound systems are discussed in Part 4.0, Section 4.1C. In addition to the very deep, well drained soils (Category 1 soils), elevated sand mound systems can be sited over moderately deep, moderately well drained soils with permeability in the middle to upper range of moderately slow (Category 2 and 5 soils).

Collectively, the above mentioned disposal systems (seepage beds, trenches, and elevated sand mounds) are generally categorized as Subsurface Wastewater Infiltration Systems (SWIS). Conventional on-lot sewage disposal systems are those which are identified in 25 PA Code Chapter 73 Standards for On-Lot Sewage Treatment Facilities. Although Individual Residential Spray Irrigation Systems (IRSIS) are also considered a conventional system, a thorough discussion regarding this system is provided in Section 5.5.E.

5.5 On-Lot Sewage Disposal Alternatives

Up until the mid 1980s, little option beyond the elevated sand mound was offered for land disposal over soils with restrictive depth, drainage and permeability characteristics. Furthermore, even when soils were found which qualified for the elevated sand mound system, excessive slope became limiting, since these systems were restricted to slopes less than 12%. However, more recently, flow and absorption area reduction techniques, as well as new on-site technologies, have emerged which provide many more options for on-lot sewage disposal in areas with shallow depths to bedrock, seasonal high water tables, steep slopes, and special groundwater quality concerns. These various alternative disposal options will be discussed below and a priority list of alternatives will be established for single family residential on lot systems and separately for multifamily residential and non residential on lot systems.

The goal of establishing a priority list is to encourage consideration of lower maintenance on-lot sewage systems before high maintenance systems would be permitted; a secondary goal is to encourage on-lot disposal options above stream discharge options. Under this approach, the Township would not prohibit approval of these other alternative and experimental systems, but would require that the simpler, lower maintenance on-lot systems be installed over the more complex, maintenance intensive, or stream discharge systems. If alternative on-lot sewage disposal systems were not prioritized, the variation of on-lot disposal systems that might be installed under specific conditions would only be restricted by systems permissible by PADEP regulations. These systems could be higher maintenance aerobic systems, drip irrigation, spray irrigation or HLLR systems, all of which will be described in greater detail later in this Section. In addition, in some cases, stream discharge sewage systems could be permitted in areas otherwise suitable or approvable for spray irrigation. Because New Britain Township is

required by PADEP to bear ultimate responsibility for ensuring adequate long term maintenance of all on-lot disposal systems within the municipality while also ensuring protection of groundwater and surface water quality, it is in the Township's best interest to establish a priority list.

In establishing a priority list, the impact of poor or insufficient maintenance can be minimized and therefore water quality and public health can be better protected from equipment failure that goes unnoticed or ignored. This is not to say that lower maintenance on lot disposal systems can be ignored; they still must be maintained through implementation of a Sewage Management Program as described in Part 7 of this Act 537 Plan. However, regardless of whether a Sewage Management Program is or is not implemented, the installation of additional equipment as part of a sewage system means a greater variety of possible mechanical failures between scheduled maintenance activities. For instance, where a site could be approved for either a drip irrigation or elevated sand mound disposal system under PADEP regulations, levels of maintenance and possible mechanical failures between the two systems are very different. A drip irrigation system using aerobic pretreatment could have air compressor failure, drip field pump failure, disc filter clogging, solenoid valve failure or air relief valve failure. Conversely, an elevated sand mound disposal system only has one pump that could fail, thereby reducing overall risk of system malfunction.

As noted above, a check list of prioritized system alternatives will not prevent alternate, experimental or stream discharge systems from being approved, but will require justification for use of these systems. In certain situations, where ground water quality is at risk, alternative systems that are lower on the priority list may be preferred to ensure a higher degree of treatment prior to discharge. This would certainly be adequate justification for the use of lower priority systems. It should also be noted that involvement of New Britain Township in the choice of on-lot disposal systems will not discourage growth potential within the planning area, as is already permitted through local zoning and land development. Furthermore community economic conditions and recreational opportunities, as they currently exist within the planning area, will continue to be encouraged and protected.

The following flow reduction and system design approaches will be explored in this section, listed alphabetically, corresponding to the order in which they will be discussed:

A. Methods for Reducing or Equalizing Flows
B. Methods for Reducing Required Absorption Field Size
C. Use of Filtration for Conventional, Alternative and Experimental Systems
D. Alternate and Experimental Systems for High Water Table and Shallow Bedrock Conditions
E. Spray Irrigation Systems
F. Drip Irrigation Systems
G. At-Grade Bed Systems
H. Hydraulic Linear Loading Rate Systems (Modified At-Grade Bed Systems)
I. Constructed Wetlands Systems
J. Small Flow Treatment Facilities
K. Retaining Tank Alternatives

Each system will be described below with regard to typical site constraints and design requirements. Also, notations will be provided for each system type, in parentheses after the system name, identifying all Sewage Disposal Soil Categories that would generally be acceptable for the disposal option. A special note however with regard to Sewage Disposal Category 7 Soils: Because of the range in possible depths to rock, this soil may or may not be appropriate where noted with an asterisk.

Category 7 soils are "shallow" soils with a depth to rock ranging from 10"-20". Since most of the optional systems are restricted to areas where depth to rock is at least 16", some areas mapped with Category 7 soils, where rock occurs at depths 16" or more, may be appropriate; others where rock occurs at depths less than 16", may not.

One should also be aware that some sewage disposal options are more appropriate to a specific Sewage Disposal Category than others. Table 7 provides a summary of all the proposed variations in possible treatment options, referenced to soil depth and drainage. These options are cross referenced to the DEP Chapter 73 Regulations as well as the DEP Alternate and Experimental Systems Guidance. Additional discussion regarding this table and a reduced required priority list of sewage disposal system options will be provided in Section 5.7.

A. Methods for Reducing or Equalizing Flows

1. Alternate Composting Toilet Systems in Conjunction with Greywater Systems

Composting Toilet Systems reduce total waste water flow to an on-lot disposal system. According to the DEP Alternate Systems Guidance, under Greywater Systems, separation of "blackwater" (domestic human waste) treatment systems via composting toilets, incinerating toilets or privies, from "greywater" treatment systems (for washwater, etc.), would allow up to a 40% reduction in sizing of an on lot sewage disposal system soil absorption area. There is only one particular composting toilet system currently approved by DEP as an acceptable "Alternate" treatment system. The system, Manufactured by Bio-Sun Systems of Millerton, PA., utilizes a compressor/blower to aerate and dehydrate waste materials. Human waste and kitchen wastes are disposed into the compost chamber via a stainless steel chute system. After addition of an initial "starter" material to initiate the composting process, oxygen is drawn into the system through the toilet and kitchen chutes, through the waste pile and out the vent stack via the blower compressor system which maintains a vacuum and prevents migration of odors into the living space. Wastes are naturally converted into a reusable humus.

Greywater Systems must still be designed with a full sized two-compartment septic tank or two septic tanks in series. In addition, testing for a full sized absorption area must be performed to ensure the additional area is available if needed in the future.

The Bio Sun Composting system includes a precast vault and separate basement door access that can be integrated into new basement construction. If a retrofit is needed for an existing building, the unit can be installed as a retrofit immediately adjacent to the building.

2. Flow Equalization

Facilities with widely fluctuating flows can reduce required soil absorption field sizing by equalizing flows to a stabilized daily rate. This is most appropriate for businesses, schools or other commercial usage, where flows tend to be concentrated within a limited time period during the day. If flow equalization is provided prior to the pretreatment units (septic tank or aerobic tank), then the size of the pretreatment units also can be reduced. If equalization is provided after the pretreatment units, then the pretreatment units must be sized to handle peak flow rates.

In sizing of an absorption area using flow equalization, the size of the absorption field must be increased by 15-20% above the calculated controlled daily flow. DEP must review each proposal before the local SEO may issue a permit.

B. Methods for Reducing Required Absorption Field Size

Various filtration systems, if placed after the pretreatment unit (septic tank), are considered by DEP to produce an effluent of sufficient quality that under certain situations, will allow a reduction in required sizing of a standard soil absorption field by up to 40% from that normally required under Title 25 Chapter 73 regulations. The following systems are approved by DEP in their Alternate Systems Guidance.

TABLE 7
ON - LOT SEWAGE DISPOSAL SYSTEM DESIGN AND PERMITTING CRITERIA

SYSTEM DESCRIPTION	SOIL CATEGORY	TYPE OF SYSTEM	DEPTH TO ROCK (in.)	DEPTH TO WATER (in.)	SLOPE %	PERC RATE (min/in)	INFORMATION SOURCE A (Sect. No.)	B (Sect. No.)	C (Sect. No.)
Standard Seepage Bed with Septic Tank	1	Conventional	≥ 72	≥ 72	0 - 8	6 - 90	53; 16c; 31	N/A	N/A
Standard Seepage Bed with Aerobic Tank to Allow Reduction in Total Required Absorption Area	1	Conventional	≥ 72	≥ 72	0 - 8	6 - 90	,53; 16c; 32	N/A	N/A
Standard Trenches with Septic Tank	1	Conventional	≥ 72	≥ 72	0 - 25	6 - 90	52; 16c; 31	N/A	N/A
Standard Trenches with Aerobic Tank to Allow Reduction in Total Required Absorption Area	1	Conventional	≥ 72	≥ 72	0 - 25	6 - 90	52; 16c; 32	N/A	N/A
Shallow Placement Beds and Trenches (Requires perimeter berm where < 12" deep)	1	Conventional	≥ 60	≥ 60	0 - 25	6 - 90	52; 53; 31/32	N/A	N/A
Subsurface Sand Filter (shallow Perc >90 mpi ; Perc Rate bet. 36 & 60" as specified) with Septic Tank	1	Conventional	≥ 72	≥ 72	0 - 25	3 - 90	54; 16c; 31	N/A	N/A
Subsurface Sand Filter (shallow Perc >90 mpi ; Perc Rate bet. 36 & 60" as specified), with Aerobic Tank to Allow Reduction in Required Absorption Area	1	Conventional	≥ 72	≥ 72	0 - 25	3 - 90	54; 16c; 32	N/A	N/A
Elevated Sand Mound with Septic Tank	2, 5 (1)	Conventional	≥ 20	≥ 20	0 - 12	3 - 180	55; 16c.; 31	N/A	N/A
Elevated Sand Mound with Aerobic Tank To Allow Reduction in Total Required Absorption Area	2, 5 (1)	Conventional	≥ 20	≥ 20	0 - 12	3 - 180	53; 16c; 32	N/A	N/A
Individual Residential Spray Irrigation System (IRSIS) w/ Septic Tank & Free Access Pressure Dosed Intermittent Sand Filter	3, 6, 7 (1, 2, 5)	Conventional	≥ 16	≥ 10	0 - 25	N/A	162; 163; 16e; 31	N/A	N/A
Individual Residential Spray Irrigation System (IRSIS) w/ Aerobic Tank & Free Access Pressure Dosed Intermittent Sand Filter	3, 6, 7 (1, 2, 5)	Conventional	≥ 16	≥ 10	0 - 25	N/A	162; 163; 16e; 32	N/A	N/A
Individual Residential Spray Irrigation System (IRSIS) w/ Septic Tank & Buried Pressure Dosed Intermittent Sand Filter	3, 6, 7 (1, 2, 5)	Conventional	≥ 16	≥ 10	0 - 25	N/A	162; 163; 16e; 31	N/A	N/A
Individual Residential Spray Irrigation System (IRSIS) w/ Aerobic Tank & Buried Pressure Dosed Intermittent Sand Filter	3, 6, 7 (1, 2, 5)	Conventional	≥ 16	≥ 10	0 - 25	N/A	162; 163; 16e; 32	N/A	N/A
Individual Residential Spray Irrigation System (IRSIS) w/ Septic Tank & Free Access Gravity Sand Filter - Option 1	3, 6, 7 (1, 2, 5)	Alternate	≥ 16	≥ 10	0 - 25	N/A	162; 163; 16e; 31	4; 4.A.	N/A
Individual Residential Spray Irrigation System (IRSIS) w/ Aerobic Tank & Free Access Gravity Sand Filter	3, 6, 7 (1, 2, 5)	Alternate	≥ 16	≥ 10	0 - 25	N/A	162; 163; 16e; 32	4; 4.A.	N/A
Individual Residential Spray Irrigation System (IRSIS) w/ Aerobic or Septic Tank and Peat Filter - Peat Based Option 2	3, 6, 7 (1, 2, 5)	Alternate	≥ 16	≥ 10	0 - 25	N/A	162; 163; 16e; 31/32	3; 3.C.	N/A
Individual Residential Spray Irrigation System (IRSIS) w/ Septic Tank and Free Access Recirculating Sand Filter - CO-OP RSF III Filter - Option 1	3, 6, 7 (1, 2, 5)	Alternate	≥ 16	≥ 10	0 - 25	N/A	162; 163; 16e; 31	5; 5.A.1.	N/A
Steep Slope Elevated Sand Mound With Septic Tank	2, 5 (1)	Alternate	≥ 20	≥ 20	12 - 15	3 - 30	55; 16c; 31	13	N/A
Steep Slope Elevated Sand Mound with Aerobic Tank (No Area Reduction Allowed)	2, 5 (1)	Alternate	≥ 20	≥ 20	12 - 15	3 - 30	55; 16c; 31	13; 13.A.4.	N/A
At-Grade Bed System with Septic Tank	1	Alternate	≥ 48	≥ 48	0 - 12	3 - 180	55.b.7; 55.d.3.; 16c; 31	9	N/A
At-Grade Bed System with Aerobic Tank (No Area Reduction Allowed)	1	Alternate	≥ 48	≥ 48	0 - 12	3 - 180	55.b.7; 55.d.3.; 16c; 32	9	N/A
At-Grade Bed System with Septic Tank and Peat Filter - Peat Based Option 1	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 12	3 - 180	55.b.7; 55.d.3.; 16c; 31	3; 3.B.; 9.	N/A
At-Grade Bed System with Aerobic Tank and Peat Filter - Peat Based Option 1 (No Area Reduction Allowed)	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 12	3 - 180	55.b.7; 55.d.3.; 16c; 32	3; 3.B.; 9.	N/A
At-Grade Bed System with Septic Tank and Free Access Gravity Sand Filter	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 12	3 - 180	55.b.7; 55.d.3.; 16c;31	4; 4A.2; 9.	N/A
At-Grade Bed System with Aerobic Tank and Free Access Gravity Sand Filter (No Area Reduction Allowed)	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 12	3 - 180	55.b.7; 55.d.3.; 16c;32	4; 4A.2; 9.	N/A
At-Grade Bed System w/ Septic Tank and Free Access Recirculating Sand Filter - CO-OP RSF III Filter - Option 2	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 12	3 - 180	55.b.7; 55.d.3.; 16c	5; 5.A.2.; 9	N/A
Modified Subsurface Sand Filter - (Shallow Perc < 3 mpi ; Perc Rate bet. 36 & 60" as specified)	1	Alternate	Note 1	≥ 72	0 - 8	3 - 180	54; 16c	10	N/A
Shallow Placement Pressure Dosed System	1	Alternate	≥ 58	≥ 58	0 - 25	6 - 90	52.b.5.	11	N/A
Drip Irrigation with Septic Tank and Free Access Pressure Dosed Intermittent Sand Filter	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 25	Note 4	162	12	N/A
Drip Irrigation with Septic Tank and Free Access Gravity Sand Filter	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 25	Note 4	31	4; 4.A.3.; 12	N/A
Drip Irrigation w/ Septic Tank and Free Access Recirculating Sand Filter - CO-OP RSF III Filter - Option 2	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 25	Note 4	31	5; 5.A.3.; 12	N/A
Drip Irrigation w/ Septic Tank and Peat Filter	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 25	Note 4	31	12; 12.B.2.b.; 3.A.	N/A
Drip Irrigation with Aerobic Tank and Free Access Pressure Dosed Intermittent Sand Filter (No Area Reduction Allowed)	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 25	Note 4	162; 32	12	N/A
Drip Irrigation with Aerobic Tank and Free Access Gravity Sand Filter (No Area Reduction Allowed)	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 25	Note 4	32	4.A.3.; 12	N/A
Drip Irrigation with Aerobic Tank and No Filter	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 25	Note 4	32	12; 12.B.2.c.	N/A
HLLR - with Septic Tank, Peat Filter, and UV Disinfection - Peat Based Option 1 for LZ < 20"	3, 6, 7 (1, 2, 5)	Alternate	≥ 16	≥ 10	0 - 12	Note 4	31	3	N/A
HLLR - with Septic Tank, CO-OP RSF III Filter, and UV Disinfection - LZ < 20"	3, 6, 7 (1, 2, 5)	Alternate	≥ 16	≥ 10	0 - 12	Note 4	31	5	N/A
A/B Soil System with Septic Tank and Recirculating Subsurface Sand filter (RSSF) for LZ < 20"	3, 6, 7 (1, 2, 5)	Alternate	≥ 16	≥ 10	0 - 12	Note 4	31	14	N/A
Subsurface Sand Filter with Septic Tank or Aerobic Tank in Conjuntion with Peat Filter in exchange for 12" sand (shallow Perc > 90 mpi) - Peat Based Option 3	1	Alternate	≥ 72	≥ 72	0 - 25	3 - 90	52; 31/32	3; 3D	N/A
Composting Toilet in Conjunction with Greywater System & Septic or Aerobic Tank, to Allow Reduction in Required Absorption Area	All Soils	Alternate	Note 2	N/A	N/A	N/A	52-55; 31/32; 16c	1; 8	N/A
Leaching Chambers as an Aggregate Replacement for Purpose Reducing Required Absorption Area (with Septic or Aerobic)	1, 2, 5	Alternate	Note 2	N/A	N/A	N/A	52-55; 31/32; 16c	6	N/A
Non-Infiltration, Evapotranspiration Bed Contained within a Greenhouse and Aerobic Tank (Sundrive System)	4 (7)	Alternate	<10	<16	N/A	N/A	31	15	N/A
Steep Slope Elevated Sand Mound for Slow Perc Rate with Septic or Aerobic Tank (No Size Reduction Allowed for Aerobic Tank)	2, 5 (1)	Experimental	≥ 20	≥ 20	12 - 15	31 - 90	16c; 55; 31/32	N/A	V
Elevated Sand Mound for Shallow Limiting Zone - Repair Only , with Septic or Aerobic tank (Size Reduction Allowance must be confirmed with DEP)	3, 6, 7	Experimental	≥ 17 & ≤ 20	≥ 17 & ≤ 20	0 - 15	3 - 180 Note 4	16c; 55; 31/32	N/A	VI
Drip Irrigation Micromound with Septic Tank	3, 6, 7 (1, 2, 5)	Experimental	≥ 16	≥ 10	0 - 25	Note 4	55.b.7; 55.d.3.; 16c;31	N/A	IV
Drip Irrigation Micromound with Aerobic Tank	3, 6, 7 (1, 2, 5)	Experimental	≥ 16	≥ 10	0 - 25	Note 4	55.b.7; 55.d.3.; 16c;32	N/A	IV
Controlled Fill For New System on Existing Lot - No Subdivision	4 (7)	Experimental	Note 3	≥ 20	0 - 12	Note 4	N/A	N/A	VII
At-Grade Bed System on steep slopes with Septic Tank or Aerobic Tank & Peat Filter with reduction of absorption field up to 40%- Peat Based Option 1	2, 5 (1)	Experimental	≥ 20	≥ 20	12 - 15	3 - 120, Note 4	55.b.7; 55.d.3.; 16c; 31; 32	9	I.B.
At-Grade Bed System on Steep Slopes over Shallow Limiting Zones with Septic Tank or Aerobic Tank & Peat Filter - Peat Based Option 2	3, 6, 7 (1, 2, 5)	Experimental	≥ 16	≥ 10	0 - 15	3 - 180, Note 4	55.b.7; 55.d.3.; 16c; 31; 32	9	I.C.
Elevated Sand Mound over Shallow Limiting Zones with Septic or Aerobic Tank & Peat Filter in Exchange for 24" Sand depth - Peat Based Option 3	3, 6, 7	Experimental	≥ 16 & ≤ 20	≥ 16 & ≤ 20	0 - 15	3 - 180, Note 4	55; 16c; 31; 32	N/A	I.D
Eljen Type B In-Drain as an Aggregate Replacement for Purpose of Reducing Required Absorption Area up to 60%, with Septic or Aerobic Tank	All Soils	Experimental	≥ 20	≥ 20	0 - 8	3 - 60	52-55; 31/32; 16c	N/A	III

NOTES:

1 Excessively permeable rock or gravel layers can exist within 72 inches of the surface; however, a layer of suitable soil at least 20 inches thick must exist, the top of which occurs between 36 and 60 inches below grade.
2 This system can be considered together with other methods of wastewater disposal as a means of reducing total required absorption area by 40%. Each proposal must include verification that a full sized system can be accomodated.
3 Only approved by DEP on soils with a limiting zone of rock or excessive course fragments. Fill must be placed by Oct. 1 of the year prior to re-evaluation, which can not occur before July 1.
4 These systems require evaluation by a Soils Scientist who is a member of the Pennsylvania Association of Professional Soil Scientists (PAPSS) or is a "Qualified Soil Scientist"as defined in Chapter 73 of DEP Regulations. A percolation test is not required unless directed by the Soil Scientist.
5 Open Grassed areas limitted to 12%, forested areas to 25%, non food producing agricultural areas to 4%.
6 Depth to water also refers to depth to evidence of a seasonal high water table (i.e., soil mottling).
7 With regard to Soil Category, those categories shown in parenthesis are suitable, but typically a system higher on the priority list is chosen due to cost and complexity.
8 Category 7 soils can be limited by shallow rock conditions. If rock occurs at depths less than 16 inches, these soils would be considered unsuitable.

DEP Information Sources

A 25 PA Code Chapter 73 - Standards for OnLot Sewage Treatment Facilities
B Alternate Systems Guidance, Department of Environmental Protection Bureau of Water Supply and Wastewater Management, Document No. 362-0300-007, last revised February 2004.
C Experimental Systems Guidance, Department of Environmental Protection Bureau of Water Supply and Wastewater Management, Document No. 362-0300-008, last revised July 29, 2003.

1. Alternate Peat System Option 1

This system entails the placement of a peat filter following either an aerobic tank or septic tank. A peat filter is a prefabricated basin filled with peat material, which provides additional treatment of septic tank effluent. Additional information regarding peat filter performance is provided in Subsection C.

When installing a conventional soil absorption system under Title 25, Chapter 73 regulations, such as a seepage bed, trench system, or elevated sand mound system, the required size of the absorption area as determined from a percolation test, could be reduced by up to 40%, if the average percolation rate were 3-60 minutes per inch. When installing an At-Grade System, where the limiting zone depth is greater than 20" below the ground surface, a 40% absorption area reduction is also permitted when using a peat filter, if the average percolation rate is 3-60 minutes per inch. If the percolation rate is more than 60 minutes per inch, a no size reduction is permitted. At-Grade Systems will be described in more detail later in this section.

If a size reduction is taken under this option, no additional absorption area size reductions are allowable under either Title 25 Chapter 73 regulations or other alternate systems options (i.e. size reductions are not cumulative). Also, if size reductions are proposed to serve a new dwelling, testing must be approved for a full sized system before any size reductions are allowed. For repairs to existing systems, sizing must be maximized up to the square footage of a full sized system.

Additional information regarding peat filters can be found in Appendix E ("The Use of Peat Filters in Domestic Wastewater Treatment", Small Flows Quarterly, Winter 2000; Also, excerpt from DEP Comment/Response Document DEP ID 362-0300-007 Alternate Systems Guidance - Filter Performance Comparison).

2. Leaching Chambers

Leaching Chambers are prefabricated plastic units that can be installed within absorption fields in place of stone aggregate. Two specific manufacturers are approved by DEP to provide leaching chambers: Infiltrator Systems Inc., supplier of the Infiltrator Leaching Chamber, and Advanced Drainage Systems, Inc. (ADS), manufacturer of the BioDiffuser Leaching Chamber. When installing a conventional soil absorption system under Title 25, Chapter 73 regulations, such as a seepage bed, trench system, or elevated sand mound system, the required size of the absorption area as determined from a percolation test, could be reduced by up to 40%. There are no restrictions regarding percolation rates when considering this alternative.

If a size reduction is taken under this option, no additional absorption area size reductions are allowable under either Title 25 Chapter 73 Regulations or other alternate systems options (i.e., size reductions are not cumulative). Also, testing must be approved for a full sized system before any size reductions are allowed.

Pretreatment with septic tanks must incorporate either a two compartment septic tank or two septic tanks in series.

Additional information regarding leaching chambers is provided in Appendix E ("Gravelless and Chamber Systems: Alternative Drainfield Designs" Pipeline, Summer 2001).

C. Use of Filtration for Conventional, Alternative and Experimental Systems

Filtration is employed for the purpose of improving quality of either aerobic treated effluent or septic tank effluent. Many of the treatment options discussed in subsequent sections will incorporate filtration as a means of allowing a reduction in the conventional depth requirements for suitable soils. Therefore, sites normally only considered suitable in the past for spray irrigation, now might be considered for alternative systems that require less land area to install. There are several types of filters which are permitted by PADEP in conjunction with various alternative types of disposal system designs. Disinfection is required when considering the more limiting soil types such as the Category 3 and Category 6 soils. These filters and their documented performance are generally described below:

1. Peat Filter

A peat filter is a prefabricated basin filled with peat material, which provides additional treatment of septic tank or aerobic tank effluent. The required filter area ranges from 195 square feet and up. The depth of the filter media is approximately 30 inches deep. Two peat filter models are approved in Pennsylvania - Ecoflow Pennsylvania System, distributed by Falling Spring Technologies of Newburg, PA, and Puraflo Peat Biofilter, manufactured by Bord na Mona of Greensboro, NC, distributed in Pennsylvania by Site Development Services, of Reading, PA. Manufacturers claim the peat material lasts up to 8 years. Peat filters have documented removal rates in the following ranges:

96 to 98% for five-day Biochemical Oxygen Demand (BOD_5)
91 to 99% of Total Suspended Solids (TSS)
80 to 98% Ammonia Nitrogen (NH_3-N)
99 to 99.9% Fecal Coliforms.

(Source: "The Use of Peat Filters in Domestic Wastewater Treatment", Small Flows Quarterly, Winter 2000; also, excerpt from DEP Comment/Response Document DEP ID 362-0300-007 Alternate Systems Guidance - Filter Performance Comparison).

2. Intermittent Sand Filter

These are sand filters which are dosed intermittently by a pump chamber. These sand filters are typically used in conjunction with spray irrigation systems (IRSIS). There are two types: free access and buried.

a. Free Access Sand Filter

The free access sand filters consist of a concrete tank, approximately 8 to 10 feet long and 4 to 5 feet wide (40 sq ft min area), with a pipe underdrain within stone aggregate, topped by 24 to 36 inches of certified sand. Two filters are required for septic tank effluent, whereas only one filter is required for aerobic tank effluent. The filters are dosed intermittently by a central pressure distribution manifold that allows for an even flooded distribution. The top layer of sand must be raked and every few years replaced to prevent ponding. Free Access Intermittent sand filters have documented removal rates in the following ranges:

71% for five-day Biochemical Oxygen Demand (BOD_5)
81% of Total Suspended Solids (TSS)
61% Ammonia Nitrogen (NH_3-N)
96% Fecal Coliforms

(Source - DEP Comment/Response Document DEP ID 362-0300-007 Alternate Systems Guidance - Filter Performance Comparison).

b. Buried Sand Filter

The buried sand filter is a much larger sand filter, because it is buried and can not be maintained as easily as a free access filter. The filter is excavated below grade, lined with a synthetic liner to prevent infiltration, backfilled with an aggregate underdrain (enclosing pipe), then 24 inches of sand, followed by a pressure distribution system enclosed in aggregate, and finally covered with 12 inches of topsoil. The buried filter generally covers an area of 450 to 600 square feet (1.15 sq. ft. of sand are per gallon per day). Documented BOD removal varies in the literature. In EPA Technology Fact Sheet 10, regarding intermittent filters of similar size, BOD removal can range from 93 to 98% when dosed with wastewater having an influent BOD value of 106 i'/l or higher, equivalent to septic tank effluent.

3. CO-OP RFS III Recirculating Sand Filter

This is a sand filter which incorporates a recirculation system (12:1) in order to improve the quality of effluent. Minimum sand filter area of 120 square feet is required for a single family home. Minimum sand depth of 24 inches is required. The filter is proprietary, manufactured by ASHCO, distributed by Pennsylvania Rural Electric Association, of Harrisburg, PA. Any type of disposal system that first employs the use of this filter type, regardless of soil type or drainage classification for disposal area, must include UV disinfection prior to discharge, as required by the manufacturer. The CO-OP RFS III Filter has the following documented removal rate:

98% for five-day Biochemical Oxygen Demand (BOD_5)
98% of Total Suspended Solids (TSS)
96% Ammonia Nitrogen (NH_3-N)
99% Fecal Coliforms

(Source - DEP Comment/Response Document DEP ID 362-0300-007 Alternate Systems Guidance – Filter Performance Comparison)

4. Free Access Gravity Sand Filter

This sand filter is similar in design to a free access intermittent filter, except that it can be fed by gravity rather than by intermittent dosing. In addition, with the exception of IRSIS systems, a minimum sand filter area of only 40 square feet is required for a single family home. Minimum sand depth of 24 inches is required. The Free Access Gravity Filter has the following documented removal rate:

82% for five-day Biochemical Oxygen Demand (BOD_5)
83% of Total Suspended Solids (TSS)
63% Ammonia Nitrogen (NH_3-N)
98% Fecal Coliforms

(Source - DEP Comment/Response Document DEP ID 362-0300-007 Alternate Systems Guidance - Filter Performance Comparison).

D. Alternate and Experimental Systems for High Water Table and Shallow Bedrock Conditions

Steep Slope Elevated Sand Mound Bed:

(Alternate System: Sewage Disposal Soil Categories 1, 2, 5, and 7*):
(Experimental System: Sewage Disposal Soil Categories 1, 2, 5, and 7*):

Typically, elevated sound mound systems are conventional sewage systems built above the surface of the ground, where the soil depth to limiting zone (rock and/or seasonal high water table) is at least 20". The system is constructed with certified sand material to provide a vertical distance of 48" between the limiting zone and bottom of aggregate. This results in "elevating" the gravel absorption bed above the surrounding ground surface with sand. The sand and gravel bed is encapsulated with an earthen berm. Wastewater is fed into the mound through a pressurized distribution piping system consisting of 1.5 to 2-inch delivery line and 1.5-inch laterals. Small diameter holes (1/4") are drilled 6 feet apart, along each lateral, through which the effluent is evenly discharged into the gravel bed. The maximum slope on which an elevated sand mound is permitted ranges from 0 to 12%.

A variation of the conventional elevated sand mound is known as a steep slope elevated sand mound, which allows for installation on slopes from 12 to 15%. An "Alternate" steep slope elevated sand mound bed system is one where the average percolation rate is 3-30 minutes per inch. If the percolation rate were 31-90 minutes per inch, the system would be considered "Experimental". The width of the system, as measured at the gravel bed, must be 10 feet or less. The length to width ratio must be at least 6:1. The downslope berm must be sloped at a 25% (4:1 horizontal to vertical), requiring very large quantities of berm material to complete the system.

E. Spray Irrigation (Conventional System: Sewage Disposal Soil Categories 1, 2, 3, 5, 6 and 7*)

Spray Irrigation has become increasingly popular and accepted throughout the State of Pennsylvania. In the case of residential systems, primary treatment is provided first by septic tank or small package aerobic treatment plant. With the larger community systems, pretreatment can be by a treatment lagoon or large-scale package treatment plant. Additional filtration is typically provided for residential systems using either sand filtration (intermittent sand filter per Title 25 Ch. 73, Free Access Gravity Sand Filter, or CO-OP RFS III Recirculating Sand Filter) or peat filtration (Alternate Peat System Option 2). Wastewater is then chlorinated and stored in either a tank or basin until it can be discharged to the land surface through pressurized sprinkler distribution systems.

Spray Irrigation is an available technology for individual homes as well as for community systems. If it is used for homes, the system is called an "Individual Residential Spray Irrigation System" (IRSIS) and is classified as a conventional type of disposal system. Spray Irrigation is approved in areas with moderately deep to deep, somewhat poorly drained soils where elevated sand mound systems can not be approved. Depth to seasonal water table cannot be less than 10 inches below the surface. Depth to rock can not be less than 16 inches below grade. Slope Conditions are limited to 4% in non-food producing agricultural areas, 12% in grass areas and 25% in forested areas. The degree of pretreatment is not excessively restrictive for spray irrigation, particularly with regard to nitrogen removal requirements for community systems. This is due to the anticipated uptake of nitrogen by vegetation within the spray field.

Land area can be an issue with both residential and community development, since spray irrigation can require substantial area. In residential applications, a single family three bedroom home generally requires a ½ acre spray field. The required spray field size increases beyond this for each additional bedroom, for shallow soil depths (rock at 16–20"), and for slopes greater than 12%. For example, an IRSIS serving a four bedroom home where the spray field is to be over soil with depth to seasonal water table at 10" and depth to rock at 16", on slopes less than 12%, a 1.15 acre spray field would be required; if soil conditions were the same but slopes exceeded 12%, a 2.3 acre spray field would be required. For community systems, land application area is less per residential unit, but as will be discussed below, the required treatment lagoons and storage ponds are substantial.

Storage volume is required to allow for inclement weather, to prevent over application during wet or cold weather when soils can not absorb the treated effluent. For residential systems, required storage is provided with a tank having at least 3 days of capacity. However for Community Systems, storage is substantial, since spray fields are usually much smaller per residential unit than for the IRSIS. A deep, moderately well drained soil would require only 3.2 acres to accommodate a unit flow increment of 10,000 gallons per day. However, DEP typically requires a storage pond with capacity to allow at least 72 days of no spray during the course of late fall through early spring. Additionally, since application over community spray fields must be reduced in winter (soil absorption and crop uptake is less at these times), additional volume is required to hold the effluent until better weather allows increasing application rates. Therefore, as much as 1.2 million gallons of storage volume can be necessary to accommodate a unit flow increment of 10,000 gallons per day. It should be noted however that the above figures provide a general idea of magnitude. Specific site conditions and design modifications can allow for smaller storage volumes, such as providing additional spray field area beyond the minimum noted.

Other concerns include preventing surface runoff, providing adequate set back from neighboring residences, restricting access during application periods (usually addressed with night time application) and vegetative buffers to prevent aerosol dispersal during spray. Additional information regarding spray irrigation is provided in Appendix E ("Spray and Drip Irrigation for Wastewater Reuse, Disposal" Pipeline, Winter 1999).

F. Drip Irrigation

Alternate System: Sewage Disposal Categories 1, 2, and 5
Experimental System: Sewage Disposal Categories 3, 6 and 7*

Drip Irrigation differs from Spray Irrigation in that Drip Irrigation is a form of subsurface land application of treated wastewater effluent through small "emitters" attached to small diameter plastic tubing, spaced closely together (every two feet or so). Drip Irrigation utilizes pretreatment in the form of either aerobic treatment systems or in the case of small residential systems, septic tanks. For smaller residential type systems, if a small package aerobic treatment plant is provided, designed in accordance with Title 25, Chapter 73, section 73.32, no further filtration is required except for the drip filter that will be described below. However if pretreatment is in the form of a two compartment septic tank or two septic tanks in series, then tertiary filtration is required using one of three possible sand filter options (DEP Intermittent Sand Filter per Ch. 73 Sect. 73.162, DEP Free Access Gravity Sand Filter Option or DEP CO-OP RSFS III Recirculating Sand Filter Option) or using a peat filter, (DEP Alternate Peat System Option 1). Following either the package aerobic treatment plant or septic tank-tertiary filtration combination, additional treatment for small residential systems must be provided in the form of a "Disk Filter" unit. The Disk Filter is a very fine filter that prevents solids in excess of 100 microns in size from entering the drip distribution system and clogging the emitters. For larger Community Systems, fine filtration can be provided by either a larger disc filter, vortex filter or high rate pressure sand filter. Following filtration, treated effluent is then discharged to the drip field under pressure. The emitters control discharge to the surrounding soil at very low rates under a wide

range of pressures and, therefore, discharge can be extremely uniform. Burial depth of the tubing and emitters is very shallow, in the range of 6 to 12 inches. Tubing can be spaced at a distance of between 1 and 2 feet, depending on the severity of the slope and the soil conditions.

Drip irrigation is a technology approved by the PADEP as either an alternate or experimental system, depending on the soil conditions. The Alternate Drip System is appropriate over areas where the seasonal high water table and bedrock occur at 20" or more below the ground surface and slopes are less than or equal to 25%. Typically areas chosen for this alternative are mapped with Category 2 or 5 Soils and exhibit slopes above 15%.

If, the seasonal high water table occurs at 10" and the depth to bedrock is 16" or more, an "experimental" system permit might be possible for a "Drip Micromound" where the drip system is installed in sand fill material placed on the ground surface. However, unless specific site restrictions interfere with placement of the longer, narrower HLLR Alternate systems, as will be described later in this section, installation of an experimental Drip Micromound appears unjustified due to the special permit requirements associated with a DEP experimental permit.

Where Community Systems will be treating flows of 10,000 gpd or more, or where hydrogeologic studies reveal the need for additional nutrient removal, additional wastewater treatment prior to drip irrigation may be required in the form of an advanced nutrient (nitrogen) removal system. Therefore the simpler large multiple septic tank or aerobic treatment system (i.e. aerated lagoon or extended aeration treatment plant), which does not provide advanced nutrient removal, would not be feasible for these types of Drip Systems. Instead, a Biological Nutrient Removal (BNR) Treatment Plant must be constructed, of which there are numerous design variations, the most common of which is the Sequencing Batch Reactor (SBR) system. Other BNR systems include Oxidation Ditches and Activated Sludge Treatment Plants that incorporate Anoxic (low oxygen) basins with internal recycle or chemical feed (methanol) systems to remove nitrogen from the wastewater effluent. The requirement for nitrogen removal in the larger Community Drip Systems is because crop nutrient uptake associated with spray irrigation is not typically credited to the same degree for drip systems due to the depth of dispersal below a portion of the root zone. An advantage to providing BNR though, is that hydraulic limitations of the soil and underlying geology can then be the sole limiting factor in sizing of the drip field, rather than nutrient loading. As a result, the land area required for a drip field can sometimes be less than for a spray field, which is typically limited based on nitrogen loading rather than hydraulic loading. Another advantage of drip is that required storage basin volumes can theoretically be reduced in size, since drip is less affected by severe weather than spray irrigation. Additionally, since the level of treatment prior to drip irrigation is more advanced, the possibility of alternate stream discharge in emergency situations, even to a high quality stream, makes emergency basin storage less of a concern.

In Pennsylvania, the use of Drip Irrigation for larger residential and commercial development is just beginning to be explored. Examples of large residential systems in southeastern Pennsylvania include the Bridlewood residential development in Chester County, which has been in operation for approximately five years (55,000 gallons per

day) and Ridgelea Development in South Coventry Township, Chester County which was completed in March 2002 (55,000 gallons per day). With both larger residential systems, advanced tertiary treatment is provided in the form of SBR systems, followed by filtration, disinfection and storage prior to discharge to the drip system. Land areas for Drip dispersal vary between these two projects, due to site conditions. The Bridlewood system was approved for application over only 5.3 acres of land, with very little short term emergency storage (215,000 gallons), whereas the Ridgelea System was approved for application over 12 acres of land, with a large volume storage reservoir (5 million gallons). The difference in the size of the systems is due to the better soil conditions and availability of alternate stream discharge at the Ridgelea Site.

Although the alternate drip systems appear well accepted, large scale drip systems (flows above 10,000 gpd) in Pennsylvania are still in the evaluation stages, to the point where DEP has not established standard storage volume requirements. For drip irrigation to be approved, soils must first be evaluated by a professional soil scientist and deemed acceptable. No percolation testing is required, although depending on the soils and geology, some form of permeability evaluation might be required for the larger community systems in order to better evaluate allowable loading rates. Depending upon the soil texture, topography and hydrogeologic conditions of a site, specific design guidelines are then established. System designs must be submitted to the local Sewage Enforcement Officer or Health Department (where appropriate) for individual residential systems. The Department of Environmental Protection provides final review and approval of larger community systems and experimental individual residential systems. Construction of the systems must be either by an installer approved by the drip system manufacturer or under the supervision of a representative of the manufacturer. With regard to residential systems, there is presently only one approved manufacturer of drip irrigation equipment in Pennsylvania: American Manufacturing Company of Gainesville, Virginia; however approval of other manufacturers is pending and expected in the near future.

Additional information regarding drip irrigation is available in Appendix E ("Spray and Drip Irrigation for Wastewater Reuse, Disposal, Pipeline, Winter 1999; and also "Alternative Dispersal Options", Pipeline, Fall 2002).

G. At-Grade Systems

Alternate System: Sewage Disposal Categories 1, 2 and 5
Experimental System: Sewage Disposal Categories 3 and 6

The At-Grade System is another disposal system presently approved by DEP for difficult site conditions that otherwise would be limited to construction of an elevated sand mound system. At-Grade systems are basically the construction of a stone aggregate bed directly on top of the ground surface, encapsulated by an earthen berm. Essentially the At-Grade System is a version of an elevated sand mound but, without the sand beneath the stone bed. Inside the stone bed, small diameter pressure distribution piping is placed with small diameter holes spaced evenly throughout the bed, similar to a sand mound distribution system. Pressurization of the piping system allows for even distribution of the wastewater effluent. The At-Grade bed can either be installed on a slope, with the top of stone sloping as well, or it can be placed with

additional stone depth downslope in order to keep the top of aggregate level (similar to the top of a sand mound). "Alternate" At-Grade Systems can be installed on slopes up to 12%. Pretreatment can be either aerobic, in the form of an aerated tank with quiescent zone (National Sanitation Foundation approved), or anaerobic in the form of a dual compartment septic tank or two septic tanks in series. The minimum depth to seasonal high water table and rock must be 48" or greater. If pretreatment is followed by a sand filter (DEP Free Access Gravity Sand Filter Option or DEP CO-OP RSFS III Recirculating Sand Filter Option) or peat filter, (DEP Alternate Peat System Option 1) the At-Grade System can be approved over areas normally restricted to elevated sand mound systems, where depth to seasonal high water table and rock is 20 inches or more. Typically areas chosen for this alternative are mapped with Category 2 and 5 Soils. Of particular interest, according to the DEP Alternate Systems Guidance, the use of a CO-OP RSFS III Filter would require UV disinfection for any system option that employs its use, even At-Grade systems over soils with 20" or more to rock or groundwater limiting zones; this is not a requirement imposed for other types of filters. This appears to be a requirement established by the filter manufacturer rather than by DEP.

The At-Grade Bed System can also possibly be approved over more restrictive limiting zones where slopes are no greater than 15%, as an "experimental" system. In this case, depth to rock must be at least 16" and depth to seasonal high water table must be at least 10". Soil testing and percolation testing is required for all At-Grade Systems. A peat filter is also required for these systems. Of course the only difference between this type of system and an Alternate "Modified At-Grade Bed System" (as will be further discussed below), would be the use of UV Disinfection and an increased length to width ratio. Therefore, a proposal to install an experimental At-Grade Bed, which would require a special DEP Permit, would appear unjustified, unless specific site restrictions interfere with placement of the longer, narrower Alternate system.

H. Hydraulic Linear Loading Rate (HLLR) Systems (AKA Modified At-Grade Bed Systems)

Several systems are now considered feasible as Alternate Systems, where soils are too restrictive for Elevated Sand Mound, At-Grade Bed or Drip Irrigation Systems. Soils are generally within Sewage Disposal Category 3 or 6, where land area is not sufficient for installation of a Spray Irrigation (IRSIS) System. A Professional Soil Scientist who is a member of the Pennsylvania Association of Professional Soil Scientists (PAPSS) or who is a "Qualified Soil Scientist" as defined by DEP, must evaluate these sites and determine suitability and system sizing based on topographic slope (0-4%, 5-9%, 10% or more) and soil morphology, including soil texture (loam, silt loam, etc.), type of soil structure (granular, subangular blocky, etc.), and grade of soil structure (a measure of how well developed the structure is - i.e., strong, medium, weak). From this information, loading rates are established in terms of gallons per day per square foot of absorption field, and Hydraulic Linear Loading Rates (HLLR) are established in terms of gallons per day per lineal foot as measured along a constant topographic contour. These systems are similar to construction of At-Grade Bed Systems, except that they are much longer and more narrow, with widths usually 3.5 to 6 feet wide and length to width ratios of approximately 20 to 1 or more, rather than typical At-Grade Bed System widths of 15 to 20 feet and length to width ratios of approximately 4 to 1. Neither percolation nor soil permeability testing is required for approval of HLLR Systems

(although they can be if requested by the soil scientist); instead the soil scientist uses his or her knowledge of soil morphology to estimate hydraulic conductivity and required system sizing. All systems require Ultraviolet (UV) light disinfection prior to disposal, due to concern regarding inadequate soil depth for sufficient fecal coliform removal. Of particular concern in system design is the requirement that the UV light be installed within a buried water tight vault that will protect the UV light from being submerged. Also, the long term integrity of a UV light exposed to substantial high humidity within a vault, even if water proof, is questionable. Should corrosion limit the life of the unit, homeowners would be faced with a substantial replacement cost. The various HLLR systems listed below are distinguished by the type of pretreatment filtration chosen. The system names noted below are taken from the DEP Alternate Systems Guidance Manual.

1. A/B Soil Systems - (Alternate System: Sewage Disposal Categories 1, 2, 3, 5 and 6)

   The A/B Soil (ABS) System (DEP Alternate System No. 14) is an individual residential "alternate" disposal system that could be approved for soil conditions on sites similar to IRSIS systems. The A/B Soil System consists of a dual compartment septic tank or two septic tanks in series, followed by Recirculating Subsurface Sand Filter (RSSF), ultraviolet disinfection and discharge of the treated effluent to an At-Grade Bed System sized based on Hydraulic Linear Loading Rate (HLLR) as described earlier. These systems can be installed on slopes up to 12%. The seasonal high water table must be at least 10 inches. Minimum depth to rock must be 16". A possible benefit of this system type appears to be a reduction in required absorption area that otherwise would be required for an IRSIS system. This option is mainly geared toward Category 3 and 6 soils where insufficient land exists for placement of a conventional IRSIS system. If soils were Category 2 or 5, then an Elevated Sand Mound, At-Grade System with filtration, or Drip System would be preferred, in order to avoid the UV disinfection requirement. Long term effluent quality monitoring and maintenance of this system is required, similar to that required for IRSIS systems (inspection on a semiannual basis, effluent sampling on an annual basis with report to local agency).

   The A/B Soil System was the first HLLR type of system PADEP has permitted in Pennsylvania. It was first conceived and installed through PADEP at two State Parks in Pennsylvania. Based on the data obtained for these two limited applications, PADEP was satisfied this system is a proven technology and, therefore, shifted the system from Experimental to Alternate. The following variations of HLLR systems generally replace the buried recirculating sand filter with an alternate type of filter.

2. Peat Filter Option 1 - (Alternate System: Sewage Disposal Categories 1, 2, 3, 5, 6 and 7*)

   By placement of a Peat Filter after either a septic tank or aerobic tank (DEP Alternate System 3.B.), and with installation of UV disinfection after the peat filter, the use of an HLLR absorption field can be employed. These systems can

be installed on slopes up to 12%. The seasonal high water table must be at least 10 inches. Minimum depth to rock must be 16". This option is mainly geared toward Category 3 and 6 soils where insufficient land exists for an IRSIS System. If soils were Category 2 or 5, then an Elevated Sand Mound, At-Grade System with filtration, or Drip System would be preferred, in order to avoid the UV disinfection requirement.

The difference between this system and the A/B Soil System is replacing the buried RSSF with a peat filter and allowing the option of using aerobic pretreatment in lieu of either a two compartment septic tank or two septic tanks in series. Otherwise, this is an identical design to the A/B Soil System.

Long term effluent quality monitoring and maintenance of this system is required, similar to that required for IRSIS systems (inspection on a semi-annual basis, effluent sampling on an annual basis with report to local agency).

3. CO-OP RFS III System Option - (Alternate System: Sewage Disposal Categories 1, 2, 3, 5, 6 and 7*)

This is an HLLR system preceded by either a two compartment septic tank or two septic tanks in series (including 4-inch Biotube effluent filter on outlet), a Free Access Recirculating Sand Filter known as the CO-OP RFS III System, manufactured by ASHCO (Pennsylvania Rural Electric Association), and UV disinfection. These systems can be installed on slopes up to 12%. The seasonal high water table must be at least 10 inches. Minimum depth to rock must be 16". This option is mainly geared toward Category 3 and 6 soils. If soils were Category 2 or 5, then an Elevated Sand Mound, At-Grade System with filtration, or Drip System would be preferred, in order to avoid the UV disinfection requirement.

Long term effluent quality monitoring and maintenance of this system is required, similar to that required for IRSIS systems (inspection on a semiannual basis, effluent sampling on an annual basis with report to local agency).

I. Constructed Wetlands - (Sewage Disposal Categories 1, 2, 3, 5 and 6)

Constructed Wetlands Disposal Systems are not presently listed by DEP in the "Alternate" or "experimental" guidance documents. However, systems have been installed in Pennsylvania, and are being evaluated by DEP. Constructed Wetlands technology is continually emerging as a viable disposal alternative, however, presently strict design guidelines are not established because of insufficient reliable treatment data and wide variation in sizing criteria. Constructed Wetlands are classified as either Free Water Surface (FWS) or Vegetated Submerged Bed (VSB) Systems. Some form of pretreatment is required prior to discharge to either type of system, either by septic tanks in the case of smaller systems, or by lagoon (or other biological treatment system) for larger community systems. Constructed Wetlands typically can produce a secondary effluent that in some cases would be suitable for surface water discharge, although removal of pathogens (as indicated by fecal coliform count), typically is erratic and cannot be assured without additional disinfection processes prior to

discharge. On a small scale, discharge of individual residential Constructed Wetlands Systems to groundwater via infiltration cells, could be considered. For larger community systems however when discharge is to ground water via infiltration cells, nutrient removal may be necessary, in the form of a BNR system, as previously described for Drip Irrigation. The FWS and VSB Systems will be further described below.

1. Free Water Surface (FWS) Wetlands

Free Water Surface (FWS) Systems are shallow water areas planted with either one or a combination of emergent rooted aquatic plants (i.e., cattail, bulrush), submergent rooted aquatic plants (i.e., sago pondweed) and sometimes floating plants (i.e., duckweed). Open water areas are sometimes intermixed to enhance aerobic conditions and associated reduction of organic nitrogen and ammonia to nitrates (nitrification). Generally, assuming influent from a stabilization pond (facultative lagoon, etc.), effluent can be renovated to secondary treatment standards or better. Nitrogen removal can be achieved by interspersing an open water zone, deep enough to prevent emergent aquatic plants, but still permitting submerged and floating species to exist. Typically, a FWS System would be split into three zones: Zone 1 would contain emergent plants with typical water depths of 2.5 to 3 feet and would provide at least 2 days of hydraulic retention time; Zone 2 would contain submerged and floating plants with water depths at 4 to 5 feet (to prevent invasion by emergent species) and 2 days of hydraulic detention time at maximum monthly flow; Zone 3 would again be similar to Zone 1. Typically the FWS System must be lined with a synthetic membrane (30–40 mil thick PVC or HDPE), clay or bentonite soil layer to prevent short circuiting of wastewater into the groundwater. Above the liner, a 6 to 12" thick layer of soil substrate is provided for rooting of plants. Splitting the wetland system into two treatment trains provides duplicity and allows for maintenance and draining of a cell while keeping the rest of the system on line. The length to width ratio (Aspect Ratio) is typically between 3 and 5 to 1. The system is surrounded by an outer berm with side slopes of 3:1; the top of the berm would be at least 10 feet wide and finished with gravel to permit vehicular access to the perimeter of the system. Before initiating treatment, an FWS system needs time for vegetation to become fully established. Two or more growing seasons are required to establish full treatment efficiency. Removal of settled non degradable solids and accumulating litter from FWS Systems is only necessary after a period of 10 to 15 years according to current research. Human exposure to mosquitoes and pathogen transmission via human access to FWS systems are a concern to some degree and, therefore, at least in regard to the first and second zones, restricted access is desirable. With regard to open water zones, keeping hydraulic detention time down to 3 days or less and introduction of predaceous fish that would feed on mosquito larvae would help to eliminate this concern.

Additional information regarding Free Water Surface Wetlands is provided in Appendix E (EPA On-Site Wastewater Treatment Systems Technology Fact Sheet 7: "Stabilization Ponds, FWS Constructed Wetlands, and other Aquatic Systems".

2. Vegetated Submerged Bed (VSB) Wetlands

The VSB System, also referred to as a Subsurface Flow (SF) system, is not an actual wetland because vegetation is not rooted in a hydric (wetland) soil, but in a course gravel substrate instead. There is no exposed water level in VSB systems. Wastewater flows beneath the surface, through the gravel substrate, placed within a "cell" that is typically lined with a synthetic membrane, clay or bentonite soil liner. Presently, according to EPA research, there is insufficient evidence that performance of the VSB system is enhanced by the presence of vegetation. Therefore, the planting of vegetation currently appears to be desirable from an aesthetic point of view only. In England, subsurface wetlands are commonly used for polishing secondary effluent. The system typically consists of four zones per cell. The first zone is the inlet zone, which should be 3 to 6 feet in length and consist of very course rock (1.5-3.0") across the entire width and depth of the wetland cell. The second zone is the initial treatment zone, which covers 30% of the entire required wetland area as determined by the most restrictive Areal Loading Rate for either BOD or TSS. Stone media in this zone should be smooth rounded media ¾ - 1" in diameter. The third zone is the final treatment zone and should cover the remaining 70% of the total ALR. Stone media should be the same as is used for the second zone. The fourth zone is the outlet zone, which should be at least 3 feet in length, covering the total width of the wetland and should contain rock media similar to the inlet zone. Flow should enter the inlet zone at the top of the media and should leave the outlet zone through a collection pipe at the bottom of the media. The recommend maximum depth of the VSB system is 16". Unless the system is being used for an individual residence, the required wetland area should be subdivided into two parallel treatment trains in order to allow periodic maintenance on a cell without completely shutting down the system.

Additional information regarding Vegtetated Submerged Bed Wetlands is provided in Appendix E (EPA On-Site Wastewater Treatment Systems - Technology Fact Sheet 5 "Vegetated Submerged Beds and other High-Specific-Surface Anaerobic Reactors").

J. Small Flow Treatment Facilities

A Small Flow Treatment Facility (SFTF) is defined in 25 PA Code Chapter 71 as an individual or community sewerage system designed to adequately treat sewage flows not greater than 2,000 gpd for final disposal using a stream discharge or other disposal method approved by the Department. Section 71.64 further explains that the use of these systems are restricted to special circumstances as a replacement or repair system which PADEP determines is necessary to abate an existing public health nuisance or public health hazard or as a system to serve residential dwellings or commercial facilities which generate domestic wastewater not containing industrial waste.

The following documentation is required by PADEP before they will consider an SFTF:

1. Documentation that soils are not suitable for the installation of individual or community onlot sewage disposal systems, excluding IRSIS proposed for use in areas outside the watershed of waters classified as high quality or exceptional value under 25 PA Code Chapter 93, Section 93.6. and 93.9.

2. A preliminary hydrogeologic evaluation when the SFTF will use land disposal or a dry stream channel discharge for final disposal.

3. Documentation which confirms that existing or proposed drinking water uses will be protected and that effluent will not create a public health hazard or a nuisance.

4. Documentation that the proposed use of the SFTF does not conflict with comprehensive sewage planning for the area.

5. Documentation that operation and maintenance of the proposed system will be provided by one or more of the following means:

    a. A maintenance agreement between the property owner and an individual, firm or corporation experienced in the operation and maintenance of sewage treatment systems.

    b. A maintenance agreement between the property owner and municipality or its designated local agency for oversight of the system.

    c. A municipal ordinance which requires that the SFTF be operated and maintained through a maintenance agreement between the property owner and individual, firm or corporation experienced in the operation and maintenance of sewage treatment systems.

    d. Municipal ownership of the system.

    e. Inclusion of the system under a sewage management agency developed in accordance with Section 71.73 (relating to sewage management program for sewage facilities permitted by local agencies) operated by the municipality.

    f. A properly chartered association, trust or other private entity which is structured to manage the system.

    g. Establishment of bonding, escrow or other security prior to planning approval. The bonding, escrow or other security shall be forfeited to the municipality upon notice of continuing noncompliance of the system with the operation, maintenance and monitoring standards contained in the permit or noncompliance with the municipal assurances for management of the operation and maintenance requirements established through Chapter 71, section 71.64. The municipality shall use the

forfeited security to cover the costs of repair or future operation and maintenance of the system over its design life. The bonding, escrow or other security shall be for an amount up to a maximum of 50% for each of the first 2 years of operation. After 2 years of operation the bond agreement must provide for a refund of a portion of the original bond so that only 10% of the cost of the equipment and installation is retained by the bond holder. The remaining bond totaling 10% of the cost of the equipment and installation shall be maintained for the life of the system.

6. An evaluation of the density of development and the number and density of other similar systems in the watershed. As a result of that evaluation, PADEP may impose additional conditions or limit the construction or operation of SFTFs.

7. An evaluation of alternatives available to provide sewage facilities which documents that the use of SFTFs is a technically, environmentally and administratively acceptable alternative.

   SFTFs must meet applicable design, installation, operation and other standards established for the SFTFs by the PADEP under sections 202 and 207 of the Clean Streams Law and shall obtain a Clean Streams Law Permit and, if there is a discharge to surface water, a National Pollutant Discharge Elimination System permit, prior to construction and operation. Plans and specifications shall be prepared by a licensed professional engineer in compliance with Chapter 91 (relating to general provisions). PADEP may require independent oversight of the system installation. Prior to obtaining a Clean Streams Law Permit (Part II Water Quality Management Permit), the applicant must submit Component 3s Sewage Facilities Planning Modules, along with Component 4a, 4b. and 4c Planning Agency Comments, in accordance with the procedures outlined on Part 2.0 of this planning document.

The following more restrictive criteria are to be employed by New Britain Township with regard to approval of SFTFs:

8. The use of SFTFs will not be approved in New Britain Township for any type of land development where the proposed ultimate disposal will be to a surface water, whether it be a flowing stream, dry stream or wetlands, unless all other on lot sewage disposal system alternatives have been thoroughly explored and determined by both PADEP and the Township to be unsuitable. If a community spray irrigation system is proposed for commercial, industrial, institutional or multi-residential purposes and flows proposed do not exceed 2000 gallons per day, an SFTF will be considered.

9. A municipal agreement must be entered into between the Applicant and New Britain Township to ensure long term operation and maintenance of the SFTF. A typical municipal agreement is provided in Appendix F.

K. Retaining Tank Alternatives

A retaining tank is defined in 25 PA Code Chapter 71 as a watertight receptacle which receives and retains sewage and is designed and constructed to facilitate ultimate disposal of the sewage at another site. The term includes:

Chemical Toilet: A permanent or portable nonflushing toilet using chemical treatment in the retaining tank for odor control.

Holding tank: A tank, whether permanent or temporary, to which sewage is conveyed by a water carrying system.

Privy: A tank designed to receive sewage where water under pressure is not available.

Incinerating toilet: A device capable of reducing waste materials to ashes.

Composting Toilet: A device for holding and processing human and organic kitchen waste, employing the process of biological degradation through the action of microorganisms to produce a stable, humus like material.

Recycling toilet: A device in which the flushing medium is restored to a condition suitable for reuse in flushing.

1. General Requirements

The general requirements established in Chapter 71, Section 71.63, are as follows:

a. The official plan or revision shall meet the requirements of Subchapters B and C (relating to official plan requirements; and new land development plan revisions).

b. Proposed disposal sites, the method of disposal and the retaining tank cleaner for retaining tank waste shall be approved by the Department in a manner consistent with the Solid Waste Management Act prior to approval of the official plan or revision allowing the use of retaining tanks.

c. A municipality, sewer authority or sewage management agency may delegate or contract for the collection and disposal of the contents of the retaining tanks, except that the ultimate responsibility for the proper collection and disposal of the contents shall remain with the municipality, authority or agency.

d. Whenever the local agency issues permits for retaining tanks, the municipality or local agency may impose other conditions it deems necessary for operation and maintenance of the tanks to prevent a nuisance or a public health hazard.

In New Britain Township, the "local agency" is considered the Bucks County Department of Health. Additional information and requirements associated with the various subcategories of retaining tanks is provided below.

2. Privies and Chemical Toilets

A privy or chemical toilet is designed to receive sewage where there is no water under pressure and no piped wastewater. Privies are permitted by PADEP only under the following conditions:

a. The applicable official plan or revision thereto indicates the use of privies for that lot and documents that soil and site suitability testing of that lot under Chapter 73.11 - 73.16 has been conducted, and the site meets the requirements for the ultimate sewage disposal by one of the systems described under Chapters 73.51 – 73.55 and 73.167 (relating to construction of absorption areas; and spray fields) to assure that adequate sewage facilities will be available to that lot in the future.

b. The municipality, sewer authority or other Department approved entity with jurisdiction or responsibility over the site has by suitable ordinance, regulation or restriction assumed responsibility for assuring the removal of a privy and the installation of an approved onlot sewage disposal system when water under pressure or piped water or plumbing to move wastewater from the structure to the privy, vault or to an unpermitted disposal system on that lot.

The above restrictions do not apply to the following:

i. To a privy or chemical toilet when proposed for use on a lot of record in existence prior to May 15, 1972, which is 1 acre or larger and is not served now and will not be served in the future by water under pressure, piped water or plumbing to move wastewater from the structure to the privy vault or to an unpermitted disposal system on that lot.

ii. To temporary use of portable retention tanks or portable chemical toilets when their use is proposed at construction sites or at the site of public gathering and entertainments.

c. Construction requirements for privies are provided in 25 PA Code Chapter 73, Section 73.63 as follows:

i. The privy shall be located so as to minimize any danger of contamination of water supplies. Where possible, the privy shall be downgrade and at least 50 feet from any source of water supply.

ii. The structure shall be accessible to the user and at least 50 feet away from any building served.

iii. Consideration shall be given to the direction of prevailing winds to reduce odor nuisances.

iv. In general terms, the structure should incorporate a vault large enough for several years use and constructed to similar standards as those for septic tanks. The vault should be fly tight, well ventilated, include a superstructure with self closing door that is fastened solidly to the vault, include a roof ventilating stack with insect screen, an exterior cleanout and an easily cleanable seat and cover. An earth mound or surface water diversion should be constructed around the privy to keep surface water from flooding the vault.

d. Additional exemptions and permitting criteria are as follows:

i. When proposed for use at temporary construction sites, facilities providing temporary recreational or sporting activities (such as a special event) or temporary seasonal activities other than those intended for human habitation, chemical toilets or other portable toilets may be exempt from the onlot permitting requirements of Chapter 72, at the discretion of the local agency but improper installation or maintenance of the toilets shall constitute a nuisance under section 14 the act (35 P.S. Section 750.14) and be enforceable by the local agency..

ii. If multiple chemical toilets or other portable toilets are proposed for temporary use a construction sites, recreational activities or seasonal facilities, all units proposed for installation shall be included under one permit.

Privies and Chemical Toilets are regulated in New Britain Township under Township Ordinance 2001-01-01, a copy of which is provided in Appendix L. A list of Bucks County Department of Health Licensed Sewage Haulers is provided in Appendix H. The use of chemical toilets in New Britain Township is limited to portable chemical toilets, which are used at the township parks and at various construction sites. There are no privies permitted in New Britain Township.

3. Holding Tanks

Holding tanks are allowed by PADEP only when the following conditions are met:

a. The applicable official plan or revision thereto indicated the use of holding tanks for that lot and provided for replacement by adequate sewerage services in accordance with a schedule approved by the Department.

b. The applicable official plan or revision includes a municipal financial assurance of the replacement project's implementation, such as public financing, bonding or other security of sufficient present value to assure completion or other assurances either singularly or in combination that the Department deems necessary.

c. The municipality, sewer authority or other Department approved entity with jurisdiction or responsibility over the site has by suitable ordinance, regulation or restriction assumed full responsibility for maintaining existing and new holding tanks. The ordinances, regulations or restrictions shall as a minimum, include:

   i. Identification of the administrative entity to receive, review and retain pumping receipts from permitted holding tanks.

   ii. An annual inspection of holding tanks within the municipality with completion and retention of a written inspection report.

   iii. Procedures and penalties for correction of malfunctions or public health hazards from holding tanks.

d. The above restrictions do not apply to holding tanks when the local agency, municipality or the Department determines that the use is necessary to abate a nuisance or public health hazard.

e. The restrictions under items a and b do not apply to holding tanks when the use is for institutions, recreational vehicle dump stations or commercial establishments with a sewage flow of less than 800 gpd.

f. Construction requirements for holding tanks are provided in 25 PA Code Chapter 73, Section 73.62 as follows:

   i. A holding tank shall be constructed to meet the specifications of Chapter 73, section 73.31(b)(1) (relating to standards for septic tanks).

   ii. The minimum capacity of a holding tank is 1,000 gallons or a volume equal to the quantity of waste generated in 3 days, whichever is larger.

iii. The holding tank shall be equipped with a warning device to indicate when the tank is filled to within 75% of its capacity. The warning device shall create an audible and visual signal at a location frequented by the homeowner or responsible individual.

iv. Disposal of waste from a holding tank shall be at a site approved by the PADEP.

Holding tanks are regulated in New Britain Township under Township Ordinance 2001-01-01, a copy of which is provided in Appendix L. A list of Bucks County Department of Health Licensed Sewage Haulers is provided in Appendix H. There are no holding tanks presently permitted in the Township.

4. Incinerating, Composting and Recycling Toilets

These forms of retaining tanks are used to minimize wastewater flow, but do not eliminate the necessity of an on-lot sewage disposal system to serve remaining "greywater" flow from sinks and showers.

Construction requirements for incinerating, composting and recycling toilets are provided in 25 PA Code Chapter 73, Section 73.65 as follows:

a. These toilets shall bear the seal of the National Sanitation Foundation indicating testing and approval by that agency under Standard No. 41.

b. The device utilized shall meet the installation specifications of the manufacturer and shall be operated and maintained in a manner that will preclude any potential pollution or health hazards.

c. When the installation of a recycling toilet, incinerating toilet or composting toilet is proposed for a new residence or establishment, an onlot sewage system or the approved method of sewage disposal shall be provided for treatment of wash water or excess liquid from the unit, except as provided under item e below. Both sewage disposal facilities shall be included under one permit.

d. When the installation of a recycling toilet, incinerating toilet, composting toilet or another type of water conservation device is proposed for an existing residence or facility and no alteration of the onlot system is proposed, a permit is not required.

e. When a composting toilet or incinerating toilet is proposed for installation on a lot meeting the requirements of Chapter 71, section 71.63 (relating to retaining tanks), it shall be deemed equivalent to and permitted as a privy. The device shall be operated and maintained in accordance with the manufacturer's specifications. Discharges of liquids from these units, except to onlot sewage systems meeting the requirements of this part or other method of sewage disposal approved under this chapter (referring to Chapter 73) or approved by the PADEP, are prohibited.

Standards are also provided by PADEP for an "alternate" individually designed composting toilet as part of the Alternate Systems Guidance (PADEP Bureau of Water Supply and Wastewater Management document no. 362-0300-007). These standards apply to composting toilets not approved by the NSF as a pre manufactured container with a designated model number identification, which are designed or installed by an individual as a custom, integral part of a building or structure, which are designed and installed by an individual or corporation with existing installations monitored and determined to be functional; which have had Pennsylvania installations monitored and determined to be functional, which are warranted for a minimum of 2 years and which are in compliance with the standards listed under the alternate guidance.

The only DEP approved alternate composting toilet at the present time is manufactured by Bio-Sun Systems of Millerton, PA. Refer to Section 5.5.A.1. for additional discussion.

There are no incinerating, composting and recycling toilets currently permitted in New Britain Township.

5.6 Special Requirements for Experimental and Alternate Systems

Table 7 provides a list of possible Alternative On-Lot Sewage Disposal Systems which could be considered under current PA State Regulations. Each Alternative On-Lot System option is described according to the type of pretreatment (septic tank or Aerobic Tank), the type of filtration, if any, and the type of absorption field (i.e., seepage beds, trenches, elevated sand mound systems etc.). As can be seen from this table, various disposal options are considered "conventional" while others are considered "Alternate" or "Experimental". Conventional systems are fully described in 25 PA Code, Chapter 73 Regulations (Standards for On-Lot Sewage Treatment Facilities). One should note that although Small Flow Treatment Facilities and Retaining Tanks are listed under this section as alternative systems, with exception of the composting toilet manufactured by Bio Sun and listed as an "Alternate" system under Section 5.5 A. 1., these facilities are typically not considered as true soil disposal alternatives for on-lot disposal and are therefore not specifically listed as such under Table 7.

A. Experimental Systems

Experimental Systems are those systems that are proposed solely for the purpose of testing and evaluation. They are considered experimental because insufficient data is available to document a consistent level of performance. Experimental Systems are only approved by DEP when it is determined ....."*that an individual or community sewage disposal system meeting the requirements of this chapter or another successful experimental design, or that sewage services meeting the requirements of the Clean Streams Law and Article II (relating to water resources), may be installed if the experiment is deemed a failure*." An exception is made however, when an experimental design is an attempt to solve an existing pollution or public health problem. Experimental Systems are not specifically described in Chapter 73, but instead, in Section 73.71, criteria is established for allowing the use of Experimental Systems, including specific considerations that must be addressed during design.

DEP lists some types of experimental systems presently under consideration in their publication entitled "Experimental Systems Guidance: (DEP Doc. 362-0300-008, last revised 7/29/03). Although Experimental System types, as taken from the Guidance Manual, are listed in Table 7, approval of these systems is rare in Bucks County. Typically, Experimental Systems are more likely to be considered for repair situations rather than for new construction. In permitting of an experimental system, DEP Regional and Central Offices must be consulted and the DEP Soil Scientist must be given an opportunity to be present during the soils evaluation phase of the permitting process.

B. Alternate Systems

Alternate Systems are those for which sufficient information has been acquired to ensure adequate performance. Permitting is performed directly by the BCDH SEO.

One of the requirements for Alternate Systems is that they are restricted to treating only domestic type wastewater, not industrial waste. More specifically, DEP has established "domestic wastewater characteristics" for which Alternate Systems could be approved. Commercial, Institutional and Industrial facilities must verify compliance with this requirement in order to qualify for use of Alternate Systems. Domestic raw wastewater characteristics are provided in Table 8 below.

TABLE 8

RAW WASTEWATER CHARACTERISTICS REQUIRED FOR USE OF ALTERNATE SYSTEMS

Pollutant	Concentration (mg/l)
5-Day Biochemical Oxygen Demand (BOD_5)	110 - 400
Total Kjeldahl Nitrogen (TKN)	20 - 85
Ammonia as Nitrogen (NH_3- N)	12 -50
Total Suspended Solids (TSS)	100 - 350

(Source: Alternate Systems Guidance, DEP Doc 362-0300-007, last revised February, 2004)

5.7 Required Priority List of On-Lot Sewage Disposal Alternatives

A. General Township Approach to Establishing Priority List

New Britain Township is ultimately concerned with the proper operation and long term management of on-lot sewage disposal systems within the Township. Therefore establishing a required priority list of on lot sewage systems based on site conditions is an important aspect of long term management. The criteria for creating a priority list are low maintenance, limited mechanical equipment and proven performance.

B. Required Priority List for Single Family Residential Development

Table 9A contains a Required Priority List of On-Lot Sewage Disposal Systems for Single Family Residential Land Development and Repairs in New Britain Township. The hierarchy begins with systems permitted as conventional, in accordance with Chapter 73 guidelines, assuming ideal site conditions. Continuing down the list, as site conditions become worse, the choices gravitate toward Individual Residential Spray Irrigation Systems (IRSIS), which are still considered conventional systems. Beyond spray irrigation, Alternative Systems are identified with specific components that are considered low maintenance.

Table 9A does not include Aerobic Treatment Units, which were purposefully avoided due to higher maintenance required over septic tanks (air compressors) and easier plant upset when the system is not constantly fed (i.e., microbial starvation as a result of non use during vacation periods can lead to total plant upset). However, if hydrogeologic evaluations reveal a necessity to further protect groundwater quality by providing some form of aerobic treatment to achieve advanced nutrient removal prior to land disposal, aerobic treatment systems will be considered for approval by the Township.

Conventional intermittent filters were chosen specifically for spray irrigation because they are proven units which are specified as conventional in Chapter 73. Where filtration is required for Alternate Systems, peat filters are preferred because they are low maintenance and have been shown to achieve a high degree of pollutant removal.

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However, other filters will be permitted, as long as effluent quality remains in compliance with PADEP design standards

Also of note is that no disposal area reduction will be allowed under the required priority list, even though it might be considered an option under the DEP guidance, unless specifically approved by the Township Supervisors based on special site limiting circumstances. Theoretically, although with greater pretreatment, a soil disposal system can be loaded at a higher rate, a conservative approach ensures that failure or reduced filtration efficiencies over time will not overload the disposal area hydraulically.

Any Applicant wishing to obtain approval for a Single Family Residential On-Lot Disposal System within the New Britain Township On-Lot Sewage Service Area, or within any other area of New Britain Township that is not currently served by public sewer, must provide the system that is highest on the list, given the field conditions present (1 being most preferred and 20 being least preferred). An alternatives analysis should be provided if the Applicant wishes to deviate from the list in any way. The alternatives analysis should identify specific reasons, other than aesthetics and economics) for choice of an alternative lower on the list than site conditions would otherwise dictate.

C. Required Priority List for Community, Commercial, Industrial and Institutional Development

For single family residential developments and existing single family lots, Community On-lot Sewage Disposal systems will not be considered as an approved alternative disposal method, unless otherwise specifically approved by New Britain Township Supervisors after review of thorough alternatives analyses and Sewage Facilities Planning Modules. However, with regard to commercial, industrial and institutional developments, Community On-lot Sewage Disposal Systems will be considered, if tested, designed and installed in accordance with PADEP regulations, contingent to prior planning approval by the New Britain Township Supervisors in accordance with the steps outlined in Part 2 and Section 7.2 of this Act 537 Planning document.

Table 9B provides a required priority list of on-lot sewage disposal systems that are to be considered for serving community, commercial, industrial and institutional facilities as part of the sewage facilities planning process for these types of systems. The list is subdivided into systems with flows equal to or less than 2000 gpd and flows above 2000 gpd. This flow classification has a similar relevance with regard to the extent of impact associated with the project and also with regard to the use of the Sewage Facilities Planning Module Component 3s when considering Small Flow Treatment Facilities (less than 2000 gpd) in conjunction with spray irrigation or stream discharge types of systems. Required treatment processes prior to land disposal would include Septic Tanks, and filters. Aerobic treatment tanks are not included on the required priority list due to the additional maintenance required in order to keep these units operating properly. However, if hydrogeologic evaluations reveal a necessity to further protect groundwater quality by providing some form of aerobic treatment to achieve advanced nutrient removal prior to land disposal, aerobic treatment systems will be considered for approval by the Township.

TABLE 9A

REQUIRED PRIORITY LIST OF ON - LOT SEWAGE DISPOSAL SYSTEMS FOR SINGLE FAMILY RESIDENTIAL LAND DEVELOPMENT AND REPAIRS ON INDIVIDUAL LOTS IN NEW BRITAIN TOWNSHIP

ORDER OF PRIORITY	SYSTEM DESCRIPTION	SOIL CATEGORY	TYPE OF SYSTEM	DEPTH TO ROCK (in.)	DEPTH TO WATER (in.)	SLOPE %	PERC RATE (min/in)	INFORMATION SOURCE		
								A (Sect. No.)	B (Sect. No.)	C (Sect. No.)
1	Standard Seepage Bed with Septic Tank	1	Conventional	≥ 72	≥ 72	0 - 8	6 - 90	,53; 16c; 32	N/A	N/A
2	Standard Trenches with Septic Tank	1	Conventional	≥ 72	≥ 72	0 - 25	6 - 90	52; 16c; 31	N/A	N/A
3	Shallow Placement Beds and Trenches (Requires perimeter berm where < 12" deep) with Septic Tank	1	Conventional	≥ 60	≥ 60	0 - 25	6 - 90	52; 53; 31/32	N/A	N/A
4	Subsurface Sand Filter (shallow Perc >90 mpi ; Perc Rate bet. 36 & 60" as specified) with Septic Tank	1	Conventional	≥ 72	≥ 72	0 - 25	3 - 90	54; 16c; 31	N/A	N/A
5	Elevated Sand Mound with Septic Tank	2, 5 (1)	Conventional	≥ 20	≥ 20	0 - 12	3 - 180	55; 16c.; 31	N/A	N/A
6	Individual Residential Spray Irrigation System (IRSIS) w/ Septic Tank & Free Access Pressure Dosed Intermittent Sand Filter	3, 6, 7 (1, 2, 5)	Conventional	≥ 16	≥ 10	0 - 25; Note 5	N/A	162; 163; 16e; 31	N/A	N/A
7	Shallow Placement Pressure Dosed System	1	Alternate	≥ 58	≥ 58	0 - 25	6 - 90	52.b.5.	11	N/A
8	At-Grade Bed System with Septic Tank	1	Alternate	≥ 48	≥ 48	0 - 12	3 - 180	55.b.7; 55.d.3.; 16c; 31	9	N/A
9	At-Grade Bed System with Septic Tank and Filter	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 12	3 - 180	55.b.7; 55.d.3.; 16c; 31	3; 3.B.; 9.	N/A
10	Drip Irrigation w/ Septic Tank and Filter	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 25	Note 4	31	12; 12.B.2.b,c.; 3.A; 4A.3.	N/A
11	Modified Subsurface Sand Filter - (Shallow Perc < 3 mpi ; Perc Rate bet. 36 & 60" as specified)	1	Alternate	Note 1	≥ 72	0 - 8	3 - 180	54; 16c	10	N/A
12	Steep Slope Elevated Sand Mound With Septic Tank	2,5 (1)	Alternate	≥ 20	≥ 20	12 - 15	3 - 30	55; 16c; 31	13	N/A
13	HLLR - with Septic Tank, Filter, and UV Disinfection LZ < 20" Including A/B Soil System	3, 6, 7 (1, 2, 5)	Alternate	≥ 16	≥ 10	0 - 12	Note 4	31	3, 5, 14	N/A
14	Composting Toilet in Conjunction with Greywater System & Septic Tank, to Allow Reduction in Required Absorption Area	All Soil Types	Alternate	Note 2	N/A	N/A	N/A	52-55; 31/32; 16c	1; 8	N/A
15	Leaching Chambers as an Aggregate Replacement for Purpose Reducing Required Absorption Area (with Septic)	1, 2, 5	Alternate	Note 2	N/A	N/A	N/A	52-55; 31/32; 16c	6	N/A
16	Non-Infiltration, Evapotranspiration Bed Contained within a Greenhouse and Aerobic Tank (Sundrive System)	4 (7)	Alternate	<10	<16	N/A	N/A	31	15	N/A
17	Steep Slope Elevated Sand Mound for Slow Perc Rate with Septic or Aerobic Tank (No Size Reduction Allowed for Aerobic Tank)	2, 5 (1)	Experimental	≥ 20	≥ 20	12 - 15	31 - 90	16c; 55; 31/32	N/A	V
18	Elevated Sand Mound for Shallow Limiting Zone - Repair Only , with Septic or Aerobic tank (Size Reduction Allowance must be confirmed with DEP)	3, 6, 7	Experimental	≥ 17 & ≤ 20	≥ 17 & ≤ 20	0 - 15	3 - 180 Note 4	16c; 55; 31/32	N/A	VI
19	Drip Irrigation Micromound with Septic Tank	3, 6, 7 (1, 2, 5)	Experimental	≥ 16	≥ 10	0 - 25	Note 4	55.b.7; 55.d.3.; 16c;31	N/A	IV
20	Elevated Sand Mound over Shallow Limiting Zones with Septic Tank & Peat Filter in Exchange for 24" Sand depth - Peat Based Option 3	3, 6, 7	Experimental	≥ 16 & ≤ 20	≥ 16 & ≤ 20	0 - 15	3 - 180, Note 4	55; 16c; 31; 32	N/A	I.D.

Notes:

1 Excessively permeable rock or gravel layers can exist within 72 inches of the surface - however a layer of suitable soil at least 20 inches thick must exist, the top of which occurs between 36 & 60 inches below grade

2 This system can be considered together with other methods of wastewater disposal as a means of reducing total required absorption area by 40%. Each proposal must include verification that a full sized system can be accomodated.

3 Only approved by DEP on soils with a limiting zone of rock or excessive course fragments. Fill must be placed by Oct. 1 of the year prior to re-evaluation, which can not occur before July 1.

4 These systems require evaluation by a Soils Scientist who is a member of the Pennsylvania Association of Professional Soil Scientists (PAPSS) or is a "Qualified Soil Scientist"as defined in Chapter 73 of DEP Regulations. A percolation test is not required unless directed by the Soil Scientist.

5 Open Grassed areas limitted to 12%, forested areas to 25%, non food producing agricultural areas to 4%.

6 Depth to water also refers to depth to evidence of a seasonal high water table (i.e., soil mottling).

7 With regard to Soil Category, those categories shown in parenthesis are suitable, but typically a system higher on the priority list is chosen due to cost and complexity.

8 Category 7 soils can be limited by shallow rock conditions. If rock occurs at depths less than 16 inches, these soils would be considered unsuitable.

DEP Information Sources

A 25 PA Code Chapter 73 - Standards for OnLot Sewage Treatment Facilities

B Alternate Systems Guidance, Department of Environmental Protection Bureau of Water Supply and Wastewater Management, Document No. 362-0300-007, last revised February 2004.

C Experimental Systems Guidance, Department of Environmental Protection Bureau of Water Supply and Wastewater Management, Document No. 362-0300-008, last revised July 29, 2003.

TABLE 9B

REQUIRED PRIORITY LIST OF COMMUNITY, COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL ON - LOT SEWAGE DISPOSAL SYSTEMS FOR LAND DEVELOPMENT AND REPAIRS IN NEW BRITAIN TOWNSHIP

ORDER OF PRIORITY	SYSTEM DESCRIPTION	SOIL CATEGORY	TYPE OF SYSTEM	DEPTH TO ROCK (in.)	DEPTH TO WATER (in.)	SLOPE %	PERC RATE (min/in)	INFORMATION SOURCE			
								A (Sect. No.)	B (Sect. No.)	C (Sect. No.)	D (Sect. No.)
	FLOWS ≤ 2000 GPD - HYDROGEOLOGIC STUDY MAY BE REQD., INCLUDING MOUNDING, DISPERSION PLUME & NUTRIENT LOADING ANAYLYSIS										
1	Standard Seepage Bed with Septic Tanks and Flow Equalization	1	Conventional	≥ 72	≥ 72	0 - 8	6 - 90	,53; 16c	N/A	N/A	N/A
2	Standard Trenches with Septic Tanks and Flow Equalization	1	Conventional	≥ 72	≥ 72	0 - 25	6 - 90	52; 16c; 31	N/A	N/A	N/A
3	Shallow Placement Beds and Trenches (Requires perimeter berm where < 12" deep) with Septic Tanks and Flow Equalization	1	Conventional	≥ 60	≥ 60	0 - 25	6 - 90	52; 53; 31	N/A	N/A	N/A
4	Subsurface Sand Filter (shallow Perc >90 mpi ; Perc Rate bet. 36 & 60" as specified) with Septic Tanks and Flow Equalization	1	Conventional	≥ 72	≥ 72	0 - 25	3 - 90	54; 16c; 31	N/A	N/A	N/A
5	Elevated Sand Mound with Septic Tanks and Flow Equalization	2, 5 (1)	Conventional	≥ 20	≥ 20	0 - 12	3 - 180	55; 16c.; 31	N/A	N/A	N/A
6	Community Spray Irrigation System w/ Septic Tanks, Filters and Short Term Storage (5 days or as Required by PADEP, whichever is greater)	3, 6, 7 (1, 2, 5)	Conventional	≥ 16	≥ 10	0 - 25; Note 5	N/A	Note 9	N/A	N/A	CH 1-6
7	Shallow Placement Pressure Dosed System w/ Septic Tanks, and Flow Equalization	1	Alternate	≥ 58	≥ 58	0 - 25	6 - 90	52.b.5., 72	11	N/A	N/A
8	At-Grade Bed System with Septic Tanks and Flow Equalization	1	Alternate	≥ 48	≥ 48	0 - 12	3 - 180	55.b.7; 55.d.3.; 16c; 31; 72	9	N/A	N/A
9	At-Grade Bed System with Septic Tanks, Filter and Flow Equalization	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 12	3 - 180	55.b.7; 55.d.3.; 16c; 31; 72	3; 3.B.; 9.	N/A	N/A
10	Drip Irrigation w/ Septic Tanks, Filters and Short Term Storage (5 days or as Required by PADEP, whichever is greater)	2, 5 (1)	Alternate	≥ 20	≥ 20	0 - 25	Note 2	31; 72	12; 12.B.2.b,c.; 3.A; 4A.3.	N/A	N/A
11	Modified Subsurface Sand Filter with Septic Tanks and Flow Equalization - (Shallow Perc < 3 mpi ; Perc Rate bet. 36 & 60" as specified)	1	Alternate	Note 1	≥ 72	0 - 8	3 - 180	54; 16c; 72	10	N/A	N/A
12	Steep Slope Elevated Sand Mound With Septic Tanks and Flow Equalization	2,5 (1)	Alternate	≥ 20	≥ 20	12 - 15	3 - 30	55; 16c; 31; 72	13	N/A	N/A
13	HLLR - with Septic Tank, Filter, and UV Disinfection LZ < 20" Including A/B Soil System (Repair Only - small systems, as approved by DEP)	3, 6, 7 (1, 2, 5)	Alternate	≥ 16	≥ 10	0 - 12	Note 2	31; 72	3, 5, 14	N/A	N/A
14	Steep Slope Elevated Sand Mound for Slow Perc Rate with Septic Tanks and Flow Equalization	2, 5 (1)	Experimental	≥ 20	≥ 20	12 - 15	31 - 90	16c; 55; 31; 71	N/A	V	V
15	Elevated Sand Mound for Shallow Limiting Zone - Repair Only , with Septic Tanks and Flow Equalization	3, 6, 7	Experimental	≥ 17 & ≤ 20	≥ 17 & ≤ 20	0 - 15	3 - 180, Note 2	16c; 55; 31; 71	N/A	VI	VI
16	Drip Irrigation Micromound with Septic Tanks and Flow Equalization	3, 6, 7 (1, 2, 5)	Experimental	≥ 16	≥ 10	0 - 25	Note 2	55.b.7; 55.d.3.; 16c;31; 71	N/A	IV	IV
17	Elevated Sand Mound over Shallow Limiting Zones with Septic Tanks & Peat Filter in Exchange for 24" Sand depth - Peat Based Option 3	3, 6, 7	Experimental	≥ 16 & ≤ 20	≥ 16 & ≤ 20	0 - 15	3 - 180, Note 2	55; 16c; 31; 71	N/A	I.D.	I.D.
	FLOWS > THAN 2000 GPD - HYDROGEOLOGIC STUDY REQD., INCLUDING MOUNDING, DISPERSION PLUME & NUTRIENT LOADING ANALYSIS										
1	Standard Seepage Bed with Septic Tanks and Flow Equalization	1	Special Permit	≥ 72	≥ 72	0 - 8	6 - 90	,53; 16c; 32	N/A	N/A	CH 1-5 & 8
2	Standard Trenches with Septic Tanks, Flow Equalization and Pressure Dosing	1	Special Permit	≥ 72	≥ 72	0 - 25	6 - 90	52; 16c; 31	N/A	N/A	CH 1-5 & 8
3	Shallow Placement Beds and Trenches with Septic Tanks, Flow Equalization and Pressure Dosing (Requires perimeter berm where < 12" deep)	1	Special Permit	≥ 60	≥ 60	0 - 25	6 - 90	52; 53; 31/32	N/A	N/A	CH 1-5 & 8
4	Subsurface Sand Filter (shallow Perc >90 mpi ; Perc Rate bet. 36 & 60" as specified) with Septic Tanks, Flow Equalization and Pressure Dosing	1	Special Permit	≥ 72	≥ 72	0 - 25	3 - 90	54; 16c; 31	N/A	N/A	CH 1-5 & 8
5	Elevated Sand Mound with Septic Tanks and Flow Equalization	2, 5 (1)	Special Permit	≥ 20	≥ 20	0 - 12	3 - 180	55; 16c.; 31	N/A	N/A	CH 1-5 & 8
6	Elevated Sand Mound with Advanced Nutrient Removal Treatment Plant to reduce impacts of high nutrient loading and Flow Equalization	2, 5 (1)	Special Permit	≥ 20	≥ 20	0 - 12	3 - 180	55; 16c.; 31	N/A	N/A	CH 1-5 & 8
7	Community Spray Irrigation System w/ Extended Aeration, filters and Long Term Storage	3, 6, 7 (1, 2, 5)	Special Permit	≥ 16	≥ 10	0 - 25; Note 3	Note 2	N/A	N/A	N/A	CH 1-6
8	Drip Irrigation w/ Advanced Nutrient Removal Treatment Plant, filters and Long Term Storage	2, 5 (1)	Special Permit	≥ 20	≥ 20	0 - 25	Note 2	N/A	N/A	N/A	CH 1-5 (Note 7)

Notes:

1 Excessively permeable rock or gravel layers can exist within 72 inches of the surface - however a layer of suitable soil at least 20 inches thick must exist, the top of which occurs between 36 & 60 inches below grade

2 These systems require evaluation by a Soils Scientist who is a member of the Pennsylvania Association of Professional Soil Scientists (PAPSS) or is a "Qualified Soil Scientist"as defined in Chapter 73 of DEP Regulations. A percolation test is not required unless directed by the Soil Scientist.

3 Open Grassed areas limitted to 12%, forested areas to 25%, non food producing agricultural areas to 4%.

4 Depth to water also refers to depth to evidence of a seasonal high water table (i.e., soil mottling).

5 With regard to Soil Category, those categories shown in parenthesis are suitable, but typically a system higher on the priority list is chosen due to cost and complexity.

6 Category 7 soils can be limited by shallow rock conditions. If rock occurs at depths less than 16 inches, these soils would be considered unsuitable.

7 Drip Irrigation sholl be designed in accordance with design criteria established by the National On-Site Wastewater Recylcing Association publiscation entitled "Subsurface Drip Dispesal Systems", latest revision

8 Influent wastewater quality for all Commercial, Industrial and Institutional facilities shall be restricted to domestic type wastewater as defined on page 1 of DEP Information Source B, unless otherwise specifically approved by New Britain Township and PADEP.

9 Since Community Spray Irrigation Systems are not specifically covered in Chapter 73. Refer to 25 PA Code Chapter 71, Section 71.62 for general regulations affecting Community Systems

Information Sources

A 25 PA Code Chapter 73 - Standards for OnLot Sewage Treatment Facilities

B Alternate Systems Guidance, Department of Environmental Protection Bureau of Water Supply and Wastewater Management, Document No. 362-0300-007, last revised February 2004.

C Experimental Systems Guidance, Department of Environmental Protection Bureau of Water Supply and Wastewater Management, Document No. 362-0300-008, last revised July 29, 2003.

D Manual for Land Application of Treated Sewage and Industrial Wastewater, Department of Environmental Protection Bureau of Water Quality Management, Document No. 362-2000-009

5.8 Geologic and Hydrogeologic Aspects Of On-Lot Sewage Disposal Alternatives

A. Geologic and Hydrogeologic Conditions

Geologic and hydrogeologic conditions of the planning area have a significant influence on siting and design of land disposal systems, including where they can be installed, the required size of the system and the level of pretreatment required. Limiting geologic and hydrogeologic conditions include the presence of rock outcrops, shallow rock conditions in the area, presence of sinkholes, solution channels, ground water mounding and dispersion plume patterns.

1. Rock Outcrops and Shallow Rock Conditions

Rock outcrops are evidence of possible shallow soil conditions in the area, which is a concern because only soil provides a medium for renovation of wastewater, rock does not. Should soil depth over rock be insufficient, there would be a concern that wastewater would not be fully renovated before reaching rock. Once into the rock, wastewater could contaminate groundwater. Typical depths to rock are identified for the various soil categories earlier in this section. As noted in Section 5.3 B and in Table 6, Category 7 soils are of the most concern with regard to site suitability as it is affected by depth to rock. As seen in Figure 3, there are very few pockets of these soil types within the planning area. Therefore, the probability of encountering sites as restrictive as these is substantially minimized.

2. Sinkholes and Solution Channels

Sinkholes or solution channels are typically found in areas of carbonate geology. These features can form from concentrated effluent distribution over a small area, such as with a large volume system (greater than 10,000 gallons per day). Sinkholes or solution channels provide a direct conduit to groundwater and can travel very quickly in unanticipated directions, contaminating groundwater over large areas. There is no carbonate geology within the planning area and therefore, these features should not be encountered.

3. Ground Water Mounding

Shallow groundwater conditions may restrict siting or design of land application systems based on the depth of unsaturated soil available for wastewater treatment. Once wastewater reaches a saturated soil, aerobic conditions necessary for treatment are lacking, and therefore, little to no further renovation takes place. Shallow groundwater conditions can be associated with a seasonal high water table or can be influenced by installation of an onlot disposal system in slowly permeable soils that causes a locally elevated groundwater table; a process also referred to as groundwater mounding. According to the PADEP Manual for Land Application of Treated Sewage and Industrial Wastewater (PADEP Land Application Manual), *"a ground water mound is a mound shaped elevation in a water table or other potentiometric surface that is formed by the*

downward percolation of water through the soil mantle…… The extent of the mound must be determined to ensure that it does not result in insufficient vertical isolation between the system and the water table.

In order to evaluate the possible formation and extent of groundwater mounding, soil permeability is first evaluated. All soil horizons above the water table must be able to transmit wastewater effluent as fast as it receives the wastewater effluent. Therefore, in addition to, or in substitution of percolation testing, other soil permeability testing and evaluations are performed to identify restrictive horizons for larger commercial, industrial, institutional and community systems. In general, land application systems are sized based on either shallow permeability tests or on a percentage of known vertical hydraulic conductivity rates for the soil types found on site (typically 4-10%), whichever is most restrictive.

Groundwater mounding must also be evaluated based on the underlying geology of the site. The ability of rock formations to transmit treated effluent away from the application site influences the groundwater table and may also cause groundwater mounding to result. A hydrogeologic evaluation is typically required for larger land application systems in order to assess the rock formations and their ability to transmit treated wastewater. The hydrogeologic investigation should be performed by a registered professional geologist experienced with groundwater flow (aquifer) characteristics of rock formations. The PADEP Land Application Manual goes on to state: *"Aquifer characteristics that need to be evaluated in the ground water mounding analysis include depth to water table, aquifer transmissivity, and aquifer specific yield. The mounding analysis should be completed for a recharge period of at least ten years."*

With regard to soil conditions, typical seasonal high water tables are identified for each soil type in Table 6 and are subsequently separated into drainage categories in Section 5.3. Of greatest concern are Category 6 soils, which are poorly drained and therefore are subject to very shallow depths to groundwater. These soils are generally found immediately adjacent to Lake Galena and in the southwestern end of the Planning Area in the vicinity of Creek and New Galena Roads. New land development should avoid these areas, as they would be typically unsuitable for any type of on-lot disposal system. This should not have much of an impact within the planning area, since many times the poorly drained soils are also hydric soil types associated with wetlands and therefore new land development would avoid these areas to begin with.

With regard to geologic conditions, as noted in Section 3.1 D., background water quality is good and no significant contamination issues have been identified. For larger on lot disposal systems with flows equal to or greater than 2,000 gallons per day, ground water mounding analysis will be required by New Britain Township. For proposed flows less than 2,000 gallons per day, should PADEP or the Township determine the proposed on lot disposal system may be limited by site specific soils or geologic conditions, ground water mounding analysis will be required.

4. Dispersion Plume

Some pollutant parameters are not adequately removed by soil treatment processes. The most common pollutant of concern is nitrate nitrogen, which is not readily removed by soils and can threaten ground water quality. When considering a high density residential development, a community or large volume on lot sewage disposal system, a dispersion plume analysis may be required to study the movement of nitrate nitrogen (or other pollutants of concern) through the ground water aquifers and determine estimated concentration of these parameters at the land development property boundary, based on normal precipitation and drought conditions.

A registered professional geologist determines the following as part of the analysis:

a. Direction of ground water flow.

b. Location of potential ground water divides.

c. Site specific background ground water quality for parameters of concern.

d. Area of project site.

e. Locations of existing or potential water supplies on the project site, surrounding properties, and within the projected dispersion plume.

f. Infiltrating recharge, which should reflect precipitation losses to surface runoff, evapotranspiration and ground water withdrawal.

In the case of nitrate nitrogen, these dispersion plume analyses are also typically required in areas where background nitrate nitrogen (as nitrogen) concentrations are 5 milligrams per liter (mg/l) or greater. This is because safe drinking water levels have been established for nitrate nitrogen (as nitrogen) at 10 mg/l.

5. Existing Ground Water Quality

Ground water quality within the planning area is examined in Section 3.1 D of this document. All background water quality parameters for the various geological formations comprising the study area, as readily available in the literature cited, are within safe drinking water standards. Of most significance with regard to on lot disposal are nitrate nitrogen and coliform bacteria; these parameters will be discussed below.

With regard to nitrate nitrogen, typical concentrations were found to be substantially less than the safe drinking limit of 10 mg/l, with median well sample concentrations ranging from 1.6 to 2.1 mg/l. These levels are also substantially less than the typical DEP special study threshold value of 5 mg/l. In addition, a water survey was performed for the entire planning area as documented in Appendix D. Only two isolated responses revealed levels of

nitrate nitrogen above 5 mg/l, and these responses were still below safe drinking water levels (less than 7 mg/l). Therefore, the use of on lot disposal systems within the planning area should not threaten safe drinking water standards for nitrate nitrogen. Site specific studies should still be performed for larger on lot disposal systems (flows of 2,000 gpd or more) to ensure groundwater quality remains protected. For smaller systems, site specific studies may still be required by the Township depending on ground water quality concerns, special soil or geologic conditions.

With regard to coliform bacteria, there is no typical well concentration cited in the literature for the geological formations within the planning area. Generally however, groundwater quality is assumed bacteriologically safe, unless influenced by a specific source of pollution. As reported in Section 3.1 D, hydraulic conductivity within geologic formations comprising the planning area is low, ranging from 0.23 to 1.3 feet per day. Typical domestic wells are cased to a depth range of 27 to 39 feet, with overall well depths ranging from 110 to 135 feet. Therefore, the majority of wells should be protected from surface and shallow subsurface contamination. If on lot disposal systems are properly cited with sufficient unsaturated soil depth available below the systems for renovation, and further assuming proper isolation distances are maintained between on lot disposal systems and wells, bacteriological contamination of groundwater associated with on lot disposal systems should be prevented. With regard to the water survey provided in Appendix D, there are isolated instances of coliform contamination noted in the survey summary. However, there is no pattern of location identified that would point to a specific "trouble spot". Those water systems that are experiencing contamination appear to be associated with older homes and typically use either UV or Chlorine disinfection to protect the users. Specific instances of fecal contamination are only documented for one property out of all survey respondents (Survey Area I).

5.9 Non-Structural Comprehensive Planning Alternatives to Assist in Meeting Sewage Disposal Needs

A. Modification of Existing Comprehensive Plans

The New Britain Township Comprehensive Plan update was finalized in August of 2005. The plan summarizes the Township's vision and policies on its future growth and conservation. It supplements New Britain Township Comprehensive Plan of 1987. This plan divides the Township into three major planning areas.

1. Land Use Designations and Densities

Planning Area 1 is characterized by residential neighborhoods of the Line Lexington Area, as well as manufacturing and industrial uses along County Line Road; it also includes a significant amount of single family residential and agricultural land uses in this portion of the Township. Planning Area 2 encompasses the southwestern area of the Township and is characterized by higher density developments including multi-family, mid-rise apartments, commercial and retail centers, and single family developments. It also contains one of the Township's two mobile home parks. Planning Area 3 covers the

remaining eastern portion of the Township and corresponds with this Act 537 Planning Area. Planning Area 3 consists predominately of the Watershed Zoning District and scattered areas of institutional land and commercial uses; it also contains the Township's second mobile home park.

As noted above, Planning Area 3 corresponds with this Act 537 Planning Area. It encompasses much of the Township's valuable natural resources, such as woodlands, agricultural soils, floodplains, wetlands, aquifer recharge areas and areas of steep slopes. It also includes Lake Galena, a popular recreational area and the source for public water supply to the Forest Park Water Treatment Plant, located downstream of Lake Galena near the confluence of the North Branch Neshaminy Creek and Pine Run.

The various on lot wastewater disposal alternatives considered in this Act 537 Plan are evaluated with the purpose of protecting the natural and rural character of this Planning Area and protecting surface and groundwater critical to maintaining water quality in Lake Galena and at the intake to the Forest Park Water Treatment Plant.

2. Municipal Ordinances, Regulations and Enforcement

Policies expressed in the Comprehensive Plan for this Act 537 Planning Area (Planning Area 3) are as follows:

- Promote a land use mix that will yield a balanced and stable tax base capable of supporting quality community services and a high quality of life for residents while protection environmental resources.

- Promote sustainable growth and development of the Township and surrounding region through the continued implementation of sound planning.

- Facilitate the aesthetic and sound design and construction of all new development and parcels which are the subject of redevelopment through the implementation of strong municipal ordinances.

Land use regulations in New Britain Township are one of the major determining factors of how future development will proceed. The Township will need to continually examine their existing land uses and compare them to underlying zoning provisions in order to guide future development while respecting and protecting natural resources within the Planning Area.

The following regulations were established during development of the current Township Comprehensive Plan such that they complement the policies and goals of the plan:

a. Township Well Ordinance

In May of 2002, New Britain Township adopted a Private Well Ordinance, which regulates the drilling of new wells and imposes restrictions on the construction of wells and the withdrawal of groundwater with the Township. The purpose of the ordinances is to ensure that new wells, including re-drilling of existing wells, are able to provide a reliable, safe and adequate water supply to support the intended use within the capacity of the available groundwater resources. It is also to ensure that new wells do not infringe upon the performance of existing wells.

b. Amended Subdivision Ordinance

New Britain Township amended its Subdivision and Land Development Ordinance to require a Water Resource Impact Study be conducted for any new residential subdivision consisting of three or more lots/units and for all non-residential land developments within the Township. Through the Water Resource Impact Study and monitoring programs, the Township is provided the opportunity to collect accurate information on the aquifers located within New Britain Township.

3. Protection of Drinking Water Sources

As noted above, the Township Comprehensive Plan has incorporated policies and regulations to protect both groundwater and surface water within the Planning Area. Since nearly the entire Planning Area is served by private wells, the Township Well Ordinance mentioned above, was enacted to ensure safe drinking water. In addition, surface water within the Planning Area drains into the Neshaminy Creek basin, ultimately serving as a water source for the Forest Park Water Treatment Plant. The Comprehensive Plan incorporates the following policies regarding protection of drinking water:

- Provide an adequate and safe water supply to all existing and future developments.

- Direct growth to the existing development districts where public sewer and water facilities exist in order to preserve the remaining rural areas of the Township and protect groundwater supplies.

- Maintain the Township's current water budget by ensuring that water withdrawn is recharged.

- Coordinate with municipalities located within the Neshaminy Creek Watershed and the North Branch Watershed Association and on issues that will protect water quality and quantity.

B. Municipal Subdivision Regulations to Assure Long Term Use of On Lot Sewage Disposal

The Township Subdivision and Land Development Ordinance was amended in May of 2002 to include additional regulations for the design and maintenance of on-lot sewage disposal systems. To address long-term sewage needs, all new developments require soil testing and approval of a primary on lot sewage system and suitable replacement area on the property, should the primary system fail. In addition, the amended ordinance requires the property owner to enter into an Operation and Maintenance Agreement with the Township for all non-conventional sewage systems that are approved by the PADEP and BCDH.

C. Existing Local Agency Programs and the need for Technical Administrative Training

As noted above, New Britain Township has already taken steps in creating regulatory framework for ensuring protection of drinking water sources and ensuring proper long term sewage facilities planning. In addition, New Britain Township has partnered with the NBWA by designating one of the Association Board members is a representative of New Britain Township. The Township has partnered with the NBWA on a grant application to the Resource Conservation and Development Councils for Stream Signs. The Township was awarded 14 signs which were placed in nine location s in the Township designating the name of the stream. It has also cooperated in stream clean-ups, stream bank restorations and educational opportunities held in the Township. Future plans are for meadow restorations, placing blue bird boxes and an environmental study of the North Branch Neshaminy Creek and Lake Galena.

New Britain Township currently has no existing Sewage Management Program, other than that established through existing ordinance 2001-01-01 Entitled " An Ordinance of the Township of New Britain, Bucks County, Pennsylvania Providing For The Implementation of the Pennsylvania Sewage Facilities Act: Establishing Standards for On-Lot Sewage Systems; And Requiring Maintenance Agreements and Financial Security; And Prescribing Penalties for Violation". This Ordinance is provided in Appendix L. Therefore, the New Britain Township Comprehensive Plan has included the Short Term Implementation Strategy of creating a Sewage Management Program for all on lot sewage disposal areas that will meet the following goals:

- Ensure the individual on lot sewage disposal systems in the community work properly and do not threaten public health, local water resources, or the environment through adequate planning and site evaluation prior to design and construction.

- Ensure that all new and future on lot sewage disposal systems within the community are correctly designed, sited, constructed and installed.

- Extend the lifespan of on lot sewage disposal systems through ongoing maintenance so as to reduce potential repair and replacement costs.

- Educate homeowners about the importance of good system operation and maintenance practices and encourage their participation and support.

The general program framework is proposed in Part 7.0 of this Act 537 Plan. Administrative needs and training necessary to implement the program is discussed in Section 8.2.

PART 6.0 - FUTURE GROWTH AND LAND DEVELOPMENT

6.1 Existing Development

There has not been an excessive amount of development within the On-Lot Sewage Service Area within the last seven years. As was stated earlier, most recently approved planning module submittals have been for the development of single lots, the majority of which are conventional sand mound systems shown in PART 2.0, Table 1.

6.2 Land Use

Most of the land use designation within the On-Lot Sewage Service Area is residential. There are a few office parks or commercial areas located in the southeast portion of the service area, and a few institutional areas in the southern portion of the service area. All of the land use designations within the OLDS service area are shown in Figure 2 - Zoning.

6.3 Future Growth Projections

New Britain Township experienced a total population increase of almost 925% between the 70-year span of 1930 to 2000. The Township has experienced this significant population growth due to its close proximity to the City of Philadelphia. The demographic history of New Britain Township for the last 70 years has been summarized in Table 10. From 1990 to 2000, the Township has experienced a 20.9% increase in the number of residential housing units. Of the 3,969 housing units indicated by the 2000 U.S. Census of Bucks County, approximately 67% are comprised of single family detached dwelling units, 23% are comprised of attached dwelling units, 6% are comprised of multifamily units, and 4% are comprised of mobile homes. This calculates to an average of 2.70 people occupying a dwelling unit. Of the 10,698 people living in New Britain Township, approximately 15% live in the On-Lot Sewage Service Area. (594 households @ 2.7 persons/household)

Three regional expressways traverse the Township which allows for easy access to major transportation routes. This factor combined with the relatively close proximity of the City of Philadelphia, major New Jersey cities and employment centers in Montgomery and Bucks Counties, will continue to provide residential growth pressures for New Britain Township. Population projections, prepared by the Bucks County Planning Commission, along with the projected number of equivalent dwelling units (EDU's based upon 2.70 persons per household) for New Britain Township are shown in Table 11. It is anticipated the population in the On-Lot Sewage Service Area of New Britain Township will remain 15% of the Township's total population. Based on a 2025 population estimated at 16,640, the On-Lot Sewage Service Area would comprise a total population of 2,596. This is an increase of 330 households above the current level of 594 households, bringing the total number of households to 924.

TABLE 10
DEMOGRAPHIC HISTORY OF NEW BRITAIN TOWNSHIP

Year	Population[1]	No. of Households[1]	Persons per Household[2]
1930	1,157	418	2.77
1940	1,119	404	2.77
1950	1,367	513	2.66
1960	3,090	1,203	2.57
1970	5,207	1,913	2.72
1980	7,415	2,543	2.92
1990	9,099	3,284	2.77
2000	10,698	3,969	2.70

[1] Data obtained from the U.S. Census and Bucks County Planning Commission.
[2] Calculated based upon U.S. Census and Bucks County Planning Commission data.

TABLE 11
POPULATION PROJECTIONS FOR NEW BRITAIN TOWNSHIP

Population Projections

Year	Population[1]	% Change[2]	# of EDU's[2]
2000	10,698 (existing)	--	--
2005	12,660	18.3	727
2010	13,620	7.6	356
2015	14,620	7.3	370
2020	14,720	0.7	37
2025	16,640	13.0	711

[1] Data obtained from the U.S. Census and Bucks County Planning Commission.
[2] Calculated based upon U.S. Census and Bucks County Planning Commission data.

6.4 Zoning

There exist two residential zoning districts (MHP and WS), one commercial district (OP), one institutional district (IN), and one Conservation and Recreation district (CR), within the On-Lot Sewage Service Area, which regulates development. Figure 2 shows the zoning districts within the On-Lot Sewage Service Area. The purpose and intent of these districts are as follows:

A. Residential Zoning Districts

- *MHP Mobile Home Park District* - To provide for mobile home development that incorporates public facilities such as recreation areas aimed at serving residents of the park.

- *WS Water Shed District* - To provide for protection of water quality environmental resources and open space within the district, which is tributary to the Forest Park Water Treatment Plant.

Most of the area within the On-Lot Sewage Service Area is made up of the Watershed District (WS). The Lake Ridge Mobile Home Park, which comprises the MHP District, is located in the southeast section of the On-Lot Sewage Service Area on Limekiln Road.

B. Commercial and Institutional Zoning Districts

- *OP Office Park District* - To provide locations for small offices and related business uses along an arterial street with careful access control.

- *IN Institutional Districts* - To provide areas for a variety of educational, religious medical and health uses.

The Office Park Districts (OP) are located in the east and southeast corner of the On-Lot Sewage Service Area. The OP District is comprised of Sylvan Golf Center, Inc., Lewis Nursery, BFI Recycling and Trash, Nova Thrift Shop, AA Self Storage, and Smith Trucking Company. Fountainville Center also makes up a portion of the OP District, but is served by public sewer. The Institutional Districts (IN) are located to the west and to the south of Lake Galena. The IN District is comprised of Plumstead Christian School located on New Galena Road, the Shrine of Czestochowa located on the northwest side of Ferry Road, and the Wordsworth Academy located on the southeast corner of the intersection of Ferry and Old Iron Hill Roads. Both the Shrine of Czestochowa and Wordsworth Academy are currently served by public sewer.

C. Conservation and Recreation Zoning Districts

- *CR Conservation and Recreation District* – To protect environmentally sensitive areas and areas of scenic beauty such as Lake Galena. Low intensity development which will encourage the preservation of open space is permitted.

D. Zoning for Natural Resources

- In addition, to implement the intent of each district, the zoning ordinance has standards that require that natural resources be identified on all development plans and specific percentages of each resource be protected. Protected natural resources include floodplains and alluvial soils, open waterways, steep slopes, forests, wetlands, lakes and ponds and their shorelines. The Township has enacted

zoning regulations to address construction in a floodplain and contains a cluster option for certain residential districts that requires the provisions of open space as part of the development process.

PART 7.0 - SEWAGE MANAGEMENT PROGRAM

7.1 Sewage Management Program Goals

The management of on-lot sewage disposal systems within New Britain Township is a key element in the successful, long term operation of properly designed and installed systems. On-lot sewage disposal system management is often perceived as the operation and maintenance of a system. However, in a truly comprehensive management program, the ownership and operation responsibilities are the final step in the program. The successful implementation of the management program will depend upon cooperation between the Bucks County Department of Health, the Pennsylvania Department of Environmental Protection, New Britain Township, and the Applicant (developer / on-lot sewage disposal system owner).

The management program is designed to address both individual and community on-lot disposal systems which include, Individual Residential Spray Irrigation Systems (IRSIS), drip irrigation systems and any alternative sewage disposal method(s) approved by the PADEP. Small Flow Treatment Facilities (SFTF) are also included under the sewage management program, although their use within the On-Lot Sewage Service Area is expected to be minimal. It is vital to future development within New Britain Township that an effective management program be put in place so that all future on-lot sewage disposal systems installed within the On-Lot Sewage Service Area provide effective permanent treatment and disposal to the properties they serve. From the location and design to ownership and maintenance of the systems, the intent of the management program is to provide for the successful long-term operation of On-Lot Systems.

The Comprehensive Sewage Management Program for New Britain Township shall consist of the following goals:

- To ensure that individual on-lot sewage disposal systems in the community work properly and do not threaten public health, local water resources, or the environment through adequate planning and site evaluation prior to design and construction.

- To ensure that all new and future on-lot sewage disposal systems within the community are correctly designed, sited, constructed and installed.

- To minimize the complexity of on lot sewage system designs wherever feasible and thereby reduce the level of operation and maintenance required for on-lot systems.

- To extend the lifespan of on-lot sewage disposal systems through ongoing maintenance so as to reduce potential repair and replacement costs.

- To educate homeowners about the importance of good system operation and maintenance practices, and encourage their participation and support.

- To provide ongoing monitoring of systems and record keeping in order to assess the performance of all existing systems and correct problems if necessary.

7.2 Planning and Site Evaluation for On-Lot Sewage Disposal Facilities

The first step in delivering an effective sewage management program is the appropriate planning of all new and future on-lot sewage disposal system(s) within the Township. The Planning Module Process was discussed in detail under Part 2.0 of this Act 537 Plan. Site Evaluation is an integral part of the process, which was only discussed briefly in Part 4.0.

A Site Evaluation consists of prerequisite soil testing that is necessary to establish whether sites are suitable to treat and dispose of wastewater generated by the proposed land development, whether it be a single family home, commercial, institutional or industrial facility. The Bucks County Department of Health Sewage Enforcement Officer (SEO) represents New Britain Township as the regulatory authority who witnesses site testing and approves sites for on-lot disposal. In the past, New Britain Township has not been a participant in the Site Evaluation Process and has not made efforts to partner with the SEO in restricting the types of sewage disposal systems permitted for various land development proposals. Likewise, the SEO has not communicated with the Township regarding various non-conventional on-lot disposal proposals. This lack of communication and understanding has resulted, in some cases, with SEO approval of Alternate System designs on sites otherwise suitable for conventional systems which are preferred by the Township. Although on lot sewage system designs approved by the SEO may be within regulatory guidelines, the designs are not always consistent with the Township primary goal of exhausting conventional system options before permitting alternate designs and the secondary goal of selecting an on-lot system design of lower complexity over one that is more complex and requires more operation and maintenance.

New Britain Township desires to become more involved in the preliminary process of site evaluation and system design review. Although there is no intention to supercede decisions by the SEO regarding site suitability, the Township would like to provide input to the SEO regarding the types of system designs preferred before the SEO approves a preliminary design during the planning process or issues a final permit. In this regard, the Township does not wish to prevent land development or the use of on-lot disposal; rather the Township would like to steer the Applicant toward a system design which the Township considers a better choice for successful long term operation and maintenance, particularly because PADEP ultimately holds municipalities responsible for ensuring long term management.

A more detailed description of the site evaluation process will be provided below, followed by a suggested procedure for involving the Township in this process.

A. Site Evaluation

Prior to development of a parcel of land, where sewage treatment and disposal will be provided by an on-lot system, a site evaluation is necessary to confirm suitability and design constraints. Site suitability is established by evaluating soil depth, drainage and permeability. Additional evaluation of underlying geologic features is sometimes also necessary, such as in areas where development density is high, where existing groundwater quality is a concern, or where geologic conditions are particularly susceptible to contamination from on-lot systems (i.e. limestone). General guidelines regarding site suitability according to various soil conditions, has already been described in Part 5.0. Field testing procedures were only touched upon in general terms under Part 4.0, Section 4.1 B and C, relating to testing for seepage beds, trenches and

elevated sand mound systems. The general procedure used to evaluate site suitability is discussed in somewhat greater detail below.

1. Deep Hole Testing

The first step in the site evaluation process is to perform "deep hole" testing. A consultant, acting on behalf of the Applicant, schedules a deep hole test by submission of an Application for Site Evaluation to the BCDH SEO. The submission typically includes a site plan showing the site location to be tested. The deep hole test entails the excavation of soil test pits, via backhoe excavation, around the perimeter of the proposed on lot sewage system area. Many times the consultant will have already performed preliminary evaluations and has already delineated the potential sites prior to the arrival of the SEO at the site. The test pits are generally 24-36" wide and are excavated to a depth of approximately 84", unless rock or groundwater is first encountered. Two to four test pits are excavated in the vicinity of a proposed on-lot disposal system area.

Generally, since most conventional systems approved in New Britain Township are elevated sand mound systems, the SEO typically requires a minimum of four test pits to be excavated within 10 feet of the proposed system area. The consultant and SEO review the soil profile in each test pit and determine depth to limiting zone, such as bedrock or seasonal high water table as evidenced by soil mottling (discoloration of the soil caused by iron bacteria exposed to seasonal saturation). The depth to limiting zone, topography and location in relation to restrictive site features such as water wells, surface waters and rock outcrops, determines site suitability. If the site is suitable for an on-lot disposal system and depending on the type of system it is suitable for, percolation testing may be required.

2. Percolation Testing

Percolation testing entails the excavation of six or more small diameter holes (6-8") to a depth prescribed by the SEO based on the system proposed. Generally percolation holes are excavated to depths ranging from 12 to 36". Water is then poured in each test hole to a depth of 12 inches the day before the test is performed; this is referred to as the "presoak". The following day, the test is performed over a period of several hours. The holes are first given a final "presoak", and then water is poured to a set reference point in each hole. After a set period of time, ranging from 10 minutes for holes that quickly drain, to 30 minutes for holes that drain at a slower rate, the new water level is measured. The test continues for a period of approximately four hours, or until the rate of water level drop becomes stabilized (consistent). The measured difference in water level for the final time period is used to calculate the percolation rate for each test hole in minutes per inch (mpi) of water drop. The average percolation rate for all the holes excavated within a system area is then calculated. If the average percolation rate is too fast (generally less than 3 mpi) or two slow (generally greater than 90 mpi for a standard system or 180 mpi for an elevated sand mound system), then the site fails and new testing must be performed in another area on the property. If the test passes, then this information is used to

determine the required size of the absorption field, and in the case of a seepage bed or trenches, whether a pressurized distribution system is required in lieu of a gravity system. The slower the rate, the larger the system absorption area must be to adequately treat the proposed flow.

3. Site Evaluation for Spray Irrigation, Drip Irrigation or HLLR Systems

The above criteria is generally required for conventional on lot sewage systems, including seepage beds, trenches, and elevated sand mound systems. With regard to Individual Spray Irrigation Systems (IRSIS), Drip Irrigation systems, and Hydraulic Linear Loading Rate (HLLR) systems (refer to Part 5.0 for information regarding these systems), the procedure does not entail percolation testing at all. Site suitability is determined by soils evaluations only.

a. Spray Irrigation

For IRSIS systems, the SEO evaluates suitability by the deep test hole method only. For spray systems up to 20,000 square feet (approximately 0.5 acres), a minimum of 4 soil test pits are required within 10 feet of the perimeter of the spray field, evenly spaced. For spray systems over 20,000 square feet, a minimum of one test pit is required at intervals of 100 lineal feet along and within 10 feet of the perimeter of the spray field.

b. Drip Irrigation

This system is evaluated by a consulting Soil Scientist who is either a professional member of the Pennsylvania Association of Professional Soil Scientists (PAPSS) or is considered a "Qualified Soil Scientist", which is defined in 25 PA Code, Chapter 73, Section 73.1 as follows:

" a person certified as a sewage enforcement officer and who has documented 2 years experience in the characterization, classification, mapping and interpretation of soils as they relate to the function of onlot sewage disposal systems and either a Bachelor of Science Degree in soils science from an accredited college or university or certification by the American Registry of Certified Professionals in Agronomy, Crops and Soils"

The consulting soil scientist has the discretion under the Alternate Systems Guidance, to determine the number and location of deep test holes necessary to determine suitability. The soil scientist also has the discretion to perform additional hand augering of soils between deep test hole locations in order to supplement the deep test hole data. Hand augering allows the soil scientist to pull a small diameter core of soil out of the ground by hand, for evaluation.

The Soil Scientist is responsible for conducting the morphological evaluation necessary to site the drip system and for confirming that the proposed loading rate (not to exceed 3.4 gallons per day per lineal foot of tubing) and Horizontal Linear Loading Rate (not to exceed 4.6 gallons per day per lineal foot along the topographic contour) are in compliance with the Alternate Systems Guidance. The Soil Scientist must sign a certification of this and attach it to the permit application.

Although the BCDH should be present to witness the testing done by the Consulting Soil Scientist, the Alternate Systems Guidance does not address this issue. However, based on discussions with Health Department representatives, it appears that either the SEO or the BCDH Soil Scientist is present to witness the testing.

c. HLLR Systems

These systems are handled in the same fashion as that described for Drip Irrigation. The Soil Scientist however is given more specific guidelines regarding placement of soil test pits:

i. A minimum of four soil profile test pits are required, including two soil profile evaluations on contour, bracketing the proposed absorption area, and two soil profile evaluations on contour, 50 feet downgradient from the absorption area.

ii. The on-contour spacing of the soil profile evaluations shall not exceed 100 feet in length. In cases where the on-contour aggregate area length exceeds 100 feet, additional test pit evaluations are required to verify the soil morphology of the both the absorption area and downgradient area.

The Soil Scientist must provide a signed report regarding the soil drainage classification determination and confirmation that the appropriate loading rate and hydraulic linear load from the HLLR table are met.

Again, as with Drip Irrigation, the Alternate Systems Guidance is not clear on whether either the SEO or the BCDH Soil Scientist need to be present to witness the testing. However, based on discussions with Health Department representatives, it appears that either the SEO or the BCDH Soil Scientist is present to witness the testing.

B. Township Involvement in Site Evaluation Process

New Britain Township desires to become involved with the Site Evaluation Process as described below.

1. Reserve Areas

A primary aspect of Long Term Sewage Management is the incorporation of provisions for future replacement systems, should the primary systems fail at some point in the future. The purpose of having at least one reserve area on a proposed lot is to ensure that there is adequate land to accommodate replacement of a disposal field should the existing field become overloaded hydraulically, or is damaged by heavy equipment or unrelated site construction activities. These "reserve" areas could be evaluated at the same time as the primary disposal areas, according to the same criteria described above and in Part 5.0. The Township would enforce this requirement for all future land development. The reserve area must be approved by both the BCDH SEO and the Township. The reserve area should be at least 25 feet from the primary system, outside of the "drainage window", and should be sized to treat 100% of the proposed flows should the primary system fail. Plans should include survey location of all site work associated with both the primary and reserve areas, including deep test holes, hand auger locations and percolation holes. The reserve area would be defined with a legal description and sketch, to be recorded as a deed restricted area with the County Recorder of Deeds.

2. Site Evaluation Process

As noted above, New Britain Township desires to be proactive with the BCDH SEO and the Applicant with regard to the site evaluation process. Therefore, this plan proposes that a procedure be implemented whereby the Applicant is required to copy the Township on all Site Evaluation Request Forms submitted to BCDH, whether it be for a system repair or for a new land development. In addition, the Applicant shall be required to notify the Township at least one week in advance of scheduled site evaluations in order to allow a Township Representative the opportunity to witness the testing and discuss Township concerns, regarding the design and site location of proposed primary and reserve on-lot disposal systems, with both the SEO and the soils consultant for the Applicant (or the Applicant directly, whichever applies).

C. Township Involvement with the Planning Process

As discussed more completely in Part 2.0 of this Act 537 Plan, through implementation of the Planning Module process, the New Britain Township Planning Commission, Township Zoning Officer, and Township Engineer will comment to the Township Supervisors regarding all proposed land development utilizing on lot sewage disposal systems.

The Township Supervisors shall consider long term management issues as part of their review of Planning Modules and shall only approve the modules when all Township concerns are addressed. In the case of single family homes, the Township will withhold approval of Planning Modules until both primary and reserve sewage disposal system areas are approved by both the Township and the Health Department SEO; in addition approval will be withheld until all reserve areas are delineated on subdivision record plans, with bearings and distances and associated legal descriptions are submitted to the

Township together with site specific recordable sketches, for the purpose of creating deed restrictions on each proposed lot. In the case of a community system, a spray irrigation system, or any type of Alternative or Experimental System, in addition to the above requirements relating to reserve areas, the Township will also withhold approval of Planning Modules until after a formal Operation and Maintenance Agreement between the Applicant and the Township is signed and recorded in the Bucks County Courthouse.

D. Design, Installation and Construction Review

Proper design review by the Township, prior to submission to the BCDH SEO for a sewage disposal system permit, ensures that the proposed on-lot sewage disposal system is reviewed against the Township preferential list of on-lot systems and that the design is sufficient to adequately treat wastewater to minimize public health and water quality impacts. Installation and construction review ensures that systems are constructed according to plans, procedures, specifications and constraints. The design and construction review shall be completed by the Township Engineer during planning and prior to submission by the Applicant to the Bucks County Department of Health for a system permit. Site installation and construction shall be coordinated in conjunction with the BCDH SEO.

E. Routine Maintenance and Operation

In New Britain Township, routine operation and maintenance of all on-lot sewage disposal systems shall be the responsibility of the system owner (i.e., homeowner or homeowner's association). In the case of community system, a spray irrigation system, or any type of Alternative or Experimental System, in addition to the above requirements, specific requirements for Operation and Maintenance shall be defined in an Operation and Maintenance Agreement. Well designed and properly installed systems may perform poorly and ultimately fail without a continuing operation and maintenance program. For this reason, New Britain Township has developed an operation and maintenance program for individual and community systems as part of this Act 537 Plan. A copy of the ordinance establishing the sewage facilities maintenance program is attached in Appendix G. A summary of key operation and maintenance issues addressed by the ordinance and through Operation and Maintenance Agreements is provided below.

1. All lots shall be tested to identify a suitable replacement area (reserve area) in the event the primary sewage disposal system fails. The on-lot sewage replacement area shall be identified for each lot on the plans and the soil testing shall be approved by the Township and the BCDH. An easement deed restricting the sewage replacement area from being built upon shall be provided and shown on the site plan. The sewage replacement area shall be located a minimum of 25 feet from the primary system, and shall not be located directly down slope of the primary system, or within any well isolation area.

2. The applicant shall provide to each lot owner a plan and specifications of the on-lot sewage disposal system and all operational manuals required for the use and proper maintenance of the system.

3. Each system installed, shall be maintained on a continuous basis. The maintenance shall be the complete responsibility of the property owner and shall include:

   a. Pumping of septic tanks by an approved pumper/hauler at least once every three years or whenever an inspection of the septic tank reveals that the septic tank is filled with solids or scum in excess of 1/3 the liquid depth of the tank.

   b. Maintaining vegetation over the absorption area to a maximum height of six inches.

   c. Leaving the reserve absorption areas undisturbed including avoidance of excavation in the area, restricting equipment from the area which might otherwise compact or disturb the soil, adding or removing soil from the site and any other activity that may be detrimental to the future use of the site as a wastewater disposal area.

   d. Inspection of the system as follows:

      1. Septic Tank - annually for accumulation of solids and possible infiltration of stormwater in the tank lid and inspection ports.

      2. Absorption areas - monthly for stormwater drainage problems, surfacing of wastewater and proper ground cover maintenance.

      3. Sand filters (if part of system) - monthly for proper operation and existence of excessive ponding over the filter media.

      4. Dosing pump (if part of system) - monthly for proper operation of pump, controls and alarm.

      5. Disinfection system - monthly for proper operation of controls and alarm.

The property owner shall execute an operation and maintenance agreement with the Township and post the required financial security for any non-conventional sewage system, such as an Individual Residential Spray Irrigation System, Drip Irrigation System, Small Flow Treatment Facility, Community Sewage System, or Holding Tank. The design, plans and specifications for the proposed system shall be approved by the Township and the Bucks County Health Department prior to final plan approval. Copies of the Township's standard Sewage System Maintenance Agreements for each appropriate system are attached in Appendix F.

7.3 Public Education

To assist on-lot sewage disposal system owners with the operation and maintenance of their systems, the Township shall provide general information about sewage system maintenance through general publications and by request of the system owner. This information shall include frequency of pumping septic systems, general inspections and installation of water conservation devices. A copy of a general publication entitled "Maintaining Your Septic System - A Guide for Homeowners" (Pipeline, Fall 1995), along with additional supplementary articles which discuss on-lot sewage disposal system maintenance is attached in Appendix E.

7.4 Implementation of Sewage Management Program

The Sewage Management Program for New Britain Township will be established to encompass the following conventional and non-conventional on-lot sewage disposal systems:

Conventional Systems

- Individual On-Lot Sewage System - an individual sewage system which uses a system of piping, tanks or other facilities for collecting, treating and disposing of sewage flow not to exceed one (1) Equivalent Dwelling Unit (400 gallons per day), into a subsurface absorption area or retaining tank.

- Individual Residential Spray Irrigation System (IRSIS) - an individual sewage system which serves a single dwelling and which treats and disposes of sewage using a system of piping, treatment tanks and soil renovation through spray irrigation.

Non-conventional Systems

- Community On-lot Sewage System - a community sewage system which uses a system of piping, tanks or other facilities for collecting, treating and disposing of wastewater flow equivalent to two (2) or more lots or Equivalent Dwelling Units into a subsurface soil absorption area or retaining tank located on one or more of the lots or at another site.

- Spray Irrigation System - a sewage system which treats and disposes of sewage using a system of piping, treatment tanks and soil renovation through spray irrigation.

- Small Flow Treatment Facility (SFTF) – an individual or community sewage system designed to adequately treat sewage flows not greater than 2,000 gallons per day (gpd) for final disposal using a stream discharge or other method approved by the PADEP.

- Drip Irrigation System - a sewage system which treats and disposes of sewage using a system of piping, treatment tanks and soil renovation through drip irrigation.

- Alternate or Experimental System as Approved by DEP – a system which disposes of sewage utilizing systems and technologies acceptable to the PADEP, as identified in DEP Publication No. 362-0300-007, entitled Alternate Systems Guidance, Revised February 2004 or latest revision thereof, and DEP Publication No. 362-0300-008,

entitled, "Experimental Systems Guidance, Revised July 29, 2003 or latest revision thereof.

The goals which have been stated previously shall become the basis for the management functions of the New Britain Township Sewage Management Program. Detailed descriptions of each management function and management responsibility are outlined in Table 12 New Britain Township Sewage Management Program.

The Sewage Management Program shall include adoption of a Sewage Facilities Maintenance Program Ordinance that specifically outlines responsibilities of property owners, sewage waste haulers and Authorized Agents of New Britain Township with respect to maintenance of sewage facilities within the Township, other than public facilities owned and/or operated by Chalfont-New Britain Sewerage Authority (CNBTJSA), Bucks County Water and Sewer Authority (BCWSA), or any other Authority specifically approved by New Britain Township. The Ordinance shall also specify permitted and prohibited discharges to on-lot disposal systems.

7.5 Sludge Transport and Disposal

All septic tank sludge generated by conventional and non-conventional on-lot disposal systems within the Township is ultimately treated by local wastewater treatment plants such as Chalfont-New Britain WWTP and Hatfield WWTP. The septic tank sludge is pumped and hauled by licensed sludge haulers. All sludge haulers must be licensed by the Bucks County Health Department (BCHD). A list of the sludge haulers licensed by the BCHD is listed in the Appendix H.

All sludge generated by the Township is municipal waste sludge. There are 536 on-lot systems within the service area. Each septic tank is required to be pumped once every three years. Assuming that a septic tank capacity is about 1,000 gallons and that a conservative value of 1/3 of the of the total number of on-lot systems in the service area are pumped yearly, the total amount of sludge hauled to local wastewater treatment plants would be approximately 178,700 gallons per year.

The proposed Sewage Facilities Maintenance Program will require sewage haulers to be licensed by the Township in accordance with the proposed Ordinance provided in Appendix G. sewage haulers will be required to apply to New Britain Township to be listed as a "Township Approved Sewage Waste Hauler". A copy of the proposed application form is provided in Appendix I.

TABLE 12
NEW BRITAIN TOWNSHIP SEWAGE MANAGEMENT PROGRAM

MANAGEMENT FUNCTION	MANAGEMENT RESPONSIBILITY		
	NEW BRITAIN TOWNSHIP	**BUCKS COUNTY DEPARTMENT OF HEALTH AND/OR PADEP**	**APPLICANT/SYSTEM OWNER**
PLANNING AND SITE EVALUATION	The Township shall review all planning submissions for conventional and non-conventional On-Lot Sewage Disposal Systems and evaluate system/site suitability based upon the On-Lot Sewage Disposal System Design and Permitting Criteria developed in Part 5.0. The Township shall ensure that the developer adheres to the hierarchy of preferred systems as established under the Preferential List of On-Lot Sewage Disposal Systems for Land Development in New Britain Township. Written documentation shall be required with justification that the system proposed is the final option available only after all other options, according to the hierarchy, have been deemed unsuitable.	The Bucks County Department of Health acts as the Sewage Enforcement Officer and shall review all planning submissions for conventional and non-conventional on-lot sewage disposal systems and evaluate system/site suitability in conjunction with the Township.	The system owner or developer shall make proper planning submissions to the Township, Bucks County Department of Health, and PADEP in accordance with the Sewage Facilities Planning Module Review Process. The system owner or developer shall ensure that he/she adheres to the hierarchy of preferred systems as established under the Preferential List of On-Lot Sewage Disposal Systems for Land Development in New Britain Township. Written documentation shall be provided to justify that the system proposed is the final option available only after all other options according to the hierarchy have been deemed unsuitable.
	The Township shall be notified by the Applicant/System Owner at least one week prior to site testing, to give the Township the opportunity to participate in the soil evaluation and system siting.	The Bucks County Department of Health performs all testing to determine the system suitability for a site as required. The BCDH SEO shall cooperate with the Township during site testing to allow the Township the opportunity to participate in the soils evaluation and system siting.	The system owner or developer shall cooperate with the Bucks County Department of Health and Township during performance of all site testing, soils suitability evaluations, and system siting.
		The PADEP shall review all planning after planning for the On-Lot Sewage Disposal systems have been approved by both the Bucks County Department of Health, the County Planning Commission and the Township.	
DESIGN, INSTALLATION AND CONSTRUCTION REVIEW	The Township shall review all On-Lot Sewage Disposal System designs including plans, procedures, specifications and constraints during the planning and site evaluation of the proposed system and make recommendations as necessary. The design and construction review shall be made by the Township Engineer prior to submission of a permit application to the Bucks County Department of Health.	The Bucks County Department of Health shall review system designs according to guidelines established by the PADEP.	The system owner or developer shall work together with the Bucks County Department of Health and Township in providing all design, installation and construction documentation.
		The Bucks County Department of Health oversees the construction and installation according to established guidelines and procedures as required by the PADEP.	

TABLE 12
NEW BRITAIN TOWNSHIP SEWAGE MANAGEMENT PROGRAM

MANAGEMENT FUNCTION	MANAGEMENT RESPONSIBILITY		
	NEW BRITAIN TOWNSHIP	BUCKS COUNTY DEPARTMENT OF HEALTH AND/OR PADEP	APPLICANT/SYSTEM OWNER
ROUTINE MAINTENANCE AND OPERATION	The Township shall carry out a maintenance program for all On-Lot Sewage Disposal systems in accordance with "Sewage Facilities Maintenance Program" ordinance attached in Appendix G. For Small Flow Treatment Facilities (SFTF), Individual Spray Irrigation Systems (IRSIS), Drip Irrigation Systems community on-lot disposal systems, and all other Alternate or Experimental systems the Township shall ensure that the system owner submits the appropriate Sewage System Maintenance Agreement, which is attached in Appendix F. The Township shall keep the Sewage System Maintenance Agreement on record.	The Bucks County Department of Health shall provide maintenance and operation inspections according to guidelines established by the PADEP.	The system owner, developer, or homeowner's association shall conduct routine maintenance and operation of the on-lot sewage disposal system in strict accordance with the "Sewage Facilities Maintenance" ordinance attached in Appendix G. For Small Flow Treatment Facilities (SFTF), Individual Residential Spray Irrigation Systems (IRSIS), Drip Irrigation Systems community on-lot sewage disposal systems, and all other alternate or experimental systems, the system owner, developer or homeowner's association shall sign and complete the appropriate Sewage System Maintenance Agreement which is attached in Appendix F and shall adhere to the policies set forth in the Sewage Maintenance Agreement.
PUBLIC EDUCATION	The Township shall provide system owners with educational materials regarding good management practices, offered through distribution of general information packets about On-Lot Sewage System Disposal issues, including proper management techniques (routine maintenance, water conservation and proper operation).	The Bucks County Department of Health shall provide system owners with general information about on-lot sewage system disposal problems and proper management techniques (routine maintenance, water conservation and proper operation) through the Health Department's web site (www.buckscounty.org/departments/health) The PADEP shall provide system owners with general information about On-Lot Sewage System Disposal problems and proper management techniques (routine maintenance, water conservation and proper operation) through the PADEP's web site (www.dep.state.pa.us)	The system owner shall make every effort to maintain the on-lot sewage disposal system according to good management practices offered from general information provided by the Township in general publications, the Bucks County Department of Health's website and PADEP's website.
MONITORING	The Township shall be involved in the monitoring of on-lot sewage disposal systems in accordance with the "Sewage Facilities System Maintenance Program" ordinance attached in Appendix G. The Township shall be involved in the monitoring of Small Flow Treatment Facilities (SFTF), Individual Spray Irrigation Systems, Drip Irrigation Systems, community On-Lot Sewage Disposal Systems, Alternate and Experimental systems, in accordance with the appropriate Sewage System Maintenance Agreement which is attached in Appendix F.	The Bucks County Department of Health shall conduct monitoring of on-lot sewage disposal systems according to guidelines established by the PADEP.	The system owner shall monitor the On-Lot Sewage Disposal System in accordance with the "Sewage Facilities System Maintenance Program" ordinance attached in Appendix G. For Small Flow Treatment Facilities (SFTF), Individual Residential Spray Irrigation Systems (IRSIS), Drip Irrigation Systems, community on-lot sewage disposal systems, Alternate and Experimental systems, the system owner shall monitor the system in accordance with the appropriate Sewage System Maintenance Agreement attached in Appendix F. The system owner shall make every effort to monitor the on-lot sewage disposal system according to good management practices offered from general information provided by the Township in general publications, the Bucks County Department of Health's website and PADEP's website.

PART 8.0 - IMPLEMENTATION AND CONSISTENCY

8.1 Implementation Steps

The following list and corresponding dates outline the steps to be performed in implementing the Selected Plan:

- New Britain review of Draft Act 537 Plan Update (July/Aug., 2006).
- Planning Agency and Health Department review of Draft Act 537 Plan Update (July/Aug., 2006).
- Public Notification of Draft Act 537 Plan Update (Sept., 2006).
- New Britain finalizes and adopts Act 537 Plan Update (Oct., 2006).
- Act 537 Plan Update submitted to DEP for review (Oct., 2006).
- DEP approval of Act 537 Plan Update (Jan., 2007).
- Apply to DEP for 50% Planning Grant (Jan., 2007).

8.2 Administration of Act 537 Plan

In order to implement the Act 537 Plan, administrative changes are necessary. First, internal administrative meetings will be necessary to plan job responsibilities and the proper handling of submissions relating to the On-lot Sewage Service Area, and with all other areas of the Township not served by public sewer, such as the following:

A. Monitoring of Site Evaluations

1. Meet with the Health Department to discuss the new approach to Township involvement in the site evaluation process and coordinate with the BCDH SEO.

2. Establish a procedure for advising land developers and other prospective Applicants of the requirement to copy the Township on Site Evaluation Applications and to notify the Township 7 days prior to the field work.

3. Create new BCDH filing system for copies of BCDH Site Evaluation Request Forms from Applicants, and identify who at the Township is to be notified.

4. Assign a Township Authorized Agent to monitor BCDH Site Evaluations and confirm that site evaluations are consistent with the Township Preferential List of On-Lot Sewage Disposal Systems for Land Development (Table 9).

5. Establish a procedure for the Township Authorized Agent to communicate Township concerns during the Site Evaluation phase to the Applicant, the Applicant's Consultant, the SEO and Township Officials.

6. Evaluate financial implications of Township involvement in the monitoring of site evaluations. Establish fee structure or review other sources of funding.

B. Planning Modules

1. Create new BCDH filing system for Planning Modules forwarded by the SEO or BCDH Soil Scientist to the Township and establish a Planning Module Distribution Procedure.

2. Assign one or more persons to handle Planning Module Completeness Reviews and to return Completeness Checklists to the Applicant.

3. Meet with Township Officials to discuss proper review procedures and time limitations.

C. Sewage Management Program:

1. Have the New Britain Township Solicitor review the proposed Sewage Facilities Maintenance Ordinance and modify as deemed necessary. Review other Township ordinances including Ordinance 2001-01-01, and revise as necessary to be consistent with the Sewage Facilities Maintenance Ordinance.

2. Enact the Sewage Facilities Maintenance Ordinance.

3. Establish who will be the Township Liaison for receiving questions and inquiries from the general public regarding the Sewage Management Plan. Also, determine who will be responsible for maintaining copies of educational materials for disbursement to interested residents.

4. Consider modifying the Township web site to incorporate educational information regarding the Sewage Management Program.

5. Implement Approved Sewage Hauler Application process.

   a. Notify Sewage Haulers on the Bucks County Department of Health approved list about the new Township Requirements and distribute applications (Appendix I).

   b. Establish fees to process Sewage Hauler Approval Applications.

   c. Establish procedure for receipt of applications, distribution and filing.

   d. Assign a person to review the applications and make a determination regarding qualification to be on the Approved Sewage Hauler List.

6. Establish a 3-year pumping cycle for residents and determine geographic boundaries, splitting the On-Lot Sewage Service Area into thirds. One third of the residents would be required to pump their systems in any given year. Establish mailing lists to notify residents of the new program requirements by direct mail and through the Township web site.

7. Establish a procedure for monitoring implementation of existing On-Lot Sewage System Maintenance Agreements and identify the Authorized Township Agent who will verify proper implementation, including scheduled maintenance, sampling, and reporting to the Township as defined by the Agreements. Establish a procedure for addressing non compliance issues.

8. Establish a list of Commercial, Institutional and Industrial facilities within New Britain Township that utilize On-lot sewage disposal systems and establish site specific sewage maintenance activities based on usage. Verify any concerns regarding non domestic waste disposal into on-lot sewage systems by visiting select properties and reviewing disposal practices with the owner. Establish sampling program if necessary, in order to verify compliance with Section 6 of the proposed Sewage Facilities Maintenance Ordinance (relating to Permitted and Prohibited Discharge) and review with Township Officials. Establish a permitting process if discharges do not comply with the Ordinance or if pretreatment is required.

9. Assign a Township Authorized Agent to perform site visits during performance of system pumping, to monitor the condition of various on-lot systems at that time. The Authorized Agent would review information provided on the Waste Hauler Proof of Compliance Form (Appendix J), and contact the Sewage Hauler and/or Applicant for additional information, if missing from the forms, or regarding maintenance issues noted on the forms. The Authorized Agent would also contact system owners to remind them about pumping systems if overdue for a specified period of time and would follow up with advising Township Officials regarding compliance by both the Sewage Haulers and Property Owners.

10. Implement the Sewage Maintenance Certificate Program (Appendix K), whenever properties are sold or ownership changes. Assign duties regarding the tracking of ownership transfers, disbursement of forms, review and signing of forms.

11. Evaluate financial implications of implementing the Sewage Management Program. Investigate State funding and required fee structures to support the Program.

8.3 Consistency of Selected Alternatives

Prior to implementation, the selected sewage disposal alternative must be evaluated for its consistency with existing plans and programs governing the same study area. The selected alternative must be shown to be consistent with the following objectives and policies:

- Neshaminy Basin Subregion II 201 Facilities Plan.
- Comprehensive Water Quality Management Plans, COWAMP/208.
- Plans developed under the Clean Water Act, or the Water Quality Act of 1987.
- County and Township-Wide Comprehensive Planning.
- New Britain Township Recreational Facility Plan.
- Anti-degradation requirements contained in Chapters 93, 95, 102, and the Clean Water Act.
- State Water Plan.
- Prime Agricultural Land Policy covered Under Title 4 of the Pennsylvania Code, Chapter 7, Subchapter W.
- Wetland Protection under Chapter 105.
- Chapter 175 Zoning Code for Township of New Britain.
- Subdivision and Land Development Ordinance in New Britain Township.
- New Britain Township Ordinance No. 2001-01-01.
- New Britain Township Ordinance No. 2003-04-02.
- New Britain Township Open Space Plan.

A. Neshaminy Basin Sub-Region II 201 Facilities Plan

The "Neshaminy Basin Sub-Region II 201 Facilities Plan" was prepared for the Chalfont-New Britain Township Joint Sewer Authority (CNBTJSA) and the Bucks County Water and Sewer Authority (BCW&SA) in January 1982 by Gilbert Associates, Inc. The Plan, hereinafter called the "201 Facilities Plan," currently serves as New Britain Township's official Act 537 plan. The overall planning area encompassed by this plan includes parts of Doylestown Township, Doylestown Borough, New Britain Township, New Britain Borough, Chalfont Borough, Plumstead Township, Warrington Township and the northwest corner of Buckingham Township.

The 201 Facilities Plan was discussed in substantial detail under Part 2.0 of this Act 537 Plan. Review of the 201 Facilities Plan against this Act 537 Plan reveals no inconsistencies. This Act 537 Plan simply provides an update regarding on-lot sewage disposal system technologies that were not available in the past. The plan further modifies the preferred list of on-lot sewage disposal system alternatives based on the newer technologies.

With regard to the Sewage Management Plan established by the 201 Facilities Plan, This Act 537 Plan shifts responsibility of ensuring proper on-lot sewage system maintenance in New Britain Township away from the CNBTJSA and BCW&SA, and instead directs this responsibility to the Township itself. Since neither of the two Authorities has followed the suggested Management Plan and taken responsibility for On-lot sewage system management, there is no conflict with the Current Plan. Furthermore, with regard to the goals of the Sewage Management Plan, the Current Act 537 Plan is basically consistent with the goals of the original 201 Facilities Plan.

B. Comprehensive Water Quality Management Plans (COWAMP)

In 1978, the Delaware Valley Regional Planning Commission prepared the COWAMP/208 Water Quality Management Plan for southeastern Pennsylvania. The purpose of the COWAMP/208 is to develop an area-wide waste treatment management plan to protect surface and groundwater from pollution.

Chapter 4 of the COWAMP/208 lists various water pollution control problems within the Planning Area. A number of pertinent problems and proposed Solutions applicable to the current Act 537 Plan are listed below:

1. *Problem: Inadequate Study of Innovative Approaches*

There is a tendency in the pollution control profession to concentrate on conventional solutions to pollution problems. Inadequate consideration appears to be given to innovative systems, such as non-sewered approaches, small community septic tank systems, and land application systems.

The following selected policies that were listed as solutions to the problem, are consistent with this Act 537 Plan:

Policy M-2

The "Non-Sewered Approach" should be encouraged by regulatory agencies and implemented where cost effective.

Policy M-4

Land Application of effluent should be encouraged, and implemented where cost effective.

Justification includes the following:

Land application of effluent offers several advantages over stream discharge for communities having adequate suitable soils:

- *Increased ground water recharge and stream base flow*
- *Reuses nutrients when crops are grown on irrigation sites*
- *Preserves open space*
- *Removes more pollutants than most Advanced Wastewater Treatment Plants (AWWTP)*
- *Easier to operate than complex AWWTP*

2. The following problems were identified under Land - Related Waste Disposal Issues:

Problem: Failure of On-Lot Disposal systems can result in public health dangers as well as surface and groundwater pollution. Attempts to alleviate failing on-lot systems often result in the installation of expensive public sewers.

Problem: Inadequate maintenance of on-lot disposal systems is a major cause of system failure. These failures have caused pollution of ground and surface waters, public health dangers and aesthetic problems.

Problem: The extent and severity of pollution problems cause by improperly planned, designed, and maintained on-lot disposal systems is not well known.

The following selected policies that were listed as solutions to the above problems, are consistent with this Act 537 Plan:

Policy LWD-1

Each municipality should adopt an official on-lot disposal policy through amendment to their 537 Plan. The policy should be supplemented by procedures and draft ordinances that specifically address the question of how to implement the official policy.

Policy LWD-2

Alleviation of failing septic tank problems should first be attempted through public education programs, mandatory water conservation devices and required maintenance. Installation of alternative systems should be utilized only if these methods fail to solve the problems. All alternative systems which are most suitable for particular soils should be considered, not just public sewers

Policy LWD – 3

Routine maintenance should be required on all on-lot systems. A program should be carried out on several levels:

(1) The homeowner must maintain the system (this requires more effective education campaigns)

(2) Municipalities (sanitary district, for example) should help the homeowners in the prevention of malfunctioning on-lot systems (perhaps via pumping ordinances)

Policy LWD-4

A program should be initiated to identify and evaluate existing and potential problems caused by septic tank systems. The program should focus on the following priority areas:

(1) Septic Tank critical density areas

(2) Malfunctioning septic tank areas.

As noted above, this Act 537 Plan addresses these policies through the proposed Township involvement in Site Evaluation, Planning Processes and a Sewage Management Program.

C. Plans Developed Under Title II of the Clean Water Act or Titles II and VI of the Water Quality Act of 1987.

Plans developed under Title II of the Clean Water Act contain information on waste treatment management plans and practices which shall provide for: the application of the best practicable waste treatment technology before discharging into receiving water, including reclaiming and recycling of water, the confined disposal of pollutants so they will not migrate to cause water or other environmental pollution, and the consideration of advanced waste treatment techniques. The implementation of this Act 537 Plan will be consistent with Title II of the Clean Water Act. In addition, the Sewage Management Plan will improve both ground and surface water quality.

D. Bucks County Comprehensive Plan

The Bucks County Planning Commission completed the "Bucks County Comprehensive Plan", in December 1993. The Plan discusses the growth, economy, community facilities, recreation, and infrastructure within Bucks County. This Act 537 Plan does not contradict the County Comprehensive Plan.

APPENDIX A

CORRESPONDENCE

DEP AUTHORIZATION OF ACT 537 TASK ACTIVITY REPORT

BUCKS COUNTY DEPARTMENT OF HEALTH

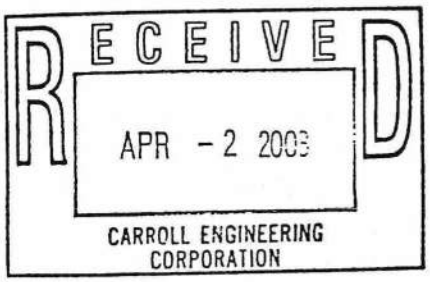
BUCKS COUNTY PLANNING COMMISSION

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Pennsylvania Department of Environmental Protection

Lee Park, Suite 6010
555 North Lane
Conshohocken, PA 19428

MAR 2 8 2003



Southeast Regional Office

610-832-6130
Fax 610-832-6133

Cornell Hopkins, Manager
New Britain Township
207 Park Avenue
Chalfont, PA 18914

Re: Act 537 - Plan of Study
On-Lot Sewage Disposal Service Area
New Britain Township, Bucks County

Dear Mr. Hopkins:

We have completed our review of your municipality's proposed plan of study, as prepared by Carroll Engineering Corp., dated January 31, 2003.

The plan of study proposes the development of a plan that will analyze the sewage disposal needs of the current on-lot sewage disposal system service area of the Township.

Approval of this proposed plan of study is hereby granted. The estimated cost of the plan is $83,835.00.

Please note, however, that this plan of study approval does not constitute a final action by the Department. When a completed plan is submitted to us, we will act upon it consistent with PA Code Title 25, Chapter 71.

Please consider the following comments as your municipality prepares its Act 537 Official Plan Update:

Your municipality's Act 537 Official Plan Update should be formatted as suggested under Appendix H of the "A Guide for Preparing Act 537 Update Revisions" including the necessary items under Appendix I – "Act 537 Plan Content and Environmental Assessment Checklist". This form is available on our website at:
http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/Forms/Act537/Forms_537Plan.htm

We note that the Township may consider the implementation of a sewage management program as part of this proposed plan. Properly designed and installed on-lot sewage disposal systems may ultimately fail without continuing operation and maintenance. An effective on-lot sewage management program is vital for the successful long-term operation of these systems. By providing a management program, New Britain Township can assure permanent sewage services for residential

MAR 2 8 2003

and commercial properties that rely on on-lot systems. Public education, water conservation, site inspections, and regular septic tank pumping are all part of a successful management program. Because sewage management is essential for the preservation of property values and the health of Pennsylvania's citizens, the Department reimburses municipalities for 85% of the costs of administering sewage management programs. The Pennsylvania Code, Title 25, § 72.44 contains a complete listing of eligible and ineligible costs for reimbursement of Sewage Permitting Programs. Where applicable, these listings also apply to Sewage Management Program reimbursements. Justification must be submitted to support reimbursement requests for unlisted categories. Questions on eligibility of specific items can be asked by calling 717-787-8184.

If you have any questions, please contact me at the above number.

Sincerely,

Elizabeth Mahoney
Sewage Planning Specialist II
Water Management

cc: Bucks County Planning Commission
Bucks County Health Department
Mr. Bodley
Planning Section
Re 30

COUNTY OF BUCKS

DEPARTMENT OF HEALTH
Health Building, Neshaminy Manor Center, Doylestown, PA 18901 – 215-345-3318
FIELD OFFICES
Bucks County Government Services Center, 7321 New Falls Road, Levittown, PA 19055 – 215-949-5805
Bucks County Government Services Center, 515 S. West End Blvd., Quakertown, PA 18951 – 215-536-6500

County Commissioners
JAMES F. CAWLEY, ESQ., Chairman
CHARLES H. MARTIN
SANDRA A. MILLER

Director
Eleanor M. Travers, M.D., MHA

August 17, 2006

Mr. John Cornelius, New Britain Township Manager .New Britain Township
207 Park Avenue
Chalfont, PA 18914-2103

Subject: New Britain Township
Act 537 Sewage Facilities Plan
For On-Lot Sewage Service Area

Dear Mr. Cornelius:

This Department has had the opportunity to review the proposed Act 537 Sewage Facilities Plan for New Britain Township. The review was conducted by Scott Cressman, Sewage Facilities Coordinator for the Department. Based upon his review, the Department finds the document that was prepared by Lane Bodley, P.E. from Carroll Engineering Corporation to be consistent with Act 537 requirements under Chapter 71, Section 71.31.

Should you have any further questions concerning this matter, please contact me in the Doylestown Office at 215-345-3335.

Sincerely

Andrew A. Schafer, Acting Chief
Division of Environmental Engineering

Cc: L. Bodley, P.E. Carroll Engineering ✓
C. Bigham, Assistant Manager New Britain Township
C. Cleaver, PA DEP
J. Fields, PA DEP
S. Cressman, Quakertown Supervisor

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Carroll Engineering Corporation

June 20, 2006

Certified Mail

Amletto A. Pucci, Jr. Ph.D., PE.
Chief, Division of Environmental Engineering
Bucks County Department of Health
Health Building
Neshaminy Manor Center
Doylestown, PA 18901

Dear Mr. Pucci:

Subject: New Britain Township Act 537 Sewage Facilities Plan for the On-Lot Sewage Service Area - Request for Comment

On behalf of New Britain Township, we are submitting one draft copy of "Act 537 Sewage Facilities Plan for On-Lot Sewage Service Area, New Britain Township, Bucks County, Pennsylvania", for your review and comment. This document is submitted in fulfillment of requirements established under Pennsylvania Code Title 25, Chapter 71.31.

Please provide your comments to John Cornelius, New Britain Township Manager, within 60 days of your receipt of this submittal. We would appreciate your copying this office on your correspondence, so we may incorporate your comments into the final documents and address any outstanding issues.

Should you have any questions or require additional information, please feel free to contact this office.

Very truly yours,

CARROLL ENGINEERING CORPORATION

Lane P. Bodley, P.E., CEC

LPB:bl
Enclosure
cc: John Cornelius, Manager, New Britain Township
Carol Bigham, Assistant Manager, New Britain Township
Kenneth E. Heydt, P.E., Executive Vice President, CEC

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AMLETTO A. PUCCI, JR., PH.D., PE
CHIEF, DIV. OF ENVIRONMENTAL ENG.
BUCKS COUNTY DEPT. OF HEALTH
HEALTH BUILDING
NESHAMINY MANOR CENTER
DOYLESTOWN, PA 18901
(#03-0485.00)

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X Steven J. Paglio ☐ Agent ☐ Addressee

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MS. GAIL FRIEDMAN
BUCKS COUNTY PLANNING COMMISSION
THE ALMSHOUSE, NESHAMINY MANOR CTR.
1260 ALMSHOUSE ROAD
DOYLESTOWN, PA 18901
#03-0485.00)

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Steven J. Paglio ☐ Agent ☐ Addressee

B. Received by (Printed Name) | C. Date of Delivery

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HEALTH BUILDING
City, State, ZIP+4 NESHAMINY MANOR CENTER
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City, State, ZIP+4 DOYLESTOWN, PA 18

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BUCKS COUNTY Planning Commission

Lynn T. Bush, AICP *Executive Director*

NEW BRITAIN TOWNSHIP

8-14-06
DATE RECEIVED

03-0485-02
LPB
KEH

COUNTY COMMISSIONERS:
Chairman, JAMES F. CAWLEY, ESQ.
CHARLES H. MARTIN
SANDRA A. MILLER

PLANNING COMMISSION:
Chairman, Robert H. Grumbine
Vice Chairman, Susanne McKeon
Secretary, Edward Kisselback
Kathleen M. Babb
Darrin Hollman
H. Paul Kenny
Carol A. Pierce
David H. Platt
James J. Stoeckhert

Post-it® Fax Note 7671 | Date 8/18 | # of pages 3
To Lane Bartley | From Carol Bigham
Co./Dept. CEC | Co. NBT
Phone # | Phone #
Fax # | Fax #

August 2, 2006
BCPC #26-06-WS1

MEMORANDUM

TO: New Britain Township Board of Supervisors
New Britain Township Planning Commission

FROM: Bucks County Planning Commission

SUBJECT: *New Britain Township Act 537 Sewage Facilities Plan for the On-Lot Sewage Service Area*
Applicant: Carroll Engineering Corporation on behalf of New Britain Township
Received: June 22, 2006
Hearing Date: Unknown

In accordance with the provisions of Act 537 of 1966, the Pennsylvania Sewage Facilities Planning Act, and Section 304(a)(4) of the Pennsylvania Municipalities Planning Code, this proposal has been sent to the Bucks County Planning Commission for review. The following review was prepared by the staff and endorsed by the Bucks County Planning Commission at a meeting held on August 2, 2006.

GENERAL INFORMATION

Proposed Plan: The subject Plan addresses the current and future on-lot sewage disposal needs of New Britain Township. The Plan is proposed to be implemented in conjunction with two other current Act 537 plans for New Britain Township, namely the 1987 *Neshaminy Basin Sub-Region II 210 Facilities Plan* and the 2005 *Act 537 Sewage Facilities Plan Update for the Chalfont-New Britain Township Joint Sewage Authority Service Area.*

Location of Wastewater Facilities Service Areas: The intent of the Plan is to provide adequate wastewater facilities for the portion of the township known as the "On-Lot Sewage Service Area" as specifically identified in the document, as well as other isolated areas within the township that are not served by public sewers. The Chalfont-New Britain Township Joint Sewage Authority (CNBTJSA) wastewater treatment facility provides treatment and disposal to sewered areas of New Britain Township outside of the On-Lot Sewage Service Area. The public sewer service area is covered by the 2005 *Act 537 Sewage Facilities Plan Update for the Chalfont-New Britain Township Joint Sewage Authority Service Area.*

Plan Scope—The Plan addresses the following issues:

A. Sewage Facilities Planning Process—The Plan provides a framework and procedure for Township involvement in the site evaluation and planning process. The procedure allows for the proper siting, evaluation, design, installation, and maintenance of on-lot sewage disposal systems. The PaDEP Planning Module process is also described in detail.

B. Township and Other Stakeholder Involvement—In addition to the Township (i.e., Supervisors, Planning Commission, Manager, Zoning Officer, Engineer, and other agents as necessary), other stakeholders identified in the Plan as being involved in the planning process include PaDEP, Bucks County Department of Health, Bucks County Planning Commission, the applicant, and agents for the applicant.

C. Physical Conditions—Geology, hydrogeology, soils, topography, floodplains, wetlands, water supply resources, and agricultural lands are detailed in Part 3 of the Plan.

D. Projected Growth—Demographics and future growth projections are detailed in Part 6 of the Plan.

E. Selection of Wastewater Alternatives—Part 5 of the Plan presents a thorough description of the various on-lot sewage system technologies and addresses soil suitability and the hydrogeologic aspects of on-site disposal. On-lot Sewage Disposal System Design and Permitting Criteria are presented in Table 7. The Plan requires that applicants for all proposed land developments in the On-Lot Sewage Service Area prepare an "On-Lot Sewage Disposal Site Suitability and Alternatives Analysis."

F. Preferential List of On-Lot Sewage Disposal Systems—Table 9 of the Plan establishes a "Preferential List of On-Lot Sewage Disposal Systems for Land Development". Any applicant seeking approval for an on-lot sewage disposal facility in New Britain Township must choose from the hierarchical list of 20 system types on Table 9A.

G. Sewage Management Program—Part 7 of the Plan establishes a Sewage Management Program that includes the following:

1. Enacting a Sewage Maintenance Ordinance;
2. Establishing a Sewage Hauler Approval Process;
3. Establishing a Waste Hauler Proof of Compliance Program;
4. Establishing an Educational Program;
5. Establishing a procedure for monitoring and implementation of existing On-Lot Sewage System Maintenance Agreements; and
6. Appointing a Township Authorized Agent to monitor the Program.

H. Plan Implementation, Administration, and Consistency—Part 8 of the Plan outlines the necessary steps for implementing the Plan and providing for township administration and coordination with the various stakeholders (e.g., PaDEP, Bucks County Department of Health, Bucks County Planning Commission, landowners/applicants, and their agents). There is also a discussion of the need for selected disposal alternatives to be consistent with the objectives and policies of myriad plans and programs at the state, county, and municipal level.

COMMENTS

The proposed Plan is a very well-organized, complete, and comprehensive document and is consistent with the Bucks County Comprehensive Plan's goals, objectives, and policies regarding wastewater facilities, particularly the following:

- Goal: "To protect public health and natural resources and prepare for the wastewater facilities needs of the future."
- Objective: "Coordinate wastewater facilities planning, land use planning, and water supply planning, encouraging consistency with the development district concept."
- Policy: "Promote non-sewered approaches to wastewater treatment and disposal outside of the development district with preference given to land disposal of treated wastewater."

New Britain Township officials and their engineering consultant are to be commended for preparing such a useful planning tool that, if used properly, will address the township's short-term and long range on-lot sewage disposal needs. We offer the following suggestion to assist in plan implementation:

- Part 8.2.C.11 of the Plan states on page 8-3 that there will be a need to "Evaluate financial implications of implementing the Sewage Management Program." and to "Investigate State funding and required fee structures to support the Program..." However, there is no indication as to the timing of Plan implementation. Perhaps an "Implementation Time Line" could be included in Part 8 of the Plan to set time horizons for the various administrative actions that will be needed to implement the Plan.

DPL:mjw

cc: Clinton Cleaver, Sewage Planning Supervisor, PaDEP
Andy Schafer, Chief, Sanitation Division, Bucks County Department of Health
Craig Kennard, Engineer, Gilmore & Associates
John Rice, Municipal Solicitor
John Cornelius, Manager, New Britain Township
Carol Bigham, Assistant Manager, New Britain Township
Lane Bodley, P.E., Carroll Engineering Corporation

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Carroll Engineering Corporation

June 21, 2006

Certified Mail

Ms. Gail Friedman
Bucks County Planning Commission
The Almshouse, Neshaminy Manor Center
1260 Almshouse Road
Doylestown, PA 18901

Dear Ms. Friedman:

Subject: New Britain Township Act 537 Sewage Facilities Plan for the On-Lot Sewage Service Area - Request for Comment

On behalf of New Britain Township, we are submitting one draft copy of "Act 537 Sewage Facilities Plan for On-Lot Sewage Service Area, New Britain Township, Bucks County, Pennsylvania", for your review and comment. This document is submitted in fulfillment of requirements established under Pennsylvania Code Title 25, Chapter 71.31.

Please provide your comments to John Cornelius, New Britain Township Manager, within 60 days of your receipt of this submittal. We would appreciate your copying this office on your correspondence, so we may incorporate your comments into the final documents and address any outstanding issues.

Should you have any questions or require additional information, please feel free to contact this office.

Very truly yours,

CARROLL ENGINEERING CORPORATION

Lane P. Bodley, P.E.

LPB:bl
Enclosure
cc: John Cornelius, Manager, New Britain Township
Carol Bigham, Assistant Manager, New Britain Township
Kenneth E. Heydt, P.E., Executive Vice President, CEC

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DOYLESTOWN, PA 18901
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X Steven J. Paglia
☐ Agent ☐ Addressee

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DOYLESTOWN, PA 18901
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X Steven J. Paglia
☐ Agent ☐ Addressee

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HEALTH BUILDING
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1260 ALMSHOUSE ROAD
City, State, ZIP+4 DOYLESTOWN, PA 18901

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APPENDIX B

"EPA DRAFT ENVIRONMENTAL IMPACT STATEMENT

WASTEWATER MANAGEMENT FACILITIES CHALFONT-NEW BRITAIN AREA, PA"

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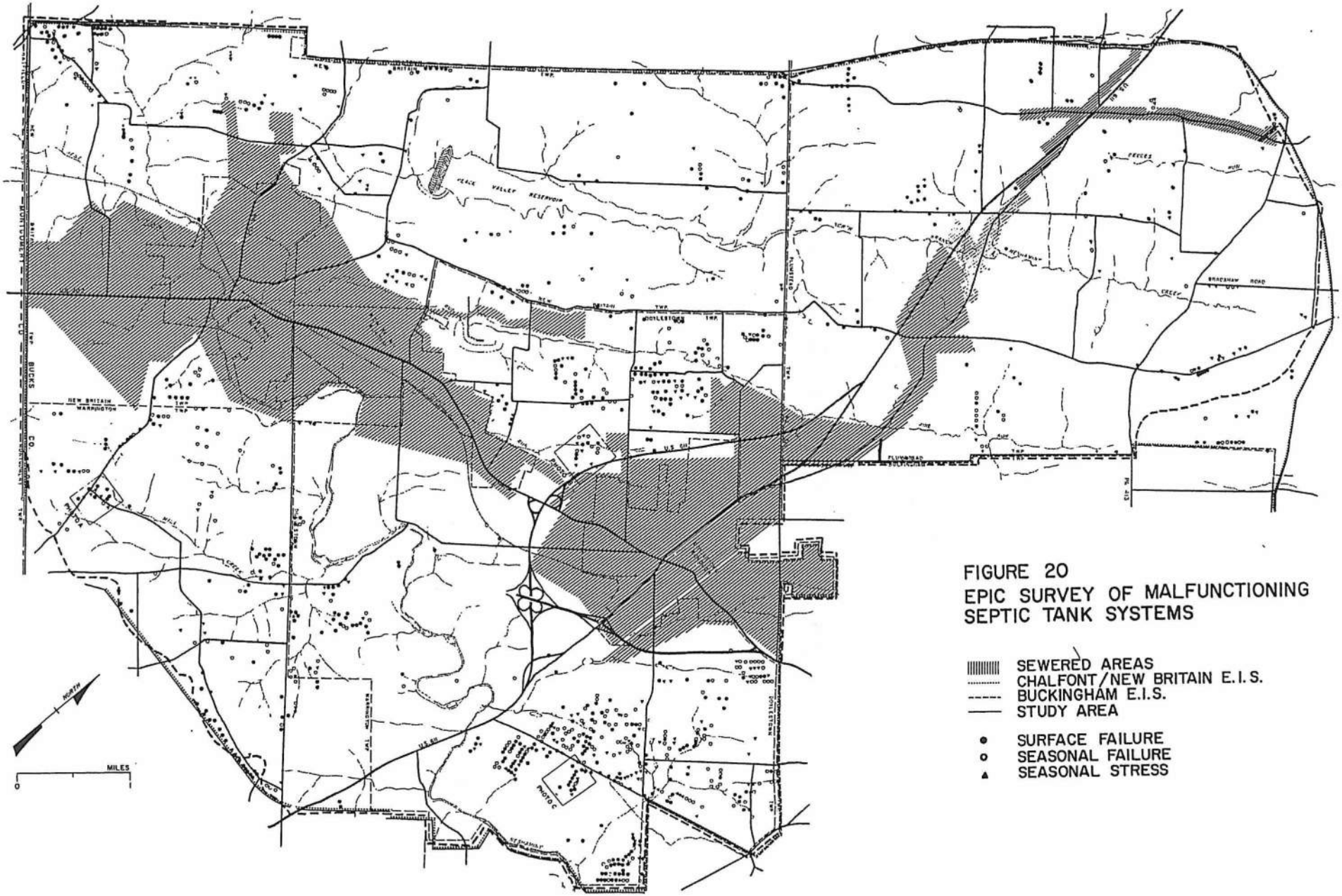


FIGURE 20
EPIC SURVEY OF MALFUNCTIONING SEPTIC TANK SYSTEMS

- SEWERED AREAS
- CHALFONT/NEW BRITAIN E.I.S.
- BUCKINGHAM E.I.S.
- STUDY AREA
- SURFACE FAILURE
- SEASONAL FAILURE
- SEASONAL STRESS

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APPENDIX C

PLANNING MODULE - FORMS AND INSTRUCTIONS

Sewage Facilities Planning Module Application Mailer (3800-FM-WSWM0359, Rev. 9/2005)

Component 1 - Exception to the Requirement to Revise the Official Plan (3800-FM-WSWM0350, Rev. 10/2005)

Component 2 - Individual and Community On-Lot Disposal of Sewage (3800-FM-WSWM0352, Rev. 10/2005)

Component 3 - Sewage Collection and Treatment Facilities (3800-FM-WSWM0353, Rev. 9/2005)

Component 3s - Small Flow Treatment Facilities (3800-FM-WSWM0353s, Rev. 10/2005)

Component 4A - Municipal Planning Agency Review (3800-FM-WSWM0362A, Rev. 9/2005)

Component 4B - County Planning Agency Review (3800-FM-WSWM0362B, Rev. 9/2005)

Component 4C - County or Joint Health Department Review (3800-FM-WSWM0362C, Rev. 9/2005)

Request for Planning Waiver & Non-Building Declaration (3800-FM-WSFR0349, Rev. 9/2005)

Municipal Flow Chart for Processing Planning Modules (Rev. 5/24/1999)

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SEWAGE FACILITIES PLANNING MODULE
APPLICATION MAILER

COMMONWEALTH OF PENNSYLVANIA
Department of Environmental Protection
Edward G. Rendell, Governor • Kathleen A. McGinty, Secretary
For more information, visit DEP's Web site at
www.dep.state.pa.us, Keyword: "DEP Act 537."

INSTRUCTIONS FOR COMPLETING SEWAGE FACILITIES PLANNING MODULE APPLICATION MAILER

(remove before sending mailer to the approving agency (the Department of Environmental Protection (DEP) or delegated local agency))

Read the following instructions carefully before completing the application mailer. This information will be used to determine if sewage facilities planning is necessary for your project, and, if it is, which forms are appropriate.

Unless your project qualifies for one of the planning exemptions provided in Act 537, a package of **sewage facilities planning module** forms appropriate for the project will be sent to the return address indicated on the mailer, or instructions for obtaining the appropriate forms from DEP's website (www.dep.state.pa.us) will be issued. Each form includes detailed instructions which explain the use of the form and how to complete it. The package of completed forms and its supporting documentation is called a **sewage facilities planning module**, or "planning module." Once the planning module is complete, it must be given to the municipality in which the project is located for review. While most planning modules are also reviewed by DEP following the municipal review, some municipalities (or groups of municipalities working together) have requested and received DEP approval to complete review of planning modules themselves. These are known as **delegated local agencies**. To find out if your project is located in an area served by a delegated local agency, contact the municipality or DEP's regional office serving your area.

Please note that both DEP and delegated local agencies are required by law to charge fees for the review of planning modules. The fees DEP must charge are set by law in Act 537, while delegated local agencies may set fees which can be the same or different from those in Act 537. For more information on review fees for your particular project, see the planning module guidance documents or contact the approving agency (DEP or delegated local agency) serving the area of your project.

NOTE: If your project is a **minor subdivision** (defined as a subdivision of 10 lots or less, intended for single family residential homes served by individual onlot sewage disposal systems) you may complete this application mailer if you are seeking an exemption from sewage facilities planning. If you are not seeking an exemption for a minor subdivision, ask the municipality in which your project is located for a "Component 1" minor subdivision planning module form.

INSTRUCTIONS (numbered items on the mailer correspond to the instruction numbers below)

1. Print the name of the proposed development and name, address and telephone number of the person who is proposing the project. If planning module components are to be sent to a different person or address, include this information on the front of the mailer in the return address block.

2. a. Enter the county in which the project is located.

   b. Enter the municipality in which the project is located.

   c. Enter the road or address (if available) or street coordinates (example - west side of T-235, 1 mile south of intersection of Rt 15 and T-235).

   d. Enter the name of the U.S. Geological Survey (USGS) 7.5-minute quadrangle map which contains the project area, and the location of the project area on that map in inches up and over from the lower right corner of the map to the approximate center of the project. (Example - Centerville West quad, 7 inches up and 2.5 inches over from lower right corner of map.) Alternatively, include an original or a copy of the USGS quad map with the project area outlined on it.

3. Check the box that best describes the intended use of the proposed land development project. **Residential** refers to single-family lots. **Multi-residential** includes apartments, condos, etc. **Commercial** includes retail centers, office parks, industrial development, etc. **Institutional** refers to schools, hospitals and the like. **Brownfield** Site Redevelopment refers to projects proposing to recycle land. Some developments will involve more than one type of use, or will not fit comfortably into any of the classifications given. If this is the case, choose more than one category or explain under **Other**.

4. a. Enter the number of single family residential lots or Equivalent Dwelling Units (EDUs) proposed. An EDU is defined as that part of a multi-family dwelling or nonresidential project with flows equal to 400 gallons per day (gpd) (the assumed flow, for planning purposes, of a single family residential lot). To determine the number of EDUs, divide the proposed sewage flow of the project by 400 gpd.

   b. Enter the total number of lots created from this parcel of land since May 15, 1972, including the lots being proposed at this time. (Onlot disposal proposals only.)

   c. Enter the total project acreage and the acreage of any remaining land (land not proposed for development but under the same ownership and adjacent to the project area).

5. Enter the proposed total sewage flow from the project in gpd. See Title 25 of the Pennsylvania Code, Chapter 73, Section 73.17, (www.pacode.com), or DEP's *Domestic Wastewater Facilities Manual*, DEP ID: 362-0300-001 available on DEP's website at www.dep.state.pa.us , Keyword: " DEP wastewater."

6. Choose the category (a, b, c or d) that describes the method of sewage disposal planned to serve the project and enter the information requested. Since this information could have an effect on the planning requirements for your project, be as accurate as possible. If more than one method of sewage disposal is planned, or if an interim method is planned, indicate it here.

   a. Sewerage System

      If an existing system is being extended to serve the proposed project, or if lots are to connect directly to an existing sewage collection system, check all boxes that describe the project. Write in the names of the existing collection systems that will be used, the interceptor sewer which will be used for conveyance and the treatment facility where the sewage flows will be treated.

   b. Construction of Sewage Treatment Facility (with stream discharge or with spray irrigation as final disposal option)

      Check the box corresponding to the chosen final disposal option (stream discharge or spray irrigation field). This category does **NOT** include individual residence spray irrigation systems (IRSIS) which are considered onlot sewage disposal systems ((c), below). For stream discharges, name the receiving waterbody. If the proposed facility is intended to replace an existing, malfunctioning onlot system, check the box marked "repair."

   c. Onlot Sewage Disposal Systems (individual, community, or large-volume)

      Check the box corresponding to the type of onlot sewage disposal systems proposed to serve the project. An **individual onlot sewage disposal system** is a system of piping, tanks or other facilities used for collecting, treating and disposing of sewage into a subsurface absorption area. This category also includes IRSIS. A **community onlot system** is a facility either publicly or privately owned which will collect and dispose of sewage from two or more lots or EDUs into a subsurface absorption area. A **large-volume onlot system** is an individual or community onlot system which is designed to treat flows in excess of 10,000 gpd.

      The approving agency must be notified at least 10 days in advance of all soil testing activities (including those related to planning exemption requests - see 8(a)(2)), so that its staff have the option of observing the tests.

   d. Retaining Tanks (holding tanks or privies)

      If retaining tanks are proposed as the method of sewage disposal, enter the number of holding tanks or privies which are proposed to serve the project.

7. Check this box if you desire to obtain your sewage facilities planning module forms from DEP's website. You will be provided with appropriate instructions, website addresses and DEP coding information in a letter rather than a package of paper forms.

8. Requests for Planning Exemption under the Sewage Facilities Act

   Effective December 15, 1995, certain classes of subdivisions that are no longer subject to the planning requirements of the Sewage Facilities Act. To help you and the approving agency determine if your project fits into one of these categories, a series of sign-off areas have been added to the Sewage Facilities Planning Module Application Mailer. They are separated based upon the type of sewage disposal proposed.

   a. Protection of rare, endangered or threatened species.

      DEP's technical guidance document "Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation," (400-0200-001) requires DEP to ensure that requests for authorizations, are coordinated with the Department of Conservation and Natural Resources' (DCNR) Pennsylvania Natural Diversity Inventory (PNDI).

      Conducting a search of the PNDI database and providing a copy of a "PNDI Project Environmental Review Receipt" for the proposed project and, if potential impacts are identified by the search, clearance or recommendation letters from the jurisdictional agency responsible for the particular species identified by a search, satisfies this requirement.

      To avoid project delay, self-explanatory, self-conducted "PNDI Project Planning Environmental Review" searches are initiated at www.naturalheritage.state.pa.us. This interactive, online search will ask questions

about the proposed project and provide the appropriate receipt, instructions or additional information regarding coordination with jurisdictional agencies.

As an alternative to the self-conducted search, project sponsors may request DEP staff to conduct the search by providing a completed "PNDI Project Planning & Environmental Review Form" (PNDI Form). The form is available at www.naturalheritage.state.pa.us. Individuals making this request should be aware that, due to the nature of the search software, DEP staff may need to contact them for additional information to successfully complete the search and that exclusive of any other items, their sewage planning exemption request is considered incomplete by DEP, until the appropriate receipt, clearance or recommendation letters are received.

For more information, see the "Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation," (400-0200-001), available online in the eLibrary at DEP's Web site address www.dep.state.pa.us.

b. Attach a plot plan for the proposed project. The plan must depict anticipated lots to be created, site suitability test locations (onlot proposals) and estimated sewer line runs (public sewer proposals).

c. Projects proposing use of onlot sewage disposal systems

(1) Information Required from the Municipality

The municipality in which the project is located (identified in Item 2.b. of the mailer) should determine if the municipality's Official Sewage Facilities Plan shows that the area planned for the project is to be served by onlot sewage disposal systems. If it is, the municipality should indicate this by having an authorized municipal official sign and date the form in the space provided. The official's name and title should be printed on the line below. In the absence of a municipal signature, the applicant should submit evidence that the approved mailer was submitted to the municipality for signature. Upon receipt of this evidence, the approving agency will make an independent determination based on the most recent Official Sewage Facilities Plan.

(2) Information Required from the Municipal Sewage Enforcement Officer (SEO)

The municipality's SEO must conduct personally, observe or otherwise confirm in a manner approved by DEP, site testing on each proposed lot in the subdivision (including any remaining land) to determine that separate sites are available for both a permitted primary onlot sewage disposal system and a replacement system (to be used if the original system fails in the future). If the SEO finds that each lot has been tested properly and fulfills these criteria, the SEO must indicate this by signing and dating the form in the space provided. His/her name and certification number should be printed on the line below.

(3) Information Required from the Applicant

The person proposing the subdivision, or his/her authorized agent, must determine if each lot in the subdivision (including the remaining land, if any) is at least one (1) acre in size. If they are, the applicant or his/her agent must indicate this by signing and dating the form in the space provided.

(4) Determinations Made by the Approving Agency

When the above listed information is received, the approving agency will determine the following:

(a) If the geology of the project area is conducive to nitrate-nitrogen contamination of groundwater (determined from the topographic map location information); or

(b) If elevated levels of nitrate-nitrogen are known to exist within one-quarter (1/4) mile of the proposed development (determined from agency groundwater sampling records in existence at the time of the application); or

(c) If the area proposed for development is within an identified High Quality (HQ) or Exceptional Value (EV) watershed (determined from the topographic map location).

Following this investigation, the approving agency will render a decision on the exemption request within 10 working days of receiving the request for exemption. Both the applicant and municipality will be notified of the decision. If the request cannot be granted, the person named in the return address block will receive the proper planning module component forms (or instructions to obtain them from the DEP website) along with the notification of the decision, including the reason(s) that the request cannot be granted.

d. Projects proposing use of public sewerage facilities (i.e., ownership by municipality or authority)

(1) Information Required from the Municipality

The municipality in which the proposed project is located (identified in Item 2.b. of the mailer) will determine the following from written documentation requested and obtained by the applicant from the facility permittee. ***This documentation MUST also be sent to the approving agency (DEP or delegated local agency) for evaluation.***

(a) Certification from the permittees of the collection, conveyance and treatment facilities proposed for use that capacity is available in these facilities to receive and treat the sewage flows from the proposed project; and

(b) That these added flows will not cause an overload or 5-year projected overload in the facilities.

If the facilities proposed for use are owned and operated by an authority, or authorities, then attach a letter from each to the mailer.

If this written certification has been submitted by the applicant, an authorized municipal official should sign and date the form and print his/her name and title and the municipality name in the spaces provided.

NOTE: Since planning is a municipal responsibility, sewer authorities involved should make required information available but should **NOT** sign the mailer as the authorized municipal official.

In the absence of a municipal signature, the applicant should submit evidence to the approving agency that the written certification, described in b.(1) above, was submitted to the appropriate municipal official. Upon receipt of the evidence and the written certification, the approving agency will make an independent determination of the available capacity to serve the proposed new land development.

(2) Determinations Made by the Approving Agency

When the above listed information is received by the approving agency, the approving agency will determine the following (from DEP records):

(a) That the existing collection, conveyance and treatment facilities are in compliance;

(b) That the existing facilities have no existing or 5-year projected overload;

(c) That the municipality has a currently approved Official Sewage Facilities Plan which is being implemented; and

(d) That the project does not propose service by facilities needing a new or modified permit from DEP under the Clean Streams Law.

Following this investigation, the approving agency will render a decision on the exemption request within 10 working days of receiving the request for exemption. Both the applicant and the municipality will be notified of the decision. If the request cannot be granted, the person named in the return address block will receive the proper planning module component forms (or instructions to obtain them from DEP's website) along with the notification of the decision, including the reason that the request cannot be granted.

If unsure of which local DEP office to contact, the following DEP regional offices will assist you in determining the appropriate local DEP office that serves your specific municipality.

If you need more information or assistance, please contact your local DEP office.

DEP REGIONAL OFFICES

Southeast Region
2 E. Main St.
Norristown, PA 19401
Main Telephone: 484-250-5900
24-Hour Emergency: 484-250-5900

Counties: *Bucks, Chester, Delaware, Montgomery and Philadelphia*

Southwest Region
400 Waterfront Drive
Pittsburgh, PA 15222-4745
Main Telephone: 412-442-4000
24-Hour Emergency: 412-442-4000

Counties: *Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland*

Southcentral Region
909 Elmerton Ave.
Harrisburg, PA 17110
Main Telephone: 717-705-4700
24-Hour Emergency: 1-877-333-1940

Counties: *Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry and York*

Northwest Region
230 Chestnut St.
Meadville, PA 16335-3481
Main Telephone: 814-332-6945
24-Hour Emergency: 1-800-373-3398

Counties: *Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren*

Northeast Region
2 Public Square
Wilkes-Barre, PA 18711-0790
Main Telephone: 570-826-2511
24-Hour Emergency: 570-826-2511

Counties: *Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne and Wyoming*

Northcentral Region
208 W. Third St., Suite 101
Williamsport, PA 17701
Main Telephone: 570-327-3636
24-Hour Emergency: 570-327-3636

Counties: *Bradford, Cameron, Clearfield, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union*

1. **Development Information**

Name of Development _____
Developer Name _____
Address _____
_____
Telephone # _____

2. **Location of Development**

a. County _____
b. Municipality _____
c. Address or Coordinates _____
_____
_____

d. USGS Quad Name _____
inches up _____ over _____
from bottom right corner of map.

3. **Type of Development Proposed**
(check appropriate box)

☐ Residential ☐ Multi-Residential

Describe _____
_____

☐ Commercial ☐ Institutional

Describe _____
_____

☐ Brownfield Site Redevelopment

☐ Other (specify) _____

4. **Size**

a. # of lots _____ # of EDUs _____
b. # of lots since 5/15/72 _____
c. Development Acreage _____
d. Remaining Acreage _____

5. **Sewage Flows** _____ gpd

6. **Proposed Sewage Disposal Method**
(check appropriate boxes)

a. ☐ Sewerage System
☐ Existing (connection only) ☐ New (extension)
☐ Public ☐ Private
☐ Pump Station(s)/Force Main ☐ Gravity
Name of existing system being extended
_____
Interceptor Name _____
Treatment Facility Name _____
_____

b. ☐ Construction of Treatment Facility
☐ With Stream Discharge
☐ With Land Application (not including IRSIS)
☐ Other
☐ Repair?
Name of waterbody where point of discharge is proposed (if stream discharge)
_____
_____

c. ☐ Onlot Sewage Disposal Systems
(check appropriate box)
☐ Individual onlot system(s) (including IRSIS)
☐ Community onlot system
☐ Large-Volume onlot system

d. ☐ Retaining tanks
Number of Holding Tanks _____
Number of Privies _____

7. ☐ **Request Sewage Facilities Planning Module forms in electronic format**

8. **Request for Planning Exemption**

a. Protection of rare, endangered or threatened species
Check one:
☐ The "PNDI Project Environmental Review Receipt" is attached.
or
☐ A completed "PNDI Project Planning & Environmental Review Form," (PNDI Form) is attached. I request DEP staff to complete the required PNDI search for my project. I realize that my planning exemption will be considered incomplete and that the DEP processing of my planning exemption request will be delayed, until a "PNDI Project Environmental Review Receipt" and all supporting documentation from jurisdictional agencies (when necessary) is/are received by DEP.

Applicant or Consultant Initials_____

b. ☐ Plot Plan Attached

c. Onlot Disposal Systems

(1) I certify that the Official Plan shows this area as an onlot service area.

_____ /_____
(Signature of Municipal Official) Date

_____ /_____
Name (Print) Title

_____
Municipality (must be same as in 2.b.)

Telephone # _____

(2) I certify that each lot in this subdivision has been tested and is suitable for both a primary and replacement sewage disposal system.

_____ /_____
(Signature of SEO) Date

_____ /_____
Name (Print) Certification #

Telephone # _____

(3) I certify that each lot in this subdivision is at least 1 acre in size

_____ /_____
(Signature of Project Applicant/Agent) Date

d. Public Sewerage Service (i.e., ownership by municipality or authority)

Based upon written documentation, I certify that the facilities proposed for use have capacity and that no overload exists or is projected within 5 years. (Attach documents.)

_____ /_____
(Signature of Municipal Official) Date

_____ /_____
Name (Print) Title

_____
Municipality (must be same as in 2.b.)

Telephone # _____

Return Correspondence/Forms to:

_____

_____

_____

_____

DEPARTMENT OF ENVIRONMENTAL PROTECTION

_____

_____

_____

DEP USE
Components Sent
Onlot Disposal ☐
Collection and Treatment ☐
Planning Agency Review ☐
Exempt from Planning ☐
Code _____
Date _____

"Fold Here"

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

Remove and recycle these instructions before mailing component to the approving agency

INSTRUCTIONS FOR COMPLETING COMPONENT 1
EXCEPTION TO THE REQUIREMENT TO REVISE THE OFFICIAL PLAN

SECTION A. PROJECT INFORMATION

Project Name. In the "Project Name" block, enter the name by which this proposed land development project is, or will be, known.

Brief Project Description. Provide a brief description of the project in this block.

Total Number of Lots. Calculate the total number of lots using the formula found in Component 1, Section A.3. If the total is greater than 10, your proposal is not eligible to use a Component 1 Sewage Facilities Planning Module. Contact your local DEP office to obtain the correct planning procedures.

SECTION B. CLIENT (MUNICIPALITY) INFORMATION

Municipality Name, County, Municipality Type. Enter the name of the client municipality and the name of the county in which the municipality is located. Check the appropriate block indicating the municipality type, whether **City, Boro,** or **Township** (Twp).

Contact Individual Last Name, First Name, MI, Suffix, Title. Enter the requested information for the municipal client contact in this block. The municipal client contact is often the municipal secretary, but may be another official, such as the chairman of the board of supervisors. Please indicate the appropriate title of the client contact in the Title block.

Additional Individual Last Name, First Name, MI, Suffix, Title (optional). This is an optional block to be used by municipalities that wish to provide an alternate client contact. Enter the requested information only if an alternate contact name is desired.

Mailing Address. This is the mailing address of the client municipality identified above. It should not include locational data that is not appropriate for a mailpiece. In addition to the street number and name, PO Box number, RR number, Box number, or Highway Contract number designations, use any appropriate designation and number to further define the mailing address.

e.g.,	APT	(Apartment)	FLR	(Floor)
	BLDG	(Building)	RM	(Room)
	DEPT	(Department)	STE	(Suite)

City, State, ZIP+4, Phone Information. **DO *NOT*** use abbreviations for the city name. Use the two-character abbreviation for the state. Include the four-digit extension to the ZIP code, if known.

SECTION C. SITE INFORMATION

DEP needs to be able to accurately locate your site and to understand the physical nature of the surrounding area. Therefore, the application must be accompanied by a 7.5 minute topographic map published by the US Geological Survey. These maps can usually be obtained from most map distributors or hunting and fishing supply stores. On the topographic map, draw the outline of the development site.

Site (Land Development) Name. Enter the name of the site at the specific physical location. **DO NOT** use abbreviations, acronyms, etc.

Site Location. Provide the physical address of the location where the permitted activities will occur. **DO NOT** use PO Box numbers for site location information. Provide the city (or municipality), state, and the ZIP+4, if known. Enter the latitude and longitude of the approximate center of the site.

Detailed Written Directions to Site. When providing written directions, **DO NOT** use PO Box address data. Include landmarks and approximate distances from the nearest highway.

Description of Site. Provide a written description of the proposed project.

Site Contact Information. Provide the name of the developer or project sponsor. This person is often the landowner or the landowner's agent. Include the individual's name, title, firm, email address (optional), mailing address, and daytime phone numbers. This individual will ultimately be responsible for paying the DEP review fee.

SECTION D. PROJECT CONSULTANT INFORMATION

If this form is completed by someone other than the applicant, such as a consultant, engineer or contractor, that individual should complete this section of the form.

SECTION E. AVAILABILITY OF DRINKING WATER SUPPLY

Indicate the intended source of the project's drinking water by checking the appropriate box. If a public water supply will be used, provide written documentation that the water supplier is aware of the project, possesses capacity to serve the project and is willing to serve the project. A public water supply is defined as a system that provides water to the public for human consumption that could serve 15 or more connections, or serve 25 or more people daily at least 60 days out of the year.

SECTION F. PROJECT NARRATIVE

The following information is required to be provided in narrative (paragraph) form and attached to the module package. Title the attachment **Project Narrative.**

1. Enter the number of lots in the development project. **LOTS** refer to single family residential dwellings. The residual tract, if any, is also counted as a lot when determining eligibility for use of a Component 1 but not when calculating the DEP review fee for this project.

2. Enter the projected sewage flows in gallons per day (GPD). Information on flows for individual onlot systems can be found in DEP's regulations, Title 25 of the Pennsylvania Code, Chapter 73 §73.17 available electronically at www.pacode.com.

3. Enter the total acreage of the proposed land development project.

4. Describe the use of any acreage or parcels under the same ownership and adjacent to the property. (Such as: for future development, recreational, agriculture, open space, etc.) If the land is proposed for future development, or is part of a phased project, the applicant should determine if adequate sewage disposal facilities will be available to serve those phases.

5. Include any other information that is relevant to the project, such as any explanations required as a result of the questions in Section E, Permit Coordination.

SECTION G. GENERAL SITE SUITABILITY

The information in this section about soils and site conditions will be used by the Sewage Enforcement Officer (SEO) and approving agency to determine if the project area is suitable for the use of individual onlot systems. This section also requires that certain information listed in the component be plotted on a plan which includes the project and adjacent areas. Some of the information required can be found in the municipality's Official Sewage Facilities Plan. Other information can be found in tax maps, zoning maps, USDA Natural Resources Conservation Service maps, Federal Emergency Management Agency (FEMA) flood plain maps and National Wetland Inventory maps.

NOTE: If one or more lots in this subdivision are planned to be served by Individual Residential Spray Irrigation Systems (IRSIS), please see the specific instructions for IRSIS in Part 3 of this section.

1. Plot Plan

The plot plan should be of a sufficiently large scale to show the development area and adjacent areas so that the plotted items can be easily identified. Preliminary lot lines can be used when soils testing is completed prior to lots being established, but the plot plan must be prepared by a registered surveyor before submission to the approving agency. The plan is required to show the following:

a. Locations of **ALL** soil profile examinations and percolation tests (both suitable and unsuitable).

The location of all soil profile excavations and percolation test sites, including those which documented unsuitable conditions for the use of onlot sewage disposal, must be shown on the plot plan. Excavations are to be shown by the symbol ▲ (triangle) and percolation tests by the symbol • (large dot). When the scale of the plot plan makes it impossible to show each percolation test hole, the area of the test may be shown using a rectangular box labeled with the percolation test symbol. Each test must be referenced by number to the appropriate "Site Investigation and Percolation Test Report".

b. The slope at each test area.

Slopes must be taken from in-field measurements recorded on "Site Investigation and Percolation Test Report" forms (3800-FM-WSWM0290A (formerly known as "Appendix A" or that are available from the Municipal SEO)) or from a registered surveyor's in-field slope measurements. The slopes should be shown on the plan with a slope arrow identifying measured percentage of grade and the source of the measurement ("Test Report" or surveyor). When slopes are measured, they must be taken across the soil profile/percolation test area from the down-grade extent to the up-grade extent of the proposed absorption area or spray field. This includes the berm area when elevated sand mound use is proposed in the subdivision. The Sewage Enforcement Officer should estimate the size of the absorption area from the percolation test data and Table A in Chapter 73, Section 73.16(e)), or the size of the spray field (from Table B in Chapter 73, Section 73.16(e)). Before a surveyor measures the slope, the sewage enforcement officer must place a labeled marker at each end of the area to be measured to assure that the tested area is being assessed. Any landscape feature, such as a bench, which may impact the general suitability of the site must be identified on the plan.

c. Soil types (as shown in USDA Natural Resources Conservation Service mapping) and their boundaries.

d. Locations of existing and proposed adjacent streets, roadways and access roads.

e. Lot lines and the sizes of individual lots in the proposed development.

Show the relationship of the development boundaries to those of the currently existing lot. Where the boundaries of the existing lot have not been formally surveyed, but are plotted from deed records, this must be written on the plan.

f. Existing and proposed rights-of-way. Proof of legal recording of rights-of-way may be required when the right-of-way is necessary for implementation of the sewage facility alternative.

g. Existing and proposed water supplies (wells, reservoirs, etc.) and surface water (ponds, lakes, streams) on the adjacent and proposed developments.

The SEO must identify existing water supplies and surface waters on adjacent properties which may impact site suitability related to isolation distances. If the sewage enforcement officer determines that the identified water supplies and surface waters are far enough away from the proposed development that they will have no impact on site suitability, the locations do not have to be plotted. If the identified water supplies or surface waters may have an affect on isolation distances, they must be shown on the plan. The SEO will provide access to the property for any required surveying activities.

h. Location of existing buildings.

i. Surface waters, including ponds, streams, lakes and impoundments.

j. Wetland areas, as identified by hydric soils in USDA Natural Resources Conservation Service maps and by National Wetland Inventory mapping.

Please note that if wetlands are present, the applicant may be required to obtain permits for any construction activities such as encroachments (fill, roads, utility lines) or obstructions (bridges, walls, piers) in, along, or across the wetlands. If this is proposed, the applicant should contact the DEP Regional Office, Water Management Program, Soils & Waterways Section for further information. Full delineation may be required as a condition of permit issuance, including issuance of onlot system permits, Clean Streams Law permits, or encroachment or obstruction permits for construction activities in, along, or across wetlands.

k. Flood plains and flood ways. As with wetlands, these areas should be plotted on the plan as they are shown on Federal Emergency Management Agency flood plain mapping.

l. Open space areas designated within the proposed development and any parks, state forests or other state land adjoining the development.

m. Any property that is not included in the plan but is under the same ownership and adjacent (whether or not it has been developed in the past or will be developed in the future). Lots located across roads, streets and rights-of-way are considered adjacent.

n. Any existing onlot or sewerage systems, pipelines, transmission lines, etc. which may impact the use of an onlot system.

o. Prime agricultural land listed by the USDA Natural Resources Conservation Service as "Pennsylvania Prime Farmland Soils," or soils listed in the USDA Natural Resources Conservation Service Soil Survey as having a capability classification of I, II or III.

p. Orientation to north, usually shown by a directional arrow.

2. Residual Tract Waiver Request

The DEP believes that developers, municipal officials and future lot owners are best protected by complying with sewage planning requirements to assure that adequate sewage facilities will be available to serve all lots in newly created subdivisions. However, DEP is aware that some subdivision proposals include residual tracts of land on which there is already an inhabited structure or which are large parcels for which there is no proposed construction which would require the use of sewage disposal facilities. Developers having such residual tracts are not required to complete sewage facilities planning for that portion of the subdivision if this claim is valid. The developer may request the residual tract waiver by checking the request block in Section G of the component.

Acceptance of the request for a waiver by the municipal planning agency and the municipality is required. When the proposal involves the subdivision of property on which there is an existing building currently served by an onlot septic

system on the residual tract, the municipality's sewage enforcement officer must inspect the system and sign and date the waiver statement in Section H. of the planning module component.

"As of the date of this deed/plot plan/deed notice recording, the residual tract of this subdivision is dedicated for the express purpose of _____ use. No portion of the residual tract of this subdivision has been approved by the municipality or the approving agency for the installation of sewage disposal facilities. No sewage permit will be issued for the installation, construction, connection to or use of any sewage collection, conveyance, treatment or disposal system (except for repairs to existing systems) unless the municipality and approving agency have approved any required sewage facilities planning for the residual tract of the subdivision described herein in accordance with the Sewage Facilities Act (35 P.S. Sections 750.1 *et seq.*) and regulations promulgated thereunder. Prior to signing, executing, implementing or recording any sales contract or subdivision plan, any purchaser or subdivider of any portion of this residual tract should contact the municipality which is charged with administering the Sewage Facilities Act to determine what type of sewage facilities planning is required and the procedure and requirements for obtaining appropriate permits or approvals."

Language similar to the above must be recorded on the plot plan and deed or deed notice and a copy of the deed or plot plan or deed notice must be submitted with this planning module submission.

3. Soils Information

a. To complete the soils portion of this section, soils testing information must be submitted on "Site Investigation and Percolation Test Report" form(s) (3800-FM-WSWM0290A, formerly known as "Appendix A"). These forms are available from the municipal SEO. The SEO must notify the approving agency at least 10 days prior to any testing, either by phone or in writing, because in some cases, the agency may wish to observe the soil testing. Soil testing can be completed by a soil consultant or by the SEO, with municipal approval, as long as all soil testing is verified by the SEO. Make sure the SEO provides a signed copy of "The Report" form(s) to include in the Component 1 package submitted to the municipality.

Enough soils tests must be conducted to determine suitability for onlot systems for both the proposed development and the residual tract, unless a residual tract waiver has been obtained. At a minimum, testing must consist of one soil profile examination, one complete percolation test and one slope measurement for each change in soil type, slope, and erosion characteristic as indicated on the USDA Natural Resources Conservation Service map for the area of the proposed system(s). Soil type boundaries must be plotted on the plan. If portions of the proposed subdivision are found to have unsuitable soils or site conditions, lots may have to be modified to eliminate these unsuitable areas, or other sewage facility alternatives may have to be considered. (When individual residential spray irrigation systems (IRSIS) are proposed, percolation tests are not required. Please see the specific instructions on IRSIS in Section G3C, below.)

b. Marginal Conditions and Long-Term Disposal Needs

If any of the conditions listed in Section H.2 of the component are present on the project site, indicate this by marking the appropriate block on the form. The presence of marginal conditions on the site requires that additional documentation be provided to assure that both the short-term and long-term sewage facilities needs of the area will be met.

The options available to the property owner and municipality to assure long-term sewage facilities where marginal conditions for onlot systems have been documented include: conducting tests for both a primary and replacement onlot system on the lots considered marginal; documenting replacement of the onlot systems with community sewerage systems; inclusion of the subdivision in a sewage management agency; or in the case of high density use of onlot systems, reduction of the density of lots below the threshold of one residential dwelling/acre. Descriptions of the documentation necessary for each of these four options can be found in Section J of these instructions.

These options should be carefully evaluated and all necessary testing or justification for the option chosen must be included with the Sewage Facilities Planning Module (Module) when it is forwarded to the municipality.

Submittal of a planning module for this project without the required documentation will result in the return of the planning module as incomplete.

c. General Site Suitability Determinations for Individual Residential Spray Irrigation Systems (IRSIS)

This guidance supplements the existing planning module guidance on determination of general site suitability for proposed subdivisions where one or more lots will use individual residential spray irrigation systems (IRSIS) as the means of sewage disposal. **It does not replace the existing guidance on general site suitability determinations for any other type of onlot sewage disposal system.**

(1) General Site Suitability

Since individual residential spray irrigation systems require relatively large land areas to function, the soil testing necessary for the design of these systems must be done at the planning stage. The number and distribution of soil test pits needed to adequately characterize the soils on a given lot is discussed in Chapter 73, Section 73.14(b) and is dependent upon the size of the proposed system. The required size of the system is dependent upon the soil, slope and cover of the lot and the projected flow volume from the residence proposed, and can be determined using Chapter 73, Section 73.16(e) - Table B. The most limiting site condition on the lot will determine the minimum testing required.

(2) Plot plan

Slopes must be determined at each of the test pit locations as described in Section G. of the planning module instructions, as well as at any other appropriate locations within the interior of the proposed system area. Slope measurements made within the area of the proposed IRSIS and their approximate areas should be noted on the plot plan. The maximum slope within the area of the proposed IRSIS determines the minimum sizing of the area to be defined. The minimum size is determined using Table B from Chapter 73, Section 73.16(e).

In addition to the list of features requested in Section G. of the planning module guidance, the following additional information is required for lots proposing IRSIS or neighboring lots that could be affected by IRSIS isolation distances.

(a) Delineation of the boundaries of any proposed IRSIS on the lot, whether the proposed system is intended for primary or replacement use.

(b) Delineation (by shading) of a 100 foot area surrounding the IRSIS site, with a notice on the plot plan that no water supply or occupied dwelling may be placed within the shaded zone. The shaded area may include areas on neighboring lots in the proposed subdivision. A legal description of the affected area on any lot impacted by the proposed IRSIS or a sketch of its shaded isolation area must accompany the plot plan and be recorded with the deed for any affected lot.

(c) Delineation of the boundaries of the features below within any proposed IRSIS area:

(1) cultivated agricultural areas
(2) open canopy forest or non-forested but vegetated areas
(3) closed canopy forest areas

(3) Soils information

While percolation testing is still required to identify a primary onlot sewage disposal system utilizing conventional technology (non-IRSIS system), no percolation testing is required to identify an IRSIS area. If IRSIS is proposed as the primary system alternative on a given lot, no percolation testing of that lot is required.

(4) Provisions for long-term sewage disposal

Where an IRSIS is proposed as the primary sewage disposal option for a lot, replacement area testing may be required depending upon the particular circumstances of the planning module proposal. The replacement area testing requirements are determined on a case-by-case basis by the approving agency. If an IRSIS is proposed only as the replacement system option for any lot in the subdivision, then both the primary and replacement area must be identified and tested.

(5) Municipal responsibilities

Prior to issuance of a permit for an IRSIS, Act 537 requires that the municipality and permittee enter into an agreement to provide management and oversight of the system. Although the absence of this permitting requirement at the planning module stage does not prevent the municipality or approving agency from granting planning module approval to subdivisions proposing IRSIS, DEP recommends that the developer and municipality explore available options to provide this management and oversight during the planning module stage. Having this agreement as part of the planning module approval could help expedite the subsequent permitting process for the individual lot owners once planning approval has been obtained.

SECTION H. MUNICIPALITY'S CERTIFIED SEWAGE ENFORCEMENT OFFICER

To Be Completed by the Municipal Sewage Enforcement Officer (SEO)

This section requires the SEO to review the submitted soils test data and indicate whether or not the subdivision qualifies as generally suitable for the use of individual onlot sewage disposal systems. The SEO's signature and certification number is evidence of SEO review. The Sewage Enforcement Officer is required to complete the review of the soils information within 20 days of receipt of the package. If marginal conditions exist, the SEO is required to complete Part 2 of Section H. If the residual tract contains an existing septic system, the SEO is required to complete Part 3 of Section H.

SECTION I. PROTECTION OF RARE, ENDANGERED OR THREATENED SPECIES

DEP's technical guidance document "Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation," (400-0200-001) requires DEP to ensure that requests for authorizations, are coordinated with the Department of Conservation and Natural Resource's (DCNR) Pennsylvania Natural Diversity Inventory (PNDI).

Conducting a search of the PNDI database and providing a copy of a "PNDI Project Environmental Review Receipt" for the proposed project and, if potential impacts are identified by the search, any clearance or recommendation letters from the jurisdictional agency responsible for the particular species identified by a search, satisfies this requirement.

To avoid project delay, self explanatory, self conducted "PNDI Project Planning Environmental Review" searches are initiated at www.naturalheritage.state.pa.us . This interactive, online search will ask questions about the propose project and provide the appropriate receipt, instructions or additional information regarding coordination with jurisdictional agencies.

As an alternative to the self conducted search, project sponsors may request DEP staff to conduct the search by providing a completed "PNDI Project Planning & Environmental Review Form" (PNDI Form). The form is available at www.naturalheritage.state.pa.us . Individuals making this request should be aware that, due to the nature of the search software, DEP staff may need to contact them for additional information to successfully complete the search and that exclusive of any other items, their sewage planning module submission is considered incomplete by DEP, until the appropriate receipt, clearance or recommendation letters are received.

For more information, see the "Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation," (400-0200-001), available on line in the eLibrary at DEP's website address www.depweb.state.pa.us.

SECTION J. PLANNING AGENCY REVIEW

This section is to be used by the local municipal planning agency and/or zoning officer to indicate that the plan is consistent with existing zoning and subdivision/land development ordinances which may affect sewage disposal. This determination is usually made upon approval of the preliminary plot plan. Municipal planning agencies should also evaluate the possible impact of onlot sewage disposal systems on natural resources described in the comprehensive plan, including prime agricultural land preservation, wetland protection, historical/archaeological preservation, and stormwater management. Zoning officers are responsible for determining if the proposed sewage facilities are consistent with any zoning ordinance or subdivision/land use ordinance for that area. If the zoning officer finds the plan to be consistent, the zoning officer may sign the form. Where there are no local planning agencies or zoning ordinances, the municipality should check the appropriate box(es). County or areawide planning/zoning agencies are not required to comment on Component 1 planning modules.

SECTION K. MUNICIPAL ACTION

Following the review by the planning and/or zoning agency, the governing body with jurisdiction is required to act on the project, check all appropriate boxes and sign the form. Acceptable signatures include the secretary or chairperson of the governing body. The municipality must review and act upon a complete Component 1 within 60 days of receipt of the package or within such additional time as the applicant and municipality may agree to in writing. Following municipal approval of the component, the municipal secretary must forward the component to the approving agency for final review.

Provisions of Marginal Conditions and Long-Term Sewage Disposal

The Sewage Facilities Act requires that adequate sewage facilities be available to serve a municipality in both the short-term and the long-term. This becomes more critical where onlot systems are proposed for lots with marginal conditions. The options available to the property owner and municipality to assure long-term sewage facilities where marginal soils conditions have been identified in Sections H and/or G of the component include: inclusion of the subdivision in a sewage management program; conducting tests for both a primary and replacement onlot system on the lots considered marginal; documenting replacement of the onlot systems with community sewage systems; or in the case of high density use of onlot systems, reduction of the density of lots below the threshold of one residential dwelling/acre.

These options should be carefully evaluated and all necessary testing or justification for all options chosen must be included with the Sewage Facilities Planning Module. Submittal of this project without the required documentation will result in return of the planning module as incomplete

Option 1 - Provision of a Sewage Management Program

When new land development projects are included in an existing sewage management program established by the municipality and approved by the department under Chapter 71, Section(s) 71.32 and 71.73, the municipality has documented provision of long-term sewage facilities if:

1. An alternative analysis evaluates the available options and describes why provision of a sewage management program is the most administratively and environmentally viable option.

2. Documentation is submitted that an approved sewage management program is currently being administered in the municipality.

3. Documentation in the form of a municipal letter or resolution is submitted to show that the proposed development will be included in the sewage management program.

Option 2 - Replacement Area Testing

A soil profile examination and percolation test may be done for the primary system and a future replacement system in the event the primary system fails. New land developments which have conducted soils testing for both a primary and replacement absorption area on each lot determined to be marginal have documented long-term sewage facilities if:

1. An alternative analysis evaluates the available options and describes why replacement area testing is the most administratively and environmentally viable option.

2. At least one soil evaluation probe and complete percolation test has been conducted for both the primary and replacement absorption area on each lot.

3. DEP staff is contacted, has concurred with the placement and number of soil evaluation probes required on each site and has been given the opportunity to observe the probes.

4. DEP staff is contacted and has concurred with the number and location of percolation test holes to be used for the testing.

5. The results of all tests, both suitable and unsuitable, are submitted on "Site Investigation and Percolation Test Report" form(s) for the primary and replacement areas.

6. The soils tests document that a suitable site is available for both the primary and replacement system.

7. The replacement area tests are conducted on those lots or areas of the development that are determined to have marginal site conditions.

8. All isolation distances (from Chapter 73, Section 73.13) from both the primary and replacement site can be met.

9. The plot plan shows both the primary and replacement absorption areas along with all other required information.

10. The recorded plot plan must contain a statement that the indicated areas are reserved for replacement absorption areas in the event the primary onlot system absorption area fails, and that the area must not be disturbed.

Option 3 - Scheduled Replacement with Sewerage Facilities

New land development projects which are determined to be marginal for use of onlot systems may propose the interim use of onlot sewage disposal systems pending connection to a community sewage system. These proposals may be considered to have documented provision of long-term sewage facilities if:

1. An alternative analysis evaluates the available options and describes why replacement with community sewage systems is the most administratively and environmentally viable option.

2. Documentation is submitted that shows that an approved sewage facilities plan update revision identifies and describes the community sewage system proposed for use, projects adequate capacity at the planned time of connection, commits the municipality to plan implementation and includes the financing, implementation timetables, conceptual designs and administrative arrangements necessary to connect the entire development to a community sewage system within five years.

3. Documentation that the proposed development is within the proposed service area projected to be served by a community sewage system within five years.

Option 4 - Reduction of the Density of Onlot Systems

When the sole reason for the designation of a subdivision as marginal for long-term onlot system use is the proposed density of lots, the development may be subdivided into larger lots to achieve a density of 1 Residential Dwelling/acre or less.

SECTION L. REVIEW FEES

Amendments to the Sewage Facilities Act established fees to be paid by the applicant for review of planning modules for land development. These fees are described below.

1. For **EXCEPTIONS** to the requirement to revise the official plan under Chapter 71, Section 71.55 (approving agency: DEP)

   Under Act 537, the fee for DEP review of a Component 1 is $35/lot. This fee may be charged for each review of the planning module. Unless submitted with the planning module package to DEP, prior to beginning the module review, DEP will calculate the required fee and advise the applicant of the amount to be remitted. DEP does not include the residual land parcel/lot in the fee calculation.

2. For **SUPPLEMENTS** to the official plan (approving agency: delegated local agency)

   Delegated local agencies must establish fees for the review of planning modules in fee schedules formally adopted by the agency and available to the public. The applicant should contact the delegated local agency to determine the amount of the review fee and the payment details. The delegated local agency may charge fees for each review of the planning module.

OTHER REQUIREMENTS

Approving Agency Review and Action

The approving agency (DEP or delegated local agency) must determine if the submission is complete within ten working days of receipt. A submission without a paid review fee is considered incomplete.

When DEP is the final reviewing agency, DEP may act upon a **COMPLETE** Component 1 within 30 days of receipt from the municipality. Delegated local agencies must act upon a **COMPLETE** Component 1 within 60 days of receipt, or within such additional time as the applicant and delegated local agency may agree to in writing.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER SUPPLY AND WASTEWATER MANAGEMENT

Code No.

SEWAGE FACILITIES PLANNING MODULE

Component 1. Exception to the Requirement to Revise the Official Plan

(Return completed module package to appropriate municipality)

DEP USE ONLY				
DEP CODE #	CLIENT ID #	SITE ID #	APS ID #	AUTH ID #

This planning module component is used to satisfy the sewage facilities planning requirements for subdivisions of 10 lots or less (*including residual lands*) intended as building sites for detached single family dwelling units served by individual onlot sewage disposal systems. The number of lots includes only those lots created after May 15, 1972. Refer to the instructions for help in completing this component.

NOTE: All soil testing must be field verified by the Sewage Enforcement Officer (SEO). The SEO must notify the approving agency verbally or in writing at least 10 days prior to testing. In some cases, a representative of the approving agency may wish to observe the soil testing.

REVIEW FEES: Amendments to the Sewage Facilities Act established fees to be paid by the developer for review of planning modules for land development. These fees may vary depending on the approving agency for the project (DEP or delegated local agency). Please see Section K and the attached instructions for more information on these fees.

A. PROJECT INFORMATION (See Section A of instructions)

1. Project Name

2. Brief Project Description

3. Total Number of Lots:

	Number of Lots Being Proposed	_____
+	Residual Land Parcel/Lot.....	+ _____
+	Number of Previous Lots Developed from Present Tract As it Appeared on May 15, 1972	+ _____
	Total	= _____ *

* If total exceeds 10, do not use this form. Contact DEP for correct forms.

B. CLIENT (MUNICIPALITY) INFORMATION (See Section B of instructions)

Municipality Name	County	City ☐	Boro ☐	Twp ☐	
Municipality Contact - Last Name	First Name	MI	Suffix	Title	
Additional Individual Last Name	First Name	MI	Suffix	Title	
Municipality Mailing Address Line 1		Mailing Address Line 2			
Address Last Line -- City		State	ZIP+4		
Phone + Ext. ( )	FAX (optional) ( )	Email (optional)			

C. SITE INFORMATION (See Section C of instructions)

Site (Land Development Project) Name

Site Location Line 1 | Site Location Line 2

Site Location Last Line -- City State ZIP+4 Latitude Longitude

Detailed Written Directions to Site

Description of Site (Project)

Site Contact (Developer) -- Last Name First Name MI Suffix Phone ( ) Ext.

Site Contact Title | Site Contact Firm (if none, leave blank)

FAX ( ) | Email

Mailing Address Line 1 | Mailing Address Line 2

Mailing Address Last Line -- City State ZIP+4

D. PROJECT CONSULTANT INFORMATION (See Section D of instructions)

Last Name First Name MI Suffix

Title Consulting Firm

Mailing Address Line 1 | Mailing Address Line 2

Address Last Line -- City State ZIP+4 Country

Email Phone ( ) Ext. FAX ( )

E. AVAILABILITY OF DRINKING WATER SUPPLY

This project will be provided with drinking water from the following source: (Check appropriate box)

☐ Individual wells or cisterns.

☐ A proposed public water supply.

☐ An existing public water supply.

If existing public water supply is to be used, provide the name of the water company and attach documentation from the water company stating that it will serve the project.

Name of water company: _____

F. PROJECT NARRATIVE (See Section F of instructions)

☐ A narrative has been prepared as described in Section F of the instructions.

The applicant may choose to include additional information beyond that required by Section F of the instructions.

G. GENERAL SITE SUITABILITY (See Section G of instructions)

1. PLOT PLAN

Attach an original or copy of a 7½ minute USGS topographic map with the area of the proposed land development plotted and labeled. Attach a copy of the plot plan of the proposed subdivision showing the following information:

a. Location of all soils profiles and percolation tests.
b. Slope at each test area.
c. Soil types and boundaries.
d. Existing and proposed streets, roadways, access roads, etc.
e. Lot lines and lot sizes.
f. Existing and proposed rights-of-way.
g. Existing and proposed drinking water supplies for proposed and contiguous lots.
h. Existing buildings.
i. Surface waters.
j. Wetlands from National Wetland Inventory Mapping and USDA Hydric Soils Mapping.
k. Floodplain and floodways (Federal Flood Insurance Mapping).
l. Designated open space areas.
m. Remaining acreage under the same ownership and adjoining lots.
n. Existing onlot or sewerage systems; pipelines, transmission lines, etc.
o. Prime agricultural land.
p. Orientation to North.

2. RESIDUAL TRACT PLANNING WAIVER REQUEST

A waiver from sewage facilities planning ☐ is, ☐ is not requested for the residual land tract associated with this project. (See Section H, I and J and instructions for additional information).

3. SOILS INFORMATION

a. Attach copies of "Site Investigation and Percolation Test Report" (3800-FM-WSWM0290A) (formerly known as "Appendix A") form(s) for the proposed subdivision.
b. Marginal conditions for long-term onlot sewage disposal ☐ are, ☐ are not present. See marginal conditions information in Sections H and J and in attached instructions.
c. If one or more lots in this subdivision are planned to be served by Individual Residential Spray Irrigation Systems (IRSIS), please see the specific information on IRSIS in Section G of the instructions.

Both the soils description preparer and developer must sign below indicating acknowledgement of the false swearing statement.

I verify that the statements made in this component are true and correct to the best of my knowledge, information and belief. I understand that false statements are made subject to the penalties of 18 Pa. C.S.A. §4904 relating to unsworn falsification to authorities.

Soils Description Preparer Name (Print)	Developer Name (Print)
Signature Date	Signature Date

H. MUNICIPALITY'S CERTIFIED SEWAGE ENFORCEMENT OFFICER (See Section H of instructions)

1. I have confirmed the information relating to the general suitability for onlot sewage disposal contained in this component. Confirmation of this information was based upon on-site verification of soil tests, general site conditions and other generally available soils information. The proposed development site:
   - ☐ Is generally suitable for onlot disposal. This module does not constitute individual permit approval.
   - ☐ Is marginal for long-term onlot disposal. (See instructions for information on marginal conditions).
   - ☐ Is not generally suitable for onlot disposal. (See my attached comments regarding this determination).
   - ☐ Cannot be evaluated for general site suitability because of insufficient soils testing.
2. The proposed development site is considered "marginal for onlot disposal" or for long-term onlot system use because one or more of the following conditions exist. (Check all that apply).
   - ☐ Soils profile examinations which document areas of suitable soil intermixed with areas of unsuitable soils.
   - ☐ Site evaluation which documents soils generally suitable for elevated sand mounds with some potential lots with slopes over 12%.
   - ☐ Site evaluation which documents soils generally suitable for in-ground systems with some potential lots with slopes in excess of 20%.
   - ☐ Lot density of more than 1 residential dwelling/acre.
3. Residual Tract Facilities (For use only when there is an existing septic system on the residual tract)
   - ☐ I have inspected the lot on which the existing building and existing septic system is located and have concluded, based on soils mapping or soils evaluation, permit information or site inspection that the long-term sewage disposal needs of this site and the building currently served can be met.
   - ☐ I further acknowledge that no violations of the Sewage Facilities Act are known to me or have become apparent as a result of my site inspection. No inferences regarding future performance of the existing septic system should be drawn from this acknowledgement.
   - ☐ A brief description and sketch of the existing system and site is attached.

Signature of Certified Sewage Enforcement Officer with jurisdiction in municipality where development is proposed	Certification	Date

I. PROTECTION OF RARE, ENDANGERED OR THREATENED SPECIES (See Section I of instructions)

Check one:

☐ The "Pennsylvania Natural Diversity Inventory (PNDI) Project Environmental Review Receipt" resulting from my search of the PNDI database and all supporting documentation from jurisdictional agencies (when necessary) is/are attached.

☐ A completed "Pennsylvania Natural Diversity Inventory (PNDI) Project Planning & Environmental Review Form," (PNDI Form) available at www.naturalheritage.state.pa.us , and all required supporting documentation is attached. I request DEP staff to complete the required PNDI search for my project. I realize that my planning module will be considered incomplete upon submission to the Department and that the DEP review will not begin, and that processing of my planning module will be delayed, until a "PNDI Project Environmental Review Receipt" and all supporting documentation from jurisdictional agencies (when necessary) is/are received by DEP.

Applicant or Consultant Initials _____.

J. PLANNING AGENCY REVIEW (See Section J of instructions)

This planning module has been reviewed by the existing municipal planning agency and zoning officer and has been found to be ☐ consistent, ☐ inconsistent with municipal zoning ordinances or subdivision and land development ordinances. A waiver of the sewage facilities planning requirements for the residual tract of this subdivision ☐ has ☐ has not been requested. If requested, the proposed waiver ☐ is ☐ is not consistent with applicable ordinances administered by this agency.

Municipal Planning Agency Name

Zoning Officer Signature

Planning Agency Signature (Authorized Official)

☐ No municipal planning agency exists

☐ No municipal zoning ordinance exists

K. MUNICIPAL ACTION (See Section K of instructions)

The municipality must act within 60 days of receipt of a complete sewage facilities planning module package.

☐ This planning module has been reviewed by the municipal governing body and has been found to be **ACCEPTABLE**. Approval of this planning module does not constitute individual onlot system permit approval.

☐ This planning module is **NOT ACCEPTABLE** because:

Check appropriate reason(s)

- ☐ The subdivision does not comply with municipal zoning ordinances.
- ☐ The subdivision does not comply with municipal subdivision and land development ordinances.
- ☐ The subdivision is not suitable for the use of individual onlot subsurface absorption areas.
- ☐ The subdivision does not meet the requirements for use of this module or other provisions of Chapter 71 (Administration of Sewage Facilities Planning Program).
- ☐ Other (Explain) _____

☐ The proposed development has been identified in Section G and/or Section H as having marginal conditions or other concerns for the long-term use of onlot sewage systems. The municipality has selected the following method of providing long-term sewage disposal to this subdivision: (Check one)

- ☐ Provision of a sewage management program meeting the minimum requirements of Chapter 71, Section 71.73
- ☐ Replacement area testing
- ☐ Scheduled replacement with sewerage facilities
- ☐ Reduction of the density of onlot systems

The justification required in Section J of the instructions is attached.

☐ A waiver of the planning requirements for the residual tract of this subdivision has been requested.

The municipality acknowledges acceptance of this proposal and requests a waiver of the sewage facilities planning requirements for the residual tract designated on the subdivision plot plan. Our municipal officials accept full responsibility now and in the future to identify any violation of this waiver and to submit to the approving agency any required sewage facilities planning for the designated residual tract should a violation occur or construction of a new sewage-generating structure on the residual tract of the subdivision be proposed. We understand that such planning information may require municipal officials to be responsible for soil testing and other environmental assessments for the residual tract in the future.

_____ _____

Chairperson/Secretary of Governing Body Signature Date

_____

Municipality Name

_____ (Area Code) Telephone No. (___) _____

Address

L. REVIEW FEE (See Section L of instructions)

The Sewage Facilities Act establishes a fee for the DEP planning module review. DEP will calculate the review fee for the project and invoice the project sponsor **OR** the project sponsor may attach a self-calculated fee payment to the planning module prior to submission of the planning package to DEP. (Since the fee and fee collection procedures may vary if a "delegated local agency" is conducting the review, the project sponsor should contact the "delegated local agency" to determine these details.) Check the appropriate box.

☐ I request DEP calculate the review fee for my project and send me an invoice for the correct amount. I understand the Department's review of my project will not begin until DEP receives the correct review fee from me for the project.

☐ I have calculated the review fee for my project using the formula found below and the review fee guidance in the instructions. I have attached a check or money order in the amount of $_____ payable to ***"Commonwealth of Pennsylvania DEP"***. **Include DEP code number and/or project name on check.** I understand DEP will not begin review of my project unless it receives the fee and determines the fee is correct. If the fee is incorrect, DEP will return my check or money order and send me an invoice for the correct amount. I understand the DEP review will **NOT** begin until I have submitted the correct fee.

☐ I request to be exempt from the DEP planning module review fee because this planning module creates **only** one new lot and is the **only** lot subdivided from a parcel of land as that land existed on December 14, 1995. I realize that subdivision of a second lot from this parcel of land shall disqualify me from this review fee exemption. I am furnishing the following deed reference information in support of my fee exemption.

County Recorder of Deeds for _____ County, Pennsylvania

Deed Volume _____ Book Number _____

Page Number _____ Date Recorded _____

Formula:

_____ Lots X $35.00 = _____

Note: (1) To calculate the review fee for any project, use the number of lots created in the above formula.

(2) When using the number of lots, include only the number of lots being proposed when calculating the review fee. Do not include any "Residual Land Parcel/Lot".

_____

Developer Name (Print)

_____

Signature Date

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

Completeness Checklist

The following items should be checked off by the applicant as each is completed. The municipality should confirm that the required items have been included within ten days of receipt and if complete, sign and date the checklist. Submissions not containing the following information will be considered incomplete.

- ☐ Complete Component 1
- ☐ Letter from public water supplier (if applicable)
- ☐ Plot plan and 7.5' topo map showing subdivision
- ☐ "Site Investigation and Percolation Test Report(s)" with results of ***ALL*** profile examinations and percolation tests (suitable and unsuitable)
- ☐ Signature of soils description preparer
- ☐ Signature of developer
- ☐ SEO signature
- ☐ PNDI "Project Planning & Environmental Review Form" (request DEP search) or "Project Environmental Review Receipt" (self completed search) and all appropriate documentation for the form submitted.
- ☐ Planning Agency Signature
- ☐ Zoning Officer Signature (if applicable)

_____
Signature of Municipal Official

_____
Date submittal determined complete

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

Remove and recycle these instructions prior to mailing component to the approving agency.

INSTRUCTIONS FOR COMPLETING COMPONENT 2 INDIVIDUAL AND COMMUNITY ONLOT DISPOSAL OF SEWAGE

How to Obtain Planning Module Components

Planning module components appropriate for your project can be obtained by completing an Application for Sewage Facilities Planning Module mailer available on DEP's website at www.dep.state.pa.us, PA Keyword "wastewater" and sending it to the agency responsible for final review of your project (the "approving agency"). This "approving agency" may be either DEP or a "delegated local agency" which is a local agency that has received planning approval delegation from DEP under Act 537. If you are unsure of where to send your mailer, contact the DEP regional office serving your county for help. **Do not use this component unless you have received a code-numbered copy of this form from DEP or delegated local agency.** You may obtain an Application for Sewage Facilities Planning Module Mailer from the municipality, the delegated local agency, a DEP regional office or on the DEP website.

Upon receipt of the mailer, the approving agency (DEP regional office or delegated local agency) will determine if your project is required to do sewage facilities planning by Act 537. If planning is not required under Act 537, you will be informed by letter. If planning is required, the agency will assign a code number to your project and provide you with the correct planning module forms and guidance.

When Should You Use Component 2?

This planning module component is used to fulfill the planning requirements of Act 537 for the following types of projects: (1) proposing the use of individual onlot sewage disposal systems (including individual residential spray irrigation systems (IRSIS)) and except for those projects qualifying for the "exception to the requirement to revise the Official Plan" under Chapter 71, Section 71.55, (2) proposing retaining tanks (including holding tanks, privies, chemical, incinerating, recycling or composting toilets), (3) proposing municipally permitted community onlot sewage systems, and (4) proposing DEP permitted individual or community large volume onlot sewage disposal systems.

Who Should Complete the Component?

This component should be completed by a competent consultant, engineer, or surveyor who is familiar with the municipality's Official Sewage Facilities Plan and available sewage disposal methods in the municipality in which the development project is proposed. Municipal officials and the municipality's Sewage Enforcement Officer (SEO) should be consulted in the development of the project. All projects must complete Sections A through I and Sections N through R. Sections J through M should be completed when indicated. The municipality should complete Section Q if marginal conditions are present and/or if a waiver of the planning requirements is requested for the residual tract and/or if an assurance of long term operation and maintenance is required. The following instructions provide general guidelines on completing the component.

Instructions for Completing Component 2

SECTION A. PROJECT INFORMATION

Project Name. In the "Project Name" block, enter the name by which this proposed land development project is, or will be, known, such as "Smith Subdivision."

Brief Project Description. Briefly describe the intended project in the space provided.

SECTION B. CLIENT (MUNICIPALITY) INFORMATION

Municipality Name, County, Municipality Type. Enter the name of the client municipality and the name of the county in which the municipality is located. Check the appropriate block indicating the municipality type, whether **City**, **Boro**, or **Township** (Twp).

Contact Individual Last Name, First Name, MI, Suffix, Title. Enter the requested information for the client contact in this block. The municipal client contact is often the municipal secretary, but may be another official, such as the chairman of the board of supervisors. Please indicate the appropriate title of the client contact in the Title block.

Additional Individual Last Name, First Name, MI, Suffix, Title (optional). This is an optional block to be used by municipalities that wish to provide an alternate client contact. Enter the requested information only if an alternate contact name is desired.

Mailing Address. This is the mailing address of the client municipality identified above. It should not include locational data that is not appropriate for a mailpiece. In addition to the street number and name, PO Box number, RR number, Box number, or Highway Contract number designations, use any appropriate designation and number to further define the mailing address.

e.g.,	APT	(Apartment)	FLR	(Floor)
	BLDG	(Building)	RM	(Room)
	DEPT	(Department)	STE	(Suite)

City, State, ZIP+4, Phone Information. **DO *NOT*** use abbreviations for the city name. Use the two-character abbreviation for the state. Include the four-digit extension to the ZIP code, if known.

SECTION C. SITE INFORMATION

DEP needs to be able to accurately locate your site and to understand the physical nature of the surrounding area. Therefore, the application must be accompanied by a 7.5 minute topographic map published by the US Geological Survey. These maps can usually be obtained from most map distributors or hunting and fishing supply stores. On the topographic map, draw the outline of the development site.

Site (Land Development) Name. The name of the site at the specific physical location. This should be similar to the project name in A.1. **DO NOT** use abbreviations, acronyms, etc.

Site Location. Provide the physical address of the location where the permitted activities will occur. **DO NOT** use PO Box numbers for site location information. Provide the city (or municipality), state, and the ZIP+4, if known. Enter the latitude and longitude of the apprximate center of the site.

Detailed Written Directions to Site. When providing written directions, **DO NOT** use PO Box address data. Include landmarks and approximate distances from the nearest highway.

Description of Site. Provide a written description of the proposed project.

Site Contact (Developer/Owner) Information. Provide the name of the person having overall responsibility for environmental matters at the site. This person is often the landowner or the landowner's agent. Include the individual's name, title, firm, email address (optional), mailing address, and daytime phone numbers. This individual will ultimately be responsible for paying the DEP review fee.

SECTION D. PROJECT CONSULTANT INFORMATION

If this form was completed by someone other than the applicant, such as a consultant, engineer or contractor, that individual should complete this section of the form.

SECTION E. AVAILABILITY OF DRINKING WATER SUPPLY

Indicate the intended source of the project's drinking water by checking the appropriate box. If a public water supply will be used, provide written documentation that the water supplier is aware of the project, possesses capacity to serve the project and is willing to serve the project. A public water supply is defined as a system that provides water to the public for human consumption that could serve 15 or more connections, or serve 25 or more people daily at least 60 days out of the year.

SECTION F. PROJECT NARRATIVE

The following information is required to be provided in narrative (paragraph) form and attached to the module package. Title the attachment **Project Narrative.**

1. Describe the nature of the planned development project (residential, commercial, institutional, etc.). If the project is commercial or institutional, describe the activity planned for the site.

2. Enter the number of lots or **equivalent dwelling units** (EDUs) in the development project. **LOTS** refer to single family residential dwellings and for flow calculation purposes are assumed to generate a minimum of 400 GPD. **If larger flows are anticipated, use the appropriate figures.** The residual tract, if any, is also counted as a lot. For multifamily units, commercial or institutional facilities, the number of EDUs in the subdivision is determined by dividing the total proposed flow for these facilities by 400.

3. Describe the proposed sewage disposal method (individual onlot, large volume onlot, holding tanks, etc.).

4. Enter the projected sewage flows in gallons per day (GPD) and how this figure was calculated. Information on flows for individual, community or large volume onlot systems can be found in Chapter 73 of DEP's regulations available electronically at www.pacode.com . Flows for other projects can be found in DEP's *Domestic Wastewater Facilities Manual* available electronically at www.dep.state.pa.us, PA Keyword "wastewater."

5. Enter the total acreage of the proposed land development project.

6. Describe the use of any acreage or parcels under the same ownership and adjacent to the property. (Such as: for future development, recreational, agriculture, open space, etc.) If the land is proposed for future development, or is part of a phased project, the applicant should determine if adequate sewage disposal facilities will be available to serve those phases.

7. Include any other information that is relevant to the project.

SECTION G. GENERAL SITE SUITABILITY

The information in this section about soils and site conditions will be used by the Sewage Enforcement Officer (SEO) and the approving agency to determine if the project area is suitable for the use of individual onlot sewage disposal systems. This section also requires that certain information listed in the planning module component be plotted on a plan which includes the project and adjacent areas. Some of the information required can be found in the municipality's Official Sewage Facilities Plan. Other information can be found in tax maps, zoning maps, USDA Natural Resources Conservation Service maps, Federal Emergency Management Agency (FEMA) flood plain maps and National Wetland Inventory maps.

1. Plot Plan

The plot plan is a drawing of the development area. The scale of the plot plan should be large enough to show the development area and adjacent areas so that the plotted items can be easily identified. Preliminary lot lines may be used if soils testing is completed before final lot lines are established, but the final plot plan must be prepared by a registered surveyor before submission of the planning module to the approving agency. The following information should be included on the plan:

a. Locations of **ALL** soil profile examinations and percolation tests, both suitable and unsuitable.

The location of all soil profile excavations and percolation test sites must be shown on the plot plan, including those which show unsuitable conditions for the use of onlot disposal. Excavations are to be shown by the symbol ▲ (triangle) and percolation tests by the symbol ● (large dot). When the scale of the plot plan makes it impossible to show each percolation hole, the area of the test may be shown using a rectangular box labeled with the percolation test symbol. Each test must be referenced by number to the appropriate "Site Investigation and Percolation Test Report for Onlot Disposal of Sewage."

b. Slope at each test area.

Slopes must be taken from in-field measurements recorded on "Site Investigation and Percolation Test Report" forms (3800-FM-WSWM0290A (formerly known as "Appendix A" and available from the Municipal SEO)) or from a registered surveyor's in-field slope measurements. The slopes should be shown on the plan with a slope arrow identifying measured percentage of grade and the source of the measurement ("Test Report" or surveyor). When slopes are measured, they must be taken across the soil profile/percolation test area from the down-grade extent to the up-grade extent of the proposed absorption area or spray field. This includes the berm area when elevated sand mound use is proposed. The Sewage Enforcement Officer should estimate the size of the absorption area from the percolation test data and Table A in Title 25, PA Code, Section 73.16 (e)), or the size of the spray field (from Table B in Section 73.16(e)). Before a surveyor measures the slope, the sewage enforcement officer should place a labeled marker at each end of the area to be measured in order to assure that the tested area is being assessed. Any landscape feature, such as a bench, which may impact the general suitability of the site must be identified on the plan.

c. Soil types (as shown in USDA Natural Resources Conservation Mapping) and their boundaries.

d. Locations of existing and proposed adjacent streets, roadways and access roads.

e. Lot lines and sizes of individual lots in the proposed development.

Show the relationship of the development boundaries to those of the existing lot. Where the boundaries of the existing lot have not been formally surveyed, but are plotted from deed records, this must be noted on the plan.

f. Existing and proposed rights-of-way. Proof of legal recording of rights-of-way may be required if the right-of-way is necessary to implement the chosen sewage facilities alternative.

g. Existing and proposed water supplies (wells, reservoirs, etc.) and surface water (ponds, lakes, streams, impoundments) on the adjacent and proposed developments must be shown on the plan.

The SEO must identify existing water supplies and surface waters on properties adjacent to the proposed land development which may affect site suitability related to required isolation distances. If the SEO determines that the identified water supplies and surface waters are far enough away from the proposed development that they will not affect the suitability of the site for onlot sewage disposal, their locations do not have to be plotted. If the identified water supplies or surface waters may be located within required isolation distances, they must be shown on the plan.

h. Show the location of any existing buildings in the project area.

i. Surface waters, including ponds, streams, lakes and impoundments.

j. Wetland areas. DEP is required by statute to protect the wetlands of the Commonwealth from unnecessary destruction. Show any wetland areas on the plot plan as they are identified by hydric soils in USDA Natural Resources Conservation Service maps and by National Wetland Inventory mapping. If there is a disagreement with the mapping, or wetlands are present and they are not shown in the mapping, plot the results of actual in-field delineation of the wetlands on the plan. Use the delineation process required by Title 25 of the Pennsylvania Code, Chapter 105, §105.451, Identification and Delineation of Wetlands-Statement of Policy.

If wetlands are present, the applicant may be required to obtain permits for any construction activities such as encroachments (fill, roads, utility lines) or obstructions (bridges, walls, piers) in, along, or across the wetlands. Contact the DEP regional office for further information.

Full delineation may be required as a condition of permit issuance, including issuance of onlot system permits, Clean Streams Law permits, or encroachment or obstruction permits for construction activities in, along, or across wetlands. The plot plan must distinguish between in-field delineations and transcribed mapping from existing sources.

k. Floodplains and floodways. As with wetlands, these areas should be plotted on the plan as they are indicated in Federal Emergency Management Agency Flood Plain mapping.

l. Open space areas designated within the proposed development and any parks, state forests or other state land adjoining the development.

m. Show the relationship of the development boundaries to those of the existing lot of which it is a part. Where the boundaries of the existing lot have not been formally surveyed, but are plotted from deed records, indicate this on the plan. Any property that is not included in the current subdivision but is under the same ownership and adjoining, (whether or not it has been developed in the past, or will be developed in the future), must be plotted. Lots located across roads, streets and rights-of-way are considered adjoining.

n. Existing onlot or sewerage systems, pipelines, transmission lines, etc. - show any functioning or abandoned facilities which may impact the use of an onlot system.

o. Prime agricultural land listed by the USDA Natural Resources Conservation Service as "Pennsylvania Prime Farmland Soils", or soils listed in the USDA Natural Resources Conservation Service Soil Survey as having a capability classification of I, II or III.

p. Orientation to north, usually shown by a directional arrow.

2. **Residual Tract Waiver Request**

DEP believes that developers, municipal officials and future lot owners are best protected by complying with sewage planning requirements to assure that adequate sewage facilities will be available to serve all newly created subdivisions. However, DEP is aware that some subdivision proposals include residual tracts of land on which there is already an inhabited structure or are large parcels for which there is no proposed construction that would require the use of sewage disposal facilities. Developers having such residual tracts may not be required to complete sewage facilities planning for that portion of the subdivision if this claim is valid. The developer may request the residual tract waiver by checking the request block in Section G.2. of the Component 2.

To be valid, acceptance of the request for a waiver by the municipal or county planning agency and the municipality is required. The municipal or county planning agency must indicate its acceptance of the proposed waiver by marking the appropriate blocks on Component 4. The municipality indicates its acceptance of the proposed waiver by signing and dating the appropriate statement in Component 2, Section Q. When the proposal involves the subdivision of property on which there is an existing building currently served by an onlot septic system on the residual tract, the municipality's SEO must inspect the system and complete the appropriate portion of Section H.3. of Component 2.

In addition, the planning module must include a plot plan or deed or deed notice which contains language similar to the following, directed to the residual tracts:

"As of the date of this deed/plot plan/deed notice recording, the residual tract of this subdivision is dedicated for the express purpose of _____ use. No portion of the residual tract of this subdivision has been approved by the municipality or the approving agency for the installation of sewage disposal facilities. No sewage permit will be issued for the installation, construction, connection to or use of any sewage collection, conveyance, treatment or disposal system (except for repairs to existing systems) unless the municipality and approving agency have approved any required sewage facilities planning for the residual tract of the subdivision described herein in accordance with the Sewage Facilities Act (35 P.S. Sections 750.1 *et seq.*) and regulations promulgated thereunder. Prior to signing, executing, implementing or recording any sales contract or subdivision plan, any

purchaser or subdivider of any portion of this residual tract should contact the municipality which is charged with administering the Sewage Facilities Act to determine what sewage facilities planning is required and the procedure and requirements for obtaining appropriate permits or approvals."

Language similar to the above must be recorded on the plot plan or deed or deed notice and a copy of the deed or plot plan or deed notice must be submitted with this planning module submission.

3. Soils Information

a. To complete the soils portion of this section, soils testing information must be submitted on "Site Investigation and Percolation Test Report" form(s) (3800-FM-WSWM0290A, formerly known as "Appendix A"). These forms are available from the municipal SEO. The SEO must notify the approving agency at least 10 days prior to any testing, either by phone or in writing, because in some cases, the agency may wish to observe the soil testing. Soil testing can be completed by a soil consultant or by the SEO, with municipal approval, as long as all soil testing is verified by the SEO. Make sure the SEO provides a signed copy of the report form(s) to include in the Component 2 package submitted to the municipality.

Enough soil tests must be conducted to determine suitability for onlot systems for both the proposed development and the residual tract, unless a residual tract waiver has been obtained. At a minimum, testing must consist of one soil profile examination, one complete percolation test and one slope measurement for each change in soil type, slope, and erosion characteristic as indicated on the USDA Natural Resources Conservation Service map for the area of the proposed system(s). Soil type boundaries must be plotted on the plan. If portions of the proposed subdivision are found to have unsuitable soils or site conditions, lots may have to be modified to eliminate these unsuitable areas, or other sewage facility alternatives may have to be considered. The approving agency may require more extensive testing based on this information, even to the point of a soil profile examination and a percolation test on each proposed lot. (When individual residential spray irrigation systems (IRSIS) are proposed, percolation tests are not required. Please see the specific instructions on IRSIS in Section G3c, below.) The following soils information must be included with Component 2 package.

1. List of soils mapped in area of the proposed disposal site(s) as described in the USDA Natural Resources Conservation Service report.

2. Description of ***all*** test pits (suitable and unsuitable) to generally verify soils mapping and limiting zones, including soil textures for each horizon, mottling, percent coarse fragments, depth to water seepage, depth to water level in excavation, and other pertinent data.

3. Results of ***all*** percolation tests (suitable and unsuitable) conducted on the site, including hole depths, date, and rates.

4. Boundaries of soil mapping units, as shown on the USDA Natural Resources Conservation Service map.

5. Location of ***all*** test pits (suitable and unsuitable) on the plot plan. Use the symbol ▲ (triangle) to indicate the location of each test pit.

6. Location of ***all*** percolation tests (suitable and unsuitable) on the plot plan. Use the symbol ● (large dot) to indicate the location of each percolation test hole.

7. Slopes as measured in field at each test area plotted on the plan and recorded on report forms.

b. Marginal Conditions

If any of the marginal conditions listed in section H.2. of the component are present on the project site, indicate this by marking the appropriate block on the form. The presence of marginal conditions on the site requires that additional documentation be provided to assure that both the short-term and long-term sewage facilities needs of the area will be met.

The options available to the property owner and municipality to assure long-term sewage facilities, where marginal conditions for onlot systems have been documented, include: inclusion of the subdivision in a

sewage management program; conducting tests for both a primary and replacement onlot system on the lots considered marginal; documenting replacement of the onlot systems with community sewage systems; or in the case of high density use of onlot systems, reduction of the density of lots below the threshold of one residential dwelling/acre. Descriptions of the documentation necessary for each of these four options can be found in Section Q of the instructions.

These options should be carefully evaluated and all necessary testing or justification for the option chosen must be included with the Sewage Facilities Planning Module when it is forwarded to the municipality. Submittal of a planning module for this project without the required documentation will result in the return of the planning module as incomplete.

c. General Site Suitability Determinations for Individual Residential Spray Irrigation Systems (IRSIS)

These instructions supplement the existing planning module guidance on determination of general site suitability for proposed subdivisions where one or more lots will use individual residential spray irrigation systems (IRSIS) as the means of sewage disposal. **It does not replace the existing guidance on general site suitability determinations for any other type of onlot sewage disposal system.**

1. General Site Suitability

Since individual residential spray irrigation systems require relatively large land areas to function, the soil testing necessary for the design of these systems must be done at the planning stage. The number and distribution of soil test pits needed to adequately characterize the soils on a given lot is discussed in Chapter 73, Section 73.14(b) and is dependent upon the size of the proposed system. The required size of the system is dependent upon the soil, slope and cover of the lot and the projected flow volume from the residence proposed, and can be determined using Chapter 73, Section 73.16(e) - Table B. The most limiting site condition on the lot will determine the minimum testing required.

2. Plot plan

Slopes must be determined at each of the test pit locations as described in Section G of the planning module instructions, as well as at other locations within the interior of the proposed system area. Slope measurements made within the area of the proposed IRSIS and their approximate areas should be noted on the plot plan. The maximum slope within the area of the proposed IRSIS determines the minimum sizing of the area to be defined. The minimum size is determined using Table B from Chapter 73, Section 73.16(e).

In addition to the list of features requested in Sections G of the planning module instruction, the following additional information is required for lots proposing IRSIS or neighboring lots that could be affected by IRSIS isolation distances.

(a) Delineation of the boundaries of any proposed IRSIS on the lot, and whether the proposed system is intended for primary or replacement use.

(b) Delineation (by shading) of a 100 foot isolation area surrounding the IRSIS site, with a notice on the plot plan that no water supply or occupied dwelling may be placed within the shaded zone. The shaded area may include areas on neighboring lots in the proposed subdivision.

(c) Delineation of the boundaries of the features below within any proposed IRSIS area:

(a) cultivated agricultural areas

(b) open canopy forest or non-forested but vegetated areas

(c) closed canopy forest areas

3. Soils information

While percolation testing is still required to identify a site for a primary onlot sewage disposal system utilizing conventional technology (non-IRSIS system), no percolation testing is required to identify an

IRSIS site. If IRSIS is proposed as the primary system alternative on a given lot, no percolation testing of that lot is required.

4. Provisions for long-term sewage disposal

   Where an IRSIS is proposed as the primary sewage disposal option for a lot, replacement area testing may be required, depending on the particular circumstances of the planning module proposal. The replacement area testing requirements are determined on a case-by-case basis by the approving agency. If an IRSIS is proposed only as the replacement system option for any lot in the subdivision, then both the primary and replacement area must be identified and tested.

5. Municipal responsibilities

   Prior to issuance of a permit for an IRSIS, Act 537 requires that the municipality and permittee enter into an agreement to provide management and oversight of the system. Although the absence of this permitting requirement at the planning module stage does not prevent the municipality or approving agency from granting planning module approval to subdivisions proposing IRSIS, DEP recommends that the developer and municipality explore available options to provide this management and oversight during the planning module stage. Having this agreement as part of the planning module approval could help expedite the subsequent permitting process for the individual lot owners once planning approval has been obtained.

4. Wetland Protection

a. DEP is required to protect the wetlands of the Commonwealth from unnecessary destruction. The applicant is required to answer "yes" or "no" to the question of whether there are any wetlands in the project area. If yes, show these areas on the plot plan as they are identified by hydric soils in USDA Natural Resources Conservation Service maps or by National Wetlands Inventory mapping. If there is a disagreement with the mapping, or if wetlands are present and and are not shown on the mapping, plot the results of actual in field identification of the wetlands on the plan. Use the identification process required by Title 25 PA Code Chapter 105, § 105.451, Identification and Delineation of Wetlands – Statement of Policy.

b. If wetlands are present, indicate with a yes or no answer if the project is proposing any construction activities such as encroachments (fill, roads, utilities) or obstructions (bridges, walls, piers) in, along or across the wetlands. If any of these are proposed, please contact the DEP regional office for further information.

c. Full delineation may be required as a condition of permit issuance, including issuance of Clean Streams Law permits, encroachment or obstruction permits for construction activities in, along, or across wetlands. The plot plan must distinguish between in-field delineations and transcribed mapping from existing sources.

5. Primary Agricultural Land Protection

Indicate whether the project involves the disturbance of prime agricultural lands. If the project will result in the disturbance of these lands, it must be consistent with policies and procedures established by the municipality for protection of prime agricultural lands. The project sponsor and local officials must rectify land use problems prior to submission of the sewage facilities planning module package to DEP for review.

6. Historic Preservation Act

Coordination with the Pennsylvania Historic and Museum Commission (PHMC) is necessary for proposals meeting conditions specified in DEP Technical Guidance 012-0700-001 *Implementation of the PA State History Code*. Specific documentation required to be submitted with this planning module package is found in the Technical Guidance, available online at the DEP website www.dep.state.pa.us, select "Subjects", then select "Technical Guidance." As a minimum this includes copies of the completed Cultural Resources Notice (CRN), a return receipt for its submission to the PHMC and the PHMC review letter.

SECTION H. SEWAGE ENFORCEMENT OFFICER ACTION

This section requires the SEO to review the submitted soils test data and indicate whether or not the subdivision qualifies as generally suitable for the use of individual onlot sewage disposal systems. The SEO's signature and certification number is evidence of SEO review. The SEO is required to complete the review of the soils information within 20 days of receipt of the package. If marginal conditions exist, the SEO is required to complete Part 2 of Section H. If the residual tract contains an existing septic system, the SEO is required to complete Part 3 of Section H.

SECTION I. ALTERNATIVE SEWAGE FACILITIES ANALYSIS

This section is used to document that the proposed sewage disposal method is appropriate for the project both over the short-term (5 years) and long-term (beyond 5 years). Local government officials should be consulted in completing this analysis. The analysis consists of a narrative that describes land uses, sewage disposal methods, sewage management programs and a comparison of existing methods of sewage disposal in the area with the proposed method of sewage disposal. The analysis is used by the municipality and approving agency to determine if the chosen disposal method will have an impact on future municipal sewer service to these areas, and whether other potential methods of sewage disposal could better serve the sewage facilities needs of the area as a whole. Attach the narrative to the planning module and title it **"Alternatives Analysis."**

To complete the analysis, include the information listed below.

1. Describe the chosen disposal method, its location, the daily flow proposed and if the method is an interim method (to be replaced by the ultimate method in 5 years or less), or is an ultimate method (to serve the development in the long term, for 5 years or more). Also provide the number of lots or EDU's that will be served.

2. Describe the types of land uses adjacent to the project area (Agricultural, Residential, Commercial etc.) and the type of sewage disposal method serving each of those land uses.

   Properties adjacent to the project must be described by indicating present land uses and zoning designations. Describe the sewage disposal methods being used for each of those adjacent land uses (onlot, municipal treatment, etc.) and it those methods are intended for interim or ultimate use.

3. Indicate if the sewage facilities described in (2) are in need of improvement due to high rates of onlot malfunction or overloaded public sewers. Is there a potential for a combined public/private project?

   If any of the sewage facilities described above are in need of improvement due to overloaded treatment facilities or high onlot malfunction rates, a combined sewage disposal alternative that proposes to upgrade or construct facilities to serve these needs areas as well as the proposed project area may be more viable than a method intended to serve only the current project.

4. Determine and indicate what sewage disposal method that is proposed for the development area in the municipality's Official Sewage Facilities Plan (such as: onlot disposal systems, public sewers, etc.).

5. Describe any existing sewage management program(s) in the area, and/or any sewage management program(s) that this project would be required to participate in, and that program's requirements.

   When the alternative analysis includes the potential construction of DEP-permitted **non-municipal** sewage treatment facilities, or a community onlot sewage system permitted by a local agency, the municipality is required to implement a sewage management program that must include one of the management options outlined in Title 25, Pennsylvania Code, §71.72 (available at www.pacode.com). These options range from financial assurances to municipal ownership of the facility. The applicant should describe which option will be proposed, how it will be implemented, and why it was chosen over the other methods outlined in §71.72. Details of the chosen option must be included.

6. Describe any potential alternative sewage disposal methods that are available for the project. Consider all reasonable possibilities for sewage disposal, such as a stream discharge or an alternate method of land disposal. The municipality, delegated local agency or DEP may also require consideration of particular types of sewage disposal methods in the analysis.

7. Describe why the proposed method was chosen over any of the other methods described in the alternatives analysis. Environmental, administrative, and financial concerns may be addressed. Also indicate how the chosen method will guarantee adequate sewage disposal for the development in both the short-term (up to 5 years) and long-term (beyond 5 years) by describing the adequacy of the proposed facilities (organic and hydraulic loading) and the ability of the facility to accept additional flows or loads.

8. Indicate who will be the owner of the facility, and who will be responsible for operation and maintenance of the facility.

   To assure adequate long-term sewage disposal for the project, the disposal system must be properly operated and maintained. The applicant must indicate in the analysis who will be the owner of the facility and who will be responsible for the operation and maintenance of the facility. This may be a private individual, a municipality, a sewer authority or a management agency; however, the ultimate responsibility lies with the municipality. The delegated local agency or DEP may require a more extensive analysis of the available choices relative to ownership and operation of the facility. If the project will be required to participate in an **EXISTING** municipal sewage management program, or if a sewage management program is to be created, describe the program's requirements. Sewage management programs can consist of requirements for tank pumping, ordinances requiring maintenance of systems, or financial arrangements (fees, taxes, etc.) guaranteeing long-term operation of the treatment facilities.

9. Finally, the applicant may use the narrative to describe any special considerations or provide any additional information that supports the choice of disposal method. The alternative analysis must be attached to the planning module package for review by the municipality and approving agency.

SECTION J. PROTECTION OF RARE, ENDANGERED OR THREATENED SPECIES

DEP's technical guidance document "Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation," (400-0200-001) requires DEP to ensure that requests for authorizations, are coordinated with the Department of Conservation and Natural Resource's (DCNR) Pennsylvania Natural Diversity Inventory (PNDI).

Conducting a search of the PNDI database and providing a copy of a "PNDI Project Environmental Review Receipt" for the proposed project and, if potential impacts are identified by the search, clearance or recommendation letters from the jurisdictional agency responsible for the particular species identified by a search, satisfies this requirement.

To avoid project delay, self explanatory, self conducted "PNDI Project Planning Environmental Review" searches are initiated at www.naturalheritage.state.pa.us . This interactive, online search will ask questions about the proposed project and provide the appropriate receipt, instructions or additional information regarding coordination with jurisdictional agencies.

As an alternative to the self conducted search, project sponsors may request DEP staff to conduct the search by providing a completed "PNDI Project Planning & Environmental Review Form" (PNDI Form). The form is available at www.naturalheritage.state.ps.us . Individuals making this request should be aware that, due to the nature of the search software, DEP staff may need to contact them for additional information to successfully complete the search and that exclusive of any other items, their sewage planning module submission is considered incomplete by DEP, until the appropriate receipt, clearance or recommendation letters are received.

For more information, see to the "Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation," (400-0200-001), available on line in the eLibrary at DEP's website address www.dep.state.pa.us .

SECTIONS K, L, M. PERMEABILITY AND HYDROGEOLOGY

(Complete if marked in component)

In certain situations, permeability testing and hydrogeology studies must be completed for the proposed development. These sections should only be completed if marked. Sections L and/or M should be completed and sealed by a registered professional geologist familiar with the requirements of these sections. If additional information is required, the registered professional geologist should contact the DEP Regional Hydrogeologist for further guidance.

SECTION K. PERMEABILITY TESTING

(Complete if marked in component or if the conditions in number 1 (below) apply)

1. Completion of this section may be required when any of the following exist:
   a. An onlot system with a total absorption area greater than 5,000 square feet will be used.
   b. DEP has determined that the soil, underlying parent material, geology at the site, or volume of the discharge may cause adverse groundwater mounding or inadequate sewage treatment.
2. The following information is to be submitted:
   a. Description of the soils and geology at the site and the characteristics of these which may limit the horizontal or vertical movement of sewage.
   b. Description, location and results of any permeability testing performed, including:
      (1) Identification and description of restrictive layers of soil, parent material and bedrock.
      (2) Rate of flow through and laterally over those restrictive layers (in inches per hour).
      (3) Calculation of potential groundwater mounding expected from the additional flows.
   c. Recommendations on system design modifications needed because of poor permeability, including absorption area sizing or placement and dosing rates for onlot overland flow.

   Note: DEP may require more detailed hydrogeologic information based on the information submitted in this section.

SECTION L. PRELIMINARY HYDROGEOLOGIC STUDY

(Complete if marked in component or if the conditions in number 1(below) apply)

Hydrogeologic work requires an appropriate professional signature and seal.

1. This section must be completed when soil-dependent treatment methods are proposed and any of the following apply:
   a. A large volume system (a system designed for flows greater than 10,000 gpd) will be used.
   b. A subdivision of more than 50 EDUs with a density of more than one EDU per acre is proposed.
   c. DEP has determined that water supplies within ¼ mile of the proposed development site exceed 5 parts per million (ppm) nitrate-nitrogen (NO3-N).
   d. DEP has determined that known geological conditions at the proposed site may contribute to the potential for groundwater pollution from such systems.
2. The following information is to be submitted on a copy of the topographic map of the area and in narrative form:
   a. Results of background sampling for total coliform, fecal coliform, pH, and nitrate-nitrogen.
   b. If as a part of a Preliminary Hydrogeologic Study a well is drilled to assess the background nitrate-nitrogen concentrations in the shallow groundwater, the hydrogeologist shall provide a log of the well or wells. The log or logs shall provide the date of drilling, total well depth, depth to bedrock, depth to bottom of casing, depth to all water bearing zones, and the static water level. The well logs do not need to be graphical. In addition, the report should contain a discussion of the well purging protocol used prior to well sampling. The protocol must assure that a fresh sample is obtained from the shallow aquifer.
   c. Topographic location of the proposed system(s).
   d. Estimated area of impacted groundwater (dispersion plume and mixing zone within the dispersion plume) calculated from the surface topography and known geologic conditions.
   e. Identification of existing and potential groundwater uses within the dispersion plume.

   Note: Based on the information submitted in this section, DEP may require more detailed hydrogeologic information (Section M, below).

SECTION M. DETAILED HYDROGEOLOGIC STUDY

(Complete if marked in component or if DEP determines during the planning process that the additional study is necessary.)

Hydrogeologic work requires an appropriate professional signature and seal. A detailed hydrogeologic study must be completed when the proposed system(s) may degrade groundwater or surface water to the point that existing or potential groundwater uses or designated stream uses may not be protected. Often specific tasks listed in the detailed hydrogeologic study will satisfy DEP concerns. Since the level of study necessary for a particular site may vary, it is recommended to contact the DEP regional hydrogeologist to determine the level of study necessary for a project.

A. Content of Detailed Hydrogeologic Study

The following information must be included in the detailed hydrogeologic study using narrative and/or maps as appropriate.

1. Type of discharge to groundwater. This includes:
   - a. Dry stream channel
     - (1) Intermittent stream (dry under low flow conditions)
     - (2) Stormwater drainage ditch (flow in wet season or during and immediately after storms)
   - b. Onlot subsurface disposal
     - (1) Individual onlot systems
     - (2) Community onlot systems
     - (3) Large Volume onlot systems
   - c. Land Application
     - (1) Spray irrigation
     - (2) Unlined wetland cell
     - (3) Groundwater infiltration
2. Plot the topographic location of the discharge.
3. The relationship between surface water and groundwater flow.
4. Investigate, describe and plot geologic and hydrogelogic characteristics influencing groundwater flow. These characteristics include but are not limited to the following:
   - a. Bedrock formations, lithologic description and range of depth
   - b. Bedding features, the frequency and direction of dominant joints and fractures
   - c. Faults, lineaments and earth fracture traces
   - d. Karst features such as open and closed sinkholes, closed depressions, known solution channels, pinnacles or other specific featues
   - e. Unconsolidated material characteristics (soil, glacial materials, fluvial materials, etc.)
   - f. Unconsolidated bedrock characteristics (saprolite, weathered zones)
   - g. Elevation of the permanent groundwater table, anticipated water table fluctuation and groundwater flow direction
   - h. Unconfined or confined aquifer characteristics
   - i. Aquifer flow characteristics as quantified through pump testing or other characterization methodology (i.e., hydraulic conductivity, storage coefficient, transmissivity, etc.)
   - j. Existing, planned and potential down-gradient groundwater uses including, but not limited to: all water supply locations; the volume of water used at these locations; the estimated horizontal extent of each well's cone of

depression; and the influence of pumping upon the natural groundwater gradient, the direction of flow and including both existing and potential water supplies.

5. Groundwater/surface water characteristics, including:

   a. If as a part of a Detailed Hydrogeologic Study a well is drilled to assess the background nitrate-nitrogen concentrations in the shallow groundwater, the hydrogeologist shall provide a log of the well or wells. The log or logs shall provide the date of drilling, total well depth, depth to bedrock, depth to bottom of casing, depth to all water bearing zones, and the static water level. The well logs do not need to be graphical. In addition, the report should contain a discussion of the well purging protocol used prior to well sampling. The protocol must assure that a fresh sample is obtained from the shallow aquifer.

   b. Existing groundwater quality and quantity, including, but not limited to, the following analyses:

1) Total coliform	10) Total manganese
2) Fecal coliform	11) Sodium
3) pH	12) Magnesium
4) Total iron	13) Calcium
5) Turbidity	14) Potassium
6) Alkalinity	15) Sulfate
7) Nitrate-Nitrogen	16) Total Dissolved Solids
8) Chloride	17) Hardness
9) Ammonia-Nitrogen	18) Volatile Organic Compounds

   c. The name, location, flow characteristics, flow volume (cfs), existing water quality and designated use of any potentially impacted surface water (receiving stream). Include all surface water uses as listed for the water body in Chapter 93.

   d. Influence of surface water runoff and groundwater recharge on groundwater characteristics.

   e. Designation of any watershed area that is utilized for a water supply, recreation, or agricultural irrigation.

   f. Any other information necessary to adequately analyze the hydrogeologic impact by the proposed facility.

B. Detailed Hydrogeological Study Analysis and Report

Using the information gathered, describe and analyze the proposed facility's impact. Use narrative and mapping where appropriate. A complete study should include, but not be limited to, the following items:

1. Discuss pre-treatment system components proposed to decrease effluent contaminant levels prior to groundwater discharge. Include design and testing data submitted to support any long-term, consistent, reliable, and measurable treatment claims.
2. Delineate any dispersion plume in which the existing water quality will be degraded. Include all identified contaminant and hydrogeological variables from the site in this analysis.
3. Describe any natural condition and/or artificial control that confines dispersion plume flow.
4. Delineate a mixing zone within the dispersion plume where any chemical or biological concentrations will exceed rates in Federal Drinking Water Quality Standards.
5. Identify a buffer zone for the dispersion plume and mixing zone and also discuss the effects of seasonal weather conditions on this zone.
6. Discuss impacts on existing, planned and potential groundwater uses in the delineated dispersion plume, mixing zone and buffer zone.
7. Discuss any surface water bodies that may intercept, or interact with the dispersion plume.

8. Predict and quantify any impacts the identified dispersion plume will have upon the uses listed for that surface water body.

9. Predict any effects of the dispersion plume on all existing, planned or future groundwater uses.

10. Predict the extent and height of any groundwater/wastewater mound and capillary fringe resulting from restrictive layers in the subsurface. Restrictive layers may include, but are not limited to restrictive soil horizons, unconsolidated geological materials, weathered bedrock materials, low permeability bedrock, or a permanent groundwater table.

11. Discuss any physical, chemical or biological impact to groundwater, surface water or treatment facility function resulting from the formation of a groundwater/wastewater mound including capillary fringe. Soil is often is part of the treatment process and for analysis purposes may be considered part of the treatment facility.

12. Discuss and propose any system change or recommendations deemed necessary to mitigate the effects of the identified groundwater/wastewater mounding.

13. Discuss any groundwater monitoring program necessary to guard against adverse impacts from the facility. The program should include proposed monitoring well locations, appropriate groundwater sampling methodologies, appropriate chemical and biological sampling parameters, and appropriate monitoring frequencies. If appropriate, include monitoring considerations to protect existing surface water uses.

14. Discuss authority for controlling groundwater uses within the mixing and buffer zones. Such items as, groundwater easements and access rights that are necessary for mitigation or abatement purposes, should be discussed.

15. Discuss contingency plan to abate pollution if groundwater monitoring reveals a problem.

SECTION N. RETAINING TANKS

When the proposed method of sewage disposal is retaining tanks (including holding tanks, privies, chemical, incinerating, recycling or composting toilets) the applicant must complete this section. For exceptions to these requirements, see Chapter 71, Section 71.63. Since holding tanks and privies require more intensive maintenance to provide for long-term use than other onlot systems, there are restrictions on their use. This section is divided into three parts: Holding Tanks; Privies; and Tank Pumping and Content Disposal.

1. Holding Tanks

To complete question (a) in the component, the applicant must refer to the municipality's Official Sewage Facilities Plan. The applicant needs to determine:

a. if the Official Plan allows for the use of holding tanks for the proposed lot(s). For new land development projects, holding tanks can only be utilized as an interim method and provision must be made for adequate replacement sewerage facilities. The approving agency will determine the length of time that holding tanks may be used before implementation of the replacement method is required. If the Official Plan does not provide for use of holding tanks, the plan must be revised to provide for use of the tanks using this component.

b. if the Official Plan provides for the replacement of the holding tanks with adequate sewerage facilities. The applicant must attach the implementation schedule for the replacement sewage disposal method. If the plan does not provide for a replacement method, the plan must be revised to provide for a replacement method using this component. The delegated local agency may require that a separate component be completed for the replacement method.

c. if the Official Plan provides for financial assurances (public financing, escrows, bonding) for the implementation of the replacement sewerage facilities. The applicant must provide a description of the financial assurances to be used and attach it to the package. If the plan does not provide for financial assurances the plan must be revised to provide for those assurances using this component.

To complete part (b) in the component, the applicant must attach proof that the municipality, authority or other DEP approved entity will be responsible for the tank(s), and that there are suitable ordinances, regulations, or restrictions in place and administered by these agencies to maintain the tanks and dispose of the tank contents. Copies of these ordinances, regulations or restrictions must be attached to the component package before the municipality or approving agency will consider the package complete.

Projects proposing the use of holding tanks must also complete Part 3, (Retaining Tank Pumping and Content Disposal). Instructions for that section are found below under "Retaining Tank Pumping and Content Disposal."

2. Privies/Chemical Toilets

This section is to be completed when privies are proposed as the sewage disposal method.

All proposals utilizing privies must complete Section G (Site Suitability) of this component showing that soil and site suitability tests have been conducted and that the site is suitable for onlot sewage disposal systems on each lot (consult the instructions for Section G).

The applicant must also attach copies of existing ordinances, regulations or restrictions that require the municipality, authority or DEP approved entity to assume responsibility for the removal of the privies and the installation of an onlot system in the event that water under pressure is supplied in the future. Part 3 below (Tank Pumping and Content Disposal) must also be completed.

For exceptions to these requirements, see Chapter 71, Section 71.63.

3. Retaining Tank Pumping and Content Disposal

When retaining tanks are proposed, the applicant must provide the name of the proposed retaining tank cleaner, their address and phone number. The applicant must identify the disposal site by name, the type of disposal site (land disposal, treatment facility), its location, and provide the NPDES permit number or the land disposal permit number of the disposal site. A letter from the disposal site verifying that the disposal site is willing to accept the retaining tank contents must be attached. DEP reserves the right to verify and approve disposal sites under the Solid Waste Management Act and the Clean Streams Law. If the chosen disposal location is a treatment facility that is not meeting effluent standards as required under its permit, that facility will not be able to accept holding tank contents. A land disposal site may also be limited in its ability to accept additional retaining tank waste. The applicant should ensure that the disposal site is able to accept the tank contents.

SECTION O. PUBLIC NOTIFICATION REQUIREMENTS

If publication is required, the published notice must certain facts about the project in a newspaper of general circulation within the municipality affected to provide a chance for the general public to comment on proposed new land development projects. The applicant or the applicant's agent, the municipality or the local agency, may provide this notice. Where an applicant or an applicant's agent provides the required notice for publication, the applicant or applicant's agent shall notify the municipality or local agency and that municipality or local agency will be relieved of the obligation to publish.

Contents of Publication Notice. The following items must be contained in the notice:

1. Name of project.
2. Type of development (residential, multi-residential, commercial, industrial).
3. Location, including road and street markers, municipality and county.
4. Acreage under development and number of equivalent dwelling units proposed.
5. Type of sewage disposal proposed (individual, community or large volume onlot, holding tanks).
6. Reason why publication was necessary.
7. Establishment of a 30 day comment and review period.
8. Where and when the Sewage Facilities Planning Module can be seen for comment and review (preferably, the municipal office).
9. Address of municipal office where comments will be accepted.

All comments, the municipal responses to comments, and proof of publication shall be submitted with the Sewage Facilities Planning Module package. If no comments were received, attach a copy of the public notice and check the appropriate box in Section O.

SECTION P. FALSE SWEARING STATEMENT

The individual who completed Section G of the component must provide the information requested in the first block and acknowledge the false swearing statement by printing their name, signing and dating the form, and checking the box that best describes their employment status in the municipality. The individual completing the rest of the component fills out and signs the second block. If a waiver of the planning requirements is requested for the residual tract of the subdivision, the block indicating this must be checked.

SECTION Q. MUNICIPAL ACTIONS

(marginal conditions and/or residual tract waiver)

This section is to be completed by the municipality if marginal conditions have been identified on the project site and/or if a waiver of the planning requirements has been requested for the residual tract of the subdivision. If neither of these conditions are met, the section should not be completed.

1. Provision of Long-Term Sewage Disposal (Marginal Conditions)

The Sewage Facilities Act requires that adequate sewage facilities be available to serve a municipality in both the short-term and the long-term. This becomes more critical where onlot systems are proposed for lots with marginal conditions. The options available to the property owner and municipality to assure long-term sewage facilities where marginal soils conditions have been identified in Section G and/or H of the component include: inclusion of the subdivision in a sewage management program; conducting tests for both a primary and replacement onlot system on the lots considered marginal; documenting replacement of the onlot systems with community sewage systems; or in the case of high density use of onlot systems, reduction of the density of lots below the threshold of one residential dwelling/acre.

The option selected must be accepted by the municipality by signing and dating Section Q of the component.

The options should be carefully evaluated and all necessary testing or justification for the option chosen must be included with the Sewage Facilities Planning Module. Submittal of this project without the required documentation will result in return of the planning module as incomplete.

a. Option 1 - Provision of a Sewage Management Program

When new land development projects are included in an existing sewage management program established by the municipality and approved by DEP under Chapter 71, Section(s) 71.32 and 71.73, the municipality has documented provision of long-term sewage facilities if:

(1) An alternative analysis evaluates the available options and describes why provision of a sewage management program is the most administratively and environmentally viable option.

(2) Documentation is submitted that an approved sewage management program is currently being administered in the municipality.

(3) Documentation in the form of a municipal letter or resolution is submitted to show that the proposed development will be included in the sewage management program.

b. Option 2 - Replacement Area Testing

A soil profile examination and percolation test may be done for the primary system and a future replacement system in the event the primary system fails. New land developments which have conducted soils testing for both a primary and replacement absorption area on each marginal lot have documented provision for long-term sewage facilities if:

(1) An alternative analysis evaluates the available options and describes why replacement area testing is the most administratively and environmentally viable option.

(2) At least one soil evaluation probe and complete percolation test has been conducted for both the primary and replacement absorption area on each lot.

(3) DEP's staff is contacted, has concurred with the placement and number of **SOIL EVALUATION PROBES** required on each site and has been given the opportunity to observe the probes.

(4) DEP's staff is contacted and has concurred with the number and location of **PERCOLATION TEST HOLES** to be used for the testing.

(5) The results of all tests, both suitable and unsuitable, are submitted on "Site Investigation and Percolation Test Report" form(s) for the primary and replacement areas.

(6) The soils tests document that a suitable site is available for both the primary and replacement system.

(7) The replacement area tests are conducted on those lots or areas of the development that are determined to have marginal site conditions.

(8) All isolation distances (from Chapter 73, Section 73.13) from both the primary and replacement site can be met.

(9) The plot plan shows both the primary and replacement absorption areas along with all other required information.

(10) The recorded plot plan must contain a statement that the indicated areas are reserved for replacement absorption areas in the event the primary onlot system absorption area fails, and that the area must not be disturbed.

c. **Option 3 - Scheduled Replacement with Sewerage Facilities**

New land development projects which are determined to be marginal for use of onlot systems may propose the interim use of onlot sewage disposal systems pending connection to a community sewage system. These proposals may be considered to have documented provision of long-term sewage facilities if:

(1) An alternative analysis evaluates the available options and describes why replacement with community sewage systems is the most administratively and environmentally viable option.

(2) Documentation is submitted that shows that an approved sewage facilities plan update revision identifies and describes the community sewage system proposed for use, projects adequate capacity at the planned time of connection, commits the municipality to plan implementation and includes the financing, implementation timetables, conceptual designs and administrative arrangements necessary to connect the entire development to a community sewage system within 5 years.

(3) Documentation that the proposed development is within the proposed service area projected to be served by a community sewage system within five years.

d. **Option 4 - Reduction of the Density of Onlot Systems**

When the sole reason for the designation of a subdivision as marginal for long-term use of onlot system use is the proposed density of lots, the development may be subdivided into larger lots to achieve a density of 1 Residential Dwelling Unit/acre or less.

2. Residual Tract Waiver

DEP believes that developers, municipal officials and future lot owners are best protected by complying with sewage planning requirements to assure that adequate sewage facilities will be available to serve all newly created subdivisions. However, DEP is aware that some subdivision proposals include residual tracts on which no construction is proposed which would require the use of sewage disposal facilities. Developers having such residual tracts may not be required to complete sewage facilities planning for that portion of the subdivision if this claim is valid. The residual tract waiver may be requested by checking the block in Section G.2. of the Component 2.

To be valid, acceptance of the request for a waiver by the municipal or county planning agency and the municipality is required. The municipal or county planning agency will indicate its acceptance of the proposed waiver by

marking the appropriate blocks on Component 4. The municipality indicates its acceptance of the proposed waiver by signing and dating the appropriate statement in Section Q of Component 2. When the proposal involves the subdivision of property on which there is an existing building currently served by an onlot septic system on the residual tract, the municipality's SEO must inspect the system and sign and date the statement in Section H.3. of the planning module.

In addition, the planning module must include a plot plan or deed or deed notice which contains language similar to the following, directed to the residual tracts:

"As of the date of this deed/plot plan/deed notice recording, the residual tract of this subdivision is dedicated for the express purpose of _____ use. No portion of the residual tract of this subdivision has been approved by the municipality or the approving agency for the installation of sewage disposal facilities. No sewage permit will be issued for the installation, construction, connection to or use of any sewage collection, conveyance, treatment or disposal system (except for repairs to existing systems) unless the municipality and approving agency have approved any required sewage facilities planning for the residual tract of the subdivision described herein in accordance with the Sewage Facilities Act (35 P.S. Sections 750.1 *et seq.*) and regulations promulgated thereunder. Prior to signing, executing, implementing or recording any sales contract or subdivision plan, any purchaser or subdivider of any portion of this residual tract should contact the municipality which is charged with administering the Sewage Facilities Act to determine what sewage facilities planning is required and the procedure and requirements for obtaining appropriate permits or approvals."

Language similar to the above must be recorded on the plot plan or deed or deed notice and a copy of the deed or plot plan or deed notice must be submitted with this planning module submission.

SECTION R. REVIEW FEES

The Sewage Facilities Act establishes a fee for the DEP planning module review. DEP will calculate the review fee for the project and invoice the project sponsor **OR** the project sponsor may attach a self-calculated fee payment to the planning module prior to submission of the planning package to DEP. (Since the fee and fee collection procedures may vary if a "delegated local agency" is conducting the review, the project sponsor should contact the "delegated local agency" to determine these details.) After consideration of the options available, please check the appropriate box in the Component 2 form attached.

1. For **REVISIONS** to the Official Plan (approving agency: DEP)

   Under Act 537, the fee for DEP review of a Component 2 planning module is $30/lot or EDU. This fee may be charged each time the planning module is denied and resubmitted.

   DEP Planning Module Review Fees for a Component 2 submission may be determined using the following formula:

   # _____ Lots (or EDUs) x $30.00 = $ _____

   Note:

   (1) To calculate the review fee for any project, use the number of lots created or the whole number of project equivalent dwelling units (EDU), (whichever is greater) in the above formula.

   (2) When using the number of lots, include only the number of lots being proposed when calculating the review fee. Do not include any "Residual Land Parcel/Lot".

   (3) In all projects, the minimum sewage flow per lot is equal to 400 gallons per day (GPD) and represents a generic three-bedroom house on each lot. Projects that knowingly propose houses larger than the generic three-bedroom unit allow for the increased sewage flows from these larger units by adding 100 gallons per day for each additional bedroom in the house to this initial 400 GPD figure. The resulting project flow is in excess of the minimum 400 GPD for each lot created and must be converted into equivalent dwelling units (EDU) in order to correctly calculate the review fee. See note 4.

(4) To determine the total number of EDUs for a project, first determine the total project flow by adding together the flow from each proposed lot. Divide this total project flow by 400 GPD and, if it is greater than the number of lots being proposed, enter this greater figure in the above formula.

2. For **SUPPLEMENTS** to the Official Plan (approving agency: delegated local agency)

Delegated local agencies must establish fees for the review of planning modules in fee schedules formally adopted by the delegated agency and available to the public. The applicant should contact the delegated agency to determine the amount of the review fee and the payment details. The delegated agency may charge fees for each review of the planning module.

OTHER REQUIREMENTS

Planning Agency Review

Component 4 (Planning Agency Review) and a copy of the entire planning module package must be forwarded by the applicant to each existing municipal, county, or areawide planning agency and any existing county or joint county health department for their comments. The use of registered mail or certified mail (return receipt requested), by the applicant when forwarding the planning module package to the agencies will provide proof of receipt. These agencies are required to provide comments within 60 days of receipt of the module package. The planning agencies will review the package for consistency with municipal and county official sewage facilities plans, municipal comprehensive plans, zoning, and land use designations. They will also determine whether the plan is consistent with wetland protection, stormwater management, archaeological and historical resources, and prime agricultural land protection as indicated in the comprehensive plan for the area. Proof that the package has been in front of these agencies for 60 days without comment will satisfy the review requirement. When the agencies return the package to the applicant, or if 60 days have passed without comment, the package may be submitted to the municipality for its action.

Municipal Review

1. For **REVISIONS** to the Official Plan (approving agency: DEP)

   The municipality must determine if the planning module package is complete within 10 days of its receipt. If it is complete, the municipality must sign and date the checklist following this guidance to document the date of receipt of a complete planning module package. Incomplete packages are returned to the applicant for completion.

   The municipality must act upon a complete Component 2 planning module package within 60 days of receipt or within such additional time as the applicant and municipality may agree to in writing. If the municipality fails to act within 60 days or the agreed-to time extension, the planning module will be deemed to be approved by the municipality. In either case, the complete planning module, along with the signed and dated completeness checklist, may then be sent to DEP by the municipality or applicant for final review.

   Municipal actions can include adoption of the planning module as a revision to the municipality's Official Plan, adoption of the revision with modifications, or denial of the revision. If the plan is adopted, the municipality sends the revision, along with the signed and sealed Resolution for Plan Revision form and signed Transmittal Letter form, to DEP. Denied revisions are returned to the applicant with the reason(s) for denial. DEP must also be informed of the reasons for denial.

2. For **SUPPLEMENTS** to the Official Plan (approving agency: delegated local agency)

   The municipality must determine if the planning module package is complete within 10 days of its receipt. If it is complete, the municipality must sign and date the checklist following this guidance to document the date of receipt of a complete module package. Incomplete packages are returned to the applicant for completion.

   The municipality must act upon a complete Component 2 planning module package within 60 days of receipt or within such additional time as the municipality and applicant may agree to in writing.

   Municipal actions can include approval of the project as a supplement to the municipality's Official Plan, approval of the supplement with modifications, or denial of the project as a supplement to the Official Plan. If the supplement is approved, the municipality forwards it to the delegated local agency serving the municipality for final review. Denied

supplements are returned to the applicant with the reason(s) for denial. The delegated local agency and DEP must also be informed of the reasons for denial.

Approving Agency (DEP or Delegated Local Agency) Review

1. For **REVISIONS** to the Official Plan (approving agency: DEP)

   DEP must determine if the proposed Official Plan revision is complete within 10 days of receipt. If it is complete, DEP will review the proposed revision. DEP must approve or disapprove the proposed revision within 120 days of receipt of a complete planning module, unless the proposed revision is for a residential subdivision plan which requires DEP action within 60 days of receipt of a complete plan submission. If DEP fails to act within this 120 day period (60 days for residential subdivision plans), the proposed plan revision is deemed to be approved, unless DEP informs the municipality before the expiration of the review period that a time extension is necessary to complete the plan review. This time extension may not exceed 60 days.

   The municipality and applicant will be informed of DEP's action by letter. If the planning module is disapproved, the municipality and applicant will also be informed of the reason(s) for the disapproval.

2. For **SUPPLEMENTS** to the Official Plan (approving agency: delegated local agency)

   The delegated agency must determine if a proposed planning module supplement is complete within 10 days of receipt. If complete, the delegated agency must approve or disapprove the proposed plan supplement within 60 days or such additional time as the applicant and delegated agency may agree to in writing. No additional approval by DEP is required.

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

Code No.

SEWAGE FACILITIES PLANNING MODULE

Component 2. Individual and Community Onlot Disposal of Sewage

(Return completed module package to appropriate municipality)

DEP USE ONLY				
DEP CODE #	CLIENT ID #	SITE ID #	APS ID #	AUTH ID #

This planning module component is used to fulfill the planning requirements of Act 537 for the following types of projects: (1) proposing the use of individual onlot sewage disposal systems (including individual residential spray irrigation systems (IRSIS)) and except for those projects qualifying for the "exception to the requirement to revise the Official Plan" under Chapter 71, Section 71.55, (2) proposing retaining tanks (including holding tanks, privies, chemical, incinerating, recycling or composting toilets), (3) proposing municipal permitted community onlot sewage disposal systems, and (4) proposing DEP permitted individual or community large volume onlot sewage disposal systems.

This component, along with any other documents specified in the cover letter, must be submitted to the municipality with jurisdiction over the project site for review and approval. All appropriate documentation must be attached for the Sewage Facilities Planning Module package to be complete. Refer to the instructions for help in completing this component.

REVIEW FEES: Amendments to the Sewage Facilities Act established fees to be paid by the applicant for review of planning modules for land development. These fees may vary depending on the approving agency for the project (DEP or delegated local agency). Please see Section R and the instructions for more information on these fees.

NOTE: All projects must complete Sections A through I and Sections N through R. Complete Sections J, K, L and/or M if indicated ☒. The municipality should complete Section Q if marginal conditions are present and/or if a waiver of the planning requirements is requested for the residual tract and/or if assurance of long term O & M option is required.

A. PROJECT INFORMATION (See Section A of instructions)

1. Project Name

2. Brief Project Description

B. CLIENT (MUNICIPALITY) INFORMATION (See Section B of instructions)

Municipality Name | County | City ☐ | Boro ☐ | Twp ☐

Municipality Contact Individual – Last Name | First Name | MI | Suffix | Title

Additional Individual Last Name | First Name | MI | Suffix | Title

Municipality Mailing Address Line 1 | Mailing Address Line 2

Address Last Line – City | State | ZIP+4

Phone + Ext. | FAX (optional) | Email (optional)

C. SITE INFORMATION (See Section C of instructions)

Site (Land Development or Project) Name

Site Location Line 1 | Site Location Line 2

Site Location Last Line – City | State | ZIP+4 | Latitude | Longitude

Detailed Written Directions to Site

Description of Site

Site Contact (Developer/Owner)

Last Name | First Name | MI | Suffix | Phone | Ext.

Site Contact Title | Site Contact Firm (if none, leave blank)

FAX | Email

Mailing Address Line 1 | Mailing Address Line 2

Mailing Address Last Line – City | State | ZIP+4

D. PROJECT CONSULTANT INFORMATION (See Section D of instructions)

Last Name | First Name | MI | Suffix

Title | Consulting Firm Name

Mailing Address Line 1 | Mailing Address Line 2

Address Last Line – City | State | ZIP+4 | Country

Email | Phone | Ext. | FAX

E. AVAILABILITY OF DRINKING WATER SUPPLY

The project will be provided with drinking water from the following source: (Check appropriate box)

- ☐ Individual wells or cisterns.
- ☐ A proposed public water supply.
- ☐ An existing public water supply.

If existing public water supply is to be used, provide the name of the water company and attach documentation from the water company stating that it will serve the project.

Name of water company: _____

F. PROJECT NARRATIVE (See Section F of instructions)

☐ A narrative has been prepared as described in Section F of the instructions and is attached.

The applicant may choose to include additional information beyond that required by Section F of the instructions.

G. GENERAL SITE SUITABILITY (See Section G of attached instructions)

This section must be completed when the proposed method of sewage disposal is the use of onlot sewage disposal systems or privies. The purpose of the information provided in this section is to determine the general suitability of the site for onlot disposal of sewage. Site suitability should not be construed as approval for permit issuance on individual lots. Additional testing may be required for permit issuance.

NOTE: If one or more lots in this subdivision are planned to be served by individual residential spray irrigation systems (IRSIS), please see the specific information on IRSIS in Section G.3 of the attached instructions.

1. **PLOT PLAN**

The following information is to be submitted on a plot plan of the proposed subdivision or development:

a. Location of all soil profiles and percolation tests.
b. Slope at each test area.
c. Soil types and boundaries.
d. Existing and proposed streets, roadways, access roads, etc.
e. Lot lines and lot sizes.
f. Existing and proposed rights-of-way.
g. Existing and proposed drinking water supplies for proposed and contiguous lots.
h. Existing buildings.
i. Surface waters.
j. Wetlands – from National Wetland Inventory Mapping and USDA Hydric Soils Mapping.
k. Floodplain or floodprone area soils, floodways (Federal Flood Insurance Mapping).
l. Designated open space areas.
m. Remaining acreage under the same ownership and contiguous lots.
n. Existing onlot or sewerage systems; pipelines, transmission lines, etc., in-use or abandoned.
o. Prime agricultural land.
p. Orientation to North

2. **RESIDUAL TRACT PLANNING WAIVER REQUEST**

A waiver from sewage facilities planning ☐ is, ☐ is not requested for the residual land tract associated with this project. (See Section H, Section Q, Component 4 and instructions for additional information).

3. **SOILS INFORMATION**

a. Attach copies of "Site Investigation and Percolation Test Report" (3800-FM-WSWM0290A) (formerly known as "Appendix A") form(s) for the proposed subdivision.

b. Marginal conditions for long-term onlot sewage disposal ☐ are, ☐ are not present. See marginal conditions information in Sections H and Q and in attached instructions.

c. If one or more lots in this subdivision are planned to be served by Individual Residential Spray Irrigation Systems (IRSIS), please see the specific information on IRSIS in Section G of the instructions.

4. **WETLAND PROTECTION**

YES NO

a. ☐ ☐ Are there wetlands in the project area? If yes, ensure these areas appear on the plot plan as shown in the mapping or through on-site delineation.

b. ☐ ☐ Are there any construction activities (encroachments, or obstructions) proposed in, along, or through the wetlands? If yes, Identify any proposed encroachments on wetlands and identify whether a General Permit or a full encroachment permit will be required. If a full permit is required, address time and cost impacts on the project. Note that wetland encroachments should be avoided where feasible. Also note that a feasible alternative **MUST BE SELECTED** to an identified encroachment on an exceptional value wetland as defined in Chapter 105. Identify any project impacts on streams classified as HQ or EV and address impacts of the permitting requirements of said encroachments on the project.

5. **PRIMARY AGRICULTURAL LAND PROTECTION**

YES NO

☐ ☐ Will the project involve the disturbance of prime agricultural lands?

If yes coordinate with local officials to resolve any conflicts with the local prime agricultural land protection program. The project must be consistent with such municipal programs before the sewage facilities planning module package may be submitted to DEP.

If no, prime agricultural land protection is not a factor to this project. Proceed to G.6.

☐ ☐ Is this project consistent with the municipal prime agricultural land protection program.

6. **HISTORIC PRESERVATION ACT**

YES NO

a. ☐ ☐ Sufficient documentation is attached to confirm that this project is consistent with DEP Technical Guidance 012-0700-001 *Implementation of the PA State History Code* (available online at the DEP website at www.dep.state.pa.us select "subject" then select "technical guidance"). As a minimum this includes copies of the completed Cultural Resources Notice (CRN), a return receipt for its submission to the PHMC and the PHMC review letter.

H. SEWAGE ENFORCEMENT OFFICER ACTION (See Section H of attached instructions)

1. I have confirmed the information relating to the general suitability for onlot sewage disposal contained in this component. Confirmation of this information was based upon on-site verification of soil tests, general site conditions and other generally available soils information. The proposed development site:
   - ☐ Is generally suitable for onlot disposal. This module does not constitute individual permit approval.
   - ☐ Is marginal for long-term onlot disposal. (See instructions for information on marginal conditions).
   - ☐ Is not generally suitable for onlot disposal. (See my attached comments regarding this determination).
   - ☐ Cannot be evaluated for general site suitability because of insufficient soils testing.
2. The proposed development site is considered "marginal for onlot disposal" or for long-term onlot system use because one or more of the following conditions exist. (Check all that apply).
   - ☐ Soils profile examinations which document areas of suitable soil intermixed with areas of unsuitable soils.
   - ☐ Site evaluation which documents soils generally suitable for elevated sand mounds with some potential lots with slopes over 12%.
   - ☐ Site evaluation which documents soils generally suitable for in-ground systems with some potential lots with slopes in excess of 20%.
   - ☐ Lot density of more than 1 Residential Dwelling Unit/acre.
   - ☐ Proposed use of a community onlot disposal system or system serving commercial, industrial or institutional uses.

3. Residual Tract Facilities (For use only when there is an existing onlot disposal system on the residual tract)
   - ☐ I have inspected the lot on which the existing building and existing onlot disposal system is located and have concluded, based on soils mapping or soils evaluation, permit information or site inspection that the long-term sewage disposal needs of this site and the building currently served can be met. (Required)
   - ☐ I further acknowledge that no violations of the Sewage Facilities Act are known to me or have become apparent as a result of my site inspection. No inferences regarding future performance of the existing onlot disposal system should be drawn from this acknowledgement. (Required)
   - ☐ A brief description and sketch of the existing system and site is attached. (Optional)

Signature of Certified Sewage Enforcement Officer having jurisdiction in municipality where development is proposed	Certification #	Date

I. ALTERNATIVE SEWAGE FACILITIES ANALYSIS (See Section I of attached instructions)

This analysis consists of a narrative that will support the chosen sewage disposal method by comparing it to methods already in use in the area or to any other available method. Attach the narrative to the package and title it **Alternative Analysis**. The narrative should describe:

1. the chosen sewage disposal method, and whether the method is interim (to be replaced within 5 years) or ultimate (will serve the development beyond 5 years). Also provide the number of lots or EDU's that will be served.

I. ALTERNATIVE SEWAGE FACILITIES ANALYSIS (Continued) (See Section I of attached instructions)

2. the types of land uses adjacent to the project area (agricultural, residential, commercial etc.) and the type of sewage disposal method serving each of those land uses.
3. if the sewage facilities described in (2) are in need of improvement due to high rates of onlot malfunction or overloaded public sewers.
4. the sewage disposal method indicated for the development area in the municipality's Official Sewage Facilities Plan. (Such as: onlot disposal systems, public sewers, etc.).
5. existing and/or proposed sewage management program(s) in the area and/or any other municipal options necessary to satisfy the requirements of section(s) 71.72 or 71.73 including the provisions of the selected option.
6. potential alternative sewage disposal methods that are available for the project.
7. why the proposed disposal method was chosen over the alternative methods discussed.
8. who will be the owner of the facility, and who will be responsible for operation and maintenance of the facility.
9. any other information that the developer feels will support the chosen disposal method.

Complete the following sections (J, K, L and/or M) if indicated ☒.

If none are indicated, go directly to Section N.

☐ J. PROTECTION OF RARE, ENDANGERED OR THREATENED SPECIES (See Section J of instructions)

Check one:

☐ The "Pennsylvania Natural Diversity Inventory (PNDI) Project Environmental Review Receipt" resulting from my search of the PNDI database and all supporting documentation from jurisdictional agencies (when necessary) is/are attached.

☐ A completed "Pennsylvania Natural Diversity Inventory (PNDI) Project Planning & Environmental Review Form," (PNDI Form) available at www.naturalheritage.state.pa.us , and all required supporting documentation is attached. I request DEP staff to compete the required PNDI search for my project. I realize that my planning module will be considered incomplete upon submission to the Department and that the DEP review will not begin, and that processing of my planning module will be delayed, until a "PNDI Project Environmental Review Receipt" and all supporting documentation from jurisdictional agencies (when necessary) is/are received by DEP.

"Applicant or Consultant Initials _____"

☐ K. PERMEABILITY TESTING (See Section K of attached instructions)

☐ The information required in Section K of the instructions is attached.

☐ L. PRELIMINARY HYDROGEOLOGIC STUDY (See Section L of attached instructions)

☐ The information required in Section L of the instructions is attached.

☐ M. DETAILED HYDROGEOLOGIC STUDY (See Section M of attached instructions)

☐ The information required in Section M of the instructions is attached.

N. RETAINING TANKS (See Section N of attached instructions)

The term "Retaining Tank" includes holding tanks and privies, as well as, chemical, incinerating, recycling, and composting toilets. Check the appropriate box.

☐ Yes ☐ No Does this new land development project propose either interim or long-term use of retaining tanks?
If yes, complete the remainder of Section N.
If no, completion of the remainder of Section N is not required. Proceed to Section O.

What types of retaining tanks are proposed? Check all that apply.

☐ Holding Tank ☐ Privy ☐ Chemical ☐ Incinerating ☐ Recycling ☐ Composting

1. **Holding Tanks** – are only to be used in new land development as an interim sewage disposal method and only for a period of time determined by DEP. A replacement sewage disposal method is required and an implementation schedule for that replacement method must be developed. Local ordinances must also be ***in place*** to provide for the maintenance of the tanks. Complete a. and b. below. For exceptions to these requirements see Chapter 71, Section 71.63 (Retaining Tanks).

   a. The following questions will help determine if a holding tank can be used.

      1) ☐ Yes ☐ No Does the Official Sewage Facilities plan or revision provide for replacement of the tanks by adequate sewage services?

      2) ☐ Yes ☐ No Does the Official Sewage Facilities Plan or revision include financial assurances for the implementation of the replacement method?

      If yes, what is the replacement sewage disposal method?

      Method _____

      If no, holding tanks may not be used.

   b. Chapter 72 requires that the municipality, sewer authority or other DEP approved entity with responsibility over the holding tanks have ***in place*** ordinances, regulations or restrictions established to maintain the tanks as outlined in Chapter 71, Section 71.63(c)(3). Attach documentation that the responsible agency has developed these ordinances or restrictions. These projects must also complete Part 3 below (Retaining Tank Pumping and Content Disposal).

2. **Privies/Chemical Toilets**
   Projects that propose privies as the method of sewage disposal must complete a, b and c below. For exceptions to these requirements see Chapter 71, Section 71.63 (Retaining Tanks).

   a. Complete Section G of this Component.

   b. The municipality, sewer authority, management agency or other DEP approved entity with responsibility over the site must have ordinances, regulations or restrictions established that assume responsibility for the removal of a privy and installation of an approved onlot sewage disposal system when water under pressure is provided to that lot. Attach a copy of these ordinances, regulations or restrictions.

c. These projects must also complete Part 3 below (Retaining Tank Pumping and Content Disposal).

N. RETAINING TANKS cont'd. (See Section N of attached instructions)

3. Retaining Tank Pumping and Content Disposal

a) Name of Retaining Tank Cleaner _____
(This can be the municipality or a contracted cleaner)

Address _____

Telephone Number _____

b) Name of Disposal Site _____

Type of treatment facility _____

NPDES or Land Disposal permit number _____

County _____ Municipality _____

Attach letter of agreement with the proposed disposal site verifying adequate capacity for disposal needs. Retaining tank wastes must be disposed of at a DEP permitted facilities or sites.

c) A municipality, sewer authority, or sewage management agency may delegate or contract for the collection and disposal of retaining tank contents, except that the ultimate responsibility for the proper collection and disposal of the contents shall remain with the municipality, authority or agency.

O. PUBLIC NOTIFICATION REQUIREMENT (See Section O of attached instructions)

This section must be completed to determine if the applicant will be required to publish certain facts about the project in a newspaper of general circulation in accordance with Chapter 71, Section 71.53(d)(6) to provide a chance for the general public to comment on proposed new land development projects. This notice may be provided by the applicant or the applicant's agent, the municipality or the local agency by publication in a newspaper of general circulation within the municipality affected. Where an applicant or an applicant's agent provides the required notice for publication, the applicant or applicant's agent shall notify the municipality or local agency and the municipality and local agency will be relieved of the obligation to publish. The required content of the publication notice are found in Section O of the instructions.

To complete this section, each of the following questions must be answered with a "yes" or "no". Newspaper publication is required if any of the following are answered "yes". Check all boxes that apply.

	Yes	No	
1.	☐	☐	Does the project propose the construction of a sewage treatment facility?
2.	☐	☐	Will the project change the flow at an existing sewage treatment facility by more than 50,000 gallons per day?
3.	☐	☐	Will the project result in a public expenditure for the sewage facilities portion of the project in excess of $100,000?
4.	☐	☐	Will the project lead to a major modification of the existing municipal administrative organizations within the municipal government?
5.	☐	☐	Will the project require the establishment of *new* municipal administrative organizations within the municipal government?
6.	☐	☐	Will the project result in a subdivision of 50 lots or more?
7.	☐	☐	Does the project involve a major change in established growth projections?
8.	☐	☐	Does the project involve a different land use pattern than that established in the municipality's Official Sewage Facilities Plan?
9.	☐	☐	Does the project involve the use of large volume onlot sewage disposal systems (Flow > 10,000 gpd)?
10.	☐	☐	Does the project require resolution of a conflict between the proposed alternative and consistency requirements contained in Chapter 71.21(a)(5)(i), (ii), (iii)?

O. PUBLIC NOTIFICATION REQUIREMENT (Continued)

11.	☐	☐	Will sewage facilities discharge into high quality or exceptional value waters?

☐ Attached is a copy of:

- ☐ the public notice,
- ☐ all comments received as a result of the notice,
- ☐ the municipal response to these comments.

☐ No comments were received. A copy of the public notice is attached.

P. FALSE SWEARING STATEMENT (See Section P of attached instructions)

The individual performing the tests and field evaluations necessary to complete ***Section G*** must provide the information below and sign the false swearing statement found to the right.

I verify that the soils information statements made in this component are true and correct to the best of my knowledge, information and belief. I understand that false statements in this component are made subject to the penalties of 18 PA C.S.A. §4904 relating to unsworn falsification to authorities.

Name (Print)

Title

Signature Date

Address

Check One:

☐ The individual conducting these tests is a Sewage Enforcement Officer authorized to perform this work under a fee schedule established by the municipality.

Telephone Number

☐ The individual conducting these tests is not a Sewage Enforcement Officer employed by the local agency in which this development is located.

The individual completing the rest of the component must provide their name, title, address, telephone

I verify that the statements made in this component are true and correct to the best of my knowledge, information and

number and sign the false swearing statement found to the right.

Name (Print)

Title

Address

Telephone Number

belief. I understand that false statements in this component are made subject to the penalties of 18 PA C.S.A. §4904 relating to unsworn falsification to authorities.

☐ A waiver of the planning requirements is requested for the residual tract of this subdivision. The requirements of Section G.2 of the instructions have been met.

Signature Date

Q. MUNICIPAL ACTIONS (Marginal conditions, Residual Tract Waiver and/or O&M option)

(See Section Q of attached instructions)

This section is to be completed by the municipality if marginal conditions have been identified on the project site and/or if a waiver of the planning requirements has been requested for the residual tract of the subdivision and/or if an assurance of long term operation and maintenance is required by Section 71.72. If none of these conditions are met, do not complete this section.

1. ☐ The proposed development has been identified in Section G and/or Section H as having marginal conditions or other concerns for the long-term use of onlot sewage systems. The municipality has selected the following method of providing long-term sewage disposal to this subdivision: (Check one)

   ☐ Provision of a sewage management program meeting the minimum requirements of Chapter 71, Section 71.73

   ☐ Replacement area testing

   ☐ Scheduled replacement with sewerage facilities

   ☐ Reduction of the density of onlot systems

   ☐ The justification required in Section Q of the instructions is attached.

2. ☐ A **waiver** of the planning requirements for the residual tract of this subdivision has been requested.

   The municipality acknowledges acceptance of this proposal and requests a waiver of the sewage facilities planning requirements for the residual tract designated on the subdivision plot plan. Our municipal officials accept full responsibility now and in the future to identify any violation of this waiver and to submit to the approving agency any required sewage facilities planning for the designated residual tract should a violation occur or construction of a new sewage-generating structure on the residual tract of the subdivision be proposed. We understand that such planning information may require municipal officials to be responsible for soil testing and other environmental assessments for the residual tract in the future.

3. ☐ The **option** selected to assure long-term proper operation and maintenance, required by Title 25, PA Code, Section 71.72, for the proposed DEP permitted non-municipal sewage facility or local agency permitted community onlot sewage system is clearly identified and attached.

Chairperson or Secretary of Governing Body	Signature / Date
Municipality Name	
Address	Address
	(Area Code) Telephone No. (___)

R. PLANNING MODULE REVIEW FEE (See Section R of attached instructions)

The Sewage Facilities Act establishes a fee for the DEP planning module review. DEP will calculate the review fee for the project and invoice the project sponsor **OR** the project sponsor may attach a self-calculated fee payment to the planning module prior to submission of the planning package to DEP. (Since the fee and fee collection procedures may vary if a "delegated local agency" is conducting the review, the project sponsor should contact the "delegated local agency" to determine these details.) Check the appropriate box.

☐ I request the DEP calculate the review fee for my project and send me an invoice for the correct amount. I understand the Department's review of my project will not begin until the Department receives the correct review fee from me for the project.

R. PLANNING MODULE REVIEW FEE cont'd. (See Section R of attached instructions)

☐ I have calculated the review fee for my project using the formula found below and the review fee guidance in the instructions. I have attached a check or money order in the amount of $ _____ payable to **"Commonwealth of PA, DEP". Include DEP code number on check.** I understand the Department will not begin review of my project unless it receives the fee and determines the fee is correct. If the fee is incorrect, The Department will return my check or money order, send me an invoice for the correct amount. I understand the Department's review will NOT begin until I have submitted the correct fee.

☐ I request to be exempt from the DEP planning module review fee because this planning module creates **only** one new lot and is the **only** lot subdivided from a parcel of land as that land existed on December 14, 1995. I realize that subdivision of a second lot from this parcel of land shall disqualify me from this review fee exemption. I am furnishing the following deed reference information in support of my fee exemption.

County Recorder of Deeds for _____ County

Deed Volume _____ Book Number _____

Page Number _____ Date Recorded _____

Formula:

_____ Lots (or EDUs) X $30.00 = $ _____

Note: (1) To calculate the review fee for any project, use the number of lots created or the whole number of project equivalent dwelling units (EDU), (whichever is greater) in the above formula.

(2) When using the number of lots, include only the number of lots being proposed when calculating the review fee. Do not include any "Residual Land Parcel/Lot".

(3) In all projects, the minimum sewage flow per lot is equal to 400 gallons per day (GPD) and represents a generic three-bedroom house on each lot. Projects that knowingly propose houses larger than the generic three-bedroom unit allow for the increased sewage flows from these larger units by adding 100 gallons per day for each additional bedroom in the house to this initial 400 GPD figure. The resulting project flow is in excess of the minimum 400 GPD for each lot created and must be converted into equivalent dwelling units (EDU) in order to correctly calculate the review fee. See note 4.

(4) To determine the total number of EDUs for a project, first determine the total project flow by adding together the flow from each proposed lot. Divide this total project flow by 400 GPD and, if it is greater than the number of lots being proposed, enter this greater figure in the above formula.

_____

Developer Name (Print)

_____

Signature Date

STOP - CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES
THREE WORKING DAYS NOTICE
Pennsylvania One Call System, Inc.
1-800-242-1776

COMPLETENESS CHECKLIST

The individual completing the component should use the checklist below to assure that all items are included in the planning module package. The municipality should confirm that the required items have been included within 10 days of receipt, and if complete, sign and date the checklist.

ALL ONLOT/RETAINING TANK PROPOSALS

- ☐ Name and address of land development project
- ☐ USGS 7.5 minute topographic map with the development area plotted
- ☐ Project narrative
- ☐ Letter of intent to serve the project from the public water supplier (if applicable)
- ☐ Alternative analysis narrative
- ☐ Proof of public notification (if applicable)
- ☐ Plot plan of project with all required information
- ☐ A Site Investigation and Percolation Test Report forms for each soil profile examination and percolation test performed
- ☐ Preliminary Hydrogeology (if applicable)
- ☐ Permeability Testing (if applicable)
- ☐ Detailed Hydrogeology (if applicable)
- ☐ Sewage Enforcement Officer's signature
- ☐ Soils information preparer's signature
- ☐ Completed Component 4 (Planning Agency Review) for each existing planning agency and health department

Projects proposing holding tanks or privies are required to provide the following additional information.

HOLDING TANKS

- ☐ Copies of all ordinances, regulations, and/or restrictions governing holding tank maintenance
- ☐ Copy of the replacement method implementation schedule
- ☐ Copy of the financial assurances description for the replacement sewage disposal method
- ☐ Name of the tank cleaner/hauler
- ☐ Name and permit number of the disposal site
- ☐ Disposal site approval for holding tank contents disposal

PRIVIES

- ☐ Site Investigation and Percolation Test Report forms for all soil profiles and percolation tests
- ☐ Copies of ordinances, regulations, and/or restrictions for replacement of privies
- ☐ Disposal site approval for retaining tank contents disposal

MUNICIPAL ACTION

- ☐ Component 2, with SEO signature
- ☐ Component 4, planning agency comments and responses to those comments
- ☐ Proof of public notification
- ☐ Comments and responses generated by public notification
- ☐ Transmittal letter

_____
Signature of Municipal Official

_____
Date Submittal Determined Complete

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

Remove and recycle these instructions prior to mailing component to the approving agency.

INSTRUCTIONS FOR COMPLETING COMPONENT 3 SEWAGE COLLECTION AND TREATMENT FACILITIES

How to Obtain Planning Module Components

Planning module components appropriate to your project can be obtained by completing an "Application for Sewage Facilities Planning Module" mailer (3800-CD-WSFR0359) and sending it to the agency responsible for final review of your project (or the "approving agency"). This "approving agency" may be either DEP or a "delegated local agency" which is a local agency that has received planning approval delegation from DEP under Act 537. If you are unsure of where to send your mailer, contact the DEP regional office serving your county for help. **Do not use this component unless you have received a properly code-numbered copy from DEP or the delegated local agency.** You may obtain an Application for Sewage Facilities Planning Module mailer from the municipality, the delegated local agency, a DEP regional office or on DEP's website at www.dep.state.pa.us, PA Keyword "Wastewater."

Upon receipt of the mailer, the "approving agency" (DEP or delegated local agency) will determine if your project is required to complete sewage facilities planning under Act 537. If planning is not required under Act 537, you will be informed by letter. If planning is required, the agency will assign a code number to your project and provide you with the correct planning module forms and instructions.

When Should You Use Component 3?

This component is used when any of the following are proposed: 1) a subdivision served by sewage collection, conveyance or treatment facilities, 2) a tap-in to public sewers with flows on a lot of 2 Equivalent Dwelling Units (EDUs) or more, or 3) the construction or modification of wastewater collection, conveyance or treatment facilities that will require DEP to issue or modify a Clean Streams Law permit. A sewer **EXTENSION** is defined as the construction of a sewage collection system to serve more than one tap-in. Sewer lines that cross property lines are also sewer extensions. A **TAP-IN** is defined as a connection to an existing sewage collection system.

Who Should Complete the Component?

This component should be completed by a consultant, engineer, or surveyor who is familiar with the municipality's Official Plan and available sewage disposal methods in the municipality in which the development project is proposed. Municipal and sewage authority officials should be consulted in the development of the project. Sections A through H, and Sections O through R must be completed for all projects. Section I, J, K, L, M and/or N should be completed only if indicated. The following instructions provide general guidelines on completing the component.

Instructions for Completing Component 3

SECTION A. PROJECT INFORMATION

Project Name. In the "Project Name" block, enter the name by which this proposed land development project is, or will be, known, such as "Smith Subdivision."

Brief Project Description. Briefly describe the intended project in the space provided.

SECTION B. CLIENT (MUNICIPALITY) INFORMATION

Municipality Name, County, Municipality Type. Enter the name of the client municipality and the name of the county in which the municipality is located. Check the appropriate block indicating the municipality type, whether **City**, **Boro**, or **Township** (Twp).

Municipality Contact Individual Last Name, First Name, MI, Suffix, Title. Enter the requested information for the client contact in this block. The municipal client contact is often the municipal secretary, but may be another official, such as the chairman of the board of supervisors. Please indicate the appropriate title of the client contact in the Title block.

Additional Individual Last Name, First Name, MI, Suffix, Title (optional). This is an optional block to be used by municipalities that wish to provide an alternate client contact. Enter the requested information only if an alternate contact name is desired.

Mailing Address. This is the mailing address of the client municipality identified above. It should not include locational data that is not appropriate for a standard mail address. In addition to the street number and name, PO Box number, RR number, Box number, or Highway Contract number designations, use any appropriate designation and number to further define the mailing address. Use these standard abbreviations:

e.g.,	APT	(Apartment)	FLR	(Floor)
	BLDG	(Building)	RM	(Room)
	DEPT	(Department)	STE	(Suite)

City, State, ZIP+4, Phone Information. Do *not* use abbreviations for the city name. Use the two-character abbreviation for the state. Include the four-digit extension to the ZIP code, if known.

SECTION C. SITE INFORMATION

DEP needs to be able to accurately locate your site and to understand the physical nature of the surrounding area. Therefore, the application must be accompanied by a 7.5 minute topographic map published by the US Geological Survey or a clear copy that includes the quadrangle name. These maps can usually be obtained from most map distributors or hunting and fishing supply stores. On the topographic map, draw the outline of the development site.

Site Name. The name of the site at the specific physical location. This should be similar to the project name in A.1. **DO NOT** use abbreviations, acronyms, etc.

Site Location. Provide the physical address of the location where the permitted activities will occur. **DO NOT** use PO Box numbers for site location information. Provide the city (or municipality), state, and the ZIP+4, if known.

Detailed Written Directions to Site. When providing written directions, **DO NOT** use PO Box address data. Include landmarks and approximate distances from the nearest highway.

Description of Site. Provide a written description of the proposed project.

Site Contact (Developer/Owner) Information. Provide the name of the person having overall responsibility for environmental matters at the site. This person is often the landowner or the landowner's agent. Include the individual's name, title, firm, email address (optional), mailing address, and daytime phone numbers. This individual will ultimately be responsible for paying the DEP review fee.

SECTION D. PROJECT CONSULTANT INFORMATION

If this form was completed by someone other than the applicant, such as a consultant, engineer or contractor, that individual should complete this section of the form.

SECTION E. AVAILABILITY OF DRINKING WATER SUPPLY

Indicate the intended source of the project's drinking water by checking the appropriate box. If a public water supply will be used, provide written documentation that the water supplier is aware of the project, possesses capacity to serve the project and is willing to serve the project. A public water supply is defined as a system that provides water to the public for human consumption that could serve 15 or more connections, or serve 25 or more people daily at least 60 days out of the year.

SECTION F. PROJECT NARRATIVE

The following information is required to be provided in narrative (paragraph) form and attached to the module package. Title the attachment **"Project Narrative."**

1. Indicate the nature of the development project. (*Residential, Commercial, Institutional, Industrial, etc.*) If the project is commercial, institutional or industrial, describe the activity, such as light manufacturing, private hospital, or heavy manufacturing.
2. Enter the number of lots or EDUs in the development project. Lots refer to single family residential dwellings and for purposes of flow calculation are assumed to generate a minimum of 400 gallons per day (gpd). If larger residential flows are anticipated, these flows should be used. The residual tract, if any, is also counted as a lot. For commercial, industrial, and institutional facilities, the number of lots in a subdivision is determined by using EDUs. Divide the total flow for these facilities by 400 to determine the number of EDUs.
3. Describe the proposed sewage disposal method (municipal treatment facility, package plant, etc.) including a description of collection and conveyance facilities, if applicable. Include a general map showing the path of the sewage to the treatment facility.
4. Specify the projected population to be served and sewage flows in gpd and how these figures were calculated. Flow figures should be consistent with those found in DEP's *Domestic Wastewater Facilities Manual* DEP ID: 362-0300-001 available on DEP's website at www.state.pa.us PA Keyword "wastewater" unless adequate justification for lower per capita flows is provided and/or has been previously approved by DEP.
5. Describe the location of the discharge, disposal point or land application, if applicable.
6. List the total acreage of the proposed land development project.
7. Describe the use of any acreage or parcels under the same ownership and adjacent to the property. (Such as: for future development, recreational, agriculture, open space, etc.) If the land is proposed for future development, or is part of a phased project, determine if there will be adequate sewage disposal facilities to serve those phases.
8. Provide information on any previous Act 537 planning completed for the site and any other information that the applicant believes is important for DEP's review of the project.

SECTION G. PROPOSED WASTEWATER DISPOSAL FACILITIES

This section requires the applicant to provide information on collection, conveyance and treatment facilities proposed for the development project.

1. Collection System

To complete this section, check the appropriate box to indicate if the collection system is a new system, an extension to an existing system or a tap-in to an existing system. For each of these cases, indicate the number of EDU's or tap-ins that will be served by the collection system and the name of the collection or conveyance system and the interceptor to be used. A sewer **EXTENSION** is defined as the construction of a sewage collection system to serve more than one tap-in. Sewer lines that cross property lines are also sewer extensions. A **TAP-IN** is defined as a connection to an existing sewage collection system.

2. Wastewater Treatment Facility

The second part of the section requires information on the treatment facility. Indicate by checking the appropriate box whether the facility is new construction or if it is an existing facility. If the facility requires upgrading or

expansion to serve the development, the appropriate box should be checked. New construction includes any proposal that will require the issuance of a Clean Streams Law permit. For existing facilities, provide the name and NPDES permit number of the facility. Contact the facility for that information.

3. Social Economic Justification

Title 25, Pennsylvania Code, Section 93.4.c of DEP regulations requires that sewage facilities proposing to discharge or increase an existing discharge into High Quality Waterways complete a Social or Economic Justification (SEJ) and publish a public notice as part of the sewage facilities planning process. Please refer to specific requirements that may be found in Section 93.4c(c), available online at www.pacode.com or from your local DEP office. Additional information is available in the *Water Quality Antidegradation Implementation Guidance* DEP ID: 391-0300-002 also available online at www.dep.state.pa.us.

4. Plot Plan

Submit a plot plan of the proposed subdivision that contains the information listed below. The scale of the plot plan should be sufficient to show the development and adjacent areas and allow the municipality and approving agency to easily identify the required information. The plot plan must be prepared by a registered surveyor prior to submittal to the approving agency. Some of the information required can be found in the municipality's Official Plan. Other information can be found in tax maps, zoning maps, soil maps, Federal Emergency Management Agency (FEMA) floodplain maps, wetland maps and on-site surveys.

a. Existing and proposed buildings. All buildings on the tract and adjacent lots (including properties across streets) must be plotted.

b. Lot lines of individual lots and size of lots in the proposed development.

c. Adjacent lots.

d. Remainder of tract. Any property that is not included in the plan but is under the same ownership and is adjacent must be plotted.

e. Existing sewage facilities on adjacent lots and proposed sewage facilities to serve the development project. (location of collection lines, pump stations, etc.). These areas may be identified by use of a legend. Actual locations of tap-ins, sewer extensions, force mains, or pump stations that will be utilized by the project should be identified.

f. The point of connection to the existing collection system. All proposed collection lines must be shown to the point of connection to the existing system.

g. Existing and proposed water supplies (wells, reservoirs, etc.) and surface water (ponds, detention facilities, lakes, streams) on the adjacent land and proposed development.

h. Existing and proposed rights-of-way. Proof of legal recording of rights-of-way may be required when the right-of-way is necessary to implement the sewage facilities alternative.

i. Existing and proposed buildings, streets, roads, access roads, highways, etc.

j. Open space areas designated within the proposed development and any parks, state forests or other state land adjacent to the development.

k. Wetland areas. DEP is required to protect the wetlands of the Commonwealth from unnecessary destruction. Show any wetland areas on the plot plan as they are identified by hydric soils in USDA Natural Resources Conservation Service maps and by National Wetland Inventory mapping. If there is disagreement with the mapping, or wetlands are present and they are not shown in the mapping, plot the results of actual in-field delineation of the wetlands on the plan. Use the delineation process required by Title 25 of the Pennsylvania Code, Chapter 105, §105.451, Identification and Delineation of Wetlands-Statement of Policy.

   If wetlands are present, the applicant may be required to obtain permits for any construction activities such as encroachments (fill, roads, utility lines) or obstructions (bridges, walls, piers) in, along, or across the wetlands. Contact the DEP regional office for further information.

   Full delineation may be required as a condition of permit issuance, including issuance of onlot system permits, Clean Streams Law permits, or encroachment or obstruction permits for construction activities in,

along, or across wetlands. The plot plan must distinguish between in-field delineations and transcribed mapping from existing sources.

l. Flood Plains. These areas should be plotted on the plan as they are indicated in Federal Emergency Management Agency Flood Plain mapping or USDA Natural Resources Conservation Service mapping.

m. Prime agricultural land listed by the USDA Natural Resources Conservation Service as "Pennsylvania Prime Farmland Soils", or soils listed as Capability Classification I, II or III in the USDA Natural Resources Conservation Service Soil Survey.

n. Existing onlot or sewerage systems, pipelines, transmission lines, etc. Show any facilities currently in use or abandoned.

o. Orientation to north, usually shown by a directional arrow.

p. Show the locations of any sites where tests were performed in accordance with Sections K, L, M and/or N (if applicable). All soil profile test pit evaluations and slope measurements should be recorded on "Site Investigation and Percolation Test Report" (3800-FM-WSFR0290A, formerly known as "Appendix A") forms available on DEP's website.

q. Show soil types and boundaries when a land based system is proposed.

r. Show topographic lines with elevation when a land based system is proposed.

5. Wetland Protection

a. DEP is required to protect the wetlands of the Commonwealth from unnecessary destruction. The applicant is required to answer "yes" or "no" to the question of whether there are any wetlands in the project area. If yes, show these areas on the plot plan as they are identified by hydric soils in USDA Natural Resources Conservation Service maps or by National Wetlands Inventory mapping. If there is disagreement with the mapping, or if wetlands are present and are not shown on the mapping, plot the results of actual in-field identification of the wetlands on the plan. Use the identification process required by Title 25 Pa. Code Chapter 105, §105.451, Identification and Delineation of Wetlands - Statement of Policy.

b. If wetlands are present, indicate with a yes or no answer if the project is proposing any construction activities such as encroachments (fill, roads, utilities) or obstructions (bridges, walls, piers) in, along or across the wetlands. If any of these are proposed, please contact the DEP regional office for further information. Full delineation may be required as a condition of permit issuance, including issuance of Clean Streams Law permits, encroachment or obstruction permits for construction activities in, along, or across wetlands. The plot plan must distinguish between in-field delineations and transcribed mapping from existing sources.

6. Primary Agricultural Land Protection

Indicate whether the project involves the disturbance of prime agricultural lands. If the project will result in the disturbance of these lands, it must be consistent with policies and procedures established by the municipality for protection of prime agricultural lands. The project sponsor and local officials must rectify land use problems prior to submission of the sewage facilities planning module package to DEP for review.

7. Historic Preservation Act

Coordination with the Pennsylvania Historic and Museum Commission (PHMC) is necessary for proposals meeting conditions specified in DEP's *Implementation of the PA State History Code DEP ID: 012-0700-001.* Specific documentation required to be submitted with this planning module package is found in the Technical Guidance, available online at the DEP website at www.dep.state.pa.us, select "Subjects" then select "Technical Guidance". As a minimum this includes copies of the completed Cultural Resources Notice (CRN), a return receipt for its submission to the PHMC and the PHMC review letter.

SECTION H. ALTERNATIVE SEWAGE FACILITIES ANALYSIS

This section is used to document that the proposed sewage disposal method is appropriate for the project both over the short-term (5 years) and long-term (beyond 5 years). Local government officials should be consulted in completing this

analysis. The analysis consists of a narrative that describes land uses, sewage disposal methods, sewage management programs and a comparison of existing methods of sewage disposal in the area with the proposed method of sewage disposal. The analysis is used by the municipality and approving agency to determine if the chosen disposal method will have an impact on future municipal sewer service to these areas, and whether other potential methods of sewage disposal could better serve the sewage facilities needs of the area as a whole. Attach the narrative to the planning module and title it **"Alternatives Analysis."**

To complete the analysis, include the information listed below.

1. Describe the chosen disposal method, its location, the daily flow proposed and if the method is an interim method (to be replaced by the ultimate method in 5 years or less), or is an ultimate method (to serve the development in the long term, for 5 years or more). Also provide the number of lots or EDU's that will be served.

2. Describe the types of land uses adjacent to the project area (Agricultural, Residential, Commercial etc.) and the type of sewage disposal method serving each of those land uses.

   Properties adjacent to the project must be described by indicating present land uses and zoning designations. Describe the sewage disposal methods being used for each of those adjacent land uses (onlot, municipal treatment, etc.) and if those methods are intended for interim or ultimate use.

3. Indicate if the sewage facilities described in (2) are in need of improvement due to high rates of onlot malfunction or overloaded public sewers. Is there a potential for a combined public/private project?

   If any of the sewage facilities described above are in need of improvement due to overloaded treatment facilities or high onlot malfunction rates, a combined sewage disposal alternative that proposes to upgrade or construct facilities to serve these needs areas as well as the proposed project area may be more viable than a method intended to serve only the current project.

4. Determine and indicate what sewage disposal method is proposed for the development area in the municipality's Official Sewage Facilities Plan (such as: onlot disposal systems, public sewers, etc.).

5. Describe any existing sewage management program(s) in the area, and/or any sewage management program(s) that this project would be required to participate in, and that program's requirements.

   When the alternatives analysis includes the potential construction of DEP-permitted **non-municipal** sewage treatment facilities, the municipality is required to implement a sewage management program that must include one of the management options outlined in Title 25, Pennsylvania Code, §71.72 (available at www.pacode.com). These options range from financial assurances to municipal ownership of the facility. The applicant should describe which option will be proposed, how it will be implemented, and why it was chosen over the other methods outlined in §71.72. Details of the chosen option must be included.

6. Describe any potential alternative sewage disposal methods that are available for the project. Consider all reasonable possibilities for sewage disposal, such as a stream discharge or an alternate method of land disposal. The municipality, delegated local agency or DEP may also require consideration of particular types of sewage disposal methods in the analysis.

7. Describe why the proposed method was chosen over any of the other methods described in the alternatives analysis. Environmental, administrative, and financial concerns may be addressed. Also indicate how the chosen method will guarantee adequate sewage disposal for the development in both the short-term (up to 5 years) and long-term (beyond 5 years) by describing the adequacy of the proposed facilities (organic and hydraulic loading) and the ability of the facility to accept additional flows or loads.

8. Indicate who will be the owner of the facility, and who will be responsible for operation and maintenance of the facility.

   To assure adequate long-term sewage disposal for the project, the disposal system must be properly operated and maintained. The applicant must indicate in the analysis who will be the owner of the facility and who will be responsible for the operation and maintenance of the facility. This may be a private individual, a municipality, a sewer authority or a management agency; however, the ultimate responsibility lies with the municipality. The delegated local agency or DEP may require a more extensive analysis of the available choices relative to ownership and operation of the facility. If the project will be required to participate in an **EXISTING** municipal sewage management program, or if a sewage management program is to be created, describe the program's requirements. Sewage management programs can consist of requirements for tank pumping, ordinances requiring maintenance of systems, or financial arrangements (fees, taxes, etc.) guaranteeing long-term operation of the treatment facilities.

9. Finally, the applicant may use the narrative to describe any special considerations or provide any additional information that supports the choice of disposal method. The alternatives analysis must be attached to the planning module package for review by the municipality and approving agency.

SECTION I. PROTECTION OF RARE, ENDANGERED OR THREATENED SPECIES

DEP's technical guidance document "Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation," (400-0200-001) requires DEP to ensure that requests for authorizations, are coordinated with the Department of Conservation and Natural Resource's (DCNR) Pennsylvania Natural Diversity Inventory (PNDI).

Conducting a search of the PNDI database and providing a copy of a "PNDI Project Environmental Review Receipt" for the proposed project and, if potential impacts are identified by the search, any clearance or recommendation letters from the jurisdictional agency responsible for the particular species identified by the search, satisfies this requirement.

To avoid project delay, self explanatory, self conducted "PNDI Project Planning Environmental Review" searches are initiated at www.naturalheritage.state.pa.us. This interactive, online search will ask questions about the proposed project and provide the appropriate receipt, instructions or additional information regarding coordination with jurisdictional agencies.

As an alternative to the self conducted search, project sponsors may request DEP staff to conduct the search by providing a completed "PNDI Project Planning & Environmental Review Form" (PNDI Form). The form is available at www.naturalheritage.state.pa.us. Individuals making this request should be aware that, due to the nature of the search software, DEP staff may need to contact them for additional information to successfully complete the search and that exclusive of any other items, their sewage planning module submission is considered incomplete by DEP, until the appropriate receipt, clearance or recommendation letters are received.

For more information, see the "Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation," (400-0200-001), available on line in the eLibrary at DEP's website address www.dep.state.pa.us.

SECTION J. CHAPTER 94 (MUNICIPAL WASTELOAD MANAGEMENT) CONSISTENCY

(Complete if box is marked in component)

Owners of municipal sewage systems are required to prepare annual Wasteload Management reports in accordance with Title 25 of the Pennsylvania Code, Chapter 94. The reports provide detailed information on collection, conveyance and treatment system flows and organic loads relative to available capacity. Loads and flows are projected 5 years into the future based on planned development. If the system or any part of the system shows or projects an overload, a **corrective action plan (CAP)** to address the need is developed. Overloaded systems result in prohibitions and bans on additional connections. It is important that the applicant know how the project will impact or change the wasteload management of the system to which his/her project will connect.

To complete this section:

1. List the anticipated project flows in gallons per day (gpd).

2. When providing "treatment facility" sewage flows, use Annual Average Flow for "Average" and Maximum Monthly Average Flow for "Peak" in all cases. For "peak flows" in "collection" and "conveyance" facilities, indicate whether these flows are "peak hourly flow" or "peak instantaneous flow" and how this figure was derived (i.e., metered, measured, estimated, etc.).

    a. Provide the design maximum monthly average and peak flows for proposed facilities, or the permitted average and peak capacity for existing facilities that will serve the project. This information can be obtained from the system designer or facility permittee.

    b. Provide the present maximum monthly average flows and peak flows in gallons per day for the critical (most hydraulically restricted) sections of existing facilities. The facility permittee can provide this information.

c. Provide the projected maximum monthly average and peak flows in five years (two years for pump stations) through the critical sections of existing facilities. Include existing, proposed and future projects. In this fashion, consideration is given to present flow, flows from other approved projects, allocated capacity, and the proposed project flows. This information can be obtained from the facility's Chapter 94 report. If the project will affect more than one municipality or authority, please provide this information for each.

The values entered in the table for existing facilities should represent flows through those areas of the sewage pathway that are most restricted in hydraulic carrying capacity. Contact the facility permittee or the individual responsible for preparing the Chapter 94 report for this information. If information is not available from these sources, a physical inspection of the facilities may be required. Based on this inspection, carrying capacity may be calculated using slope and diameter of the collection or conveyance system and the size of such facilities as pump stations and treatment facilities. If flow information on critical sections cannot be determined based on calculations, flow measurements may be conducted for a representative period of time (to include both wet and dry weather conditions) for a minimum of seven days. This information must then be used to determine the flow through these sections. Proposed facilities must use design values to complete the table for design and projected flows. **COLLECTION** refers to pipelines and conduits. **CONVEYANCE** refers to pump stations and force mains, interceptors, trunk sewers, or any other appurtenant facility used for conveying sewage to a plant. **TREATMENT** refers to the sewage treatment plant to be used.

3. & 4. The person responsible for preparing the Chapter 94 report for each of the collection, conveyance and treatment systems that are planned for use must sign the form. In most cases, the Chapter 94 report preparer is an employee or representative of the treatment facility permittee. Contact the owner or permittee of each facility to determine if this is the case for your project. The signoff will indicate that there is adequate capacity available for the project's sewage disposal needs as required in §71.53(d)(3), and that the additional load will not negatively impact the Chapter 94 status of the facility, taking into account projected loads and any previously allocated capacity. If the project will negatively impact the Chapter 94 status of the facility, the project cannot be approved. In some cases, DEP has approved a CAP for the allocation of connections to systems where flow or loading problems exist. Where CAPs are in effect, the project may be approved based on these allocations. If this is the case, the Chapter 94 report preparer should attach a letter that grants these allocations to the project. In some cases, municipalities have an approved list of projects for the allocation of connections; in other instances, a municipality has a general allocation. The letter should indicate if the allocation is from an approved list or is part of a general allocation.

SECTION K. TREATMENT AND DISPOSAL OPTIONS

(Complete only if marked in component)

Three options are available for the disposal of treated sewage effluent: (1) spray irrigation or other land application, (2) discharge to a dry stream channel, or (3) discharge to a perennial surface water body. Each of the three options has technical requirements that must be met before the planning module can be approved. The following paragraphs describe the type of information that must be included for each of the three discharge alternatives.

1. Spray Irrigation or other Land Application

   For more detailed information, see DEP's "*Manual For Land Application of Treated Sewage and Industrial Wastewater*" DEP ID: 362-2000-009 (available on the DEP website at www.dep.state.pa.us PA Keyword "Wastewater"), and the EPA documents "Guidelines for Water Reuse" (EPA/625/R-92/004) and "Land Treatment of Municipal Wastewater" (EPA/625/1-81-013).

   a. Ensure the proposed spray or land application field provided in Section G4 of this form depicts sufficient contour lines to allow the determination of slopes in the area of the proposed system. Please note that proposed spray sites may not be suitable on slopes greater than 8 percent. In agricultural areas with somewhat poorly drained soils, the slope may even be limited to 4 percent. Careful evaluation of the slope versus the soils characteristics must be completed to ensure that the effluent will not run off. DEP recommends that the applicant consult a soils scientist for assistance when slope constraints are encountered on a site.

   b. Describe the proposed effluent discharge rate and quality, including any seasonal variations, in sufficient detail to allow DEP to assess their impact on the suitability of the site. These criteria can affect both the suitability of the site for the use of land application and spray systems and the size of the area needed. The

specific soil conditions present on the site will determine how much effluent can be treated and discharged on the site.

c. Since land application systems depend upon the soil and underlying geology of a site for adequate treatment and disposal of treated sewage effluent, provide additional site-specific soil testing information, including soils horizons and permeability testing, to document the suitability of the soils on the site. Please give DEP verbal or written notification at least 10 days prior to testing to allow DEP staff the option to observe the testing. Please note that, although some sites that cannot meet the soils suitability criteria for onlot systems may be suitable for spray irrigation or land treatment, systems may still not be approvable in areas having the following soils conditions:

- Severely and moderately eroded phases of shallow, well drained soils;
- Severely eroded phases of moderately well-drained soils;
- Poorly drained soils;
- Floodplain soils (as mapped during flood insurance studies of the municipality)

d. Submit documentation that drinking water supplies will be protected, including a brief description of the topographic setting of the spray field in relation to the discharge rate and quantity and the location of proposed and existing water supplies in the area of the proposed spray site. If land application discharge is proposed, document that existing water supplies or groundwater uses will be protected for 200 feet on either side of the ditch or swale from the discharge point until perennial conditions are encountered and that the effluent will not create a public health hazard or nuisance.

2. Dry Channel Stream Discharge

If a discharge is proposed to a dry stream channel:

a. On a 7.5' USGS topographic map, show the property lines of the development and the point of discharge.

b. Specify the quality and rate at which sewage effluent will be discharged. Seasonal variations in the discharge flows should also be discussed if they are proposed. (*Contact the appropriate regional office regarding their procedure concerning the timing for determination of preliminary effluent limits.*)

c. Justify the proposed discharge point: Identify existing water supplies or groundwater uses for 200 feet on either side of the channel from the discharge point until perennial stream conditions (point of first use) are encountered. Document that existing and proposed drinking water uses will be protected and that the discharge effluent will not create a public health hazard or nuisance.

Note: If unable to comply with the provisions of paragraph c, the discharge location may be relocated to a point where perennial stream conditions exist. All necessary rights-of-way needed to reach the new discharge point must be obtained and included, or letters of intent to grant right-of-way from landowners, municipalities, agencies, etc., must be included with the planning module submission.

3. Perennial Surface Water (Stream) Discharge

If a discharge to perennial surface waters is proposed:

a. On a 7.5' USGS topographic map, show the property lines of the development and the point of discharge to the stream. Label the stream name. If the discharge is to an unnamed tributary of a stream, label the first-named body of water on the map.

b. Specify the quality and rate at which sewage effluent will be discharged to the stream. DEP may evaluate the stream flow and current quality of the stream to determine if the level of treatment proposed is sufficient, or if additional treatment is needed. Seasonal variations in the discharge flows should also be discussed if they are proposed. (*Contact the appropriate regional office regarding their procedure concerning the timing for determination of preliminary effluent limits.*)

SECTIONS L, M, N. PERMEABILITY AND HYDROGEOLOGY

(Complete if marked in component)

In certain situations, permeability testing and hydrogeology studies must be completed for the proposed development. These sections should be completed if marked. Sections M and/or N should be completed and sealed by a registered professional geologist familiar with the requirements of these sections. This person should contact the DEP hydrogeologist for further guidance.

SECTION L. PERMEABILITY TESTING

(Complete if marked in component or if the conditions in number 1 (below) apply)

1. Completion of this section may be required when any of the following exist:
   a. An onlot system with a total absorption area greater than 5,000 square feet will be used.
   b. DEP has determined that the soil, underlying parent material, geology at the site, or volume of the discharge may cause adverse groundwater mounding or inadequate sewage treatment.
2. The following information is to be submitted:
   a. Description of the soils and geology at the site and the characteristics of these which may limit the horizontal or vertical movement of sewage.
   b. Description, location and results of any permeability testing performed, including:
      (1) Identification and description of restrictive layers of soil, parent material and bedrock.
      (2) Rate of flow through and laterally over those restrictive layers (in inches per hour).
      (3) Calculation of potential groundwater mounding expected from the additional flows.
   c. Recommendations on system design modifications needed because of poor permeability, including absorption area sizing or placement and dosing rates for onlot overland flow.

   Note: DEP may require more detailed hydrogeologic information based on the information submitted in this section.

SECTION M. PRELIMINARY HYDROGEOLOGIC STUDY

(Complete if marked in component or if the condition from number 1 (below) apply)

Hydrogeologic work requires an appropriate professional signature and seal.

1. This section must be completed when soil-dependent treatment methods are proposed and any of the following apply:
   a. A large volume system (a system designed for flows greater than 10,000 gpd) will be used.
   b. A subdivision of more than 50 EDUs with a density of more than one EDU per acre is proposed.
   c. DEP has determined that water supplies within ¼ mile of the proposed development site exceed 5 parts per million (ppm) nitrate-nitrogen (NO3-N).
   d. DEP has determined that known geological conditions at the proposed site may contribute to the potential for groundwater pollution from such systems.
2. The following information is to be submitted on a copy of the topographic map of the area and in narrative form:
   a. Results of background sampling for total coliform, fecal coliform, pH, and nitrate-nitrogen.
   b. If as a part of a Preliminary Hydrogeologic Study a well is drilled to assess the background nitrate-nitrogen concentrations in the shallow groundwater, the hydrogeologist shall provide a log of the well or wells. The log or logs shall provide the date of drilling, total well depth, depth to bedrock, depth to bottom of casing, depth to all water bearing zones, and the static water level. The well logs do not need to be graphical. In addition, the

report should contain a discussion of the well purging protocol used prior to well sampling. The protocol must assure that a fresh sample is obtained from the shallow aquifer.

c. Topographic location of the proposed system(s).

d. Estimated area of impacted groundwater (dispersion plume and mixing zone within the dispersion plume) calculated from the surface topography and known geologic conditions.

e. Identification of existing and potential groundwater uses within the dispersion plume.

Note: Based on the information submitted in this section, DEP may require more detailed hydrogeologic information (Section N, below).

SECTION N. DETAILED HYDROGEOLOGIC STUDY

(Complete if marked in component or if DEP determines during the planning proves that the additional study is necessary)

Hydrogeologic work requires an appropriate professional signature and seal. A detailed hydrogeologic study must be completed when the proposed system(s) may degrade groundwater or surface water to the point that existing or potential groundwater uses or designated stream uses may not be protected. Often specific tasks listed in the detailed hydrogeologic study will satisfy DEP concerns. Since the level of study necessary for a particular site may vary, it is recommended the DEP regional hydrogeologist be contacted to determine the level of study necessary for a project.

A. Content of Detailed Hydrogeologic Study

The following information must be included in the detailed hydrogeologic study using narrative and/or maps as appropriate.

1. Type of discharge to groundwater. This includes:
   a. Dry stream channel
      (1) Intermittent stream (dry under low flow conditions)
      (2) Stormwater drainage ditch (flow in wet season or during and immediately after storms)
   b. Onlot subsurface disposal
      (1) Individual onlot systems
      (2) Community onlot systems
      (3) Large Volume onlot systems
   c. Land Application
      (1) Spray irrigation
      (2) Unlined wetland cell
      (3) Groundwater infiltration
2. Plot the topographic location of the discharge.
3. The relationship between surface water and groundwater flow.
4. Investigate, describe and plot geologic and hydrogelogic characteristics influencing groundwater flow. These characteristics include but are not limited to the following:
   a. Bedrock formations, lithologic description and range of depth
   b. Bedding features, the frequency and direction of dominant joints and fractures
   c. Faults, lineaments and earth fracture traces
   d. Karst features such as open and closed sinkholes, closed depressions, known solution channels, pinnacles or other specific featues
   e. Unconsolidated material characteristics (soil, glacial materials, fluvial materials, etc.)

f. Unconsolidated bedrock characteristics (saprolite, weathered zones)

g. Elevation of the permanent groundwater table, anticipated water table fluctuation and groundwater flow direction

h. Unconfined or confined aquifer characteristics

i. Aquifer flow characteristics as quantified through pump testing or other characterization methodology (i.e., hydraulic conductivity, storage coefficient, transmissivity, etc.)

j. Existing, planned and potential down-gradient groundwater uses including, but not limited to: all water supply locations; the volume of water used at these locations; the estimated horizontal extent of each well's cone of depression; and the influence of pumping upon the natural groundwater gradient, the direction of flow and including both existing and potential water supplies.

5. Groundwater/surface water characteristics, including:

a. If as part of a Detailed Hydrogeologic Study a well is drilled to assess the background nitrate-nitrogen concentrations in the shallow groundwater, the hydrogeologist shall provide a log of the well or wells. The log or logs shall provide the date of drilling, total well depth, depth to bedrock, depth to bottom of casing, depth to all water bearing zones, and the static water level. The well logs do not need to be graphical. In addition, the report should contain a discussion of the well purging protocol used prior to well sampling. The protocol must assure that a fresh sample is obtained from the shallow aquifer.

b. Existing groundwater quality and quantity, including, but not limited to, the following analyses:

1) Total coliform
2) Fecal coliform
3) pH
4) Total iron
5) Turbidity
6) Alkalinity
7) Nitrate-Nitrogen
8) Chloride
9) Ammonia-Nitrogen
10) Total manganese
11) Sodium
12) Magnesium
13) Calcium
14) Potassium
15) Sulfate
16) Total Dissolved Solids
17) Hardness
18) Volatile Organic Compounds

c. The name, location, flow characteristics, flow volume (cfs), existing water quality and designated use of any potentially impacted surface water (receiving stream). Include all surface water uses as listed for the waterbody in Chapter 93.

d Influence of surface water runoff and groundwater recharge on groundwater characteristics.

e. Designation of any watershed area that is utilized for a water supply, recreation, or agricultural irrigation.

f. Any other information necessary to adequately analyze the hydrogeologic impact by the proposed facility.

B. Detailed Hydrogeological Study Analysis and Report

Using the information gathered, describe and analyze the proposed facility's impact. Use narrative and mapping where appropriate. A complete study should include, but not be limited to, the following items:

1. Discuss pre-treatment system components proposed to decrease effluent contaminant levels prior to groundwater discharge. Include design and testing data submitted to support any long-term, consistent, reliable, and measurable treatment claims.

2. Delineate any dispersion plume in which the existing water quality will be degraded. Include all identified contaminant and hydrogeological variables from the site in this analysis.

3. Describe any natural condition and/or artificial control that confines dispersion plume flow.
4. Delineate a mixing zone within the dispersion plume where any chemical or biological concentrations will exceed rates in Federal Drinking Water Quality Standards.
5. Identify a buffer zone for the dispersion plume and mixing zone and also discuss the effects of seasonal weather conditions on this zone.
6. Discuss impacts on existing, planned and potential groundwater uses in the delineated dispersion plume, mixing zone and buffer zone.
7. Discuss any surface water bodies that may intercept, or interact with the dispersion plume.
8. Predict and quantify any impacts the identified dispersion plume will have upon the uses listed for that surface water body.
9. Predict any effects of the dispersion plume on all existing, planed or future groundwater uses.
10. Predict the extent and height of any groundwater/wastewater mound resulting from restrictive layers in the subsurface. Restrictive layers may include, but are not limited to restrictive soil horizons, unconsolidated geological materials, weathered bedrock materials, low permeability bedrock, or a permanent groundwater table.
11. Discuss any physical, chemical or biological impact to groundwater, surface water or treatment facility function resulting from the formation of a groundwater/wastewater mound. Soil is often part of the treatment process and for analysis purposes may be considered part of the treatment facility.
12. Discuss and propose any system change or recommendations deemed necessary to mitigate the effects of the identified groundwater/wastewater mounding.
13. Discuss any groundwater monitoring program necessary to guard against adverse impacts from the facility. The program should include proposed monitoring well locations, appropriate groundwater sampling methodologies, appropriate chemical and biological sampling parameters, and appropriate monitoring frequencies. If appropriate, include monitoring considerations to protect existing surface water uses.
14. Discuss authority for controlling groundwater uses within the mixing and buffer zones. Such items as, groundwater easements and access rights that are necessary for mitigation or abatement purposes, should be discussed.
15. Discuss contingency plan to abate pollution if groundwater monitoring reveals a problem.

SECTION O. SEWAGE MANAGEMENT

This section is to be completed by the developer, representatives of the non-municipal treatment facilities and the municipality.

1. & 2. (Developer) List the anticipated project flows in gallons per day (gpd).

3. & 4. (Non-municipal Facility Agent) The person responsible for the collection, conveyance, and treatment system (normally the facility permittee) planned for use must answer the questions and sign the form. Attach the analysis necessary to properly answer the capacity questions. Evaluate the various options available to the municipality to assure long-term proper operation and maintenance of the proposed non-municipal facilities.

5. (Municipality) DEP permitted non-municipal sewage facilities and community onlot sewage systems permitted by a local agency require long-term operation and maintenance to keep them working correctly and to prevent public health hazards or pollution caused by a discharge of inadequately treated sewage effluent. When these systems fail due to lack of adequate operation or maintenance, DEP holds both the property owner and the municipal government responsible to either repair or replace the improperly functioning system. The municipality should protect itself from potential future liabilities associated with improperly operated or maintained sewage disposal systems by assuring that guarantees of long-term operation and maintenance are properly evaluated and in place before use of the facility is approved.

DEP regulations, §71.72 requires that all planning modules proposing non-municipal and community onlot systems include an evaluation of the options available to assure long-term proper operation and maintenance of the proposed

facilities. Prior to adoption of the planning module the municipality shall require one or more or a combination of the following:

1. A bond or escrow account sufficient to cover the costs of future operation and maintenance of the sewage facilities under local ordinances. Bonding, escrow or other security shall be forfeited to the municipality upon notice by DEP of continuing noncompliance of the system with the operation and maintenance standards established through a condition in the permit issued by DEP or the local agency. (For additional details on this option refer directly to §71.72(a)(1)).

2. A maintenance agreement between the property owner and an individual, firm or corporation experienced in the operation and maintenance of sewage treatment systems.

3. A maintenance agreement between the property owner and municipality or its designated local agency which establishes the property owner's responsibility for operating and maintaining the system and the responsibility of the municipality or local agency for oversight of the system.

4. A municipal ordinance which requires the system to be operated and maintained through a maintenance agreement between the property owner and an individual, firm or corporation experienced in the operation and maintenance of sewage treatment systems.

5. Establishment of a properly chartered association, trust or other private entity which is structured to manage the system.

   a. **ASSOCIATIONS** must meet the following minimum requirements to be considered adequate:

      (1) The association must be nonprofit and incorporated or must be a co-op under the Public Utility Commission's jurisdiction.

      (2) Articles of Incorporation and Bylaws must:

         (a) limit the purpose of the association and stipulate that funds collected for sewerage services be disbursed only in payment for expenses of these systems.

         (b) provide for membership and voting rights for each owner of an improved property in the development.

         (c) provide for suspension of service to property owners for non-payment of bills.

         (d) stipulate that the corporation owns the sewerage facilities.

         (e) establish the capability of the association to:

            - keep records and an accounting/auditing system
            - collect fees for services provided
            - disburse funds
            - contract with public or private agencies for labor or other services
            - employ personnel to operate and maintain sewage facilities
            - establish contingency funds for use in repairing system components
            - have elected officer and bylaws.

         (f) establish association membership as a deed restriction and condition of sale of the property.

         (g) establish the legal right to enter upon property for routine inspections or maintenance and to respond to emergencies.

(h) establish assurance that adequate operation and maintenance funds are available from the start of the sewerage system operation.

b. Properly chartered **TRUSTS** must meet the following minimum requirements to be considered adequate:

(1) The sewage facilities are legally conveyed to a third party (trustee) through a trust deed.

(2) The trust deed contains specific provisions which require the original owner of the facilities to:

(a) Maintain the sewage system in accordance with normally accepted operation and maintenance standards and permit conditions at all times.

(b) Provide continued service to each property connected to the sewage facilities.

(c) Provide service at a rate established in the trust deed or by action or regulation of the Public Utilities Commission.

(3) The Trust Deed states that upon the original owner's default on any of the Trust Deed provisions, the Trustee named has the authority and responsibility to take possession, operate and manage the sewage facilities.

6. Municipal ownership of the system.

7. Establishment of, or inclusion of, the system under a management agency through existing municipal codes, including but not limited to municipal authorities, sanitary boards and boards of health.

8. Establishment of, or inclusion of, the system under a management agency through the adoption of local ordinances under municipal codes.

SECTION P. PUBLIC NOTIFICATION REQUIREMENTS

If publication is required under Section 71.53(d)(6), the published notice must certain facts about the project in a newspaper of general circulation within the municipality affected to provide a chance for the general public to comment on proposed new land development projects. The applicant or the applicant's agent, the municipality or the local agency, may provide this notice. Where an applicant or an applicant's agent provides the required notice for publication, the applicant or applicant's agent shall notify the municipality or local agency and that municipality or local agency will be relieved of the obligation to publish.

Contents of Publication Notice. The following items must be contained in the notice:

1. Name of project.
2. Type of development (residential, multi-residential, commercial, industrial).
3. Location, including road and street markers, municipality and county.
4. Acreage under development and number of equivalent dwelling units proposed.
5. Type of sewage disposal proposed (individual, community or large volume onlot, holding tanks).
6. Reason why publication was necessary.
7. Establishment of a 30 day comment and review period.
8. Where and when the Sewage Facilities Planning Module can be seen for comment and review (preferably, the municipal office).
9. Address of municipal office where comments will be accepted.

All comments, the municipal responses to comments, and proof of publication shall be submitted with the Sewage Facilities Planning Module package. If no comments were received, attach a copy of the public notice and check the appropriate box in Section P.

SECTION Q. FALSE SWEARING STATEMENT

The final requirement of the component requires the person who has completed the component to provide the requested information and acknowledge the false swearing statement by signing and dating the form.

SECTION R. REVIEW FEES

The Sewage Facilities Act establishes a fee for the DEP planning module review. DEP will calculate the review fee for the project and invoice the project sponsor **OR** the project sponsor may attach a self-calculated fee payment to the planning module prior to submission of the planning package to DEP. (Since the fee and fee collection procedures may vary if a "delegated local agency" is conducting the review, the project sponsor should contact the "delegated local agency" to determine these details.) After consideration of the options available, please check the appropriate box in the Component 3 form attached.

Planning module review fees for a Component 3 submission may be determined using the following formulae:

1. For a new collection system (with or without a Clean Streams Law Permit), a collection system extension, or individual tap-ins to an existing collection system use this formula.

   # _____ Lots (or EDUs) X $50.00 = $ _____

   The fee is based upon:
   - The number of lots created or number of EDUs whichever is higher.
   - For community sewage system projects one EDU is equal to a sewage flow of 400 gallons per day.

2. For a surface and subsurface discharge system use the appropriate one of these formulae.

   A. A new surface discharge greater than 2000 gpd will use a flat fee:
   $ 1,500 per submittal (non-municipal)
   $ 500 per submittal (municipal)

   B. A sub-surface discharge system that requires a permit under the Clean Streams Law will use a flat fee:
   $ 1,500 per submittal (non-municipal)
   $ 500 per submittal (municipal)

   C. An increase in an existing discharge (not addressed in R1 above) will use:
   # _____ Lots (or EDUs) X $35.00 = $ _____
   to a maximum of $ 1,500 per submittal (non-municipal) or $ 500 per submittal (municipal)
   The fee is based upon:
   - The number of lots created or number of EDUs whichever is higher.
   - For community sewage system projects one EDU is equal to a sewage flow of 400 gallons per day.
   - For non-single family residential projects, EDUs are calculated using projected population figures.

OTHER REQUIREMENTS

Planning Agency Review

Component 4 *Planning Agency Review* form (3800-FM-WSFR0362 A, B, & C) available on DEP's website and a copy of the entire planning module package must be forwarded by the applicant to each existing municipal, county or areawide planning agency, and any existing county or joint county health department for their comments. The use of registered mail or certified mail (return receipt requested) by the applicant when forwarding the package to the agencies will provide proof of receipt. These agencies are required to provide comments within 60 days of receipt of the module package. The planning agencies will review the package for consistency with municipal and county official sewage facilities plans, municipal comprehensive plans, zoning, and land use designations. They will also determine consistency of the plan with wetland protection, storm water management, archaeological and historical resources, and prime agricultural land

protection as indicated in the comprehensive plan for the area. Proof that the package has been in front of these agencies for 60 days without comment will satisfy the review requirement. When the agencies return the package to the applicant, or if 60 days have passed without comment, the package may be submitted to the municipality for their action.

Municipal Review

1. For **REVISIONS** to the Official Plan (Approving agency: DEP)

   The municipality must determine if the planning module package is complete within 10 days of its receipt. If it is complete, the municipality must sign and date the checklist following this guidance to document the date of receipt of a complete module package. Incomplete packages are to be returned to the applicant for completion.

   The municipality must act upon a complete Component 3 planning module package within 60 days of receipt or within such additional time as the applicant and municipality may agree to in writing. Failure of the municipality to act within 60 days or within the agreed time extension will cause the planning module to be deemed approved by the municipality. The complete planning module, along with the signed and dated completeness checklist, may then be sent to DEP by the municipality or applicant for final review and approval.

   Municipal actions can include adoption of the planning module as a revision to the municipality's Official Plan, adoption of the revision with modifications, or denial of the revision. If the plan is adopted, the municipality forwards the revision, along with the signed and sealed Resolution for Plan Revision form and signed Transmittal Letter form, to DEP. Denied revisions are to be returned to the applicant with the reason(s) for denial. DEP must also be informed of the reasons for denial of the revision.

2. For **SUPPLEMENTS** to the Official Plan (Approving agency: delegated local agency)

   The municipality must determine if the planning module package is complete within 10 days of its receipt. If it is complete, the municipality must sign and date the checklist following this guidance to document the date of receipt of a complete module package. Incomplete packages are to be returned to the applicant for completion.

   The municipality must act upon a complete Component 3 planning module package within 60 days of receipt or within such additional time as the applicant and municipality may agree to in writing.

   Municipal actions include approval of the planning module as a supplement to the municipality's Official Plan, approval of the supplement with modifications, or denial of the planning module as a supplement to the Official Plan. If the supplement is approved, the municipality sends it to the delegated local agency serving the municipality for final review. If the supplement is denied, it is returned to the applicant with the reason(s) for denial. The delegated local agency and DEP must also be informed of the reasons for denial.

Approving Agency (DEP or Delegated Local Agency) Review

1. For **REVISIONS** to the Official Plan (Approving agency: DEP)

   DEP must determine if the planning module is complete within 10 days of receipt. If it is complete, DEP will do a technical review of the revision. DEP must approve or disapprove the planning module revision within 120 days of receipt, unless the planning module is for a residential subdivision plan, which requires DEP action within 60 days of receipt of a complete submission. If DEP fails to act within this 120 day period (60 days for residential subdivision plans), the planning module is deemed to be approved, unless DEP informs the municipality before the end of the review period that an extension of time is necessary to complete the plan review. This time extension may not exceed 60 days.

   The municipality and applicant will receive a letter informing them of DEP action. If the plan is disapproved, the municipality and applicant will also be notified of the reason(s) for the disapproval.

2. For **SUPPLEMENTS** to the Official Plan (Approving agency: Delegated local agency)

   The delegated local agency must determine if a proposed plan supplement is complete within 10 days of receipt. If it is complete, the delegated local agency must approve or disapprove the proposed plan supplement within 60 days or within an additional time that the applicant and delegated local agency agree to in writing. No additional approval by DEP is required unless the plan supplement proposes service by sewerage facilities requiring a new or modified permit from DEP under the Clean Streams Law. In this case, the plan supplement must be forwarded to the DEP for final action.

Completeness Checklist

The individual completing the component should use the checklist below to assure that all items are included in the module package. The municipality should confirm that the required items have been included within 10 days of receipt, and if complete, sign and date the checklist.

Sewage Collection and Treatment Facilities

- ☐ Name and Address of land development project.
- ☐ U.S.G.S. 7.5 minute topographic map with development area plotted.
- ☐ Letter from water company (if applicable).
- ☐ Project Narrative.
- ☐ Plot plan of project with required information.
- ☐ Information on selected treatment and disposal option.
- ☐ Details of chosen financial assurance method.
- ☐ Alternative Analysis Narrative.
- ☐ PNDI Project Planning and Environmental Review Form (search requested) or Project Environmental Review Receipt (search completed).
- ☐ Name of existing collection and conveyance facilities.
- ☐ Name and NPDES number of existing treatment facility to serve proposed development.
- ☐ Total sewage flows to facilities table.
- ☐ Signature of existing collection and/or conveyance Chapter 94 report preparer.
- ☐ Signature of existing treatment facility Chapter 94 report preparer.
- ☐ Letter granting allocation to project (if applicable).
- ☐ Signature acknowledging False Swearing Statement.
- ☐ Permeability information (if applicable).
- ☐ Preliminary hydrogeology (if applicable).
- ☐ Detailed hydrogeology (if applicable).
- ☐ Proof of Public Notification (if applicable).
- ☐ Completed Component 4 (Planning Agency Review) for each existing planning agency and health department.

Municipal Action

- ☐ Component 3 (Sewage Collection and Treatment Facilities).
- ☐ Component 4 (Planning Agency Comments and Responses).
- ☐ Proof of Public Notification.
- ☐ Long-term operation and maintenance option selection.
- ☐ Comments, and responses to comments generated by public notification.
- ☐ Transmittal Letter

_____
Signature of Municipal Official

_____
Date submittal determined complete

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

Code No.

SEWAGE FACILITIES PLANNING MODULE

Component 3. Sewage Collection and Treatment Facilities

(Return completed module package to appropriate municipality)

DEP USE ONLY				
DEP CODE #	CLIENT ID #	SITE ID #	APS ID #	AUTH ID #

This planning module component is used to fulfill the planning requirements of Act 537 for the following types of projects: (1) a subdivision to be served by sewage collection, conveyance or treatment facilities, (2) a tap-in to an existing collection system with flows on a lot of 2 EDU's or more, or (3) the construction of, or modification to, wastewater collection, conveyance or treatment facilities that will require DEP to issue or modify a Clean Streams Law permit. Planning for any project that will require DEP to issue or modify a permit cannot be processed by a delegated agency. Delegated agencies must send their projects to DEP for final planning approval.

This component, along with any other documents specified in the cover letter, must be completed and submitted to the municipality with jurisdiction over the project site for review and approval. All required documentation must be attached for the Sewage Facilities Planning Module to be complete. Refer to the instructions for help in completing this component.

REVIEW FEES: Amendments to the Sewage Facilities Act established fees to be paid by the developer for review of planning modules for land development. These fees may vary depending on the approving agency for the project (DEP or delegated local agency). Please see section R and the instructions for more information on these fees.

NOTE: All projects must complete Sections A through H, and Sections O through R. Complete Sections I, J, K, L, M and/or N if applicable or marked ☒.

A. PROJECT INFORMATION (See Section A of instructions)

1. Project Name

2. Brief Project Description

B. CLIENT (MUNICIPALITY) INFORMATION (See Section B of instructions)

Municipality Name	County	City ☐	Boro ☐	Twp ☐
Municipality Contact Individual - Last Name	First Name	MI	Suffix	Title
Additional Individual Last Name	First Name	MI	Suffix	Title
Municipality Mailing Address Line 1		Mailing Address Line 2		
Address Last Line -- City		State	ZIP+4	
Phone + Ext.	FAX (optional)	E-mail (optional)		

C. SITE INFORMATION (See Section C of instructions)

Site (Land Development or Project) Name

Site Location Line 1 | Site Location Line 2

Site Location Last Line -- City | State | ZIP+4 | Latitude | Longitude

Detailed Written Directions to Site

Description of Site

Site Contact (Developer/Owner)

Last Name | First Name | MI | Suffix | Phone | Ext.

Site Contact Title | Site Contact Firm (if none, leave blank)

FAX | E-mail

Mailing Address Line 1 | Mailing Address Line 2

Mailing Address Last Line -- City | State | ZIP+4

D. PROJECT CONSULTANT INFORMATION (See Section D of instructions)

Last Name | First Name | MI | Suffix

Title | Consulting Firm Name

Mailing Address Line 1 | Mailing Address Line 2

Address Last Line – City | State | ZIP+4 | Country

Email | Phone | Ext. | FAX

E. AVAILABILITY OF DRINKING WATER SUPPLY

The project will be provided with drinking water from the following source: (Check appropriate box)

- ☐ Individual wells or cisterns.
- ☐ A proposed public water supply.
- ☐ An existing public water supply.

If existing public water supply is to be used, provide the name of the water company and attach documentation from the water company stating that it will serve the project.

Name of water company: _____

F. PROJECT NARRATIVE (See Section F of instructions)

☐ A narrative has been prepared as described in Section F of the instructions and is attached.

The applicant may choose to include additional information beyond that required by Section F of the instructions.

G. PROPOSED WASTEWATER DISPOSAL FACILITIES (See Section G of instructions)

Check all boxes that apply, and provide information on collection, conveyance and treatment facilities and EDU's served. This information will be used to determine consistency with Chapter 93 (relating to wastewater treatment requirements).

1. **COLLECTION SYSTEM**

a. Check appropriate box concerning collection system

☐ New collection system ☐ Pump Station ☐ Force Main

☐ Grinder pump(s) ☐ Extension to existing collection system ☐ Expansion of existing facility

Clean Streams Law Permit Number _____

b. Answer questions below on collection system

Number of EDU's and proposed connections to be served by collection system. EDU's _____

Connections _____

Name of:

existing collection or conveyance system _____

owner _____

existing interceptor _____

owner _____

2. **WASTEWATER TREATMENT FACILITY**

Check appropriate box and provide requested information concerning the treatment facility

☐ New facility ☐ Existing facility ☐ Upgrade of existing facility ☐ Expansion of existing facility

Name of existing facility _____

NPDES Permit Number for existing facility _____

Clean Streams Law Permit Number _____

Location of discharge point for a new facility. Latitude _____ Longitude _____

3. **SOCIAL ECONOMIC JUSTIFICATION**

Yes No

☐ ☐ Will the proposed project result in a new or increased discharge into special protection waters as identified in Title 25, Pennsylvania Code, Chapter 93? If yes, attach the Social or Economic Justification (SEJ) required by Section 93.4c.

G. PROPOSED WASTEWATER DISPOSAL FACILITIES (Continued)

4. PLOT PLAN

The following information is to be submitted on a plot plan of the proposed subdivision.

a. Existing and proposed buildings.

b. Lot lines and lot sizes.

c. Adjacent lots.

d. Remainder of tract.

e. Existing and proposed sewerage facilities. Plot location of discharge point, land application field, spray field, COLDS, or LVCOLDS if a new facility is proposed.

f. Show tap-in or extension to the point of connection to existing collection system (if applicable).

g. Existing and proposed water supplies and surface water (wells, springs, ponds, streams, etc.)

h. Existing and proposed rights-of-way.

i. Existing and proposed buildings, streets, roadways, access roads, etc.

j. Any designated recreational or open space area.

k. Wetlands - from National Wetland Inventory Mapping and USGS Hydric Soils Mapping.

l. Flood plains or Floodprone areas, floodways, (Federal Flood Insurance Mapping)

m. Prime Agricultural Land.

n. Any other facilities (pipelines, power lines, etc.)

o. Orientation to north.

p. Locations of all site testing activities (soil profile test pits, slope measurements, permeability test sites, background sampling, etc. (if applicable).

q. Soils types and boundaries when a land based system is proposed.

r. Topographic lines with elevations when a land based system is proposed

5. WETLAND PROTECTION

	YES	NO	
a.	☐	☐	Are there wetlands in the project area? If yes, ensure these areas appear on the plot plan as shown in the mapping or through on-site delineation.
b.	☐	☐	Are there any construction activities (encroachments, or obstructions) proposed in, along, or through the wetlands? If yes, Identify any proposed encroachments on wetlands and identify whether a General Permit or a full encroachment permit will be required. If a full permit is required, address time and cost impacts on the project. Note that wetland encroachments should be avoided where feasible. Also note that a feasible alternative **MUST BE SELECTED** to an identified encroachment on an exceptional value wetland as defined in Chapter 105. Identify any project impacts on streams classified as HQ or EV and address impacts of the permitting requirements of said encroachments on the project.

6. PRIMARY AGRICULTURAL LAND PROTECTION

YES	NO	
☐	☐	Will the project involve the disturbance of prime agricultural lands? If yes, coordinate with local officials to resolve any conflicts with the local prime agricultural land protection program. The project must be consistent with such municipal programs before the sewage facilities planning module package may be submitted to DEP. If no, prime agricultural land protection is not a factor to this project.
☐	☐	Have prime agricultural land protection issues been settled?

7. HISTORIC PRESERVATION ACT

YES	NO	
☐	☐	Sufficient documentation is attached to confirm that this project is consistent with DEP's *Implementation of the PA State History Code*. As a minimum this includes copies of the completed Cultural Resources Notice (CRN), a return receipt for its submission to the PHMC and the PHMC review letter.

H. ALTERNATIVE SEWAGE FACILITIES ANALYSIS (See Section H of instructions)

☐ An alternative sewage facilities analysis has been prepared as described in Section H of the attached instructions and is attached to this component.

The applicant may choose to include additional information beyond that required by Section H of the attached instructions.

I. PROTECTION OF RARE, ENDANGERED OR THREATENED SPECIES (See Section I of instructions)

Check one:

☐ The "Pennsylvania Natural Diversity Inventory (PNDI) Project Environmental Review Receipt" resulting from my search of the PNDI database and all supporting documentation from jurisdictional agencies (when necessary) is/are attached.

☐ A completed "Pennsylvania Natural Diversity Inventory (PNDI) Project Planning & Environmental Review Form," (PNDI Form) available at www.naturalheritage.state.pa.us, and all required supporting documentation is attached. I request DEP staff to complete the required PNDI search for my project. I realize that my planning module will be considered incomplete upon submissin to the Department and that the DEP review will not begin, and that processing of my planning module will be delayed, until a "PNDI project Environmental Review Receipt" and all supporting documentation from jurisdictional agencies (when necessary) is/are received by DEP.

Applicant or Consultant Initials _____.

☐ J. CHAPTER 94 CONSISTENCY DETERMINATION (See Section J of instructions)

Projects that propose the use of existing municipal collection, conveyance or wastewater treatment facilities, or the construction of collection and conveyance facilities to be served by existing municipal wastewater treatment facilities must be consistent with the requirements of Title 25, Chapter 94 (relating to Municipal Wasteload Management). If not previously included in Section F, include a general map showing the path of the sewage to the treatment facility. If more than one municipality or authority will be affected by the project, please obtain the information required in this section for each. Additional sheets may be attached for this purpose.

1. Project Flows _____gpd
2. Total Sewage Flows to Facilities (pathway from point of origin through treatment plant)

   When providing "treatment facilties" sewage flows, use Annual Average Flow for "average" and Maximum Monthly Average Flow for "peak" in all cases. For "peak flows" in "collection" and "conveyance" facilities, indicate whether these flows are "peak hourly flow" or "peak instantaneous flow" and how this figure was derived (i.e., metered, measured, estimated, etc.).

   a. Enter average and peak sewage flows for each proposed or existing facility as designed or permitted.

   b. Enter the average and peak sewage flows for the most restrictive sections of the existing sewage facilities.

   c. Enter the average and peak sewage flows, projected for 5 years (2 years for pump stations) through the most restrictive sections of the existing sewage facilities. Include existing, proposed (this project) and future project (other approved projects) flows.

   To complete the table, refer to the instructions, Section J.

	a. Design and/or Permitted Capacity (gpd)		b. Present Flows (gpd)		c. Projected Flows in 5 years (gpd) (2 years for P.S.)	
	Average	Peak	Average	Peak	Average	Peak
Collection						
Conveyance						
Treatment						

☐ J. CHAPTER 94 CONSISTENCY DETERMINATION (Continued)

3. Collection and Conveyance Facilities

The questions below are to be answered by the sewer authority, municipality, or agency responsible for completing the Chapter 94 report for the collection and conveyance facilities. These questions should be answered in coordination with the latest Chapter 94 annual report and the above table. The individual(s) signing below must be legally authorized to make representation for the organization.

	YES	NO	
a.	☐	☐	This project proposes sewer extensions or tap-ins. Will these actions create a hydraulic overload within 5 years on any existing collection or conveyance facilities that are part of the system?

If yes, this sewage facilities planning module will not be accepted for review by the municipality, delegated local agency and/or DEP until all inconsistencies with Chapter 94 are resolved or unless there is an approved Corrective Action Plan (CAP) granting an allocation for this project. A letter granting allocations to this project under the CAP must be attached to the module package.

If no, a representative of the sewer authority, municipality, or agency responsible for completing the Chapter 94 report for the collection and conveyance facilities must sign below to indicate that the collection and conveyance facilities have adequate capacity and are able to provide service to the proposed development in accordance with both §71.53(d)(3) and Chapter 94 requirements and that this proposal will not affect that status.

b. Collection System

Name of Agency, Authority, Municipality _____

Name of Responsible Agent _____

Agent Signature _____

Date _____

c. Conveyance System

Name of Agency, Authority, Municipality _____

Name of Responsible Agent _____

Agent Signature _____

Date _____

4. Treatment Facility

The questions below are to be answered by a representative of the facility permittee in coordination with the information in the table and the latest Chapter 94 report. The individual signing below must be legally authorized to make representation for the organization.

	Yes	No	
a.	☐	☐	This project proposes the use of an existing wastewater treatment plant for the disposal of sewage. Will this action create a hydraulic or organic overload within 5 years at that facility?

If yes, this planning module for sewage facilities will not be reviewed by the municipality, delegated local agency and/or DEP until this inconsistency with Chapter 94 is resolved or unless there is an approved CAP granting an allocation for this project. A letter granting allocations to this project under the CAP must be attached to the planning module.

If no, the treatment facility permittee must sign below to indicate that this facility has adequate treatment capacity and is able to provide wastewater treatment services for the proposed development in accordance with both §71.53(d)(3) and Chapter 94 requirements and that this proposal will not impact that status.

b. Name of Agency, Authority, Municipality _____

Name of Responsible Agent _____

Agent Signature _____

Date _____

☐ K. TREATMENT AND DISPOSAL OPTIONS (See Section K of instructions)

This section is for land development projects that propose construction of wastewater treatment facilities. Please note that, since these projects require permits issued by DEP, these projects may **NOT** receive final planning approval from a delegated local agency. Delegated local agencies must send these projects to DEP for final planning approval.

Check the appropriate box indicating the selected treatment and disposal option.

☐ 1. Spray irrigation or other land application is proposed, and the information requested in Section K.1. of the planning module instructions are attached.

☐ 2. A discharge to a dry stream channel is proposed, and the information requested in Section K.2. of the planning module instructions are attached.

☐ 3. A discharge to a perennial surface waterbody is proposed, and the information requested in Section K.3. of the planning module instructions are attached.

☐ L. PERMEABILITY TESTING (See Section L of instructions)

☐ The information required in Section L of the instructions is attached.

☐ M. PRELIMINARY HYDROGEOLOGIC STUDY (See Section M of instructions)

☐ The information required in Section M of the instructions is attached.

☐ N. DETAILED HYDROGEOLOGIC STUDY (See Section N of instructions)

☐ The detailed hydrogeologic information required in Section N. of the instructions is attached.

O. SEWAGE MANAGEMENT (See Section O of instructions)

(1-2 for completion by the developer, 3-4 for completion by the non-municipal facility agent and 5 for completion by the municipality)

Yes No

1. ☐ ☐ Connection to, or construction of, a DEP permitted, non-municipal sewage facility or a local agency permitted, community onlot sewage facility is proposed.

If Yes, respond to the following questions, attach the supporting analysis, and an evaluation of the options available to assure long-term proper operation and maintenance of the proposed non-municipal facilities. If No, skip the remainder of Section O.

2. Project Flows _____ gpd

(For completion by non-municipal facility agent)

3. Collection and Conveyance Facilities

The questions below are to be answered by the organization/individual responsible for the non-municipal collection and conveyance facilities. The individual(s) signing below must be legally authorized to make representation for the organization.

Yes No

a. ☐ ☐ If this project proposes sewer extensions or tap-ins, will these actions create a hydraulic overload on any existing collection or conveyance facilities that are part of the system?

O. SEWAGE MANAGEMENT (See Section O of instructions) (Continued)

If yes, this sewage facilities planning module will not be accepted for review by the municipality, delegated local agency and/or DEP until this issue is resolved.

If no, a representative of the organization responsible for the collection and conveyance facilities must sign below to indicate that the collection and conveyance facilities have adequate capacity and are able to provide service to the proposed development in accordance with Chapter 71 §71.53(d)(3) and that this proposal will not affect that status.

b. Collection System

Name of Responsible Organization _____

Name of Responsible Agent _____

Agent Signature _____

Date _____

c. Conveyance System

Name of Responsible Organization _____

Name of Responsible Agent _____

Agent Signature _____

Date _____

4. Treatment Facility

The questions below are to be answered by a representative of the facility permittee. The individual signing below must be legally authorized to make representation for the organization.

	Yes	No	
a.	☐	☐	If this project proposes the use of an existing non-municipal wastewater treatment plant for the disposal of sewage, will this action create a hydraulic or organic overload at that facility?

If yes, this planning module for sewage facilities will not be reviewed by the municipality, delegated local agency and/or DEP until this issue is resolved.

If no, the treatment facility permittee must sign below to indicate that this facility has adequate treatment capacity and is able to provide wastewater treatment services for the proposed development in accordance with §71.53(d)(3) and that this proposal will not impact that status.

b. Name of Facility _____

Name of Responsible Agent _____

Agent Signature _____

Date _____

(For completion by the municipality)

5. ☐ The **SELECTED OPTION** necessary to assure long-term proper operation and maintenance of the proposed non-municipal facilities is clearly identified with documentation attached in the planning module package.

P. PUBLIC NOTIFICATION REQUIREMENT (See Section P of instructions)

This section must be completed to determine if the applicant will be required to publish facts about the project in a newspaper of general circulation to provide a chance for the general public to comment on proposed new land development projects. This notice may be provided by the applicant or the applicant's agent, the municipality or the local agency by publication in a newspaper of general circulation within the municipality affected. Where an applicant or an applicant's agent provides the required notice for publication, the applicant or applicant's agent shall notify the municipality or local agency and the municipality and local agency will be relieved of the obligation to publish. The required content of the publication notice is found in Section P of the instructions.

To complete this section, each of the following questions must be answered with a "yes" or "no." Newspaper publication is required if any of the following are answered "yes."

	Yes	No	
1.	☐	☐	Does the project propose the construction of a sewage treatment facility?
2.	☐	☐	Will the project change the flow at an existing sewage treatment facility by more than 50,000 gallons per day?
3.	☐	☐	Will the project result in a public expenditure for the sewage facilities portion of the project in excess of $100,000?
4.	☐	☐	Will the project lead to a major modification of the existing municipal administrative organizations within the municipal government?
5.	☐	☐	Will the project require the establishment of *new* municipal administrative organizations within the municipal government?
6.	☐	☐	Will the project result in a subdivision of 50 lots or more? (onlot sewage disposal only)
7.	☐	☐	Does the project involve a major change in established growth projections?
8.	☐	☐	Does the project involve a different land use pattern than that established in the municipality's Official Sewage Plan?
9.	☐	☐	Does the project involve the use of large volume onlot sewage disposal systems (Flow > 10,000 gpd)?
10.	☐	☐	Does the project require resolution of a conflict between the proposed alternative and consistency requirements contained in §71.21(a)(5)(i), (ii), (iii)?
11.	☐	☐	Will sewage facilities discharge into high quality or exceptional value waters?

☐ Attached is a copy of:

- ☐ the public notice,
- ☐ all comments received as a result of the notice,
- ☐ the municipal response to these comments.

☐ No comments were received. A copy of the public notice is attached.

Q. FALSE SWEARING STATEMENT (See Section Q of instructions)

I verify that the statements made in this component are true and correct to the best of my knowledge, information and belief. I understand that false statements in this component are made subject to the penalties of 18 PA C.S.A. §4904 relating to unsworn falsification to authorities.

Name (Print)	Signature
Title	Date
Address	Telephone Number

R. REVIEW FEE (See Section R of instructions)

The Sewage Facilities Act establishes a fee for the DEP planning module review. DEP will calculate the review fee for the project and invoice the project sponsor **OR** the project sponsor may attach a self-calculated fee payment to the planning module prior to submission of the planning package to DEP. (Since the fee and fee collection procedures may vary if a "delegated local agency" is conducting the review, the project sponsor should contact the "delegated local agency" to determine these details.) Check the appropriate box.

☐ I request DEP calculate the review fee for my project and send me an invoice for the correct amount. I understand DEP's review of my project will not begin until DEP receives the correct review fee from me for the project.

☐ I have calculated the review fee for my project using the formula found below and the review fee guidance in the instructions. I have attached a check or money order in the amount of $_____ payable to "Commonwealth of PA, DEP." Include DEP code number on check. I understand DEP will not begin review of my project unless it receives the fee and determines the fee is correct. If the fee is incorrect, DEP will return my check or money order, send me an invoice for the correct amount. I understand DEP review will NOT begin until I have submitted the correct fee.

☐ I request to be exempt from the DEP planning module review fee because this planning module creates **only** one new lot and is the **only** lot subdivided from a parcel of land as that land existed on December 14, 1995. I realize that subdivision of a second lot from this parcel of land shall disqualify me from this review fee exemption. I am furnishing the following deed reference information in support of my fee exemption.

County Recorder of Deeds for _____ County, Pennsylvania

Deed Volume _____ Book Number _____

Page Number _____ Date Recorded _____

Formula:

1. For a new collection system (with or without a Clean Streams Law Permit), a collection system extension, or individual tap-ins to an existing collection system use this formula.

   #_____ Lots (or EDUs) X $50.00 = $ _____

   The fee is based upon:

   - The number of lots created or number of EDUs whichever is higher.
   - For community sewer system projects, one EDU is equal to a sewage flow of 400 gallons per day.

2. For a surface or subsurface discharge system, use the appropriate one of these formulae.

   A. A new surface discharge greater than 2000 gpd will use a flat fee:

   $ 1,500 per submittal (non-municipal)
   $ 500 per submittal (municipal)

   B. A sub-surface discharge system that requires a permit under The Clean Streams Law will use a flat fee:

   $ 1,500 per submittal (non-municipal)
   $ 500 per submittal (municipal)

   C. An increase in an existing discharge (not addressed in R1 above) will use:

   #_____ Lots (or EDUs) X $35.00 = $ _____

   to a maximum of $ 1,500 per submittal (non-municipal) or $ 500 per submittal (municipal)

   The fee is based upon:

   - The number of lots created or number of EDUs whichever is higher.
   - For community sewage system projects one EDU is equal to a sewage flow of 400 gallons per day.
   - For non-single family residential projects, EDUs are calculated using projected population figures

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

Remove and recycle these instructions prior to mailing component to DEP.

INSTRUCTIONS FOR COMPLETING COMPONENT 3s SMALL FLOW TREATMENT FACILITIES

How to Obtain Planning Module Components

Planning module components appropriate for your project can be obtained by completing an Application for Sewage Facilities Planning Module mailer available on DEP's website at www.depweb.state.pa.us Keyword: "wastewater" and sending it to the agency responsible for final review of your project (the "approving agency"). This "approving agency" for a Component 3s is the DEP regional office serving your county. **Do not use this component unless you have received a code-numbered copy of this form from DEP.** You may obtain an Application for Sewage Facilities Planning Module Mailer from the municipality, a DEP regional office or on the DEP website.

Upon receipt of the mailer, the approving agency (DEP regional office) will assign a code number to your project and provide you with the correct planning module forms and instructions.

When Should You Use Component 3s?

This component is used to fulfill the planning requirements of Act 537 for projects proposing the use of Small Flow Treatment Facilities (SFTF). An SFTF is an individual or community sewerage system designed to adequately treat sewage flows not greater than 2,000 gallons per day (gpd) for final disposal using a stream discharge or other disposal method approved by DEP. SFTF systems may also be used, under some circumstances, for repairs to existing, malfunctioning systems serving residential or commercial developments.

Who Should Complete the Component 3s?

This component should be completed by a competent consultant, engineer or surveyor who is familiar with the municipality's Official Sewage Facilities Plan and available sewage disposal methods in the municipality in which the development project is proposed. Municipal officials and the municipality's Sewage Enforcement Officer (SEO) should be consulted in the development of the project.

Instructions for Completing Component 3s

Sections A through H, N, P and Q must be completed for all projects proposing an SFTF as a repair to a malfunctioning sewage disposal system. Repair proposals located in watersheds classified as High Quality (HQ) or Exceptional Value (EV) must also complete Section O. All other projects must complete sections A through I, and N through Q. Sections J through M must be completed when indicated by DEP or if justified by preliminary test results.

Section A. Project Information and Qualification

1. **Project Name.** In the "Project Name" block, enter the name by which this proposed land development project is, or will be, known, such as "Smith Subdivision."

2. **Brief Project Description.** Briefly describe the intended project in the space provided.

3. **Qualification.** Small flow treatment facilities (SFTF) may only be used under a specific set of circumstances. For planning purposes the SFTF is treated differently than other sewage treatment facilities because it is not required to have a certified treatment plant operator. Since only certain types of proposals qualify for SFTF use, this section is designed to help the applicant and DEP determine whether the proposed use meets these qualifications.

   a. Check the appropriate box describing the nature of the proposal and expected sewage flows. Sewerage systems are classified as SFTFs only when they are proposed to serve residential dwellings or commercial facilities which generate domestic wastewater not containing industrial waste with flow volumes no greater than 2,000 gallons per day. The projected sewage flow, for the purpose of planning, is based upon 400 gallons per day (GPD) per residential dwelling or equivalent to be connected to the SFTF. The total flow from the subdivision cannot exceed 2,000 GPD for either an individual or community small flow treatment facility proposal.

   b. Indicate whether sufficient site testing, as described in Title 25 Pa. Code Chapter 73, was conducted to determine if the site is suitable for onlot systems. Before an SFTF can be considered for use, the site must be tested and shown to be unsuitable for installation of onlot sewage disposal systems as described in Chapter 73, subject to the following constraints:

      (1) In watersheds that are NOT classified as HQ or EV in Title 25 Pa. Code Chapter 93, the individual residential spray irrigation system (IRSIS), a specialized type of onlot system described in Chapter 73, is NOT included in the eligibility determination for SFTFs and need not be ruled out before an SFTF may be considered for use.

      (2) In watersheds that ARE classified as HQ or EV, IRSIS and other non-discharge alternatives must be ruled out as a sewage disposal option before an SFTF may be considered for use.

   A soil profile and percolation test must be conducted for each change in soil type, slope and erosion characteristic in order to adequately document the unsuitability of the lot for onlot sewage disposal. If the tests show that the site is unsuitable for an onlot system, an SFTF may be proposed. Help in determining the location and number of soils tests required can be obtained from USDA Natural Resources Conservation Service mapping, the municipality's SEO or a qualified soils consultant.

   c. Indicate whether the proposed SFTF will discharge to an HQ or EV stream or an unnamed tributary of an HQ or EV stream as defined in Chapter 93 of DEP regulations. SFTFs are generally not permitted to discharge to HQ or EV streams. However, discharge to an HQ stream <u>may</u> be approved by DEP in the following circumstances:

      (1) Where it can be shown to DEP's satisfaction that the discharge will not change the long-term average water quality of the receiving HQ stream. Include evidence supporting this contention in the planning module submission.

      (2) Where there is a necessary social and economic justification for the discharge, such as if the SFTF is designed to correct an existing public health, pollution or nuisance problem. Include evidence supporting this position in the planning module submission.

      For more information on HQ/EV waters, please consult DEP's *Water Quality Antidegradation Guidance Manual* (391-0300-002), available on the web or contact your DEP regional office.

If there is any question regarding the stream classification, obtain the name of the stream and the waterbody to which it discharges from the appropriate USGS quadrangle map and contact the DEP regional office to confirm if the stream is in one of these classifications. If DEP discovers that discharge to an HQ/EV stream is proposed during evaluation of the Application Mailer, DEP will notify the applicant of the potential problem in the mailer response.

If the proposed system does not fit the criteria given above, the proposal does not qualify for an SFTF. Contact DEP for the correct Sewage Facilities Planning Module component(s).

Section B. Client (Municipality) Information

Municipality Name, County, Municipality Type. Enter the name of the client municipality and the name of the county in which the municipality is located. Check the appropriate block indicating the municipality type, whether **City**, **Boro** or **Township** (Twp).

Municipality Contact Individual Last Name, First Name, MI, Suffix, Title. Enter the requested information for the client contact in this block. The municipal client contact is often the municipal secretary, but may be another official, such as the chairman of the board of supervisors. Please indicate the appropriate title of the client contact in the Title block.

Additional Individual Last Name, First Name, MI, Suffix, Title (optional). This is an optional block to be used by municipalities that wish to provide an alternate client contact. Enter the requested information only if an alternate contact name is desired.

Mailing Address. This is the mailing address of the client municipality identified above. It should not include locational data that is not appropriate for a standard mail address. In addition to the street number and name, PO Box number, RR number, Box number or Highway Contract number designations, use any appropriate designation and number to further define the mailing address. Use these standard abbreviations:

e.g.,	APT	(Apartment)	FLR	(Floor)
	BLDG	(Building)	RM	(Room)
	DEPT	(Department)	STE	(Suite)

City, State, ZIP+4, Phone Information. **DO NOT** use abbreviations for the city name. Use the two-character abbreviation for the state. Include the four-digit extension to the ZIP code, if known.

Section C. Site Information

DEP needs to be able to accurately locate your site and to understand the physical nature of the surrounding area. Therefore, the application must be accompanied by a 7.5-minute topographic map published by the US Geological Survey or a clear copy that includes the quadrangle name. These maps can usually be obtained from most map distributors or hunting and fishing supply stores. On the topographic map, draw the outline of the development site.

Site Name. The name of the site at the specific physical location. This should be similar to the project name in A.1. **DO NOT** use abbreviations, acronyms, etc.

Site Location. Provide the physical address of the location where the permitted activities will occur. **DO NOT** use PO Box numbers for site location information. Provide the city (or municipality), state and the ZIP+4, if known.

Detailed Written Directions to Site. When providing written directions, **DO NOT** use PO Box address data. Include landmarks and approximate distances from the nearest highway.

Description of Site. Provide a written description of the proposed project.

Site Contact (Developer/Owner) Information. Provide the name of the person having overall responsibility for environmental matters at the site. This person is often the landowner or the landowner's agent. Include the individual's

name, title, firm, e-mail address (optional), mailing address and daytime phone numbers. This individual will ultimately be responsible for paying the DEP review fee.

SECTION D. PROJECT CONSULTANT INFORMATION

If this form was completed by someone other than the applicant, such as a consultant, engineer or contractor, that individual should complete this section of the form.

Section E. Availability of Drinking Water Supply

Indicate the intended source of the project's drinking water by checking the appropriate box. If a public water supply will be used, provide written documentation that the water supplier is aware of the project, possesses capacity to serve the project and is willing to serve the project. A public water supply is defined as a system that provides water to the public for human consumption that could serve 15 or more connections, or serve 25 or more people daily at least 60 days out of the year.

Section F. Project Description Narrative

This section provides basic information about the project. The narrative must include, at a minimum, the following information:

1. The total number of lots proposed. This total includes all of the subdivided lots. Any remaining acreage, parent tract or parcel under the same ownership as the subdivided lots also counts as a lot, even if no development is proposed on this tract. The plot plan, discussed in Section G, must also show this remaining acreage.

2. The number of residential dwellings or equivalent proposed. This includes all proposed or existing dwellings or equivalent which will connect to SFTFs as part of this proposal.

3. The projected sewage flow. For planning purposes, this flow is based upon a minimum of 400 gallons per day per residential dwelling or EDU to be connected to the SFTF. The total flow cannot exceed 2,000 gallons per day for each SFTF.

4. The number of proposed SFTF installations. DEP does **NOT** consider the use of numerous SFTFs serving single family dwellings, or multiple SFTFs serving numerous clusters of homes in a development, to be viable sewage facilities planning options. DEP will closely assess the number and density of existing and proposed systems in the watershed in relation to comprehensive programs of sewage facilities planning and water pollution control for the area.

   The number of SFTFs proposed consists of the number of treatment/discharge systems anticipated to serve the land development. For residential development, assuming flows of 2,000 gallons per day per SFTF and 400 gallons per day per dwelling unit, a maximum of 5 dwelling units may be connected to one SFTF.

5. The total acreage of the development. For the purposes of this section, this includes only the acreage of the lots to be developed at the present time. It does not include any remaining acreage which is not being subdivided at this time.

6. The remaining acreage or land adjacent to the proposed subdivision (including tracts of land across roads, streets or rights-of-way) under the same ownership as the proposed development. The current and future use of this property is an important factor in the evaluation of the proposed sewage facilities and must be described.

SECTION G. General Site Suitability

The information in this section about soils and site conditions will be used by the Sewage Enforcement Officer (SEO) and the approving agency to determine if the project area is suitable for the use of SFTF systems. This section also requires that certain information listed in the planning module component be plotted on a plan which includes the project and

adjacent areas. Some of the information required can be found in the municipality's Official Sewage Facilities Plan. Other information can be found in tax maps, zoning maps, USDA Natural Resources Conservation Service maps, Federal Emergency Management Agency (FEMA) flood plain maps and National Wetland Inventory maps.

1. Plot Plan

The plot plan is a drawing of the development area. The scale of the plot plan should be large enough to show the development area and adjacent areas so that the plotted items can be easily identified. Preliminary lot lines may be used if soils testing is completed before final lot lines are established, but the final plot plan must be prepared by a registered surveyor before submission of the planning module to the approving agency. The following information should be included on the plan:

a. Locations of **ALL** soil profile examinations and percolation tests, both suitable and unsuitable.

The location of all soil profile excavations and percolation test sites must be shown on the plot plan, including those which show unsuitable conditions for the use of onlot disposal. Excavations are to be shown by the symbol ▲ (triangle) and percolation tests by the symbol ● (large dot). When the scale of the plot plan makes it impossible to show each percolation hole, the area of the test may be shown using a rectangular box labeled with the percolation test symbol. Each test must be referenced by number to the appropriate "Site Investigation and Percolation Test Report for Onlot Disposal of Sewage."

b. Slope at each test area.

Slopes must be taken from in-field measurements recorded on "Site Investigation and Percolation Test Report" forms (3800-FM-WSWM0290A (formerly known as "Appendix A" and available from the Municipal SEO)) or from a registered surveyor's in-field slope measurements. The slopes should be shown on the plan with a slope arrow identifying measured percentage of grade and the source of the measurement ("Test Report" or surveyor). When slopes are measured, they must be taken across the soil profile/percolation test area from the down-grade extent to the up-grade extent of the proposed absorption area or spray field.

c. Soil types (as shown in USDA Natural Resources Conservation Mapping) and their boundaries.

d. Locations of all proposed treatment units and discharge points.

e. Locations of existing and proposed adjacent streets, roadways and access roads.

f. Lot lines and sizes of individual lots in the proposed development.

Show the relationship of the development boundaries to those of the existing lot. Where the boundaries of the existing lot have not been formally surveyed, but are plotted from deed records, this must be noted on the plan.

g. Existing and proposed rights-of-way. Proof of legal recording of rights-of-way may be required if the right-of-way is necessary to implement the chosen sewage facilities alternative.

h. Existing and proposed water supplies (wells, reservoirs, etc.) and surface water (ponds, lakes, streams, impoundments) on the adjacent and proposed developments must be shown on the plan.

Identify existing water supplies and surface waters on properties adjacent to the proposed land development which may affect site suitability related to required isolation distances. If determined that the identified water supplies and surface waters are far enough away from the proposed development that they will not affect the suitability of the site for onlot sewage disposal, their locations do not have to be plotted. If the identified water supplies or surface waters may be located within required isolation distances, they must be shown on the plan.

i. Show the location of any existing buildings in the project area.

j. Surface waters, including ponds, streams, lakes and impoundments.

k. Wetland areas. DEP is required by statute to protect the wetlands of the Commonwealth from unnecessary destruction. Show any wetland areas on the plot plan as they are identified by hydric soils in USDA Natural Resources Conservation Service maps and by National Wetland Inventory mapping. If there is a disagreement with the mapping, or wetlands are present and they are not shown in the mapping, plot the results of actual in-field delineation of the wetlands on the plan. Use the delineation process required by Title 25 of the Pennsylvania Code, Chapter 105, §105.451, Identification and Delineation of Wetlands-Statement of Policy.

If wetlands are present, the applicant may be required to obtain permits for any construction activities such as encroachments (fill, roads, utility lines) or obstructions (bridges, walls, piers) in, along or across the wetlands. Contact the DEP regional office for further information.

Full delineation may be required as a condition of permit issuance, including issuance of onlot system permits, Clean Streams Law permits, or encroachment or obstruction permits for construction activities in, along or across wetlands. The plot plan must distinguish between in-field delineations and transcribed mapping from existing sources.

l. Floodplains and floodways. As with wetlands, these areas should be plotted on the plan as they are indicated in Federal Emergency Management Agency Flood Plain mapping.

m. Open space areas designated within the proposed development and any parks, state forests or other state land adjoining the development.

n. Show the relationship of the development boundaries to those of the existing lot of which it is a part. Where the boundaries of the existing lot have not been formally surveyed, but are plotted from deed records, indicate this on the plan. Any property that is not included in the current subdivision but is under the same ownership and adjoining (whether or not it has been developed in the past, or will be developed in the future), must be plotted. Lots located across roads, streets and rights-of-way are considered adjoining.

o. Existing onlot or sewerage systems, pipelines, transmission lines, etc. - show any functioning or abandoned facilities which may impact the use of an SFTF system.

p. Prime agricultural land listed by the USDA Natural Resources Conservation Service as "Pennsylvania Prime Farmland Soils," or soils listed in the USDA Natural Resources Conservation Service Soil Survey as having a capability classification of I, II or III.

q. Orientation to north, usually shown by a directional arrow.

2. Residual Tract Waiver Request

DEP believes that developers, municipal officials and future lot owners are best protected by complying with sewage planning requirements to assure that adequate sewage facilities will be available to serve all newly created subdivisions. However, DEP is aware that some subdivision proposals include residual tracts of land on which there is already an inhabited structure or are large parcels for which there is no proposed construction that would require the use of sewage disposal facilities. Developers having such residual tracts may not be required to complete sewage facilities planning for that portion of the subdivision if this claim is valid. The developer may request the residual tract waiver by checking the request block in Section G.2.

To be valid, acceptance of the request for a waiver by the municipal or county planning agency and the municipality is required. The municipal or county planning agency must indicate its acceptance of the proposed waiver by marking the appropriate blocks on Component 4. The municipality indicates its acceptance of the proposed waiver by signing and dating the appropriate statement in Component 3, Section N. When the proposal involves the subdivision of property on which there is an existing building currently served by an onlot septic system on the residual tract, the municipality's sewage enforcement officer must inspect the system for proper operation.

In addition, the planning module must include a plot plan or deed or deed notice which contains language similar to the following, directed to the residual tracts:

"As of the date of this deed/plot plan/deed notice recording, the residual tract of this subdivision is dedicated for the express purpose of _____ use. No portion of the residual tract of this subdivision has been approved by the municipality or the approving agency for the installation of sewage disposal facilities. No sewage permit will be issued for the installation, construction, connection to or use of any sewage collection, conveyance, treatment or disposal system (except for repairs to existing systems) unless the municipality and approving agency have approved any required sewage facilities planning for the residual tract of the subdivision described herein in accordance with the Sewage Facilities Act (35 P.S. Sections 750.1 *et seq.*) and regulations promulgated thereunder. Prior to signing, executing, implementing or recording any sales contract or subdivision plan, any purchaser or subdivider of any portion of this residual tract should contact the municipality which is charged with administering the Sewage Facilities Act to determine what sewage facilities planning is required and the procedure and requirements for obtaining appropriate permits or approvals."

Language similar to the above must be recorded on the plot plan or deed or deed notice and a copy of the deed or plot plan or deed notice must be submitted with this planning module submission.

3. Social or Economic Justification

Title 25 Pa. Code Section 93.4c of DEP regulations requires that sewage facilities proposing to discharge or increase an existing discharge into HQ Waterways complete a Social or Economic Justification (SEJ) and publish a public notice as part of the sewage facilities planning process. Please refer to specific requirements that may be found in Section 93.4c(c), available online at www.pacode.com or from your local DEP office. Additional information is available as Technical Guidance 391-0300-002, also available online at www.depweb.state.pa.us.

4. Wetland Protection

a. DEP is required to protect the wetlands of the Commonwealth from unnecessary destruction. The applicant is required to answer "yes" or "no" to the question of whether there are any wetlands in the project area. If yes, show these areas on the plot plan as they are identified by hydric soils in USDA Natural Resources Conservation Service maps or by National Wetlands Inventory mapping. If there is disagreement with the mapping, or if wetlands are present and are not shown on the mapping, plot the results of actual in-field identification of the wetlands on the plan. Use the identification process required by Title 25 Pa. Code Chapter 105, §105.451, Identification and Delineation of Wetlands - Statement of Policy.

b. If wetlands are present, indicate with a yes or no answer if the project is proposing any construction activities such as encroachments (fill, roads, utilities) or obstructions (bridges, walls, piers) in, along or across the wetlands. If any of these are proposed, please contact the DEP regional office for further information. Full delineation may be required as a condition of permit issuance, including issuance of Clean Streams Law permits, encroachment or obstruction permits for construction activities in, along or across wetlands. The plot plan must distinguish between in-field delineations and transcribed mapping from existing sources.

5. Primary Agricultural Land Protection

Indicate whether the project involves the disturbance of prime agricultural lands. If the project will result in the disturbance of these lands, it must be consistent with policies and procedures established by the municipality for protection of prime agricultural lands. The project sponsor and local officials must rectify land use problems prior to submission of the sewage facilities planning module package to DEP for review.

6. Historic Preservation Act

Coordination with the Pennsylvania Historic and Museum Commission (PHMC) is necessary for proposals meeting conditions specified in DEP Technical Guidance 012-0700-001 *Implementation of the PA State History Code.* Specific documentation required to be submitted with this planning module package is found in the Technical Guidance, available on-line at DEP's website at www.depweb.state.pa.us, select "Subjects" then select "Technical Guidance." As a minimum this includes copies of the completed Cultural Resources Notice (CRN), a return receipt for its submission to the PHMC and the PHMC review letter.

Section H. Treatment and Disposal Options

There are three options available for the disposal of treated effluent from an SFTF. They are: 1) spray irrigation and other land application; 2) discharge to a dry or intermittent stream channel; or 3) discharge to perennial surface waters. Each of the three options has specific technical requirements that must be met before the planning module can be approved by DEP. The following paragraphs describe the information which must be submitted for each of the discharge alternatives.

1. Spray irrigation or other land application (*Manual For Land Application of Treated Sewage and Industrial Wastewater* DEP ID: 362-2000-009, available on DEP's website for more detailed information).

   If spray irrigation or other land application is proposed, do the following:

   a. Plot the proposed spray or land application field on a USGS topographic map showing sufficient contour lines to allow the determination of slopes in the area of the proposed system.

      Please note that proposed spray sites may not be suitable on slopes greater than 8 percent. In agricultural areas with somewhat poorly drained soils, the slope may be limited to 4 percent. In these cases, a careful evaluation of the slope versus the soils characteristics must be done to ensure that the effluent will not run off. DEP recommends that the applicant consult a soil scientist for assistance when slope constraints are encountered on a site.

   b. Describe the proposed effluent discharge rate and quality, including any seasonal variations, in sufficient detail to allow DEP to assess their impact on the suitability of the site. These criteria can affect both the suitability of the site for the use of land application and spray systems and the size of the area needed. The specific soil conditions present on the site will determine how much effluent can be treated and discharged on the site.

   c. Since land application systems depend upon the soil and underlying geology of a site for adequate treatment and disposal of treated sewage effluent, provide additional site-specific soil testing information, including soils horizons and permeability testing, to document the suitability of the soils on the site. Please notify DEP verbally or in writing at least 10 days prior to testing to allow DEP staff the option to observe the testing.

      Please note that, although some sites that cannot meet the soils suitability criteria for onlot systems may be suitable for spray irrigation or land treatment, systems may not be approvable in areas having the following soils conditions:

      - Severely and moderately eroded phases of shallow/well-drained soils;
      - Severely eroded phases of moderately well-drained soils;
      - Poorly drained soils;
      - Floodplain soils (as mapped during Flood Insurance studies of the municipality).

   d. If you are proposing spray irrigation, submit documentation that drinking water uses will be protected, including a brief description of the topographic setting of the spray field in relation to the discharge rate and quantity and the location of proposed and existing water supplies in the area of the proposed spray site. In addition, since improperly treated or controlled spray can cause nuisance conditions or health hazards, include a plan for preventing these problems on the proposed site.

2. Dry Channel Stream Discharge

   If a discharge is proposed to a dry stream channel:

   a. On a 7.5-minute USGS topographic map, show the property lines of the development and the point of discharge.

   b. Specify the quality and rate at which sewage effluent will be discharged. Seasonal variations in the discharge flows should also be discussed if they are proposed. *(Contact the appropriate regional office regarding their procedure concerning the timing for determination of preliminary effluent limits.)*

   c. Justify the proposed discharge point by identifying existing water supplies or groundwater uses for 200 feet on either side of the channel from the discharge point until perennial stream conditions (point of first use) are

encountered. Document that these uses will be protected and that the discharge effluent will not create a public health hazard or nuisance, **and**

(1) Obtaining easements from downstream property owner(s) between the point of discharge and the point of perennial stream conditions (point of first use), unless the applicant can demonstrate that the proposed discharge will not create a nuisance or adverse impact to the quality or quantity of the dry stream channel flow. *(Please be advised that **even if** easements are obtained, DEP will deny planning module approval **IF** the proposed discharge will likely cause a nuisance);* **or**

(2) Attach copies of certified letters and signed certified mail receipts by which you have notified all downstream property owners through which your treated effluent would flow until it would reach the point of first use. In addition to information on the nature of your proposed system and discharge, the notice must advise each property owner to provide written comment, if desired, to the municipality and DEP office to which this planning module will be directed. (This individual notification period may run concurrently with the general public notification required in section O.)

Note: If unable to comply with the provisions of paragraph c, the discharge location may be relocated to a point where perennial stream conditions exist. All necessary rights-of-way needed to reach the new discharge point must be obtained and included, or letters of intent to grant right-of-way from landowners, municipalities, agencies, etc., must be included with the planning module submission.

3. Perennial Surface Water (Stream) Discharge

If a discharge to perennial surface waters is proposed, do the following:

a. On a 7.5-minute USGS topographic map, show the property lines of the development and the point of discharge to the stream. Label the stream name. If the discharge is to an unnamed tributary of a stream, label the first-named body of water on the map.

b. Specify the quality and rate at which sewage effluent will be discharged to the stream, since these are factors which influence the approval of the discharge. DEP may evaluate the stream flow and current quality of the stream to determine if the level of treatment proposed is sufficient, or if additional treatment is needed. Seasonal variations in the flows should also be discussed if they are proposed. *Contact the appropriate regional office regarding their procedure concerning the timing for determination of preliminary effluent limits.*

Section I. Alternative Analysis

An alternative analysis is required to document that the method of sewage disposal selected for use is the best alternative in terms of both planning and environmental protection. The analysis should be written in narrative form and must address each of the following issues:

1. Describe the SFTF proposed. Include the method of treatment (septic tank/sand filter, aerobic tank/sand filter, etc.) and the method of disposal (spray irrigation, stream discharge, etc.).

2. Describe the method of sewage disposal identified by the municipality's Official Plan for the area of the proposal.

3. If the use of SFTFs was not identified in the municipality's Official Plan, discuss why it was chosen as the best alternative.

4. List all of the other alternatives considered to serve this property, and why each was considered unacceptable for use. It is critical that the applicant include any environmental factors that influenced alternative selection.

5. Describe any existing sewage problem(s) in the area of the proposal as described in the municipality's Official Plan, including the nature of the problem and its location in relation to the project area.

6. If the SFTF will be replaced within 5 years by some other method of sewage disposal, describe the ultimate method of sewage disposal to be used, the portion of the current proposal to be served, and the anticipated date of service. Include a statement acknowledging the interim status of the SFTF and stating that the SFTF will be abandoned when the ultimate method of sewage disposal is installed.

7. Describe the land uses adjacent to the project area and the types of sewage disposal systems serving these areas. (Example: North, commercial, holding tank; South, residential, septic systems; East and West, agricultural, septic systems.)

If the proposal involves the use of individual SFTFs to serve multiple lots in a subdivision, or if more than one community SFTF is proposed to serve a development, this alternative analysis must include a detailed justification for this use, as compared to the use of collection, conveyance and treatment at a single treatment facility serving the entire development.

Section J. Protection of Rare, Endangered or Threatened Species

DEP's technical guidance document "Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation," (400-0200-001) requires DEP to ensure that requests for authorizations, are coordinated with the Department of Conservation and Natural Resource's (DCNR) Pennsylvania Natural Diveristy Inventory (PNDI).

Conducting a search of the PNDI database and providing a copy of a "PNDI Project Environmental Review Receipt" for the proposed project and, if potential impacts are identified by the search, any clearance or recommendation letters from the jurisdictional agency responsible for the particular species identified by a search, satisfies this requirement.

To avoid project delay, self explanatory, self conducted "PNDI Project Planning Environmental Review" searches are initiated at www.naturalheritage.state.pa.us . This interactive, online search will ask questions about the proposed project and provide the appropriate receipt, instructions or additional information regarding coordination with jurisdictional agencies.

As an alternative to the self conducted search, project sponsors may request DEP staff to conduct the search by providing a completed "PNDI Project Planning & Environmental Review Form" (PNDI Form). The form is available at www.naturalheritage.state.pa.us . Individuals making this request should be aware that, due to the nature of the search software, DEP staff may need to contact them for additional information to successfully complete the search and that exclusive of any other items, their sewage planning module submission is considered incomplete by DEP, until the appropriate receipt, clearance or recommendation letters are received.

For more information, see to the "Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation," (400-0200-001), available on line in the eLibrary at DEP's website address www.depweb.state.pa.us.

Section K-M. Permeability and Hydrogeology

In certain situations, permeability testing and hydrogeology studies must be completed for the proposed development. These sections should only be completed if indicated by the approving agency. Sections L and/or M should be completed and sealed by a registered professional geologist familiar with the requirements of these sections. This person should contact the DEP Regional Hydrogeologist for further instructions.

Section K. Permeability Testing

(Complete if marked in component or if the conditions in number 1 (below) apply.)

1. Completion of this section may be required when any of the following exist:

   a. An onlot system with a total absorption area greater than 5,000 square feet will be used.

   b. DEP has determined that the soil, underlying parent material, geology at the site or volume of the discharge may cause adverse groundwater mounding or inadequate sewage treatment.

2. The following information is to be submitted:

   a. Description of the soils and geology at the site and the characteristics of these which may limit the horizontal or vertical movement of effluent.

b. Description, location and results of any permeability testing performed, including:

(1) Identification and description of restrictive layers of soil, parent material and bedrock.

(2) Rate of flow through and laterally over those restrictive layers (in inches per hour).

(3) Calculation of potential groundwater mounding expected from the additional flows.

c. Recommendations on system design modifications needed because of poor permeability, including absorption area sizing or placement and dosing rates for onlot overland flow.

NOTE: *DEP may require more detailed hydrogeologic information based on the information submitted in this section.*

Section L. Preliminary Hydrogeologic Study

(Complete if marked in component or if the conditions in number 1 (below) apply.)

Hydrogeologic work requires an appropriate professional signature and seal.

1. This section must be completed when soil-dependent treatment methods are proposed and any of the following apply:

   a. DEP has determined that water supplies within ¼ mile of the proposed development site exceed 5 parts per million (ppm) nitrate-nitrogen (NO_3-N).

   b. DEP has determined that known geological conditions at the proposed site may contribute to the potential for groundwater pollution from such systems.

2. The following information is to be submitted on a copy of the topographic map of the area and in narrative form:

   a. Results of background sampling for total coliform, fecal coliform, pH and nitrate-nitrogen.

   b. If as a part of a Preliminary Hydrogeologic Study a well is drilled to assess the background nitrate-nitrogen concentrations in the shallow groundwater, the hydrogeologist shall provide a log of the well or wells. The log or logs shall provide the date of drilling, total well depth, depth to bedrock, depth to bottom of casing, depth to all water bearing zones and the static water level. The well logs do not need to be graphical. In addition, the report should contain a discussion of the well purging protocol used prior to well sampling. The protocol must assure that a fresh sample is obtained from the shallow aquifer.

   c. Topographic location of the proposed system(s).

   d. Estimated area of impacted groundwater (dispersion plume and mixing zone within the dispersion plume) calculated from the surface topography and known geologic conditions.

   e. Identification of existing and potential groundwater uses within the dispersion plume.

   Note: Based on the information submitted in this section, DEP may require more detailed hydrogeologic information (Section M, below).

Section M. Detailed Hydrogeologic Study (Complete if marked in component)

(Complete if marked in component or if DEP determines during the planning process that the additional study is necessary.)

Hydrogeologic work requires an appropriate professional signature and seal. A detailed hydrogeologic study must be completed when the proposed system(s) may degrade groundwater or surface water to the point that existing or potential groundwater uses or designated stream uses may not be protected. Often specific tasks listed in the detailed

hydrogeologic study will satisfy DEP concerns. Since the level of study necessary for a particular site may vary, it is recommended to contact the DEP regional hydrogeologist to determine the level of study necessary for a project.

A. Content of Detailed Hydrogeologic Study

The following information must be included in the detailed hydrogeologic study using narrative and/or maps as appropriate.

1. Type of discharge to groundwater. This includes:
   a. Dry stream channel
      (1) Intermittent stream (dry under low flow conditions)
      (2) Stormwater drainage ditch (flow in wet season or during and immediately after storms)
   b. Onlot subsurface disposal
      (1) Individual onlot systems
      (2) Community onlot systems
      (3) Large Volume onlot systems
   c. Land Application
      (1) Spray irrigation
      (2) Unlined wetland cell
      (3) Groundwater infiltration
2. Plot the topographic location of the discharge.
3. The relationship between surface water and groundwater flow.
4. Investigate, describe and plot geologic and hydrogelogic characteristics influencing groundwater flow. These characteristics include but are not limited to the following:
   a. Bedrock formations, lithologic description and range of depth
   b. Bedding features, the frequency and direction of dominant joints and fractures
   c. Faults, lineaments and earth fracture traces
   d. Karst features such as open and closed sinkholes, closed depressions, known solution channels, pinnacles or other specific featues
   e. Unconsolidated material characteristics (soil, glacial materials, fluvial materials, etc.)
   f. Unconsolidated bedrock characteristics (saprolite, weathered zones)
   g. Elevation of the permanent groundwater table, anticipated water table fluctuation and groundwater flow direction
   h. Unconfined or confined aquifer characteristics
   i. Aquifer flow characteristics as quantified through pump testing or other characterization methodology (i.e., hydraulic conductivity, storage coefficient, transmissivity, etc.)
   j. Existing, planned and potential down-gradient groundwater uses including, but not limited to: all water supply locations; the volume of water used at these locations; the estimated horizontal extent of each well's cone of depression; and the influence of pumping upon the natural groundwater gradient, the direction of flow and including both existing and potential water supplies.
5. Groundwater/surface water characteristics, including:
   a. If as a part of a Detailed Hydrogeologic Study a well is drilled to assess the background nitrate-nitrogen concentrations in the shallow groundwater, the hydrogeologist shall provide a log of the well or wells. The log or logs shall provide the date of drilling, total well depth, depth to bedrock, depth to bottom of casing, depth to all water bearing zones and the static water level. The well logs do not need to be graphical. In addition, the

report should contain a discussion of the well purging protocol used prior to well sampling. The protocol must assure that a fresh sample is obtained from the shallow aquifer.

b. Existing groundwater quality and quantity, including, but not limited to, the following analyses:

1) Total coliform	10) Total manganese
2) Fecal coliform	11) Sodium
3) pH	12) Magnesium
4) Total iron	13) Calcium
5) Turbidity	14) Potassium
6) Alkalinity	15) Sulfate
7) Nitrate-Nitrogen	16) Total Dissolved Solids
8) Chloride	17) Hardness
9) Ammonia-Nitrogen	18) Volatile Organic Compounds

c. The name, location, flow characteristics, flow volume (cfs), existing water quality and designated use of any potentially impacted surface water (receiving stream). Include all surface water uses as listed for the water body in Chapter 93.

d. Influence of surface water runoff and groundwater recharge on groundwater characteristics.

e. Designation of any watershed area that is utilized for a water supply, recreation or agricultural irrigation.

f. Any other information necessary to adequately analyze the hydrogeologic impact by the proposed facility.

B. Detailed Hydrogeological Study Analysis and Report

Using the information gathered, describe and analyze the proposed facility's impact. Use narrative and mapping where appropriate. A complete study should include, but not be limited to, the following items:

1. Discuss pre-treatment system components proposed to decrease effluent contaminant levels prior to groundwater discharge. Include design and testing data submitted to support any long-term, consistent, reliable and measurable treatment claims.
2. Delineate any dispersion plume in which the existing water quality will be degraded. Include all identified contaminant and hydrogeological variables from the site in this analysis.
3. Describe any natural condition and/or artificial control that confines dispersion plume flow.
4. Delineate a mixing zone within the dispersion plume where any chemical or biological concentrations will exceed rates in Federal Drinking Water Quality Standards.
5. Identify a buffer zone for the dispersion plume and mixing zone and also discuss the effects of seasonal weather conditions on this zone.
6. Discuss impacts on existing, planned and potential groundwater uses in the delineated dispersion plume, mixing zone and buffer zone.
7. Discuss any surface waterbodies that may intercept or interact with the dispersion plume.
8. Predict and quantify any impacts the identified dispersion plume will have upon the uses listed for that surface waterbody.
9. Predict any effects of the dispersion plume on all existing, planned or future groundwater uses.
10. Predict the extent and height of any groundwater/wastewater mound and capillary fringe resulting from restrictive layers in the subsurface. Restrictive layers may include, but are not limited to, restrictive soil horizons, unconsolidated geological materials, weathered bedrock materials, low permeability bedrock or a permanent groundwater table.

11. Discuss any physical, chemical or biological impact to groundwater, surface water or treatment facility function resulting from the formation of a groundwater/wastewater mound including capillary fringe. Soil is often part of the treatment process and for analysis purposes may be considered part of the treatment facility.
12. Discuss and propose any system change or recommendations deemed necessary to mitigate the effects of the identified groundwater/wastewater mounding.
13. Discuss any groundwater monitoring program necessary to guard against adverse impacts from the facility. The program should include proposed monitoring well locations, appropriate groundwater sampling methodologies, appropriate chemical and biological sampling parameters and appropriate monitoring frequencies. If appropriate, include monitoring considerations to protect existing surface water uses.
14. Discuss authority for controlling groundwater uses within the mixing and buffer zones. Such items as groundwater easements and access rights that are necessary for mitigation or abatement purposes should be discussed.
15. Discuss contingency plan to abate pollution if groundwater monitoring reveals a problem.

IN NARRATIVE FORM ESTABLISH:

1. A monitoring program for groundwater and/or surface water where appropriate.
2. Authority for control of groundwater use in the mixing and buffer zones and access rights for abatement purposes should the contaminant leave control of the mixing zone.
3. Contingencies available to abate pollution should the contaminant leave control of the mixing zone.
4. Treatment capabilities of any pre-treatment system components proposed to decrease contaminant levels prior to discharge to groundwater. This must include design and testing data which supports claims of consistent, reliable and measurable improvements in treatment.
5. System design, placement and sizing recommendations based on the hydrogeologic study.
6. Controls of present and future water usage within the mixing and buffer zone.

Section N. Municipal Action

This section is to be completed by the municipality.

1. Sewage Management

   SFTF systems require long-term operation and maintenance to keep them working correctly and to prevent pollution or public health hazards caused by discharge of inadequately treated sewage effluent. These systems are the only sewage treatment plants that are not required to be operated and maintained by a certified treatment plant operator. Although the operation and maintenance requirements are usually minimal, problems can occur when untrained property owners are left with the responsibility to operate and maintain these systems. When these systems fail due to lack of adequate operation or maintenance, DEP holds both the property owner and the municipal government responsible to either repair or replace the improperly functioning system. The municipality should protect itself from potential future liabilities associated with improperly operated or maintained SFTFs by assuring that guarantees of long-term operation and maintenance are properly evaluated and in place before use of SFTFs is approved.

   DEP's regulations (Section 71.64(c)(5)) require that all planning modules for SFTF systems include an evaluation that establishes specific responsibilities for operation and maintenance of the proposed system. This evaluation must include documentation that one or a combination of the following operation and maintenance requirements have been established or approved in writing by the municipality.

   1. A maintenance agreement between the property owner and an individual, firm or corporation experienced in the operation and maintenance of sewage treatment systems.

2. A maintenance agreement between the property owner and municipality or its designated local agency which establishes the property owner's responsibility for operating and maintaining the system and the responsibility of the municipality or local agency for oversight of the system.

3. A municipal ordinance which requires that the small flow treatment facilities be operated and maintained through a maintenance agreement between the property owner and an individual, firm or corporation experienced in the operation and maintenance of sewage treatment systems.

4. Municipal ownership of the system.

5. Inclusion of the system under a sewage management agency developed in accordance with §71.73 (relating to sewage management programs for sewage facilities permitted by local agencies) operated by the municipality.

6. A properly chartered association, trust or other private entity which is structured to manage the system.

   a. Associations must meet the following minimum requirements to be considered adequate:

      (1) The association must be nonprofit and incorporated or must be a co-op under the Public Utility Commission's jurisdiction.

      (2) Articles of Incorporation and Bylaws must:

         (a) limit the purpose of the association and stipulate that funds collected for sewerage services be disbursed only in payment for expenses of these systems.

         (b) provide for membership and voting rights for each owner of an improved property in the development.

         (c) provide for suspension of service to property owners for non-payment of bills.

         (d) stipulate that the corporation owns the sewerage facilities.

         (e) establish the capability of the association to:

            - keep records and an accounting/auditing system
            - collect fees for services provided
            - disburse funds
            - contract with public or private agencies for labor or other services
            - employ personnel to operate and maintain sewage facilities
            - establish contingency funds for use in repairing system components
            - have elected officer and bylaws

         (f) establish association membership as a deed restriction and condition of sale of the property.

         (g) establish the legal right to enter upon property for routine inspections or maintenance and to respond to emergencies.

         (h) establish assurance that adequate operation and maintenance funds are available from the start of the sewerage system operation.

   b. Properly chartered trusts must meet the following minimum requirements to be considered adequate:

      (1) The sewage facilities are legally conveyed to a third party (trustee) through a trust deed.

(2) The trust deed contains specific provisions which require the original owner of the facilities to:

(a) Maintain the sewage system in accordance with normally accepted operation and maintenance standards and permit conditions at all times.

(b) Provide continued service to each property connected to the sewage facilities.

(c) Provide service at a rate established in the trust deed or by action or regulation of the Public Utilities Commission.

(3) The Trust Deed states that upon the original owner's default on any of the Trust Deed provisions, the Trustee named has the authority and responsibility to take possession, operate and manage the sewage facilities.

7. Bonding, escrow or other security must be established prior to planning approval and must be forfeited to the municipality upon notice of continuing noncompliance of the system with the operation, maintenance and monitoring standards contained in DEP's *Guidelines for Design, Installation and Operation of Small Flow Sewage Treatment Facilities*, DEP ID: 362-0300-002 available on DEP's website or noncompliance with the municipal assurances for management of the operation and maintenance requirements established through the provisions of this subsection. The municipality will use the forfeited security to cover the costs of repair and/or future operation and maintenance of the system over its design life. This bonding, escrow or other security must equal an amount up to a maximum of 50 percent for each of the first 2 years of operation. After 2 years of operation the bond agreement must provide for a refund of part of the bond so that only 10 percent of the cost of the equipment and installation is retained by the bondholder. The remaining 10 percent is retained for the life of the system.

2. Residual Tract Waiver

DEP believes that developers, municipal officials and future lot owners are best protected by complying with sewage planning requirements to assure that adequate sewage facilities will be available to serve all newly created subdivisions. However, DEP is aware that some subdivision proposals include residual tracts on which no construction is proposed which would require the use of sewage disposal facilities. Developers having such residual tracts may not be required to complete sewage facilities planning for that portion of the subdivision if this claim is valid. The residual tract waiver may be requested by checking the request block in Section G.2.

To be valid, acceptance of the request for a waiver by the municipal or county planning agency and the municipality is required. The municipal or county planning agency will indicate its acceptance of the proposed waiver by marking the appropriate blocks on Component 4. The municipality indicates its acceptance of the proposed waiver by signing and dating the appropriate statement in Section N, Component 3s. When the proposal involves the subdivision of property on which there is an existing building currently served by an onlot septic system on the residual tract, the municipality's sewage enforcement officer must inspect the system for proper operation.

In addition, the planning module must include a plot plan or deed or deed notice which contains language similar to the following, directed to the residual tracts:

"As of the date of this deed/plot plan/deed notice recording, the residual tract of this subdivision is dedicated for the express purpose of _____ use. No portion of the residual tract of this subdivision has been approved by the municipality or the approving agency for the installation of sewage disposal facilities. No sewage permit will be issued for the installation, construction, connection to or use of any sewage collection, conveyance, treatment or disposal system (except for repairs to existing system) unless the municipality and approving agency have approved any required sewage facilities planning for the residual tract of the subdivision described herein in accordance with the Sewage Facilities Act (35 P.S. Sections 750.1 *et seq.*) and regulations promulgated thereunder. Prior to signing, executing, implementing or recording any sales contract or subdivision plan, any purchaser or subdivider of any portion of this residual tract should contact the municipality which is charged with administering the Sewage Facilities Act to determine what sewage facilities planning is required and the procedure and requirements for obtaining appropriate permits or approvals."

Language similar to the above must be recorded on the plot plan or deed or deed notice and a copy of the deed or plot plan or deed notice must be submitted with this planning module submission.

Section O. Public Notification Requirements

Notification of proposals for the use of SFTFs must be published at least once in the legal section of a newspaper of general circulation in the municipality in which the system will be used. This newspaper publication may be provided by the applicant or the applicant's agent, the municipality or the local agency by publication in a newspaper of general circulation within the municipality affected. Where an applicant or an applicant's agent provides the required notice for publication, the applicant or applicant's agent shall notify the municipality or local agency and the municipality and local agency will be relieved of the obligation to publish. Prior to publication of the notification, the applicant should notify the municipality that comments regarding their development will be directed to the municipality. The applicant should work with the municipality in coordinating the comment period, the time and location where the plan can be reviewed and the municipal review of the planning module package. The notification must contain the following as a minimum:

1. Name of project.
2. Type of development (residential, multi-residential, commercial, industrial).
3. Location, including road and street markers, municipality and county.
4. Acreage under development and number of equivalent dwelling units proposed.
5. Type of sewage disposal proposed (small flow treatment facility with stream discharge/spray irrigation/dry stream channel discharge, etc.).
6. Establishment of a 30-day comment and review period.
7. Where and when the land development plan can be reviewed. The recommended site for this public access to the plan is the municipal office or some other public building within the municipality where the project is proposed.
8. Address of the municipal office where comments will be accepted.

A copy of the newspaper notification, the comments received as a result of the publication, if any, and the municipal response to these comments must be submitted to DEP with the Sewage Facilities Planning Module.

Section P. False Swearing Statement

The individual completing the planning module is required to provide the information requested and to sign the false swearing statement.

Section Q. Planning Module Review Fees

The Sewage Facilities Act establishes a fee for the DEP planning module review. DEP will calculate the review fee for the project and invoice the project sponsor **OR** the project sponsor may attach a self-calculated fee payment to the planning module prior to submission of the planning package to DEP. After consideration of the options available, please check the appropriate box in the Component 3s form attached.

Planning module review fees for a Component 3s submission may be determined using the following formula:
A new surface or sub-surface discharge of less than 2000 gpd will use:

_____ Lots (or EDUs) X $35.00 = $ _____

The fee is based upon:

- The number of lots created or number of EDUs whichever is greater.

- An EDU is equal to a sewage flow of 400 gallons per day.
- For other than single-family residential projects, EDUs are calculated using projected population figures.

OTHER REQUIREMENTS

Planning Agency Review

Except when proposing an SFTF as a repair to a malfunctioning sewage disposal system, Component 4 (Planning Agency Review) and a copy of the entire completed planning module for new land development must be forwarded by the applicant to each existing municipal, county or areawide planning agency and existing health department for their action. In repair situations, where new land development is not proposed, planning agency reviews are not required. Where available, obtaining existing county health department comments is appropriate using Component 4C. The use of registered mail or certified mail (return receipt requested) by the applicant when forwarding the planning module to the agencies will establish the date of receipt. These agencies are required to provide comments within 60 days of receipt of the complete planning module package. The planning agencies will review the planning module for consistency with municipal and county official sewage facilities plans, municipal comprehensive plans, zoning and land use designations. They will also determine consistency of the plan with wetland protection, stormwater management, archaeological and historical resources and prime agricultural land protection as indicated in the comprehensive plan for the area. Proof that these agencies have been in possession of the planning module for 60 days without comment will satisfy the review requirement. When the agencies return the planning module to the applicant, or if 60 days have passed without comment, it may be submitted to the municipality for review and action.

Municipal Review

The municipality must determine if the planning module package is complete within 10 days of its receipt. If it is complete, the municipality must sign and date the checklist following this guidance to document the date of receipt of a complete module. Incomplete planning modules are returned to the applicant for completion.

The municipality must act upon a complete Component 3s planning module package within 60 days of receipt or within such additional time as the applicant and municipality may agree to in writing. Failure of the municipality to act within 60 days or the agreed-to time extension causes the planning module to be deemed approved by the municipality. The municipality or applicant may then send the complete planning module, along with the signed and dated completeness checklist, to DEP for final review.

Municipal actions can include adoption of the project as a revision to the municipality's Official Plan, adoption of the revision with modifications or denial of the revision. If the plan is adopted, the municipality forwards the revision, along with the signed and sealed Resolution for Plan Revision form and signed Transmittal Letter form, to DEP. Denied revisions are to be returned to the applicant with the reason(s) for denial. DEP must also be informed of the reasons for denial.

DEP Review

DEP must determine if the proposed residential subdivision plan is complete within 10 days of receipt. If it is complete, DEP will review the proposed revision. DEP must approve or disapprove the proposed plan revision within 120 days of receipt of a complete package, unless the proposed revision is for a residential subdivision plan which requires DEP action within 60 days of receipt of a complete plan submission. If DEP fails to act within this 120 day period (60 days for residential subdivision plans), the proposed plan revision will be deemed to be approved, unless DEP informs the municipality prior to the end of the review period that an extension of time is necessary to complete the plan review. This extension of time may not exceed 60 days.

The municipality and applicant will be informed of DEP's action by letter. If the plan is disapproved, the municipality and applicant will also be notified of the reason(s) for the disapproval.

Code No. _____
_____ New System _____ Repair

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

SEWAGE FACILITIES PLANNING MODULE

Component 3s. Small Flow Treatment Facilities (SFTF)

(Return completed module package to appropriate municipality)

DEP USE ONLY				
DEP CODE #	CLIENT ID #	SITE ID #	APS ID #	AUTH ID #

This Component is used to satisfy the sewage facilities planning requirements for projects proposing the use of Small Flow Treatment Facilities (SFTF). An SFTF is an individual or community sewerage system designed to adequately treat sewage flows not greater than 2,000 gallons per day (gpd) for final disposal using a stream discharge or other disposal methods approved by DEP.

If the SFTF is proposed as a repair to an existing malfunctioning sewage system, complete Component 3s Sections A through H, N, P and Q. (In HQ/EV watersheds, Section O must also be completed.)

All other SFTF proposals must complete sections A through I and N through Q. Sections J, K, L and M must be completed if indicated by DEP or if justified by preliminary test results.

A. PROJECT INFORMATION AND QUALIFICATION (See Section A of instructions)

1. Project Name

2. Brief Project Description

3. Qualification

Answer the following questions. Check all answers that apply.

	Yes	No	
a.	☐	☐	Is the SFTF proposed to serve a residential dwelling(s) or commercial facility which will generate domestic wastewater not containing industrial waste and which will generate a total sewage flow of no more than 2,000 gallons per day (gpd)? or Is the SFTF proposed to repair a malfunctioning sewage system generating no more than 2,000 gpd?
b.	☐	☐	Are "Site Investigation and Percolation Test Report" forms attached to this module that document sufficient testing was performed to establish that the soils on this property are unsuitable for installation of any type of individual or community onlot disposal system (other than an Individual Residence Spray Irrigation System (IRSIS))?
c.	☐	☐	Is the proposed discharge into a stream that is NOT classified as a High Quality (HQ) or Exceptional Value (EV) in Title 25 PA Code Chapter 93.
	☐ n/a		n/a may only be chosen if the proposed SFTF will not discharge to a surface water body. Please see the discussion of treatment and disposal options in Section H of the instructions for more information.

In general, if the answer to any of the above questions is "No," the SFTF cannot be used at this site. However, under Title 25 Pa. Code Chapter 95, discharge to streams classified as HQ or EV can be justified in certain repair situations. Please refer to the instructions attached to this component or contact the DEP regional office for more information.

B. CLIENT (MUNICIPALITY) INFORMATION (See Section B of instructions)

Municipality Name | County | City ☐ | Boro ☐ | Twp ☐

Municipality Contact Individual - Last Name | First Name | MI | Suffix | Title

Additional Individual Last Name | First Name | MI | Suffix | Title

Municipality Mailing Address Line 1 | Mailing Address Line 2

Address Last Line -- City | State | ZIP+4

Phone + Ext. | FAX (optional) | E-mail (optional)

C. SITE INFORMATION (See Section C of instructions)

Site (Land Development or Project) Name

Site Location Line 1 | Site Location Line 2

Site Location Last Line -- City | State | ZIP+4 | Latitude | Longitude

Detailed Written Directions to Site

Description of Site

Site Contact (Developer/Owner)

Last Name | First Name | MI | Suffix | Phone | Ext.

Site Contact Title | Site Contact Firm (if none, leave blank)

FAX | E-mail

Mailing Address Line 1 | Mailing Address Line 2

Mailing Address Last Line -- City | State | ZIP+4

D. PROJECT CONSULTANT INFORMATION (See Section D of instructions)

Last Name | First Name | MI | Suffix

Title | Consulting Firm Name

Mailing Address Line 1 | Mailing Address Line 2

Address Last Line – City | State | ZIP+4 | Country

E-mail | Phone | Ext. | FAX

E. AVAILABILITY OF DRINKING WATER SUPPLY

The Project will be provided with drinking water from the following source: (Check appropriate box)

☐ Individual wells or cisterns.

☐ A proposed public water supply.

☐ An existing public water supply.

If existing public water supply is to be used, provide the name of the water company and attach documentation from the water company stating that it will serve the project.

Name of water company: _____

F. PROJECT NARRATIVE (See Section F of instructions)

☐ A narrative has been prepared as described in Section F of the instructions and is attached.

The applicant may choose to include additional information beyond that required by Section F of the instructions.

G. GENERAL SITE SUITABILITY AND PROPOSED WASTEWATER DISPOSAL FACILITIES (See Section G of instructions)

1. PLOT PLAN

The following information is to be submitted on a plot plan of the proposed subdivision.

a. Location of all soil profiles and percolation tests.
b. Slope at each test area.
c. Soil types and boundaries.
d. Location of proposed treatment units and discharge point.
e. Existing and proposed streets, roadways, access roads, etc.
f. Lot lines and lot sizes.
g. Existing and proposed rights-of-way.
h. Existing and proposed drinking water supplies for proposed and contiguous lots.
i. Existing buildings.
j. Surface waters.
k. Wetlands – from National Wetland Inventory Mapping and USDA Hydric Soils Mapping.
l. Floodplain or floodprone area soils, floodways (Federal Flood Insurance Mapping).
m. Designated open space areas.
n. Remaining acreage under the same ownership and contiguous lots.
o. Existing onlot or sewerage systems; pipelines, transmission lines, etc., in-use or abandoned.
p. Prime agricultural land.
q. Orientation to North.

2. RESIDUAL TRACT PLANNING WAIVER REQUEST

A waiver from sewage facilities planning ☐ is, ☐ is not requested for the residual land tract associated with this project. (See Section N, Component 4 and instructions for additional information.)

3. SOCIAL OR ECONOMIC JUSTIFICATION

Yes	No	
☐	☐	Will the proposed project result in a new or increased discharge into special protection waters as identified in Chapter 93? If yes, attach the Social or Economic Justification (SEJ) required by Section 93.4c.

4. **WETLAND PROTECTION**

	Yes	No	
a.	☐	☐	Are there wetlands in the project area? If yes, ensure these areas appear on the plot plan as shown in the mapping or through on-site delineation.
b.	☐	☐	Are there any construction activities (encroachments or obstructions) proposed in, along or through the wetlands? If yes, identify any proposed encroachments on wetlands and identify whether a General Permit or a full encroachment permit will be required. If a full permit is required, address time and cost impacts on the project. Note that wetland encroachments should be avoided where feasible. Also note that a feasible alternative **MUST BE SELECTED** to an identified encroachment on an exceptional value wetland as defined in Title 25 Pa. Code Chapter 105. Identify any project impacts on HQ or EV streams and address impacts of the permitting requirements of said encroachments on the project.

5. **PRIMARY AGRICULTURAL LAND PROTECTION**

	Yes	No	
a.	☐	☐	Will your project involve the disturbance of any prime agricultural lands? If yes, indicate any alternatives to this disturbance that were considered and the reasons they were not deemed feasible. Identify any primary or secondary impacts of the project on the Commonwealth's prime agricultural lands. Evaluate alternatives to avoid or mitigate undesirable impacts. The selected sewage facilities plan must be consistent with local measures in place to protect prime agricultural lands.

6. **HISTORIC PRESERVATION ACT**

Yes	No	
☐	☐	Sufficient documentation is attached to confirm that this project is consistent with DEP Technical Guidance (012-0700-001) *Implementation of the PA State History Code* (available on-line at DEP's website at www.depweb.state.pa.us, select "subject" then select "technical guidance"). As a minimum this includes copies of the completed Cultural Resources Notice (CRN), a return receipt for its submission to the PHMC and the PHMC review letter.

Check the appropriate box and supply the required information.

☐ 1. Spray irrigation or other land application is proposed and the requirements of Section H.1. of the planning module instructions are attached.

☐ 2. A discharge to a dry stream channel is proposed and the requirements of Section H.2. of the planning module instructions are attached.

☐ 3. A discharge to a perennial surface waterbody is proposed and the requirements of Section H.3. of the planning module instructions are attached.

I. ALTERNATIVE ANALYSIS (See Section I of instructions)

☐ An alternative analysis has been prepared as described in Section I of the attached instructions and is attached to this component.

The applicant may wish to include additional factors beyond those required to support the SFTF alternative.

Complete the following sections (J, K, L and/or M) only if marked ☒. If none are marked, go directly to Section N.

J. PROTECTION OF RARE, ENDANGERED OR THREATENED SPECIES (See Section J of instructions)

Check one:

☐ The Pennsylvania Natural Diversity Inventory (PNDI) Project Environmental Review Receipt" resulting from my search of the PNDI database and all supporting documentation from jurisdictional agencies (when necessary) is/are attached.

☐ A completed "Pennsylvania Natural Diversity Inventory (PNDI) Project Planning & Environmental Review Form," (PNDI Form) available at www.naturalheritage.state.pa.us , and all required supporting documentation is attached. I request DEP staff to complete the required PNDI search for my project. I realize that my planning module will be considered incomplete upon submission to the Department and that the DEP review will not begin, and that processing of my planning module will be delayed, until a "PNDI Project Environmental Review Receipt" and all supporting documentation from jurisdictional agencies (when necessary) is/are received by DEP.

Applicant or Consultant Initials _____

☐ The information required in Section K of the instructions is attached.

☐ The information required in Section L of the instructions is attached.

☐ The information required in Section M of the instructions is attached.

1. Sewage Management

	Yes	No	
a.	☐	☐	Is a sewage management ordinance that will address this proposal already in effect?

b. If yes, what is the identification number and the effective date of the ordinance?

_____

c. If no, the appropriate documentation describing and confirming the sewage management method to be used must be attached (see Section N of the instructions).

d. If sewage management is not proposed, explain why (see Section N of the instructions for cases where sewage management may not be required).

_____

2. ☐ A **waiver** of the planning requirements for the residual tract of this subdivision has been requested.

The municipality acknowledges acceptance of this proposal and requests a waiver of the sewage facilities planning requirements for the residual tract designated on the subdivision plot plan. Our municipal officials accept full responsibility now and in the future to identify any violation of this waiver and to submit to the approving agency any required sewage facilities planning for the designated residual tract should a violation occur or construction of a new sewage-generating structure on the residual tract of the subdivision be proposed. We understand that such planning information may require municipal officials to be responsible for soil testing and other environmental assessments for the residual tract in the future.

☐ Attached is a copy of the public notice, all comments received as a result of the notice and the municipal response to these comments.

☐ No comments were received. A copy of the public notice is attached.

I verify that the statements made in this Sewage Facilities Planning Module are true and correct to the best of my knowledge, information and belief. I understand that false statements in this document is subject to the penalties of 18 PA C.S.A. §4904 relating to unsworn falsification to authorities.

Name (Print)	Signature
Title	Address
Telephone Number	

The Sewage Facilities Act establishes a fee for DEP planning module review. DEP will calculate the review fee for the project and invoice the project sponsor OR the project sponsor may attach a self-calculated fee payment to the planning module prior to submission of the planning package to DEP. Check the appropriate box.

☐ I request DEP calculate the review fee for my project and send me an invoice for the correct amount. I understand DEP's review of my project will not begin until DEP receives the correct review fee from me for the project.

☐ I have calculated the review fee for my project using the formula found below and the review fee guidance in the instructions. I have attached a check or money order in the amount of $_____ payable to **"Commonwealth of PA, DEP." Include DEP code number on check.** I understand DEP will not begin review of my project unless it receives the fee and determines the fee is correct. If the fee is incorrect, DEP may return my check or money order and send me an invoice for the correct amount. I understand DEP's review will NOT begin until I have submitted the correct fee.

☐ I request to be exempt from the DEP planning module review fee because this planning module creates **only** one new lot and is the **only** lot subdivided from a parcel of land as that land existed on December 14, 1995. I realize that subdivision of a second lot from this parcel of land shall disqualify me from this review fee exemption. I am furnishing the following deed reference information in support of my fee exemption request.

County Recorder of Deeds for _____ County, Pennsylvania
Deed Volume _____ Book Number _____
Page Number _____ Date Recorded _____

☐ I request to be exempt from the DEP planning module review fee because this planning module is proposed to repair a malfunctioning onlot sewage disposal system.

Formula:
A new surface or sub-surface discharge of 2000 gpd or less will use:

#_____ Lots (or EDUs) X $35.00 = $_____

The fee is based upon:

- The number of lots created or number of EDUs, whichever is greater.
- An EDU is equal to a sewage flow of 400 gallons per day.
- For other than single-family residential projects, EDUs are calculated using projected population figures.

STOP - CALL BEFORE YOU DIG!

PENNSYLVANIA LAW REQUIRES
THREE WORKING DAYS NOTICE

Pennsylvania One Call System,Inc.

1-800-242-1776

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

CHECKLIST

The individual completing the component should use the checklist below to assure that all items are included in the module package. The municipality should confirm that the required items have been included within 10 days of receipt, and if complete, sign and date the checklist.

Small Flow Treatment Facilities

- ☐ Complete Component 3s form and attachments.
- ☐ USGS 7.5-minute topographic map with all planned and/or installed SFTFs plotted.
- ☐ Documentation required by the part of Section E appropriate to the project.
- ☐ Project description narrative.
- ☐ Documentation of chosen sewage management method (if applicable).
- ☐ Alternative analysis narrative.
- ☐ Copy of public notification (if applicable).
- ☐ Plot plan.
- ☐ Site Investigation and Percolation Test reports for all soil profile examinations and percolation tests.
- ☐ PNDI "Project Planning & Environmental Review Form" (request DEP search) or "Project Environmental Review Receipt" (self completed search) and all appropriate documentation for the form submitted.
- ☐ Completed Component 4 Planning Agency Review for each existing planning agency and/or health department (if applicable). (Planning Agency Comments are not required for repair proposals.)
- ☐ Permeability information (if applicable).
- ☐ Preliminary hydrogeology (if applicable).
- ☐ Detailed hydrogeology (if applicable).

Municipal Action

- ☐ Component 3s, with attachments.
- ☐ Component 4, Planning Agency Comments (if applicable), with responses to any comments. Planning Agency Comments are not required in repair situations.
- ☐ Proof of public notification (if applicable), any comments generated as a result of the public notice and responses to these comments.
- ☐ Adoption resolution.
- ☐ Transmittal Letter.

_____
Signature of Municipal Official

_____
Date Submittal Determined Complete

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

DEP Code #

SEWAGE FACILITIES PLANNING MODULE
COMPONENT 4A - MUNICIPAL PLANNING AGENCY REVIEW

Note to Project Sponsor: To expedite the review of your proposal, one copy of your completed planning module package and one copy of this ***Planning Agency Review Component*** should be sent to the existing local municipal planning agency for their comments.

SECTION A. PROJECT NAME (See Section A of instructions)

Project Name _____

SECTION B. REVIEW SCHEDULE (See Section B of instructions)

1. Date plan received by municipal planning agency. _____
2. Date review completed by agency. _____

SECTION C. AGENCY REVIEW (See Section C of instructions)

Yes	No		
☐	☐	1.	Is there a municipal comprehensive plan adopted under the Municipalities Planning Code (53 P.S. 10101, *et seq.*)?
☐	☐	2.	Is this proposal consistent with the comprehensive plan for land use? If no, describe the inconsistencies _____
☐	☐	3.	Is this proposal consistent with the use, development, and protection of water resources? If no, describe the inconsistencies _____
☐	☐	4.	Is this proposal consistent with municipal land use planning relative to Prime Agricultural Land Preservation?
☐	☐	5.	Does this project propose encroachments, obstructions, or dams that will affect wetlands? If yes, describe impacts _____
☐	☐	6.	Will any known historical or archaeological resources be impacted by this project? If yes, describe impacts _____
☐	☐	7.	Will any known endangered or threatened species of plant or animal be impacted by this project? If yes, describe impacts _____
☐	☐	8.	Is there a municipal zoning ordinance?
☐	☐	9.	Is this proposal consistent with the ordinance? If no, describe the inconsistencies _____
☐	☐	10.	Does the proposal require a change or variance to an existing comprehensive plan or zoning ordinance?
☐	☐	11.	Have all applicable zoning approvals been obtained?
☐	☐	12.	Is there a municipal subdivision and land development ordinance?

SECTION C. AGENCY REVIEW (continued)

Yes	No	
☐	☐	13. Is this proposal consistent with the ordinance?
		If no, describe the inconsistencies _____
☐	☐	14. Is this plan consistent with the municipal Act 537 Official Sewage Facilities Plan?
		If no, describe the inconsistencies _____
☐	☐	15. Are there any wastewater disposal needs in the area adjacent to this proposal that should be considered by the municipality?
		If yes, describe _____
☐	☐	16. Has a waiver of the sewage facilities planning requirements been requested for the residual tract of this subdivision?
☐	☐	If yes, is the proposed waiver consistent with applicable ordinances?

17. Name, title and signature of planning agency staff member completing this section:

Name: _____

Title: _____

Signature: _____

Date: _____

Name of Municipal Planning Agency: _____

Address _____

Telephone Number: _____

SECTION D. ADDITIONAL COMMENTS (See Section D of instructions)

This Component does not limit municipal planning agencies from making additional comments concerning the relevancy of the proposed plan to other plans or ordinances. If additional comments are desired, attach additional sheets.

The planning agency must complete this Component within 60 days.

This component and any additional comments are to be returned to the project sponsor.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

INSTRUCTIONS FOR COMPLETING COMPONENT 4A MUNICIPAL PLANNING AGENCY REVIEW

Remove and recycle these instructions prior to mailing component to the approving agency (DEP or delegated local agency).

Background

This component, Component 4, is used to obtain the comments of planning agencies and/or health departments having jurisdiction over the project area. It is used in conjunction with other planning module components appropriate to the characteristics of the project proposed.

Who Should Complete the Component?

The component should be completed by any existing municipal planning agency, county planning agency, planning agency with areawide jurisdiction, and/or health department having jurisdiction over the project site. It is divided into sections to allow for convenient use by the appropriate agencies.

The project sponsor must forward copies of this component, along with supporting components and data, to the appropriate planning agency or agencies and health department(s) (if any) having jurisdiction over the development site. These agencies are responsible for responding to the questions in their respective sections of Component 4, as well as providing whatever additional comments they may wish to provide on the project plan. After the agencies have completed their review, the component will be returned to the applicant. The agencies have 60 days in which to provide comments to the applicant. If the agencies fail to comment within this 60 day period, the applicant may proceed to the next stage of the review without the comments. The use of registered mail or certified mail (return receipt requested) by the applicant when forwarding the module package to the agencies will document a date of receipt.

After receipt of the completed Component 4 from the planning agencies, or following expiration of the 60 day period without comments, the applicant must submit the entire component package to the municipality having jurisdiction over the project area for review and action. If approved by the municipality, the proposed plan, along with the municipal action, will be forwarded to the approving agency (DEP or delegated local agency). The approving agency, in turn, will either approve the proposed plan, return it as incomplete, or disapprove the plan, based upon the information provided.

Instructions for Completing Planning Agency and/or Health Department Review Component

Section A. Project Name

Enter the project name as it appears on the accompanying sewage facilities planning module component (Component 2, 3, 3s or 3m).

Section B. Review Schedule

Enter the date the package was received by the reviewing agency, and the date that the review was completed.

Section C. Agency Review

1. Answer the yes/no questions and provide any descriptive information necessary on the lines provided. Attach additional sheets, if necessary.

2. Complete the name, title, and signature block.

Section D. Additional Comments

The Agency may provide whatever additional comment it deems necessary, as described in the form. Attach additional sheets, if necessary.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

DEP Code #

SEWAGE FACILITIES PLANNING MODULE
COMPONENT 4B - COUNTY PLANNING AGENCY REVIEW
(or Planning Agency with Areawide Jurisdiction)

Note to Project Sponsor: To expedite the review of your proposal, one copy of your completed planning package and one copy of this ***Planning Agency Review Component*** should be sent to the existing county planning agency or planning agency with areawide jurisdiction for their comments.

SECTION A. PROJECT NAME (See Section A of instructions)

Project Name _____

SECTION B. REVIEW SCHEDULE (See Section B of instructions)

1. Date plan received by county planning agency. _____
2. Date plan received by planning agency with areawide jurisdiction _____

   Agency name _____
3. Date review completed by agency _____

SECTION C. AGENCY REVIEW (See Section C of instructions)

Yes	No		
☐	☐	1.	Is there a county or areawide comprehensive plan adopted under the Municipalities Planning Code (53 P.S. 10101 *et seq.*)?
☐	☐	2.	Is this proposal consistent with the comprehensive plan for land use?
☐	☐	3.	Does this proposal meet the goals and objectives of the plan? If no, describe goals and objectives that are not met _____
☐	☐	4.	Is this proposal consistent with the use, development, and protection of water resources? If no, describe inconsistency _____
☐	☐	5.	Is this proposal consistent with the county or areawide comprehensive land use planning relative to Prime Agricultural Land Preservation? If no, describe inconsistencies: _____
☐	☐	6.	Does this project propose encroachments, obstructions, or dams that will affect wetlands? If yes, describe impact _____
☐	☐	7.	Will any known historical or archeological resources be impacted by this project? If yes, describe impacts _____
☐	☐	8.	Will any known endangered or threatened species of plant or animal be impacted by the development project?
☐	☐	9.	Is there a county or areawide zoning ordinance?
☐	☐	10.	Does this proposal meet the zoning requirements of the ordinance? If no, describe inconsistencies _____

Yes	No	SECTION C. AGENCY REVIEW (continued)
☐	☐	11. Have all applicable zoning approvals been obtained?
☐	☐	12. Is there a county or areawide subdivision and land development ordinance?
☐	☐	13. Does this proposal meet the requirements of the ordinance?
		If no, describe which requirements are not met _____
☐	☐	14. Is this proposal consistent with the municipal Act 537 Official Sewage Facilities Plan?
		If no, describe inconsistency _____
☐	☐	15. Are there any wastewater disposal needs in the area adjacent to this proposal that should be considered by the municipality?
		If yes, describe _____
☐	☐	16. Has a waiver of the sewage facilities planning requirements been requested for the residual tract of this subdivision?
☐	☐	If yes, is the proposed waiver consistent with applicable ordinances.
		If no, describe the inconsistencies _____
☐	☐	17. Does the county have a stormwater management plan as required by the Stormwater Management Act?
☐	☐	If yes, will this project plan require the implementation of storm water management measures?
		18. Name, Title and signature of person completing this section:
		Name: _____
		Title: _____ Signature: _____
		Date: _____
		Name of County or Areawide Planning Agency: _____
		Address: _____
		Telephone Number: _____

SECTION D. ADDITIONAL COMMENTS (See Section D of instructions)

This Component does not limit county planning agencies from making additional comments concerning the relevancy of the proposed plan to other plans or ordinances. If additional comments are needed, attach additional sheets.

The county planning agency must complete this Component within 60 days.

This Component and any additional comments are to be returned to the applicant.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

INSTRUCTIONS FOR COMPLETING COMPONENT 4B
COUNTY PLANNING AGENCY REVIEW
(or Planning Agency with Areawide Jurisdiction)

Remove and recycle these instructions prior to mailing component to the approving agency (DEP or delegated local agency).

Background

This component, Component 4, is used to obtain the comments of planning agencies and/or health departments having jurisdiction over the project area. It is used in conjunction with other planning module components appropriate to the characteristics of the project proposed.

Who Should Complete the Component?

The component should be completed by any existing municipal planning agency, county planning agency, planning agency with areawide jurisdiction, and/or health department having jurisdiction over the project site. It is divided into sections to allow for convenient use by the appropriate agencies.

The project sponsor must forward copies of this component, along with supporting components and data, to the appropriate planning agency or agencies and health department(s) (if any) having jurisdiction over the development site. These agencies are responsible for responding to the questions in their respective sections of Component 4, as well as providing whatever additional comments they may wish to provide on the project plan. After the agencies have completed their review, the component will be returned to the applicant. The agencies have 60 days in which to provide comments to the applicant. If the agencies fail to comment within this 60 day period, the applicant may proceed to the next stage of the review without the comments. The use of registered mail or certified mail (return receipt requested) by the applicant when forwarding the module package to the agencies will document a date of receipt.

After receipt of the completed Component 4 from the planning agencies, or following expiration of the 60 day period without comments, the applicant must submit the entire component package to the municipality having jurisdiction over the project area for review and action. If approved by the municipality, the proposed plan, along with the municipal action, will be forwarded to the approving agency (DEP or delegated local agency). The approving agency, in turn, will either approve the proposed plan, return it as incomplete, or disapprove the plan, based upon the information provided.

Instructions for Completing Planning Agency and/or Health Department Review Component

Section A. Project Name

Enter the project name as it appears on the accompanying sewage facilities planning module component (Component 2, 3, 3s or 3m).

Section B. Review Schedule

Enter the date the package was received by the reviewing agency, and the date that the review was completed.

Section C. Agency Review

1. Answer the yes/no questions and provide any descriptive information necessary on the lines provided. Attach additional sheets, if necessary.

2. Complete the name, title, and signature block.

Section D. Additional Comments

The Agency may provide whatever additional comment it deems necessary, as described in the form. Attach additional sheets, if necessary.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

DEP Code #

SEWAGE FACILITIES PLANNING MODULE
COMPONENT 4C - COUNTY OR JOINT HEALTH DEPARTMENT REVIEW

Note to Project Sponsor: To expedite the review of your proposal, one copy of your completed planning module package and one copy of this ***Planning Agency Review Component*** should be sent to the county or joint county health department for their comments.

SECTION A. PROJECT NAME (See Section A of instructions)

Project Name _____

SECTION B. REVIEW SCHEDULE (See Section B of instructions)

1. Date plan received by county or joint-county health department. _____

   Agency name _____

2. Date review completed by agency _____

SECTION C. AGENCY REVIEW (See Section C of instructions)

Yes	No		
☐	☐	1.	Is the proposed plan consistent with the municipality's Official Sewage Facilities Plan?
			If no, what are the inconsistencies? _____
☐	☐	2.	Are there any waste water disposal needs in the area adjacent to the new land development that should be considered by the municipality?
			If yes, describe _____
☐	☐	3.	Is there any known groundwater degradation in the area of the proposed subdivision?
			If yes, describe _____
☐	☐	4.	The county or joint county health department recommendation concerning this proposed plan is as follows: _____
		5.	Name, title and signature of person completing this section:
			Name: _____
			Title: _____
			Signature: _____
			Date: _____
			Name of County Health Department: _____
			Address: _____
			Telephone Number: _____

SECTION D. ADDITIONAL COMMENTS (See Section D of instructions)

This Component does not limit county planning agencies from making additional comments concerning the relevancy of the proposed plan to other plans or ordinances. If additional comments are needed, attach additional sheets.

The county planning agency must complete this Component within 60 days.
This Component and any additional comments are to be returned to the applicant.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

INSTRUCTIONS FOR COMPLETING COMPONENT 4C COUNTY OR JOINT HEALTH DEPARTMENT REVIEW

Remove and recycle these instructions prior to mailing component to the approving agency (DEP or delegated local agency).

Background

This component, Component 4, is used to obtain the comments of planning agencies and/or health departments having jurisdiction over the project area. It is used in conjunction with other planning module components appropriate to the characteristics of the project proposed.

Who Should Complete the Component?

The component should be completed by any existing municipal planning agency, county planning agency, planning agency with areawide jurisdiction, and/or health department having jurisdiction over the project site. It is divided into sections to allow for convenient use by the appropriate agencies.

The project sponsor must forward copies of this component, along with supporting components and data, to the appropriate planning agency or agencies and health department(s) (if any) having jurisdiction over the development site. These agencies are responsible for responding to the questions in their respective sections of Component 4, as well as providing whatever additional comments they may wish to provide on the project plan. After the agencies have completed their review, the component will be returned to the applicant. The agencies have 60 days in which to provide comments to the applicant. If the agencies fail to comment within this 60 day period, the applicant may proceed to the next stage of the review without the comments. The use of registered mail or certified mail (return receipt requested) by the applicant when forwarding the module package to the agencies will document a date of receipt.

After receipt of the completed Component 4 from the planning agencies, or following expiration of the 60 day peri without comments, the applicant must submit the entire component package to the municipality having jurisdiction ove the project area for review and action. If approved by the municipality, the proposed plan, along with the municipal action, will be forwarded to the approving agency (DEP or delegated local agency). The approving agency, in turn, will either approve the proposed plan, return it as incomplete, or disapprove the plan, based upon the information provided.

Instructions for Completing Planning Agency and/or Health Department Review Component

Section A. Project Name

Enter the project name as it appears on the accompanying sewage facilities planning module component (Component 2, 3, 3s or 3m).

Section B. Review Schedule

Enter the date the package was received by the reviewing agency, and the date that the review was completed.

Section C. Agency Review

1. Answer the yes/no questions and provide any descriptive information necessary on the lines provided. Attach additional sheets, if necessary.

2. Complete the name, title, and signature block.

Section D. Additional Comments

The Agency may provide whatever additional comment it deems necessary, as described in the form. Attach additior sheets, if necessary.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

INSTRUCTIONS FOR COMPLETING REQUEST FOR PLANNING WAIVER & NON-BUILDING DECLARATION

This form replaces all previous versions of the "Non-Building Waiver" forms. Previous forms may no longer be used and should be recycled.

Background: Act 537 (the Pennsylvania Sewage Facilities Act) and Title 25, Pennsylvania Code, Chapter 71 require each municipality to modify its Official Sewage Plan whenever a subdivision of land occurs. To modify an Official Plan, an appropriate sewage facilities planning module or planning exemption request, completion of required soils testing where onlot disposal is proposed, and formal approval by both the municipality and DEP is required. This sewage facilities planning requirement is not altered by the presence or absence of local or county subdivision regulations or ordinance. Developers, municipal officials and future lot owners are best protected by complying with sewage planning requirements to assure that adequate sewage facilities will be available to serve all newly created parcels of land.

In consideration of claims that since there is no present or future need for sewage disposal facilities on a given site and that completion of sewage facilities planning need not be required, DEP created this waiver request and declaration form (previously known as "Form B") to allow individuals proposing strictly "non-building" subdivisions to document that they may qualify for a waiver from these planning requirements. This form may only be used during the process resulting in creation of new lot boundary lines and a change in land ownership. Neither this declaration nor a Sewage Facilities Planning Module is required to be submitted for a side lot addition when a local ordinance requires such a side lot addition to be legally merged into the tract to which it is being added and any future proposal to subdivide any portion of the merged tracts is to be in accordance with the provision of the Municipalities Planning Code (53 P.S.A. § 10101 *et seq.*). This request may be submitted in support of "non-building" subdivision proposals in both sewered and unsewered areas.

Acceptable Uses: Examples of acceptable large parcel uses for this form include subdivision of property for agriculture, silviculture, mineral lease, division of farmland to settle estates where no building or development is proposed and airport runway extensions. Examples of acceptable small parcel uses for this form include, location of water towers, sewerage pump stations, cell phone towers, separating an existing dwelling from its farmland for agricultural use and where "legally merged" is not a municipal requirement for "side lot additions".

Unacceptable Uses: Use of this form is **NOT** acceptable where parcels are being created for new structures that will generate sewage. It may **NOT** be used for subdivision proposals concerning hunting cabins, recreational vehicle sites, camps, or other uses involving construction or placement of temporary or seasonal dwellings on the lots. This form may not be used for further subdivision where lot sizes were originally established in response to local environmental conditions nor may it be used as a means to simply **defer** sewage facilities testing or planning for any purpose. This form may **NOT** be used in conjunction with or as an "add-on" to a planning module for new land development.

Form Instructions: The person requesting the subdivision must complete Section A. The person buying or receiving the parcel must complete Section B. Section C must be signed by the municipality's Sewage Enforcement Officer when the proposal involves the subdivision of property on which there is an existing building currently served by an onlot system. Sections D and E document acceptance of the request by the municipal or county planning agency and by the municipality. The completed waiver/declaration form must be retained by the municipality as part of the permanent record of the subdivision. Following municipal approval, a copy of this form and all attachments must be submitted to DEP and to the municipality's sewage enforcement officer.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

REQUEST FOR PLANNING WAIVER & NON-BUILDING DECLARATION

Section A - To Be Completed by Subdivider

I, _____ (subdivider), propose a subdivision of _____ lot(s), located in _____ Township/Borough, _____ County. No facility or building will be erected on the subdivided lot(s) either now or in the future that will result in the generation of sewage requiring a permit or planning under the Pennsylvania Sewage Facilities Act or the Pennsylvania Clean Streams Law. In support thereof, I have attached the following:

1. A written description of the subdivision and its intended use.

2. A copy of the plot plan and deed (if available) which contains language identical to or similar to:

   "As of the date of this deed/plot plan recording, the property/subdivision described herein is and shall be dedicated for the express purpose of _____ use. No portion (or lot number(s) _____) of this property/subdivision are approved by _____ (Municipality) or the Department of Environmental Protection (DEP) for the installation of any sewage disposal facility. No permit will be issued for the installation, construction, connection to or use of any sewage collection, conveyance, treatment or disposal system (except for repairs to existing systems) unless the municipality and DEP have both approved sewage facilities planning for the property/subdivision described herein in accordance with the Pennsylvania Sewage Facilities Act (35 P.S. Sections 750.1 *et seq.*) and regulations promulgated thereunder. Prior to signing, executing, implementing or recording any sales contract or subdivision plan, any purchaser or subdivider of any portion of this property should contact appropriate officials of _____ (municipality), who are charged with administering the Sewage Facilities Act to determine the form of sewage facilities planning required and the procedure and requirements for obtaining appropriate permits or approvals."

3. **Language identical to or similar to that in Section A.2 above has been recorded on the plot plan and will b recorded on the deed. A copy of the deed (if available) and plot plan is submitted with this waiver reques non-building declaration as documentation of this fact.**

   I verify that the statements made in Section A of this document are true and correct to the best of my knowledge, information and belief. I understand that false statements in this document are subject to the penalties prescribed by applicable law, including, but not limited to, 18 Pa. C.S.A. Section 4904 relating to unsworn falsification to authorities.

_____	_____	_____
Subdivider/Developer (Print Name)	Signature	Date

Section B - To Be Completed By Buyer Or Recipient Of The Non-Building Parcel

As the anticipated buyer or recipient of the non-building land parcel described in Section A, I declare that my intended use of the parcel is for the purpose of _____, that it will not result in any sewage generating facility and that I cannot obtain a permit for a sewage disposal system located on this parcel except in accordance with the Pennsylvania Sewage Facilities Act (35 P.S. §§ 750.1 *et seq.*), the Pennsylvania Clean Streams Law (35 P.S. §§ 691.1 *et seq.*) and regulations promulgated thereunder. I understand that false statements in this document are subject to the penalties prescribed by applicable law, including, but not limited to, 18 Pa. C.S.A. Section 4904 relating to unsworn falsification to authorities.

_____	_____	_____
Buyer/Recipient (Print Name)	Signature	Date

Section C - Sewage Enforcement Officer (Only when there is an existing septic system on the parcel under consideration)

I have inspected the lot on which the existing building and existing septic system are located and have concluded, based on soils mapping or soils evaluation, permit information or site inspection that the long-term sewage disposal needs of this site and the building currently served can be met. I further acknowledge that no violations of the Sewage Facilities Act are known to me or have become apparent as a result of my site inspection. No inferences regarding future performance of the existing septic system should be drawn from this acknowledgement. A brief description and sketch of the existing system and site is attached.

Sewage Enforcement Officer (Print Name)	Signature	Certification Number	Date

Section D - Planning Agency Concurrence

The described use (agriculture, silviculture, utility placement, mining, etc.) of parcel(s) herein proposed must be consistent with the zoning, land use ordinances and comprehensive plans for the area involved in the proposed subdivision. By signature of the designated official, _____ (planning agency with Municipal Planning Code jurisdiction), has reviewed the information submitted requesting a non-building waiver and has found this request to be consistent with applicable plans and ordinances administered by this agency and that it is not part of a subdivision that proposes new sewage generating structures.

Planning Agency Official (Print Name)	Signature	Date

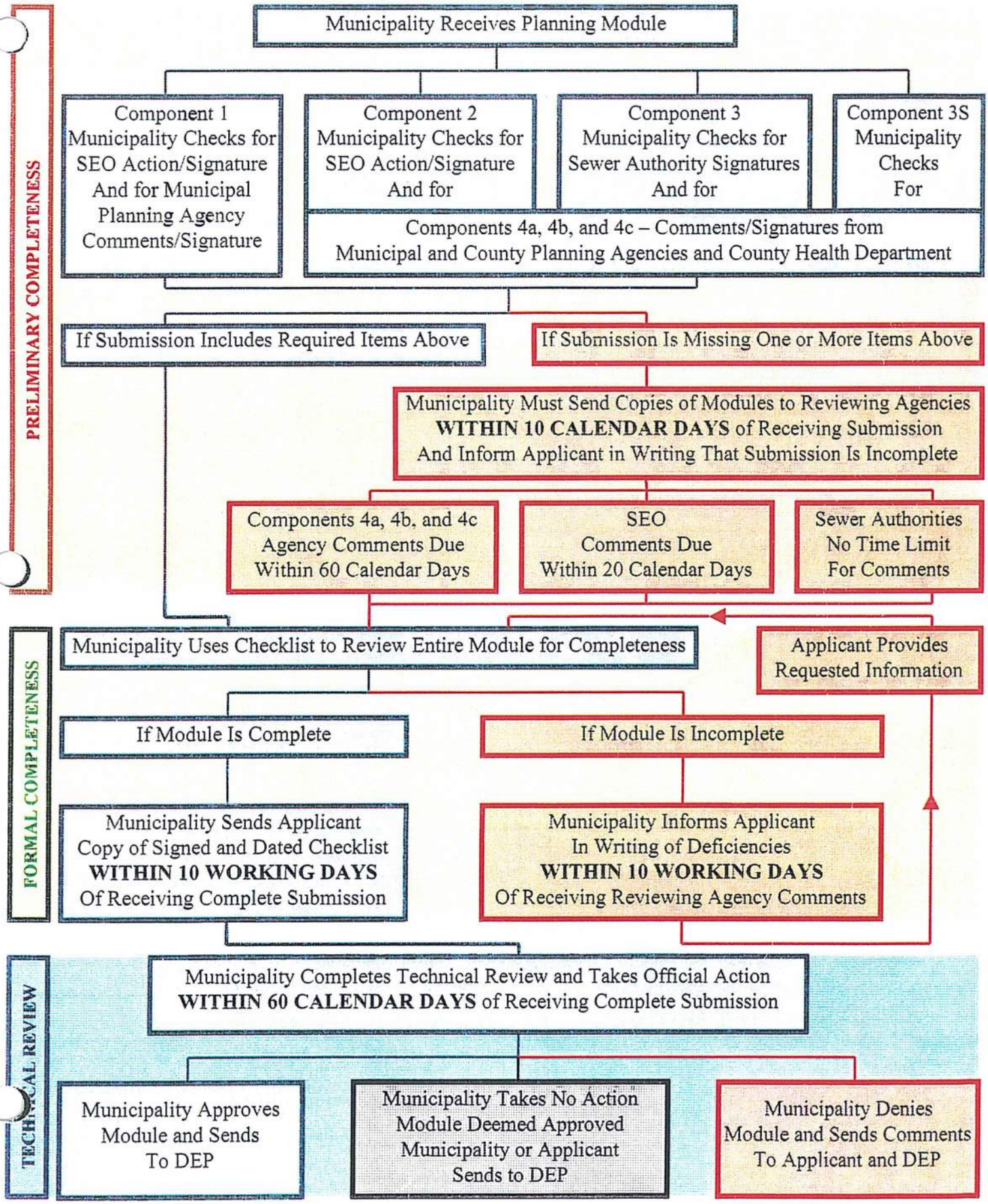
Section E - Municipal Concurrence

By signature of the designated official, _____ Township/Borough, _____ County acknowledges acceptance of this proposal as a non-building lot subdivision. Officials of _____ (Municipality) accept full responsibility now and in the future to identify any violation of the non-building lot criteria described and to submit to Pennsylvania DEP a completed Sewage Facilities Planning Module for the entire subdivision should a violation occur. We understand that such planning information may require municipal officials to be responsible for soil testing and other environmental assessments for all the lots in the subdivision. This municipality will retain a copy of this waiver and all attachments. A copy of this form and all attachments are being forwarded to the appropriate office of Pennsylvania DEP and to the municipal sewage enforcement officer.

Municipal Secretary or Chairperson (Print Name)	Signature	Date

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Municipal Flow Chart for Processing Planning Modules



APPENDIX D

SANITARY SURVEY AND ON-LOT SEWAGE SYSTEM REPAIRS

New Britain Township Questionnaire

Table D-1 - New Britain Township Act 537 Water & Sewer Survey Questionnaire Response Summary

Table D-2 - Water & Sewer Survey Summary Percentage of "Yes" Responses to Key Questions

Table D-3 - Bucks County Department of Health Repair Permits Issued Within The On-Lot Sewage Service Area

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TABLE D-1
NEW BRITAIN TOWNSHIP ACT 537 WATER AND SEWER SURVEY QUESTIONNAIRE RESPONSE SUMMARY

GENERAL INFORMATION				WATER SURVEY RESPONSES											SEWER SURVEY RESPONSES										
Street Name	Property Use Category	Service Area Location	Comments	Public Water	Private Well	Tested?	Nitrate Level (Mg/1 as N)	Total Coliform (#/100 mL)	Fecal Coliform (#/100 mL)	Contamination	Restricted Usage	Depth (ft)	Redrilled to Lower Depth?	Comments	Type of Sewage System	System Age (Yrs)	Does System/Plumbing Back Up?	Sump Pump Connected to System?	Black Liquid/Residue Near Septic Tank?	Odor from System?	Continuously Soggy Wet/Ground Near System?	How Often System Pumped?	Any Problems with System?	Ever Repaired System?	Comments
Newville Road	SFR	A			Y	N	-	-	-	NR	N	200	N		STD	45	N	N	N	N	N	5 yrs	N	NR	
Curly Mill Road	SFR	A			Y	Y	NR	NR	NR	N	N	220	N		STD	29	N	N	N	N	N	2 yrs	N	NR	
N. Limekiln Pike	SFR	A			Y	Y	NR	<1	<1	NR	NR	725	N	Rotten egg smell in water	STSM	15	N	N	N	N	N	5 yrs	N	NR	
Newville Road*	SFR	A			Y	Y	NR	NR	NR	N	N	100	N		CP	18	N	N	N	N	N	2 yrs	N	N	
Curly Mill Road	SFR	A			Y	Y	NR	NR	NR	N	Y	450	N		CP	19	Y	N	N	Y	Y	1 yr	Y	Y	Not enough drainage, backs up, redug 3 times to repair drainage problem
Curly Mill Road	SFR	A			Y	Y	NR	NR	NR	N	N	505	N		STD	30	N	N	N	N	N	5 yrs	N	N	
N. Limekiln Pike	SFR	A			Y	Y	NR	NR	NR	N	N	250	N		CP	20	N	N	N	N	N	7 yrs	N	N	
N. Limekiln Pike	SFR	A			Y	Y	NR	NR	NR	N	N	25	N		STD	25	N	N	N	N	N	U	N	Y	Replaced old rusted septic tank with new one 9 month ago
Newville Road	SFR	A			Y	Y	NR	NR	NR	N	N	440	N		STD	16	N	N	N	N	N	3 to 4 yrs	N	N	
Township Line Road	SFR	A			Y	Y	U	U	U	N	N	1,100	N		STD	U	N	N	N	N	N	3 yrs	N	N	
Newville Road	SFR	A			Y	Y	NR	NR	NR	N	N	U	N		NR	NR	N	N	N	N	N	1 to 2 yrs	N	NR	
Newville Road	SFR	A			Y	Y	2.0	<1	NT	N	N	NR	N		PS	-	-	-	-	-	-	-	-	-	
Curly Mill Road	SFR	A			Y	Y	U	U	U	N	N	U	N		CP	U	N	N	N	N	N	Never	N	N	
N. Limekiln Pike	SFR	A			Y	Y	NR	NR	NR	N	Y	120	N		STD	49	N	N	N	N	N	20 yrs	N	NR	
Newville Road	SFR	A			Y	Y	U	U	U	N	N	75	N		STD	40	N	N	N	N	N	3 to 4 yrs	Y	Y	Pipe collapsed and clogged, repaired
	SFR	A			Y	Y	NR	T	NR	Y	Y	U	N	Purchases bottle water	STSD/STD	18	Y	N	Y	Y	Y	3 yrs	Y	Y	Daily backups
Curly Mill Road	NR	A			Y	N	-	-	-	N	N	NR	N		NR	40	N	N	N	N	N	2 yrs	N	N	
Curly Mill Road*	SFR	A			Y	N	NR	NR	NR	NR	N	600	N		STSM	4	N	N	N	N	N	Never	N	N	
Curly Mill Road	O	A	Undeveloped		-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	
Curly Mill Road	SFR	A			Y	Y	0.11	0	0	N	Y	740	N		STSM	3	N	N	Y	N	N	2 yrs	Y	Y	Pump replaced, ground around system sometimes wet in spring
N. Limekiln Pike*	SFR	A			Y	Y	NR	NR	NR	N	N	190	N		STD	12	N	N	N	N	N	2 yrs	Y	Y	Root penetration in system, pipe replaced
Limekiln Pike	SFR	A			Y	Y	NR	NR	NR	N	Y	600	Y		STD	50	Y	N	N	N	N	2 yrs	Y	NR	Root penetration in tank & pipe
N. Limekiln Pike	SFR	A			Y	Y	T	T	NR	NR	N	U	N		U	U	N	N	N	N	N	2 to 3 yrs	N	NR	
N. Limekiln Pike	SFR	A			Y	Y	NR	NR	NR	N	N	700	N	Sulfer in well	STSM	12	N	N	N	N	N	2 yrs	N	NR	
N. Limekiln Pike*	O	A	Agricultural		Y	U	NR	NR	NR	N	N	U	N		STD	50	N	N	N	N	N	Rarely	N	N	
Curly Mill Road	SFR	A			Y	NR	NR	NR	NR	N	N	464	N		STD	15	N	N	N	N	Y	1.5 yrs	N	NR	Ground around system wet in spring
Upper Church Road	SFR	B			Y	N	-	-	-	NR	Y	230	N		STD	20	N	N	N	N	N	Rarely	N	N	
Skunk Hollow Road	SFR	B			Y	N	-	-	-	N	N	80	N		STD	42	N	N	N	N	N	4 yrs	N	N	
Upper Stump Road*	SFR	B			Y	Y	U	U	U	N	N	U	N		STD	50	N	N	N	N	N	Once	N	N	
Patricia Lane	SFR	B			Y	Y	NR	NR	NR	N	N	U	N		O	25	N	N	N	N	N	2 yrs	N	Y	Replaced lid on septic tank
Callowhill Road	MFR	B			Y	Y	NR	NR	NR	N	N	633	Y		STD	60	N	N	N	N	N	2 yrs	N	NR	
Patricia Lane	SFR	B			Y	N	-	-	-	NR	Y	400	Y		STD	30	N	N	N	N	N	4 yrs	N	N	
Callowhill Road	SFR	B			Y	Y	NR	NR	NR	N	N	600	N		STSM	2	N	N	N	N	N	Never	N	NR	
Upper Stump Road	SFR	B			Y	Y	NR	NR	NR	N	N	150	N		STD	33	N	N	N	N	N	4 yrs	N	NR	
Skunk Hollow Road	SFR	B			Y	Y	NR	NR	NR	N	N	U	N		STD	42	N	N	N	N	N	1 to 2 yrs	N	N	
Patricia Lane	SFR	B			Y	Y	NR	NR	NR	N	Y	500	NR		STD	30	N	N	N	N	N	3 yrs	Y	Y	Installed riser on tank for pumping
Callowhill Road	SFR	B			Y	Y	NR	NR	NR	N	N	U	Y		STD	25	N	N	N	N	N	5 yrs	N	NR	
Callowhill Road	SFR	B			Y	N	-	-	-	NR	N	500	N		STD	15	N	N	N	N	N	2 yrs	N	NR	
New Galena Road	SFR	B			Y	Y	NR	NR	NR	N	Y	U	N		O	1	N	N	N	N	N	1 yr	Y	Y	Original system replaced with peat moss drainage system
Upper Stump Road	SFR	B			Y	Y	NR	NR	NR	NR	Y	153	N		STD	47	N	N	N	Y	N	Never	Y	Y	New 1000 gallon tank installed
Upper Church Road	SFR	B			Y	Y	NR	NR	NR	N	N	275	N		STD	15	N	N	N	N	N	2 yrs	N	N	
Upper Stump Road	SFR	B			Y	Y	NR	NR	NR	N	N	U	N		STD	NR	N	N	N	N	N	NR	NR	NR	
Upper Stump Road*	MFR	B			Y	Y	NR	NR	NR	N	N	160	N		STSP	40	N	N	N	N	N	Rarely	N	NR	
New Galena Road	SFR	B			Y	Y	NR	NR	NR	N	N	227	N		STD	43	N	N	N	N	N	2 yrs	N	N	
Upper Stump Road	SFR	B			Y	Y	NR	<1	NR	N	N	U	N		STD	27	N	N	N	N	N	3 yrs	N	N	
Myers Road	SFR	B			Y	Y	NR	NR	NR	NR	Y	400	N		STD	30	N	N	N	N	N	3 to 5 yrs	N	N	
Callowhill Road	SFR	B			Y	Y	NR	NR	NR	N	Y	350	Y		STSP	30	N	N	N	N	N	2 yrs	N	N	
Limekiln Pike	SFR	B			Y	Y	NR	T	NR	Y	N	130	N		STD	NR	N	N	N	N	N	2 yrs	N	NR	
Patricia Lane	SFR	B			Y	N	-	-	-	NR	N	400	N		STD	30	N	N	N	N	N	Never	N	NR	
Patricia Circle	SFR	B			Y	Y	NR	NR	NR	N	N	150	N		STD	28	N	N	N	N	N	2 to 3 yrs	N	N	
New Galena Road*	SFR	B			Y	Y	NR	<1	NR	N	N	100	N		STD	30	N	N	N	N	N	3 yrs	N	NR	
Callowhill Road*	SFR	B			Y	N	-	-	-	NR	Y	U	N		STD	U	N	N	N	N	N	2 yrs	N	NR	
Patricia Lane	SFR	B			Y	Y	U	U	U	N	N	260	N		STSM	6	N	N	N	N	N	3 yrs	N	NR	
Callowhill Road*	MFR	B			Y	Y	NR	NR	NR	N	N	170	N		CP/ST	35	N	N	N	N	N	NR	N	N	
Upper Stump Road	MFR	B			Y	N	-	-	-	N	Y	260	Y		STD	45	N	N	N	N	N	2 yrs	N	N	
Skunk Hollow Road	SFR	B			Y	Y	U	<1	<1	N	Y	100	N		STD	40	N	N	N	N	N	NR	N	N	
Upper Stump Road	SFR	B			Y	Y	6.71	0	0	N	Y	U	N		STD	U	N	N	N	N	N	2 yrs	N	NR	
Myers Road*	SFR	B			Y	Y	1.03	0	0	N	Y	410	N		STD	30	N	N	N	N	N	2 yrs	N	NR	
Patricia Lane	SFR	B			Y	N	U	U	U	N	N	U	N		STD	27	Y	N	N	N	N	5 yrs	Y	N	System is overfilled
Upper Stump Road	SFR	B			Y	Y	NR	NR	NR	N	N	U	NR		STSM	10	N	N	N	N	N	1 yr	N	NR	

TABLE D-1
NEW BRITAIN TOWNSHIP ACT 537 WATER AND SEWER SURVEY QUESTIONNAIRE RESPONSE SUMMARY

GENERAL INFORMATION				WATER SURVEY RESPONSES											SEWER SURVEY RESPONSES										
Street Name	Property Use Category	Service Area Location	Comments	Public Water	Private Well	Tested?	Nitrate Level (Mg/l as N)	Total Coliform (#/100 mL)	Fecal Coliform (#/100 mL)	Contamination	Restricted Usage	Depth (ft)	Redrilled to Lower Depth?	Comments	Type of Sewage System	System Age (Yrs)	Does System/Plumbing Back Up?	Sump Pump Connected to System?	Black Liquid/Residue Near Septic Tank?	Odor from System?	Continuously Soggy Wet/Ground Near System?	How Often System Pumped?	Any Problems with System?	Ever Repaired System?	Comments
Myers Road*	SFR	B			Y	N	-	-	-	NR	Y	750	N	Well was hydrofracted to increase well water	STSM	24	N	N	N	N	N	12 yrs	Y	Y	Repaired electrical problems, replaced aeration system
N. Limekiln Pike	SFR	B			Y	N	-	-	-	NR	N	100	N		STD	40	N	N	N	N	N	2 yrs	N	NR	
Callowhill Road	SFR	B			Y	N	-	-	-	NR	NR	109	N		STD	30	N	N	N	N	Y	6 yrs	Y	NR	Continuous wet soggy ground
Upper Church Road	SFR	B			Y	NR	NR	NR	NR	NR	N	100	N		STD	NR	N	N	N	N	N	3 yrs	N	NR	
	SFR	B			Y	NR	NR	NR	NR	NR	N	400	N		STSM	8	N	N	N	N	N	3 yrs	N	NR	
Patricia Lane	SFR	B			Y	Y	NR	NR	NR	N	N	400	N		STSM	20	N	N	N	N	N	3 yrs	N	NR	
Upper Stump Road	SFR	B			Y	Y	NR	NR	NR	Y	N	U	N	Bacterial contamination	STSP	35	N	N	N	Y	N	2 yrs	N	NR	
Callowhill Road	O	B	Agricultural property		Y	Y	NR	NR	NR	N	Y	U	Y	Low water levels, low pressure, periodically loses water	STD	35	N	N	N	N	Y	8 yrs	N	NR	
Upper Stump Road	O	B	Undeveloped		Y	N	-	-	-	NR	N	180	N		STSM	-	-	-	-	-	-	-	-	-	System hasn't been constructed yet
Skunk Hollow Road	SFR	B			Y	N	-	-	-	NR	N	800	N		STSM	15	N	N	N	N	N	1 to 2 yrs	N	NR	
Callowhill Road	SFR	B			Y	Y	NR	NR	NR	N	Y	300	N		STD	15	N	N	N	N	N	NR	N	N	
New Galena Road	SFR	B			Y	N	NR	NR	NR	NR	N	U	Y		STD	35	N	N	N	N	N	2 yrs	N	NR	
Myers Road	SFR	B			Y	Y	NR	NR	NR	N	N	200	N		STSM	2	N	N	N	N	N	2 yrs	N	N	
Upper Stump Road	SFR	B			Y	N	-	-	-	NR	N	U	N		STD	36	N	Y	N	N	N	2 to 3 yrs	N	N	
Upper Stump Road	SFR	B			Y	Y	NR	NR	NR	N	N	U	N		STSP	47	N	N	N	N	N	2 to 4 yrs	N	NR	
Upper Stump Road	SFR	B			Y	Y	NR	NR	NR	N	Y	150	N		STD	U	N	N	N	N	N	1 yr	N	Y	New baffle installed at drain line
Callowhill Road	SFR	B			Y	Y	NR	NR	NR	N	N	90	N		STD	15	N	N	N	N	N	3 yrs	N	N	
Callowhill Road	SFR	B			Y	NR	NR	NR	NR	NR	NR	NR	NR		STD	25	N	N	N	N	N	U	N	N	
Upper Church Road	SFR	B			Y	Y	NR	NR	NR	NR	N	375	N		STD	16	N	N	N	N	N	3 to 4 yrs	N	N	
Upper Church Road	SFR	B			Y	Y	NR	NR	NR	N	N	300	N		STD	21	N	N	N	N	N	3 yrs	N	N	
Myers Road	SFR	B			Y	Y	NR	NR	NR	N	N	375	N		STD	20	N	N	N	N	N	1 yr	N	N	
Upper Stump Road	SFR	B			Y	Y	NR	NR	NR	N	N	200	N		STD	44	N	N	N	N	N	Never	N	NR	
Old Limekiln Road	SFR	C			Y	N	NR	NR	NR	NR	NR	NR	NR		U	30	N	N	N	N	N	1 yr	Y	Y	System clogged up and blockage removed
Upper Stump Road	SFR	C			Y	Y	NR	NR	NR	N	N	U	N		STD	30	N	N	N	N	N	2 yrs	N	N	
Old Limekiln Road	SFR	C			Y	Y	NR	NR	NR	N	Y	U	N		NR	NR	N	N	N	N	N	NR	NR	NR	
Upper Stump Road	SFR	C			Y	Y	NR	NR	NR	N	N	300	N		STSM	2	N	N	N	Y	N	2 yrs	N	NR	
King Road	SFR	C			Y	Y	NR	NR	NR	N	Y	160	N		STD	10	N	N	N	N	N	3 yrs	N	NR	
New Galena Road	SFR	C			Y	Y	NR	NR	NR	N	Y	575	Y		STD	17	N	N	N	N	N	1 yr	N	NR	
Old Limekiln Road	SFR	C			Y	Y	NR	NR	NR	N	N	U	N		STSM	5	N	N	N	N	N	U	Y	Y	Extensive system problems due to incorrect installation, repairs made, BCHD notified
New Galena Road*	SFR	C			Y	N	NR	NR	NR	N	N	275	N		STD	45	N	N	N	N	N	2 yrs	N	NR	
Old Limekiln Road*	SFR	C			Y	Y	U	U	U	N	N	500	N	UV disinfection	STSM	3	N	N	N	N	N	2 yrs	N	Y	Sewage pump replaced
King Road*	SFR	C			Y	Y	U	U	O	N	N	590	N		STSM	2.5	N	N	N	N	N	3 yrs	N	N	
King Road*	SFR	C			Y	N	-	-	-	N	N	125	N		STD	43	N	N	N	N	N	2 yrs	N	NR	
Upper Stump Road	SFR	C			Y	Y	NR	NR	NR	N	Y	100	N		STSP	NR	N	N	N	N	N	3 to 5 yrs	N	NR	
King Road	SFR	C			Y	N	NR	0	NR	N	Y	300	N		STD	40	N	N	N	N	N	NR	N	NR	
New Galena Road	SFR	C			Y	Y	NR	NR	NR	N	N	U	N		STD	50	N	N	N	N	N	2 yrs	N	NR	
Old Limekiln Road	SFR	C			Y	Y	NR	NR	NR	N	Y	110	Y		STSP	U	N	N	N	N	N	Once	Y	Y	Grease buildup in system, seepage pit added 30 years ago
Old Limekiln Road	SFR	C			Y	Y	5.9	0	NR	N	N	95	N		STSP	50	N	N	N	N	N	2 yrs	N	Y	Repaired sewage line from house to tank
Upper Church Road	SFR	C			Y	Y	U	U	U	N	N	360	N		STD	25	N	N	N	N	N	Never	Y	Y	Entire system replaced 25 years ago, new tank installed 6 years ago
Old Limekiln Road	SFR	C			Y	Y	0.72	0	0	N	N	U	N		STD	20	N	N	N	N	N	2 yrs	N	Y	System upgraded within past 6 years to bring up to code
New Galena Road	SFR	C			Y	Y	1.46	T	NR	NR	N	150	N	UV disinfection	STD	U	N	N	N	N	N	2 yrs	N	Y	New baffle and clean out installed in system by previous owner
Upper Stump Road	SFR	C			Y	N	NR	NR	NR	N	N	90	N		STD	45	N	N	N	N	N	2 yrs	N	NR	
King Road	SFR	C			Y	Y	NR	NR	NR	N	Y	400	N		STD	28	N	N	N	N	N	3 yrs	N	NR	
Upper Stump Road*	SFR	C			Y	Y	NR	NR	NR	U	N	225	N		STD	16	N	N	N	N	N	10 yrs	N	NR	
Old Limekiln Road	SFR	C			Y	Y	1.63	0	0	N	Y	250	N		STD	36	N	N	N	N	N	2 yrs	U	U	Recently purchased property in 2001
New Galena Road	SFR	C			Y	Y	NR	NR	NR	N	N	100	N		STD	NR	N	N	N	N	N	1 to 2 yrs	N	N	
King Road	SFR	C			Y	Y	NR	NR	NR	N	N	U	N		STD	19	N	N	N	Y	Y	3 yrs	N	N	
Upper Church Road	SFR	C			Y	Y	<1	<1	<1	N	N	U	N		STD	35	N	N	N	N	N	1 yr	N	N	
Shady Hill Drive	O	C	Undeveloped		Y	U	NR	NR	NR	NR	NR	NR	NR		O	-	-	-	-	-	-	-	-	-	No system has been proposed or constructed yet
King Road	SFR	C			Y	N	NR	NR	NR	NR	N	600	N		STSM	1	N	N	N	N	N	Never	N	NR	
Church Road	SFR	C			Y	N	-	-	-	NR	N	146	N		STD	30	N	N	N	N	N	5 yrs	N	N	
Old Limekiln Road	SFR	C			Y	Y	NR	0	NR	N	N	350	N		STD	19	N	Y	N	N	N	2 to 3 yrs	N	N	
Old Limekiln Road	SFR	C			Y	Y	NR	NR	NR	N	N	125	N		STD	30	N	N	N	N	N	2 yrs	N	N	
King Road	SFR	C			Y	Y	NR	NR	NR	N	Y	500	N		STSM	6	N	N	N	N	N	NR	N	N	
Old Limekiln Road*	SFR	C			Y	Y	NR	NR	NR	N	Y	500	N		STD	25	N	N	N	N	N	5 yrs	NR	N	
King Road	MFR	C			Y	Y	NR	NR	NR	N	N	300	N		STSM	2	N	N	N	N	N	2 yrs	N	NR	

TABLE D-1
NEW BRITAIN TOWNSHIP ACT 537 WATER AND SEWER SURVEY QUESTIONNAIRE RESPONSE SUMMARY

GENERAL INFORMATION				WATER SURVEY RESPONSES										SEWER SURVEY RESPONSES										
Street Name	Property Use Category	Service Area Location	Comments	Public Water	Private Well	Tested?	Nitrate Level (Mg/1 as N)	Total Coliform (#/100 mL)	Fecal Coliform (#/100 mL)	Contamination	Restricted Usage	Depth (ft)	Redrilled to Lower Depth?	Comments	Type of Sewage System	System Age (Yrs)	Does System/Plumbing Back Up?	Sump Pump Connected to System?	Black Liquid/Residue Near Septic Tank?	Odor from System?	Continuously Soggy Wet/Ground Near System?	How Often System Pumped?	Any Problems with System?	Ever Repaired System?	Comments
Old Limekiln Road*	SFR	C			Y	Y	NR	NR	NR	N	N	90	N		STD	35	N	N	N	N	N	2 yrs	N	N	
Upper Stump Road	SFR	C			Y	Y	NR	NR	NR	U	N	U	N		STD	U	N	N	N	N	N	1 yr	NR	NR	
Old Limekiln Road	SFR	C			Y	Y	NR	T	NR	N	Y	600	N		STD	13	N	N	N	N	N	1 yr	N	NR	
Old Limekiln Road	SFR	C			Y	Y	NR	NR	NR	N	N	480	N		STSM	6	N	Y	N	N	N	2 yrs	N	NR	
King Road	MFR	C			Y	N	-	-	-	NR	N	U	NR		STSM	NR	N	N	N	N	N	NR	N	NR	
Upper Stump Road*	SFR	C			Y	Y	U	0	0	N	Y	600	Y		STD	16	N	N	N	N	N	2 yrs	N	N	
New Galena Road*	O	C	Non-conforming		Y	Y	NR	NR	NR	Y	Y	120	N	chlorine disinfection	CP	U	N	N	N	N	N	2 yrs	Y	Y	Line from house to cesspool collapsed, replaced with PVC pipe in 2003
King Road	COM/O	D	Mini-warehouse		Y	Y	U	U	U	N	N	U	N		STSM	5	N	N	N	N	N	3 to 4 yrs	N	N	
King Road	SFR	D			Y	Y	0.7	<1	0	NR	Y	800	N		STSM	11	N	N	N	N	N	5 yrs	N	N	
New Galena Road	MFR	D			Y	Y	NR	NR	NR	N	Y	950	Y		STSP	10	N	N	N	N	N	3 yrs	N	NR	
Swamp Road*	SFR	D			Y	Y	NR	NR	NR	N	N	U	N		STD	NR	N	N	N	N	N	5 yrs	N	N	
King Road	SFR	D			Y	Y	NR	NR	NR	N	Y	125	Y		STD	25	N	N	N	N	N	7 yrs	N	N	
Swamp Road	MFR	D			Y	Y	NR	60	NR	Y	N	74	N	Contaminatio from flood in hurricane of 1999	STSP	62	N	N	N	N	N	2 yrs	N	N	
Chapman Road*	SFR	D			Y	Y	0	0	0	N	Y	800	Y		STD	28	N	N	N	N	N	Never	N	NR	
New Galena Road	MFR	D			Y	Y	NR	NR	NR	N	N	U	N		CP	40	N	N	N	N	N	2 yrs	Y	Y	Repaired broken pipe from house to system
Swamp Road*	SFR	D			Y	N	-	-	-	N	N	230	N		STD	U	N	N	N	N	N	1 yr	N	NR	
New Galena Road	SFR	D			Y	Y	NR	NR	NR	N	N	200	N		STSM	0.08	N	N	N	N	N	2 to 3 yrs	N	NR	House and property just constructed 1 month ago
King Road	SFR	D			Y	Y	U	U	U	N	N	350	N		STD	NR	N	N	N	N	N	2 yrs	N	N	
New Galena Road	SFR	D			Y	Y	NR	NR	NR	N	N	U	N		STD	45	N	N	N	N	N	1 yr	N	Y	Replaced old outlet pipe
Swamp Road	SFR	D			Y	Y	NR	NR	NR	N	Y	175	N		STSP	15	N	N	N	N	N	2 yrs	N	Y	New pipes installed to system
N. Chapman Road	SFR	D			Y	Y	NR	NR	NR	N	Y	155	N		STSP	35	N	N	N	N	N	2 to 3 yrs	N	NR	
Swamp Road*	SFR	D			Y	Y	NR	NR	NR	N	N	U	N		STD	U	N	N	N	N	N	3 yrs	N	N	
New Galena Road	SFR	D			Y	Y	T	T	T	N	N	400	N		STD	49	N	N	N	N	N	0.5 yrs	Y	Y	Original drainfield failed, new drainfield constructed in 1982
New Galena Road	SFR	D			Y	N	-	-	-	NR	N	53	N		STD	50	N	N	N	N	N	4 to 5 yrs	N	NR	
Ferry Road	SFR	D			Y	Y	NR	NR	NR	N	N	150	N		STD	35	N	N	N	N	N	3 yrs	N	NR	
New Galena Road	SFR	D			Y	Y	3	<1	<1	N	N	250	N		STSP	33	N	N	N	N	N	5 yrs	N	N	
King Road	SFR	D			Y	Y	U	U	U	N	N	190	N		STSP	38	N	N	N	N	N	3 yrs	N	N	
Swamp Road	SFR	D			Y	Y	2.55	16	T	NR	N	300	N		STD	15	N	N	N	N	N	3 yrs	N	N	
New Galena Road	SFR	D			Y	Y	4.0	0	0	N	Y	30	N		ST	22	N	N	N	N	N	2 to 3 yrs	N	N	Has septic tank but does not know type of drainage
Chapman Road	SFR	D			Y	Y	NR	NR	NR	NR	Y	400	Y		CP	20	N	N	N	Y	N	5 yrs	Y	NR	
Swamp Road	SFR	D			Y	N	-	-	-	N	N	55	N		STD	54	N	N	N	N	N	Never	N	N	
New Galena Road*	SFR	D			Y	N	-	-	-	NR	N	U	N		STD	34	N	N	N	N	N	2 yrs	N	NR	
Chapman Road	SFR	D			Y	Y	NR	NR	U	N	Y	U	N		STD	31	N	N	N	N	N	2 to 4 yrs	N	N	
King Road	SFR	D			Y	Y	U	U	U	N	N	175	N		STSP	32	N	N	N	N	N	Never			
King Road	SFR	D			Y	Y	NR	NR	NR	N	Y	400	N		STD	33	N	N	N	N	N	2 yrs	N	N	
Stone Creek Lane	SFR	D			Y	Y	0	0	0	N	N	240	N	UV disinfection	STSM	7	N	N	N	N	N	2 yrs	N	Y	Installed new septic pump
Swamp Road	SFR	D			Y	Y	NR	NR	NR	Y	N	87	N	Contamination within acceptable limits	STD	U	N	N	N	N	N	4 to 5 yrs	N	NR	
New Galena Road	SFR	D			Y	Y	NR	NR	NR	N	N	U	N		STD	U	N	N	N	N	N	2 yrs	N	N	
New Galena Road	SFR	D			Y	Y	NR	NR	NR	N	Y	U	N		STD	33	N	N	N	Y	Y	2 to 3 yrs	Y	Y	Drainfield is saturated and received permit to build sand mound system
Upper Stump Road	SFR	D			Y	Y	<1	<1	<1	N	N	125	N		STD	30	N	N	N	N	N	NR	N	N	
Swamp Road	SFR	D			Y	Y	NR	NR	NR	N	N	U	N		STD	50	N	Y	N	N	N	3 yrs	N	N	
Upper Stump Road	SFR	D			Y	Y	U	U	U	N	N	U	N		STD	20	N	N	N	N	N	2 to 3 yrs	N	NR	
Upper Stump Road*	SFR	D			Y	Y	NR	NR	NR	N	N	U	N		STD	18	N	N	N	N	N	2 yrs	N	NR	
Chapman Road	SFR	D			Y	N	-	-	-	N	N	100	N		STD	20	N	N	N	N	N	3 to 4 yrs	N	NR	
King Road	SFR	D			Y	Y	NR	NR	NR	N	N	270	N		STD	41	N	N	N	N	N	3 yrs	N	NR	
New Galena Road	SFR	D			Y	Y	NR	NR	NR	N	N	410	N		STD	22	N	N	N	N	N	10 yrs	N	NR	
Chapman Road	SFR	E			Y	Y	NR	U	NR	Y	N	U	N	Coliform detected	STD	30	N	N	N	N	N	4 to 5 yrs	N	NR	
New Galena Road*	SFR	E			Y	Y	0.7	<1	<1	N	Y	155	N		STD	30	N	N	N	Y	Y	3 to 5 yrs	Y	Y	Standing water in drainage field with odor, repaired cast iron pipes inside house
N. Chapman Road*	SFR	E			Y	Y	NR	NR	NR	Y	N	100	N	Radon detected	STD	32	N	N	N	N	N	2 to 3 yrs	N	N	
Rogers Road	SFR	E		Y		-	-	-	-	-	-	-	-		STD	50	N	N	N	N	N	2 yrs	N	NR	
Route 313	SFR	E			Y	Y	0	0	0	N	N	360	N		STD	14	N	N	N	N	N	1 to 2 yrs	N	NR	
New Galena Road	SFR	E			Y	N	NR	NR	NR	N	N	129	N		STD	47	N	N	N	N	N	5 yrs	N	NR	
Chapman Road	MFR	E			Y	Y	NR	NR	NR	N	N	85	N		STD	56	N	N	N	N	N	As needed	N	N	

TABLE D-1
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GENERAL INFORMATION				WATER SURVEY RESPONSES										SEWER SURVEY RESPONSES										
Street Name	Property Use Category	Service Area Location	Comments	Public Water	Private Well	Tested?	Nitrate Level (Mg/1 as N)	Total Coliform (#/100 mL)	Fecal Coliform (#/100 mL)	Contamination	Restricted Usage	Depth (ft)	Redrilled to Lower Depth?	Comments	Type of Sewage System	System Age (Yrs)	Does System/Plumbing Back Up?	Sump Pump Connected to System?	Black Liquid/Residue Near Septic Tank?	Odor from System?	Continuously Soggy Wet/Ground Near System?	How Often System Pumped?	Any Problems with System?	Ever Repaired System?	Comments
	SFR	E			Y	N	-	-	-	NR	N	90	N		CP	22	N	N	N	N	N	1 yr	N	N	
	SFR	E			Y	Y	NR	NR	NR	N	N	275	N		STSM	19	N	N	N	N	N	4 yrs	Y	Y	Old drain field became saturated, new pump tank and sand mound installed
S. Chapman Road*	MFR	E			Y	Y	T	T	T	N	N	475	N		STSP	20	N	N	N	N	N	2 to 3 yrs	N	N	
Easton Road	O	E	Agricultural property		-	-	-	-	-	-	-	-	-	No well, farm use only	O	-	-	-	-	-	-	-	-	-	No sanitary system, farm use only
Swamp Road	COM	E	Golf Club		Y	Y	NR	NR	NR	N	N	U	N		STSM	3	N	N	N	N	N	NR	N	N	
Swamp Road	SFR	E			Y	Y	NR	NR	NR	N	N	U	N		CP	50	N	N	N	N	N	2 yrs	N	NR	
Layle Lane	SFR	F			Y	Y	NR	NR	NR	N	N	400	N		STD	30	N	N	N	N	N	Never	N	NR	
New Galena Road*	SFR	F			Y	Y	0.14	U	0	N	NR	100	N		STD	40	N	N	N	N	N	4 to 5 yrs	N	N	
E. Peace Valley Road	SFR	F			Y	Y	NR	NR	NR	N	N	U	N		CP	U	N	N	N	N	N	2 yrs	N	NR	
New Galena Road*	SFR	F			Y	N	-	-	-	NR	N	75	N		STD	55	N	N	N	N	N	3 yrs	N	NR	
New Galena Road	SFR	F			Y	Y	NR	NR	NR	N	N	131	N		STD	50	N	N	N	N	N	Once	N	N	
Chapman Road	SFR	F			Y	Y	NR	NR	NR	N	N	U	N		STSP	14	N	N	N	N	N	1 yr	N	N	
Chapman Road*	SFR	F			Y	N	-	-	-	NR	N	90	N		STSP	44	N	N	N	N	N	3 yrs	N	N	
New Galena Road	SFR	F			Y	Y	NR	NR	NR	N	Y	110	N		STD	50	N	N	N	N	N	1 yr	N	NR	
Callowhill Road	SFR	F			Y	N	-	-	-	N	U	U	U		STD	5	N	U	N	N	N	1 yr	N	N	
P.O. Box	SFR	G			Y	N	-	-	-	NR	N	U	N		STD	30	N	N	N	N	N	Never	N	N	
Limekiln Pike*	SFR	G			Y	N	-	-	-	N	N	U	N		STSP	40	N	N	N	N	N	2 yrs	N	N	
Chapman Road	SFR	G			Y	N	NR	NR	NR	N	N	280	N		STD	16	N	N	N	N	N	Never	N	N	
E. Butler Avenue	MFR	G			Y	NR	NR	NR	NR	NR	NR	NR	NR		STD/STSP/O	58	NR	NR	NR	NR	NR	Weekly	NR	NR	Some sewage is hauled away
Limekiln Pike	SFR	G			Y	Y	NR	NR	NR	N	N	325	N		STSM	13	N	N	N	N	N	3 yrs	N	NR	
Old Limekiln Road	SFR	G			Y	Y	NR	NR	NR	N	N	86	N		STD	U	N	N	N	N	N	3 yrs	N	N	
Old Limekiln Road*	SFR	G			Y	N	-	-	-	N	N	300	N		STD	19	N	N	N	N	N	4 yrs	N	N	
Creek Road	SFR	G			Y	Y	NR	NR	NR	N	N	90	N		STD	31	N	N	N	N	N	1 yr	Y	Y	Original system poorly drained, new drainfield installed in 1972 which eliminated problem, wet soggy areas occur only during very wet rain periods
Chapman Road	COM	G	Day camp/school		Y	Y	NR	<1	0	N	N	U	N		O	5	N	N	N	N	N	Weekly	N	N	Day camp utilizes septic holding tanks which are pumped weekly
Old Limekiln Road	SFR	G			Y	Y	NR	NR	NR	N	N	308	N		STD	40	N	N	N	N	N	1 yr	N	NR	
Ferry Road*	SFR	G			Y	N	-	-	-	N	Y	400	N		STD	U	N	N	N	N	N	Never	N	N	
heese Factory Road*	SFR	G			Y	N	-	-	-	NR	NR	120	N		STD	40	N	N	N	N	N	3 yrs	NR	Y	French drains added to systems 10 yrs ago
Ferry Road	SFR	G			Y	N	-	-	-	NR	N	195	N		STD	50	N	N	N	N	N	4 to 5 yrs	N	Y	Replaced septic tank
Ferry Road	SFR	G			Y	Y	NR	NR	NR	N	N	300	N		STSM	15	N	N	N	N	N	3 to 4 yrs	Y	Y	Pump failed and replaced 12 yrs ago
Chapman Road	SFR	G			Y	Y	NR	NR	NR	N	N	260	N		STSM	9	N	N	N	N	N	1 yr	N	NR	
Limekiln Pike	SFR	G			Y	N	-	-	-	N	N	U	N		STSP	40	N	N	N	N	N	5 yrs	N	N	
Limekiln Pike	SFR	G			Y	N	-	-	-	NR	N	125	N		CP	57	N	N	N	N	N	2 to 3 yrs	N	N	
Limekiln Pike	SFR	G			Y	Y	NR	0	NR	N	N	162	N		STD	50	N	N	N	N	N	3 yrs	N	N	
Limekiln Pike	SFR	G			Y	Y	NR	NR	NR	NR	N	400	N		STD	24	N	N	N	N	N	Never	N	N	
Ferry Road*	MFR	G			Y	N	-	-	-	NR	N	260	N		STSM	27	N	N	N	N	N	1 yr	N	N	
Ferry Road	SFR	G			Y	N	-	-	-	NR	N	226	N		STD	30	N	N	N	N	N	2 yrs	N	NR	
Old Ironhill Road	MFR	H			Y	N	-	-	-	NR	Y	348	N		STD	37	N	N	N	N	N	2 yrs	Y	Y	Replaced collapsed line from tank to distribution box
Callowhill Road*	SFR	H			Y	N	-	-	-	NR	N	300	N		STD	30	N	N	N	N	N	2 yrs	N	NR	
Ferry Road	SFR	H			Y	Y	NR	NR	NR	N	N	40	N		STD	U	N	N	N	N	N	2 yrs	N	Y	Replaced intake pipe
Ferry Road	SFR	H			Y	Y	NR	NR	NR	N	N	310	N		STSP	40	N	N	N	N	N	8 yrs	Y	Y	Water once backed up into house, replaced cast iron pipe
Old Ironhill Road*	SFR	H			Y	Y	2.6	<1	<1	N	N	300	N		STD	20	N	N	N	N	N	1 yr	N	N	
Ferry Road	SFR	H			Y	Y	U	U	U	N	N	U	N		STSM	20	N	N	N	N	N	2 to 3 yrs	N	Y	Replaced sewage pump
Ferry Road	SFR	H			Y	N	-	-	-	NR	NR	NR	NR		STSM	4	N	N	N	N	N	3 yrs	N	NR	
Creek Road	SFR	H			Y	Y	U	U	U	N	N	300	N		STD	35	N	N	N	N	N	1 yr	N	NR	
Ferry Road*	SFR	H			Y	Y	NR	NR	NR	N	N	200	N		STSP	40	N	N	N	N	N	4 yrs	N	NR	
Layle Lane	SFR	H			Y	Y	NR	NR	NR	N	N	322	N		NR	33	N	N	N	N	N	1 yr	N	N	
Ferry Road	SFR	H			Y	Y	NR	T	NR	Y	N	U	N		STD	1	N	Y	N	N	N	1 yr	Y	Y	Soft, odiferous areas around system, replaced existing system with drip irrigation field in 2002
Layle Lane*	SFR	H			Y	N	-	-	-	NR	N	U	N		STD	45	Y	N	N	Y	N	0.5 yrs	Y	Y	Drain fields no longer function properly, constant backups and odors, many attempts made to repair system
Creek Road	SFR	H			Y	Y	NR	NR	NR	N	N	NR	N		STD	40	N	N	N	N	N	1 yr	N	N	
Layle Lane	MFR	H			Y	N	-	-	-	NR	N	NR	N		STD	36	N	N	N	N	N	2 yrs	Y	N	Water wasn't draining to drainfield
Old Ironhill Road*	SFR	H			Y	Y	0	0	0	N	N	240	N		STD	38	N	N	N	N	N	5 to 6 yrs	N	Y	Replaced broken pipe 37 years ago
Ferry Road	SFR	H			Y	Y	NR	NR	NR	N	N	150	N		STD	40	N	N	N	N	N	3 yrs	N	NR	
Callowhill Road	SFR	H			Y	NR	NR	NR	NR	NR	Y	170	Y		STD	32	Y	N	N	N	N	Never	Y	N	Slow flushing toilets and backups during heavy rains
Park Avenue	SFR	H			Y	NR	NR	NR	NR	NR	N	U	N		STD	U	N	N	N	N	N	2 yrs	N	N	
Creek Road	SFR	H			Y	Y	NR	NR	NR	N	N	600	N		ATSI	18	N	N	N	N	N	2 yrs	N	Y	Minor maintenance to spray irrigation heads
Ferry Road	SFR	H			Y	Y	NR	NR	NR	N	N	260	N		STSM	6	N	N	N	N	N	2 yrs	N	NR	
Layle Lane	SFR	H			Y	Y	T	T	T	N	N	U	N		STD	6	N	N	N	N	N	Never	N	N	
Creek Road	SFR	H			Y	Y	NR	NR	NR	N	N	40	N		STD	19	N	N	N	N	N	2 yrs	N	Y	Replaced defective pumps in 2002
Creek Road	SFR	H			Y	Y	U	U	U	N	N	U	N		ST	30	N	N	N	N	N	NR	N	NR	
Creek Road	NR	H			Y	N	-	-	-	NR	Y	240	N		STD	33	Y	N	Y	Y	N	3 to 4 yrs	Y	Y	Must frequently pump tank, soggy ground in spring, replaced distribution box to drainfield

TABLE D-1
NEW BRITAIN TOWNSHIP ACT 537 WATER AND SEWER SURVEY QUESTIONNAIRE RESPONSE SUMMARY

GENERAL INFORMATION				WATER SURVEY RESPONSES											SEWER SURVEY RESPONSES										
Street Name	Property Use Category	Service Area Location	Comments	Public Water	Private Well	Tested?	Nitrate Level (Mg/1 as N)	Total Coliform (#/100 mL)	Fecal Coliform (#/100 mL)	Contamination	Restricted Usage	Depth (ft)	Redrilled to Lower Depth?	Comments	Type of Sewage System	System Age (Yrs)	Does System/Plumbing Back Up?	Sump Pump Connected to System?	Black Liquid/Residue Near Septic Tank?	Odor from System?	Continuously Soggy Wet/Ground Near System?	How Often System Pumped?	Any Problems with System?	Ever Repaired System?	Comments
Creek Road	SFR	H			Y	Y	NR	NR	NR	N	N	U	N		STD	U	N	N	N	N	N	4 to 5 yrs	N	N	
Callowhill Road	SFR	H			Y	N	-	-	-	NR	N	160	N		STD	30	N	N	Y	Y	N	2 yrs	N	N	Black liquid and odor are produced around system after heavy periods of rain
Callowhill Road	SFR	H			Y	Y	NR	NR	NR	N	N	177	N		STD	NR	N	N	N	N	N	5 yrs	N	Y	Replaced existing pipe to box after 25 years
Cheese Factory Road	MFR	H			Y	NR	NR	NR	NR	NR	N	105	N		STSM	5	N	NR	NR	NR	NR	NR	Y	NR	Sandmound installed 5 years ago due to poor drainage
Ferry Road	SFR	H			Y	Y	NR	0	NR	N	N	200	N		STD	25	N	N	N	N	N	3 to 5 yrs	N	N	
Cheese Factory Road	SFR	H			Y	Y	T	T	T	N	N	U	N		STD	30	N	N	N	N	N	7 yrs	Y	Y	Replaced rusted cast iron pipe between tank and distribution box
Old Ironhill Road	SFR	H			Y	Y	NR	NR	NR	N	N	724	N		STSM	10	N	N	N	N	N	Never	N	NR	
Cheese Factory Road	SFR	H			Y	Y	NR	NR	NR	N	N	300	N		STSM	14	N	N	N	N	N	1.5 yrs	N	NR	
Ferry Road	SFR	H			Y	Y	NR	NR	NR	N	Y	500	Y		STD	30	N	N	N	N	N	2 to 3 yrs	N	NR	
Creek Road	SFR	H			Y	Y	NR	NR	NR	N	N	125	N		STD	NR	N	N	N	N	N	3 to 5 yrs	N	N	
Creek Road	SFR	H			Y	Y	NR	0	NR	N	N	325	N		STD	10	N	N	N	N	N	3 yrs	N	N	
Ferry Road*	SFR	H			Y	Y	NR	0	0	N	Y	106	N		CP	45	N	N	N	N	N	Never	N	N	
P.O. Box	SFR	H			Y	N	-	-	-	N	N	110	N		CP	30	N	N	N	N	N	1 yr	N	NR	
Callowhill Road*	MFR	H			Y	Y	NR	NR	NR	N	Y	U	N		STD	34	N	N	N	N	N	5 yrs	Y	N	Has 2 septic tanks & drainfields
Layle Lane	SFR	H			Y	Y	NR	NR	NR	N	N	U	N		STSD	40	N	N	N	N	N	10 yrs	N	N	
E. Peace Valley Road	SFR	I			Y	Y	1.6	0	0	N	N	200	N		STSM	7	N	N	N	N	N	2 yrs	N	N	
Creek Road	SFR	I			Y	Y	U	U	U	N	N	U	N		STD	30	N	N	N	N	N	3 yrs	N	NR	
Creek Road*	SFR	I			Y	Y	NR	NR	NR	N	N	U	N		STSM	3	N	N	N	N	N	2 yrs	Y	Y	Replaced old septic system with new sand mound
Callowhill Road	MFR	I			Y	Y	NR	NR	NR	N	N	U	N		STD	45	N	N	N	N	N	As needed	N	N	
E. Peace Valley Road	SFR	I			Y	Y	U	U	U	N	N	245	N		STSM	9	N	N	N	N	N	2 yrs	N	N	
Creek Road	O	I	Holding Zone		Y	Y	0	0	0	N	N	80	N		O	NR	NR	NR	NR	NR	NR	0.5 yrs	N	Y	Temporary holding zone pumps from 2 Creek Road up S.R. 152 to Farber Road, replaced broken pipe
Creek Road*	SFR	I			Y	Y	NR	NR	NR	N	Y	250	Y		STD	15	N	N	N	Y	N	1 yr	N	N	
Creek Road	SFR	I			Y	Y	NR	NR	NR	N	N	137	N		STD	U	N	N	N	N	N	NR	NR	NR	
Creek Road	SFR	I			Y	Y	NR	NR	NR	N	N	100	N		STD	40	N	N	N	N	N	2 yrs	N	NR	
Creek Road	SFR	I			Y	Y	NR	NR	NR	N	N	270	N		STD	46	N	N	N	N	N	5 yrs	N	N	
J. Peace Valley Road*	SFR	I		Y		-	-	-	-	-	-	-	-		PS	-	-	-	-	-	-	-	-	-	
Callowhill Road	SFR	I			Y	N	-	-	-	NR	N	125	N		STD	30	N	N	N	N	N	2 yrs	N	NR	
Creek Road	SFR	I			Y	Y	T	100	100	N	N	402	N		STD	31	N	NR	N	N	N	2 to 3 yrs	N	Y	New drainfield installed in 1978
New Galena Road	SFR	I			Y	Y	U	U	U	Y	N	140	N	chlorine disinfection	STD	38	N	N	N	N	N	7 yrs	Y	Y	Junction box was clogged, had tank baffle repaired
E. Peace Valley Road	SFR	I			Y	N	-	-	-	NR	N	185	N		STSP	21	N	N	N	N	N	2 to 3 yrs	N	N	
Creek Road	SFR	I			Y	Y	0.9	0	0	N	N	140	N		STSM	2	N	N	N	N	N	2 yrs	N	N	
E. Peace Valley Road	SFR	I			Y	Y	NR	1.0	NR	N	N	60	N		STSM	6	N	N	N	N	N	NR	NR	NR	
New Galena Road	SFR	I			Y	Y	NR	NR	NR	N	N	250	N		STSM	5	N	N	N	N	N	2 yrs	N	NR	
Harvest Hill Drive*	SFR	I			Y	N	-	-	-	N	N	NR	N		STD	7	N	N	N	N	N	1 yr	N	N	
W. Peace Valley Road	SFR	I			Y	Y	U	U	U	N	N	U	N		STD	50	N	N	N	N	N	3 yrs	N	NR	
	O	I	Undeveloped\]		-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	
Creek Road	SFR	I			Y	Y	U	U	U	N	N	420	N		STD	30	N	N	N	N	N	5 yrs	N	NR	
E. Peace Valley Road	SFR	I			Y	Y	NR	NR	NR	N	N	U	U		STSI	5	N	N	N	N	N	2 yrs	N	NR	
E. Peace Valley Road	SFR	I			Y	Y	NR	NR	NR	N	N	190	N		STD	25	N	N	N	N	N	3 yrs	N	NR	
E. Peace Valley Road	SFR	I			Y	Y	NR	NR	NR	N	N	U	N		STSP	30	N	N	N	N	N	4 yrs	N	NR	
Creek Road	SFR	I			Y	Y	NR	NR	NR	N	Y	400	Y		STD	32	N	N	N	N	N	5 yrs	N	NR	
New Galena Road	SFR	I			Y	Y	NR	NR	NR	N	N	U	N		STD	30	N	N	N	N	N	3 yrs	N	N	
Creek Road	SFR	I			Y	Y	NR	NR	NR	N	N	300	N		STD	40	N	N	N	N	N	2 yrs	N	NR	
Harvest Hill Drive	SFR	I			Y	Y	0.9	<1	<1	N	N	U	N		ATSD	14	N	N	N	N	N	2 to 4 yrs	N	N	
Callowhill Road	SFR	I			Y	Y	NR	NR	NR	N	N	U	N		STD	15	N	N	N	N	N	1 yr	N	N	
Creek Road	SFR	I			Y	Y	NR	NR	NR	Y	Y	500	Y	Fecal coliform high, UV disinfection	STSM	14	N	N	N	N	N	2 to 3 yrs	N	NR	
Creek Road	SFR	I			Y	Y	NR	NR	NR	N	N	U	N		STD	40	N	N	N	N	N	2 yrs	N	N	
Creek Road	SFR	I			Y	Y	0	0	0	N	N	140	N		STD	30	N	N	N	N	N	2 to 3 yrs	N	NR	
New Galena Road	SFR	I			Y	Y	0.43	<1	<1	N	N	85	N		STSM	30	N	N	N	N	N	3 yrs	N	NR	

TABLE D-1
NEW BRITAIN TOWNSHIP ACT 537 WATER AND SEWER SURVEY QUESTIONNAIRE RESPONSE SUMMARY

GENERAL INFORMATION				WATER SURVEY RESPONSES										SEWER SURVEY RESPONSES									
Street Name	Property Use Category	Service Area Location	Comments	Public Water	Private Well	Tested?	Nitrate Level (Mg/l as N)	Total Coliform (#/100 mL)	Fecal Coliform (#/100 mL)	Contamination	Restricted Usage	Depth (ft)	Redrilled to Lower Depth?	Comments	Type of Sewage System	System Age (Yrs)	Does System/Plumbing Back Up?	Sump Pump Connected to System?	Black Liquid/Residue Near Septic Tank?	Odor from System?	Continuously Soggy Wet/Ground Near System?	How Often System Pumped?	Any Problems with System?	Ever Repaired System?	Comments
New Galena Road	SFR	I			Y	Y	NR	NR	NR	N	N	U	N		STD	40	N	N	N	N	N	1.5 yrs	Y	Y	Replaced topsoil and regraded eroded drainfield from excessive rainfall
W. Peace Valley Road	SFR	I		Y		-	-	-	-	-	-	-	-		PS	-	-	-	-	-	-	-	-	-	
E. Peace Valley Road	SFR	I			Y	Y	NR	NR	NR	N	N	180	N		STD	33	N	N	N	N	N	2 yrs	N	Y	Replaced drainage pipes
Peace Valley Road	SFR	I			Y	NR	NR	NR	NR	NR	NR	NR	NR		STD	30	N	U	N	N	N	10 yrs	Y	Y	Root penetration between tank and drainfield
New Galena Road	SFR/O	I			Y	N	-	-	-	N	Y	250	N		STD	26	N	N	N	N	N	10 yrs	N	N	
Callowhill Road	SFR	I			Y	Y	NR	NR	NR	NR	Y	120	N		STD	25	N	N	N	N	N	Never	N	N	
New Galena Road	SFR	I			Y	Y	NR	NR	NR	N	N	NR	N		STD	35	N	N	N	N	N	3 yrs	N	NR	
Harvest Hill Drive	SFR	I			Y	Y	4.6	<1	U	N	N	90	N		STSM	20	N	N	N	N	N	5 yrs	N	N	
Hellberg Avenue	O	I	Undeveloped		-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	
New Galena Road	SFR	I			Y	Y	NR	NR	NR	N	Y	170	N		STD	U	N	N	N	N	N	NR	N	NR	
Harvest Hill Drive	SFR	I			Y	Y	0	<1	<1	N	N	U	N		STSM	17	N	U	N	N	N	Never	N	NR	

GENERAL INFORMATION

*Property was field verified.

WATER SURVEY RESPONSES

N - "No"
NR - "No Response" (No response indicated for question)
NT - "Not Tested" (Water quality parameter for private well water was not tested for)
T - "Tested" (Water quality parameter for private well was tested for but no specific value given)
U - "Unknown" (Response was indicated as unknown)
Y - "Yes"

GENERAL INFORMATION RESPONSES

COM - "Commercial"
INST - "Institutional"
MFR - "Multiple Family Residential"
NR - "No Response" (No response indicated for question)
O - "Other"
SFR - "Single Family Residential"

SURVEY RESPONSE KEY

SEWER SURVEY RESPONSES

ATSD - Aerobic Tank-Stream Discharge"
ATSI - "Aerobic Tank-Spray Irrigation"
CP - "Cesspool"
N - "No"
NR - "No Response" (No response indicated for question)
O - "Other"
PS - "Public Sewer"
ST - "Septic Tank"
STD - "Septic Tank Drainfield"
STSD - "Septic Tank-Stream Discharge"
STSI - "Septic Tank-Spray Irrigation"
STSM - "Septic Tank-Sand Mound"
STSP - "Septic Tank-Seepage Pit"
U - "Unknown" (Response was indicated as unknown)
Y - "Yes"

TABLE D-2
WATER AND SEWER SURVEY SUMMARY
PERCENTAGE OF "YES" RESPONSES TO KEY QUESTIONS

	A	B	C	D	E	F	G	H	I	Totals
No. of Responses Per Area	26	56	41	39	13	9	21	39	45	289
Property Use:										
Single Family Residential	92.3	89.3	90.2	92.3	69.2	100.0	85.7	89.7	88.9	89.3
Multiple Family Residential	0	7.1	4.9	5.1	15.4	0	9.5	10.3	2.5	5.9
Commercial	0	0	0	2.6	7.7	0	4.8	0	0	1.0
Institutional	0	0	0	0	0	0	0	0	0	0
Other	7.7	3.6	4.9	2.6	7.7	0	0	0	8.9	4.2
Well Tested	76.9	67.9	78.0	87.2	61.5	66.7	42.9	71.8	80.0	73.0
Contamination Found	3.8	3.6	2.4	5.1	23.1	0	0	2.6	13.3	5.5
Usage Restricted	19.2	28.6	31.7	28.2	7.7	11.1	4.8	15.4	13.3	20.8
Well Depth (Feet):										
0 to 250	30.8	33.9	34.1	43.6	38.5	55.6	33.3	35.9	42.2	37.4
251 to 500	11.5	28.6	24.4	15.4	23.1	11.1	42.9	23.1	13.3	21.8
501 to 750	23.1	5.4	12.2	0	0	0	0	5.1	0	5.5
751 to 1000	0	1.8	0	7.7	0	0	0	0	0	1.4
1000+	3.8	0	0	0	0	0	0	0	0	0.3
Well Redrilled	3.8	12.5	7.3	10.3	0	0	0	2.6	6.7	6.6
Type of Sewage System:										
Aerobic Tank-Stream Discharge	0	0	0	0	0	0	0	0	2.2	0.3
Aerobic Tank-Spray Irrigation	0	0	0	0	0	0	0	2.6	0	0.4
Cesspool	15.4	1.8	2.4	5.1	15.4	11.1	4.8	5.1	0	4.8
Septic Tank	0	1.8	0	2.6	0	0	0	2.6	0	1.1
Septic Tank Drainfield	50.0	71.4	61.0	64.1	53.8	66.7	61.9	64.1	57.8	62.3
Septic Tank-Stream Discharge	3.8	0	0	0	0	0	0	2.6	0	0.7
Septic Tank-Spray Irrigation	0	0	0	0	0	0	0	0	2.2	0.3
Septic Tank-Sand Mound	15.4	14.3	22.0	10.3	15.4	0	19.0	28.6	22.2	18.1
Septic Tank-Seepage Pit	0	7.1	7.3	17.9	7.7	22.2	14.3	5.1	4.4	8.3
Public Sewer	3.8	0	0	0	0	0	0	0	4.4	1.0
Other	0	3.6	2.4	0	7.7	0	9.5	0	2.2	2.4
System Age (Years):										
0 to 5	7.7	5.4	14.6	5.1	7.7	11.1	4.8	7.7	8.8	7.9
6 to 10	0	5.4	7.3	5.1	0	0	4.8	10.3	8.8	5.9
11 to 20	34.6	16.1	17.1	17.9	23.1	11.1	19.0	12.8	13.3	17.6
21 to 30	11.5	53.8	17.1	12.8	23.1	11.1	19.0	17.9	26.7	25.0
31 to 40	11.5	10.7	9.8	24.4	7.7	11.1	23.8	33.3	17.7	17.5
41 to 50	15.4	16.1	12.2	12.8	23.1	33.3	9.5	5.1	6.7	12.5
50+	0	1.8	0	5.1	7.7	11.1	9.5	0	0	2.4
System Backs Up	11.5	1.8	0	0	0	0	0	7.7	0	2.4
Sump Pump Connected to System	0	1.8	4.9	2.6	0	0	0	2.6	0	1.7
Black Liquid/Residue Near System	7.7	0	0	0	0	0	0	5.1	0	1.4
Odor from System	7.7	3.6	4.9	2.6	7.7	0	0	7.7	2.2	4.2
Continuously Soggy/Wet Ground	11.5	3.6	2.4	2.6	7.7	0	0	0	0	2.8
How Often System Pumped (Years):										
0 to 1	3.8	7.1	9.8	7.7	7.7	33.3	28.6	17.9	8.8	11.4
2 to 3	46.2	51.8	58.6	56.4	38.5	44.4	33.3	38.5	51.1	48.8
4 to 5	19.2	8.9	2.4	17.9	30.8	11.1	19.0	15.4	11.1	13.1
6 to 10	3.8	3.6	2.4	5.1	0	0	0	10.3	6.7	4.5
10+	3.8	3.6	2.4	0	7.7	11.1	0	0	2.2	2.4
Never	11.5	10.7	4.9	7.7	0	11.1	19.0	7.7	2.2	8.0
Problem with System	23.1	10.7	12.2	7.7	15.4	0	9.5	25.6	8.8	13.1
System Repaired	23.1	10.7	22.0	15.4	15.4	0	19.0	30.8	15.6	18.0

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TABLE D-3
BUCKS COUNTY DEPARTMENT OF HEALTH
REPAIR PERMITS ISSUED WITHIN THE ON-LOT SEWAGE SERVICE AREA

Tax Parcel #[1]	Primary Treatment[1]	Secondary Treatment[1]	Soil Type (Abbreviation[1])	Soil Class[1]	Slope[2] (%)	Depth to Rock[2] (in)	Depth to Seasonal High Water Table[2] (ft)	Permeability[2]	Drainage Class[2]	Hydric Soil[2]
26-001-041-001	No Data Given	No Data Given	No Data Given	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-001-049-001	Privey		No Data Given	Abbotstown Silt Loam	0 to 15	40 to 60	1.0 to 2.5	Slow to moderately rapid	Somewhat poorly drained	No
26-001-089-009	Septic Tank	Elevated Sand Mound	*CaB*	Chalfont Silt Loam	3 to 8	48 to 96	0.5 to 1.5	Slow to moderately rapid	Somewhat poorly drained	No
26-001-106-001	Septic Tank	Elevated Sand Mound	No Data Given	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-003-008	Septic Tank	French Drain/Serial Distribution	*RdB*	Readington Silt Loam	3 to 8	42 to 72	1.5 to 3.0	Moderately slow to moderately rapid	Moderately well drained	No
			WeD	Weikert Channery Silt Loam	15 to 25	10 to 20	Greater than 6	Moderately rapid to rapid	Somewhat excessively drained	No
26-003-042-001	Septic Tank	Elevated Sand Mound	*DoB*	Doylestown Silt Loam	3 to 8	48 to 84	0.0 to 0.5	Slow to moderately rapid	Poorly drained	Yes
26-003-049	Septic Tank	Elevated Sand Mound	*CwB*	Croton Silt Loam	3 to 8	40 to 60	0.0 to 0.5	Slow to moderately rapid	Poorly drained	Yes
26-003-050-001	Septic Tank	Standard Trench	*CwC*	Culleoka-weikert Shaly Silt Loam	8 to 15	12 to 42	Greater than 3	Moderately rapid to rapid	Somewhat excessively to excessively well drained	No
26-003-077	Septic Tank	Gravel Mound	*DoB*	Doylestown Silt Loam	3 to 8	48 to 84	0.0 to 0.5	Slow to moderately rapid	Poorly drained	Yes
26-003-123-003	Septic Tank	Elevated Sand Mound	No Data Given	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-003-135-004	Septic Tank	Elevated Sand Mound	*Re*	Reaville Shaly Silt Loam	0 to 3	18 to 30	1.0 to 2.0	Slow to moderately rapid	Somewhat poorly drained	No
26-003-167	Septic Tank	Elevated Sand Mound	*DoB*	Doylestown Silt Loam	3 to 8	48 to 84	0.0 to 0.5	Slow to moderately rapid	Poorly drained	Yes
26-004-014	Septic Tank	Elevated Sand Mound	*CwB*	Croton Silt Loam	3 to 8	40 to 60	0.0 to 0.5	Slow to moderately rapid	Poorly drained	Yes
26-004-025-003	Complaint issued, no permit found			N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-004-032	Septic Tank	Gravel Mound	*CwB*	Croton Silt Loam	3 to 8	40 to 60	0.0 to 0.5	Slow to moderately rapid	Poorly drained	Yes

TABLE D-3
BUCKS COUNTY DEPARTMENT OF HEALTH
REPAIR PERMITS ISSUED WITHIN THE ON-LOT SEWAGE SERVICE AREA

Tax Parcel #[1]	Primary Treatment[1]	Secondary Treatment[1]	Soil Type (Abbreviation[1])	Soil Class[1]	Slope[2] (%)	Depth to Rock[2] (in)	Depth to Seasonal High Water Table[2] (ft)	Permeability[2]	Drainage Class[2]	Hydric Soil[2]
26-004-044-001	Septic Tank	Seepage Bed	*AbB*	Abbotstown Silt Loam	3 to 8	40 to 60	0.5 to 1.5	Slow to moderately rapid	Somewhat poorly drained	No
26-004-089	Septic Tank	Shallow Place	No Data Given	Doylestown Silt Loam	0 to 8	48 to 84	0.0 to 0.5	Slow to moderately rapid	Poorly drained	Yes
26-005-062	Septic Tank	Elevated Sand Mound	No Data Given	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-005-080	Septic Tank	Elevated Sand Mound	No Data Given	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-009-025	Septic Tank	Shallow Place	No Data Given	Readington Silt Loam	0 to 15	42 to 72	1.5 to 3.0	Moderately slow to moderately rapid	Moderately well drained	No
26-011-008-001	Septic Tank	Elevated Sand Mound	No Data Given	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-011-034	Septic Tank	Elevated Sand Mound	No Data Given	Neshaminy Silt Loam	3 to 8	48 to 60	Greater than 6	Moderately slow to moderately rapid	Well drained	No
26-011-041-002	Septic Tank	Elevated Sand Mound	No Data Given	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-011-044	Septic Tank	Elevated Sand Mound	*RdB*	Readington Silt Loam	3 to 8	42 to 72	1.5 to 3.0	Moderately slow to moderately rapid	Moderately well drained	No
26-011-045	Septic Tank	Elevated Sand Mound	*AbB*	Abbotstown Silt Loam	3 to 8	40 to 60	0.5 to 1.5	Slow to moderately rapid	Somewhat poorly drained	No
26-012-003	Septic Tank	Holding Tank	*AbA*	Abbotstown Silt Loam	0 to 3	40 to 60	0.5 to 1.5	Slow to moderately rapid	Somewhat poorly drained	No
26-019-005	Septic Tank	Elevated Sand Mound	*AbA*	Abbotstown Silt Loam	0 to 3	40 to 60	0.5 to 1.5	Slow to moderately rapid	Somewhat poorly drained	No

[1] Data taken directly from maintenance permits issued by the Bucks County Health Department.
[2] Soil data obtained from the 1975 USDA Soil Survey of Bucks and Philadelphia Counties.
[3] Soil type abbreviations can be cross returned to Table 6 in Section 5 for additional information.

APPENDIX E

EDUCATIONAL LITERATURE
(See Sheets E-1 and E-2 for complete listing)

Selected Issues From Pipeline

Use of Peat Filters in Domestic Wastewater Treatment

EPA Technology Fact Sheets

EPA Special Issues Fact Sheets

Filter Performance Comparison

DEP Fact Sheets

On-Lot Disposal

Understanding Septic Systems

Sewage Planning Requirements Under Act 537 for
Exceptions to the Requirement to Revise the Official Plan

Sewage Management Programs

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APPENDIX E
EDUCATIONAL LITERATURE

1. Selected issues from *"Pipeline"*, a quarterly publication of National Small Flow Clearinghouse: (All issues consist of 8pages except Fall 1995 which has 13)

   Summer 1995 (Vol. 6, No. 3) Septic Systems - A Practical Alternative for Small Communities

   Fall 1995 (Vol. 6, No. 4) Maintaining Your Septic System - A Guide for Homeowners

   Summer 1997 (Vol. 8, No. 3) Sand Filters Provide Quality Low Maintenance Treatment

   Fall 1997 (Vol. 8, No. 4) Basic Wastewater Characteristics

   Winter 1999 (Vol. 10, No. 1) Spray and Drip Irrigation for Wastewater Reuse, Disposal

   Summer 1999 (Vol. 10, No. 3) Mounds - A Septic System Alternative

   Spring 2000 (Vol. 11, No. 2) Site Evaluations

   Summer 2000 (Vol. 11, No. 3) Alternative Toilets - Options for Conservation and Specific Site Conditions

   Winter 2001 (Vol. 12, No. 1) Water Softener Use Raises Questions for system Owners

   Summer 2001 (Vol. 12, No. 3) Gravelless and Chamber Systems: Alternative Drainfield Designs

   Spring 2002 (Vol. 13, No. 2) Soil Characteristics - Demystifying Dirt

   Fall 2002 (Vol. 13, No. 4) Alternative Dispersal Options

   Fall 2003 (Vol. 14, No. 4) Septic tank Enhancements

   Winter 2004 (Vol. 15, No. 1) Attached Growth Process - An Old Technology Takes on New Forms

2. "The Use of Peat Filters in Domestic Wastewater Treatment Small Flow", quarterly, Winter 2000, (Volume 1 No. 1) (2 pages)

3. EPA Technology Fact Sheets - Selected Topics:

   Technology Fact Sheet 4 - Effluent Disinfection Processes (TFS17-TFS-22)

   Technology Fact Sheet 5 - Vegetated Submerged Beds and Other High-Specific-Surface Anaerobic Reactors (TFS23-TFS29)

Technology Fact Sheet 7 - Stabilization Ponds, FWS Constructed Wetlands, and Other Aquatic Systems (TFS37-TFS40)

Technology Fact Sheet 10 - Intermittent Sand/Median Filters (TFS53-TFS59)

Technology Fact Sheet 11 - Recirculating Sand/Median Filters (TFS61-TFS69)

Technology Fact Sheet 12 - Land Treatment Systems (TFS71-TFS76)

Technology Fact Sheet 13 - Renovation/Restoration of Subsurface Wastewater Infiltration Systems (SWIS) (TFS77-TFS81)

4. EPA Special Issues Fact Sheets - Selected Topics:

Special Issue Fact Sheet 1 - Septic Tank Additives (SIFS-1 to SIFS-2)

Special Issue Fact Sheet 2 - High Organic Strength Wastewater (Including Garbage Grinders) (SIFS-3 to SIFS6)

Special Issue Fact Sheet 3 - Water Softeners (SIFS7 to SIFS8)

5. Filter Performance Comparison - Except from DEP Comment Response Document - DEP Pub. No. 362-0300-007 Alternate Systems Guidance

SELECTED ISSUES FROM PIPELINE

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Pipeline

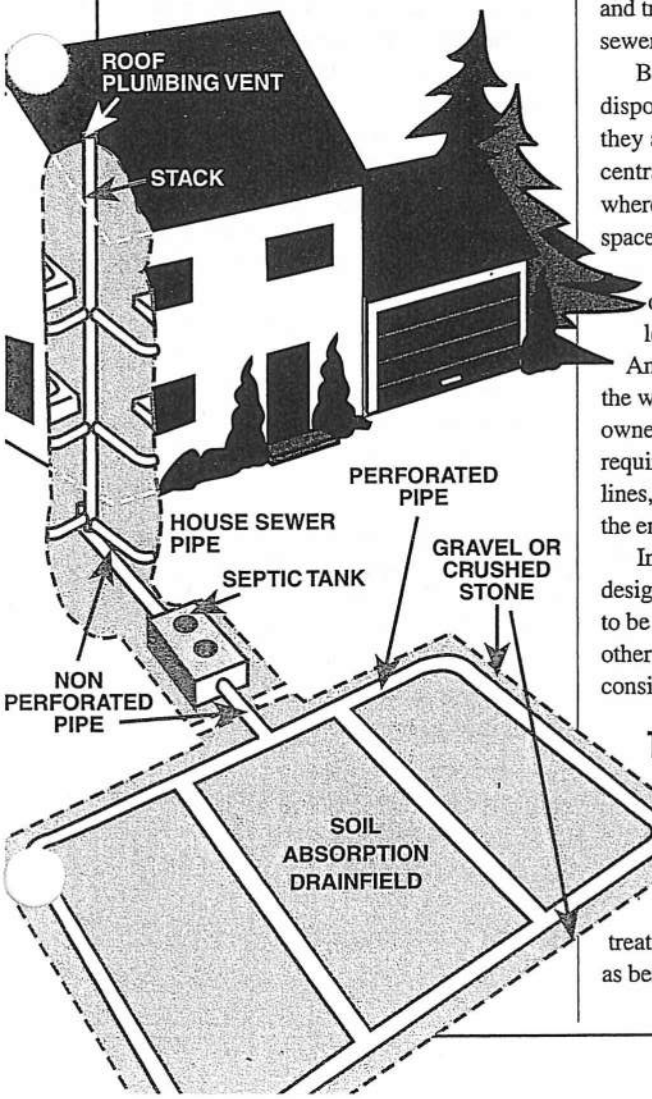
Summer 1995
Vol. 6, No. 3

NATIONAL SMALL FLOWS CLEARINGHOUSE

Small Community Wastewater Issues Explained to the Public

Septic Systems—a practical alternative for small communities

Are you the proud owner of a septic system? If so, you're in good company. Nearly one out of every four homes in the U.S. relies on some form of septic system to treat and dispose of household wastewater. When properly designed, installed, and maintained, septic systems can be the most cost-effective and efficient method of wastewater treatment a homeowner can choose.



A septic system is an especially good alternative for homeowners in many small and rural communities. In these communities, the cost per household of installing, maintaining, and operating a conventional sewer system is usually higher because the population is smaller. (A conventional sewer system is the type of centralized wastewater collection and treatment system used by most U.S. communities. Wastewater is collected from individual households and transported through a network of sewers to a wastewater treatment plant.)

Because septic systems treat and dispose of household wastewater onsite, they are often more economical than centralized sewer systems in rural areas where lot sizes are larger and houses are spaced widely apart.

Septic systems are also simple in design, which make them generally less expensive to install and maintain. And by using natural processes to treat the wastewater onsite, usually in a homeowner's backyard, septic systems don't require the installation of miles of sewer lines, making them less disruptive to the environment.

In addition, there are many innovative designs for septic systems that allow them to be placed in areas with shallow soils or other site-related conditions previously considered to be unsuitable.

Too good to be true?

In spite of these facts, septic systems suffer from an image problem. Many people who would be better served by a septic system than a centralized treatment system still think of septic tanks as being undependable, old-fashioned, or as a temporary solution until a conventional sewer system can be built.

ADVANTAGES OF SEPTIC SYSTEMS

- Simple and effective wastewater treatment
- Less disruptive to the environment to install and maintain
- Less expensive to operate than centralized treatment facilities
- Provide wastewater treatment in areas where it would not be available otherwise
- When functioning properly, can help replenish groundwater

Part of the blame for the poor reputation of septic systems can be traced to the popularity of conventional sewer systems in the 1960s and early 1970s, when more government funding was available to install and maintain large, complex systems. Many communities weren't informed about possible alternatives and, therefore, didn't consider more cost-effective or appropriate technologies like septic systems. And engineers, local officials, and community residents sometimes may be easily impressed by more high-tech solutions to problems. Septic systems may be overlooked as a solution in some cases because they are such a simple technology.

Pollution of local groundwater, lakes, and streams due to septic system failures is also responsible for their unpopularity in some communities. The U.S. Environmental Protection Agency (EPA) has identified failing septic systems as a major source of groundwater pollution in some areas. However, most of these failures can be attributed to old systems with poor design,

Continued on page 2

Are septic systems right for my community?

When planning cost-effective wastewater treatment, homeowners and community leaders should work together to identify the needs of residents and other potential users of a system, such as schools, businesses, and industry. It is also important to evaluate factors such as the amount of money available for financing, regulations, and the performance of existing wastewater facilities and any needed repairs, expansion, or replacement.

Communities may decide that using a combination of technologies is the most effective way to fulfill the needs and goals of the entire community. Many small and rural communities use septic systems in less densely populated areas and cluster or community treatment systems where there are more users or smaller lot sizes.

The National Small Flows Clearinghouse (NSFC) offers information and technical assistance for small communities and homeowners planning or installing individual or commmunity wastewater treatment systems. Some of the resources available are listed throughout this newsletter and on page 8. *To order products or to request further assistance, call the NSFC at (800) 624-8301.*

Approximately one out of every four homes in the U.S. uses an onsite system to treat household wastewater.



HOW COMMON ARE SEPTIC TANKS?

According to the 1990 U.S. Census, there are approximately 24.7 million households across the U.S. that use septic tank systems or cesspools (holes or pits for receiving sewage) for wastewater treatment. This figure represents roughly 24 percent of the total households included in the census. Roughly half of the households in Vermont, Maine, New Hampshire, and North Carolina use septic systems or cesspools.

According to a review of local health department information by the National Small Flows Clearinghouse, 94 percent of participating health departments allow or permit the use of septic tank and soil absorption systems. Those that do not allow septic systems have sewer lines available to all residents.

The total volume of waste disposed of through septic systems is over one trillion gallons per year, according to a study conducted by the U.S. Environmental Protection Agency's Office of Technology Assessment, and virtually all of that waste is discharged directly to the subsurface, which affects groundwater quality.

Septic Systems—*continued from page 1*

poor maintenance, poor installation, or inadequate site evaluations before installation.

In the past, a lack of adequate regulations for septic system design, construction, and installation also contributed to septic system failures. With education, most problems with septic systems can be avoided. Education can lead to the proper operation and maintenance of septic systems or the possible rehabilitation of failing systems.

This issue of *Pipeline* presents some basic information about septic tank systems, how they work, and where homeowners and community leaders can find further information and assistance. The fall issue of *Pipeline* will cover the care and maintenance of septic systems in detail, including important tips for homeowners who want to ensure the success and longevity of their systems.

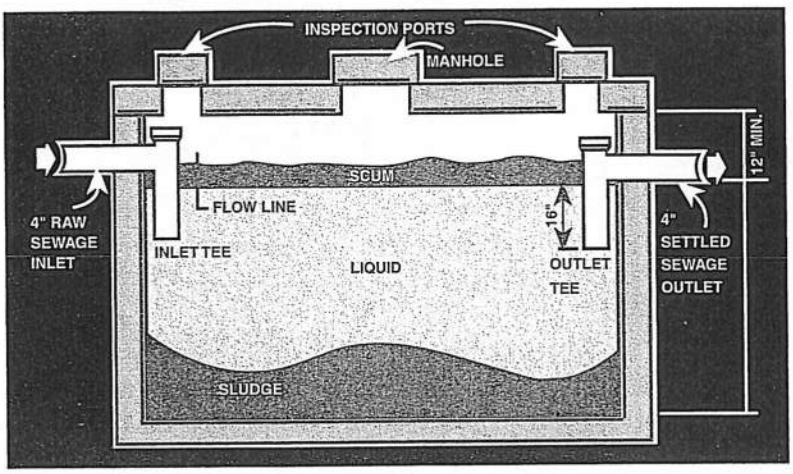
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IN THIS ISSUE

1 Septic Systems—a practical alternative for small communities
2 Are septic systems right for my community?
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3 How septic systems work
3 What homeowners need to know about septic tank design
4 A proper site evaluation is essential
5 Distribution systems for drainfields
5 How much do septic systems cost?
6 Alternative septic system designs
6 How regulations affect septic system owners
6 NSFC offers watersheds information package
7 Fall issue of *Pipeline* to focus on septic system maintenance for homeowners
7 Contacts
8 Resources available from NSFC

How Septic Systems Work

Septic systems are wastewater treatment systems that collect, treat, and dispose of wastewater generated by homes or businesses. The wastewater is treated onsite, rather than collected and transported to a centralized community wastewater treatment plant. If properly designed, installed, and maintained, a septic tank system can effectively treat household wastewater for up to 20 years or more.



There are several variations of the basic septic system design in use today. While many systems are individually designed or adapted for a specific site, most work using the same basic principles.

A septic system consists of two main parts—a *septic tank* and a *drainfield*, also known as a leachfield, disposal field, or a soil absorption system. The entire system is connected by pipes, and a sewer pipe connects the home or business to the septic system.

The Septic Tank

The main function of the septic tank is to collect household wastewater, which includes water from the toilet, referred to as blackwater, and water from the bathtub, showers, sinks, and laundry, which is known collectively as graywater. The septic tank treats the wastewater naturally by holding it in the tank long enough for solids and liquids to separate.

Treatment begins when the household wastewater flows from the home to the septic tank through the sewer pipe. A baffle (an internal flap) or tee (a T-shaped pipe) at the inlet slows the flow of wastewater going into the tank and directs it downward toward the middle of the tank. The wastewater is then retained for a day or more in the tank to allow the solids in the wastewater to separate from the liquids.

Inside the tank, solids lighter than water—such as greases, oils, and, sometimes, other solid materials like toilet paper—float to the top forming a layer of scum. Solids heavier than water settle at the bottom of the tank forming a layer of sludge. This leaves a middle layer of partially clarified wastewater.

An outlet baffle in the septic tank is positioned to allow only the partially treated liquid waste in the middle layer to flow out of the tank for further treatment.

The layers of scum and sludge remain in the septic tank where bacteria found naturally in the wastewater work to break the solids down. This process takes place anaerobically, or without the presence of oxygen, and gases produced from the decaying solids are vented back through the sewer line and released, usually through a plumbing vent located on the roof of the house. The sludge and scum that cannot be

Continued on page 4

What Homeowners Need To Know About Septic Tank Design

Septic tanks are usually made of precast concrete, fiberglass, or plastic, and come in a variety of shapes and sizes. In order for septic tanks to work properly, they must be watertight and resistant to corrosion—for this reason, metal tanks are not recommended.

Most septic tanks are single-compartment tanks. Tanks with two or more compartments use the same processes to treat the wastewater, but often retain the wastewater in the tank longer allowing for additional settling time for the solids, and thus providing additional treatment before releasing it to the drainfield. Some states recommend or require two or more compartments for septic tanks that hold 1,000 gallons or more, or two or more septic tanks used in series to provide additional treatment.

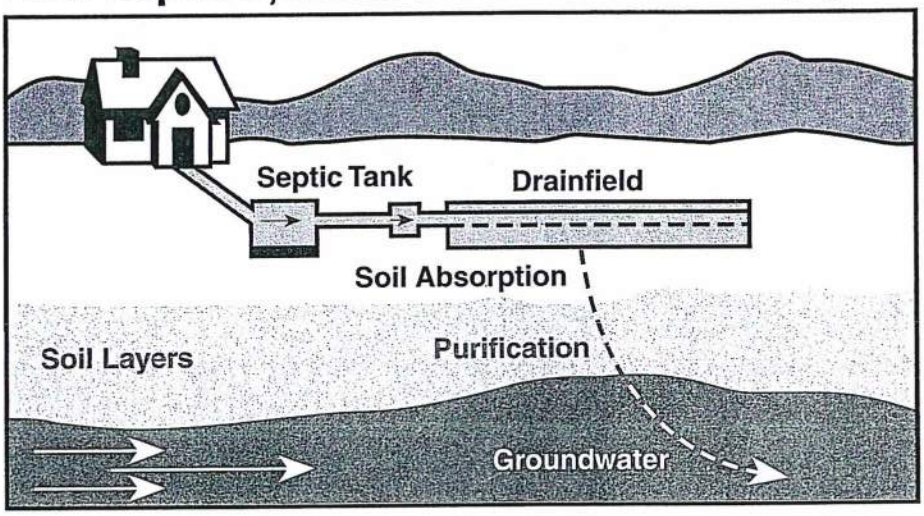
Septic tank filters, screen- or basket-like devices that trap and retain solids, are another way to enhance treatment inside septic tanks. A relatively new technology, septic tank filters are included with some newer septic tank designs, or can be retrofitted to work with older designs. Homeowners should check with their local health departments to see if septic tank filters are required or recommended.

Septic tanks are often rectangular, oval, or round. The overall shape of the septic tank has little to do with its performance, but tank size is a very important factor. Septic tanks must be large enough to accommodate the needs of the household.

The size of a septic tank is usually determined by the number of bedrooms (not bathrooms) in a home. One way to estimate the size of septic tank necessary for an average household would be to multiply 150 gallons per bedroom per day, and then multiply this number by two to allow for two days retention time in the tank. Using this formula, a three-bedroom house would use 450 gallons of water per day, and would require at least a 900-gallon septic tank for two days retention. Standard septic tank sizes include 750; 1,000; 1,200; and 1,500 gallons.

While there are several formulas available for estimating septic tank size, it is most important for homeowners to know the specific regulations for septic tank size and design in their state or area. *For more information on septic system regulations, see the article on page 6.*

How Septic Systems Work—*continued from page 3*



broken down is retained in the tank until the tank is eventually pumped.

After the wastewater is allowed to settle and separate in the septic tank, the partially treated liquid from the middle layer flows through the outlet baffle or tee to the drainfield.

The Drainfield

In a conventional septic system, the wastewater flows by gravity from the septic tank to the drainfield or to a distribution device, which helps to uniformly distribute the wastewater flow in the drainfield. *(For more information on distribution methods, see the article on page 5.)*

The drainfield or soil absorption field provides the final step in the wastewater treatment process. A standard drainfield is a series of trenches or a bed lined with gravel or coarse sand and buried one to three feet below the ground surface. Perforated pipes or drain tiles run through the trenches to distribute the wastewater.

The drainfield treats the wastewater by allowing it to slowly trickle from the pipes out into the gravel and down through the soil. The gravel and soil in a drainfield act as biological filters.

As the wastewater percolates (moves through the soil) to the groundwater below, the filtration process and organisms in the soil work together to remove toxics, bacteria, viruses, and other pollutants from the wastewater. Soil particles, particularly clay, chemically attract and hold sewage nutrients, metals, and disease carrying organisms. This process can effectively treat the wastewater to an acceptable level that will not contaminate the groundwater.

Certain toxics, such as paints, thinners, pesticides, waste oils, and other hazardous chemicals, cannot be treated by the drainfield and should never be disposed of through a septic system. Some of these chemicals also kill the bacteria found in the septic tank, temporarily disrupting the natural treatment process that occurs in the septic tank.

The size of the drainfield is determined by the amount of wastewater flow anticipated and the quality of the soil below. Soil type and the position of the water table also help determine how deep the trenches should be. A thorough site evaluation should be conducted when the septic system is still in the planning stages. Septic system failures are often caused by poorly sited drainfields. *For more information, see the article on site evaluations at left.*

WARNING

Toxic gases, including methane and hydrogen sulfide, are produced by the natural treatment processes in septic tanks. These gases can kill in minutes. Extreme care should be taken when inspecting your tank, even when just looking in. Never enter a septic tank or try to inspect the tank alone. Most communities have licensed septic contractors who can inspect your system periodically. For guidelines on how to safely and properly inspect your system, call your local health department.

A Proper Site Evaluation Is Essential

In a typical site evaluation, a sanitarian, engineer, or other wastewater professional examines the soils, landscape features, and past surveys of the potential site. He or she makes special note of the location of nearby wells, other septic systems, the slope of the land, depth to the groundwater source and to impermeable layers (such as bedrock), natural drainage patterns, and the boundaries of the lot.

An important feature of the site evaluation is a thorough study of the soil. Marking the position of the absorption field, the sanitarian digs an observation pit to examine the soil layers for texture, structure, and color patterns that will give clues about the soil's permeability and potential for seasonal water saturation. Sometimes the sanitarian will conduct a percolation, or "perc," test to measure how quickly the water moves through the soil. In some states, other methods of testing soil permeability may be used.

A good site evaluation defines the limitations of a site. If the soil or other conditions are inappropriate for a conventional drainfield, workable alternatives can be designed using the data collected in the evaluation.

Poorly sited septic systems may fail, causing inadequately treated wastewater to pond on the ground surface or to contaminate the groundwater.

If you are planning to construct a septic tank system, be sure to contact your local health department for more information on site evaluation and permit requirements for your area.

DISTRIBUTION SYSTEMS FOR DRAINFIELDS

Some septic systems require the use of a distribution system to ensure that the flow of wastewater coming from the septic tank is evenly distributed to the different parts of the drainfield. Uneven distribution can overload areas of the drainfield, causing it to fail.

Following are descriptions of some of the most common distribution methods.

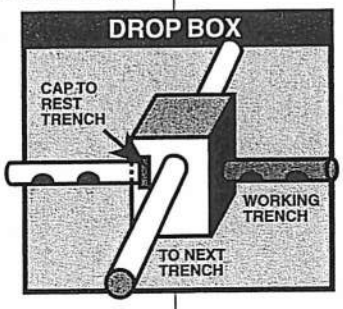
Distribution Box

A distribution box is a tank-like box with as many outlets as there are pipes or lines in the drainfield. The effluent, or partially treated wastewater, from the septic tank flows into the box and through the different outlets to the drainfield. Because the outlets in the box are level with each other, and because this system relies on gravity to work effectively, it is important that the distribution box be level. If the distribution box is not exactly level, the flow to the drainfield will be uneven.

Advantages of this distribution method include easy inspection (the top of the box opens) and the option of capping outlets to give certain drainfield trenches a chance to rest.

Drop Box

A drop box is also a very simple tank-like box designed for effluent distribution. A series of drop boxes can be used for distributing wastewater to drainfields on sloped sites using only gravity.



Inside the drop box, the pipe inlet is higher than the outlets, allowing the wastewater to flow downward to the drainfield trenches. A series of drop boxes can be arranged on the sloped drainfield so that after the highest drainfield trench is saturated with wastewater, the flow continues on to the next drop box and trench below. Drop box outlets can also be capped to control the direction of flow and to give the saturated upper trenches a rest.

Siphons and Pumps

Some septic systems, because of site conditions, soil conditions, or design, cannot rely on gravity alone to efficiently distribute the flow of effluent from the septic tank to the drainfield. Siphons or pumps are sometimes used as a method of distribution with these systems.

Siphons are often used when septic tank effluent must be evenly distributed over a large area; for example, with drainfields using more than 500 feet of pipe. The effluent flows from the siphon to the drainfield in pressurized doses, making uniform distribution easier to achieve. The effluent from the septic tank flows into a dosing tank, then through the siphon to the drainfield. Siphons work using only air, water pressure and gravity—no outside power source is necessary.

Siphons are a relatively low-cost technology that can improve the performance of the drainfield, but because they require approximately two feet between the septic tank outlet and the drainfield, they are unsuitable for some sites and septic system designs. They also require more maintenance than some other methods of distribution.

Electric pumps are also used to deliver controlled amounts or doses of effluent to the drainfield. Dosing can improve the performance of any drainfield by guaranteeing more uniform distribution, but it is especially advantageous for drainfields with shallow or poor soil conditions. However, electric pumps are more expensive to operate than other distribution systems and they require regular maintenance.

Some sites and drainfield designs require the use of electric pumps because the drainfield is higher than the septic tank, making it impossible to rely on gravity for distribution. Mound systems, for example, always require an electric pump to elevate and distribute the effluent flow from the septic tank. *For more information about mound systems and other alternative septic system and drainfield designs, see the article on page 6.*

Q&A

How much do septic systems cost?

The cost of installing and maintaining a septic system varies greatly depending on its location and design. In order to accurately estimate what a septic system will cost, homeowners should contact their local health department for more information about the costs of septic systems in their area.

In most areas in the U.S., conventional septic systems cost from $2,500 to $7,500 to install. While certain site conditions or alternative drainfield designs can make installation more expensive, this is a general range for standard septic tank and soil absorption systems. Alternative septic systems requiring pumps or specially constructed drainfields can be considerably more expensive.

As a general rule of thumb, septic systems are most cost-effective in communities where houses are spaced widely apart, and where connection to a sewer system is not an option. When the cost of operation and maintenance of a centralized treatment plant is factored in, residents in small rural communities may pay many times more per household for a centralized sewer system than residents in more densely populated areas. In certain communities, a centralized sewer system would be so expensive to install and maintain that costs per household could exceed property values.

In order to find the most cost-effective wastewater system for their homes, small community residents should discuss available options with local health department officials, neighbors, and community leaders.

How Regulations Affect Septic System Owners

Homeowners considering installing or upgrading their septic systems need to familiarize themselves with local regulations.

In most areas of the U.S., there are laws regulating the construction of the septic tank itself, the size of the tank, the number of tank compartments required, the construction and design of the drainfield, and maintenance of the system.

These regulations can vary from state to state and county to county. Often, communities have their own practices and standards regarding how and where septic systems may be constructed. Homeowners should contact their local health department for information about local regulations and permit requirements. *See the list of contacts on page 7.*

NSFC Offers Watersheds Information Package—

Watershed and groundwater protection have become important concerns for everyone who cares about the environment. Questions often arise about the role of wastewater and wastewater treatment systems in preventing water pollution.

To answer these concerns, The National Small Flows Clearinghouse (NSFC) is offering a new information package, "Wastewater in Watersheds." This helpful package defines what a watershed is, describes the role of septic tanks and other onsite systems in maintaining watershed and groundwater quality, provides examples of successful watershed management projects, and lists additional resources for information.

The cost of the package is $16.40. To obtain a copy, call the NSFC at (800) 624-8301 and ask for Item #WWPCGN57. Please include $2 for shipping and handling.

Alternative septic system designs

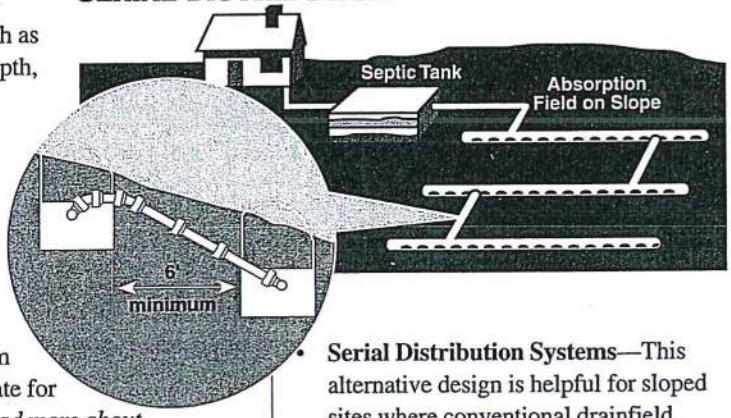
Because of the importance of site-related factors, such as soil quality, soil depth, the position of the water table, lot restrictions, and slope of the land, a thorough site evaluation is needed to determine if a conventional septic system design is appropriate for a given site. *(To read more about site evaluations, see the article on page 4.)*

If the evaluation reveals difficult or unsuitable site characteristics, many alternative drainfield designs are available. The following are just a few of the many available alternatives *(be sure to contact your local health department for more information about these alternatives, state regulations, and other options available in your area)*:

- **Low Pressure Pipe (LPP) Systems**—This drainfield design is typically used in areas where the land is rocky, the soil is shallow or tight, or the water table is high. A pump is used to guarantee uniform distribution and to prevent soil saturation.

  LPP system trenches are more shallow and narrow than conventional drainfield trenches, and the drainfield pipes are perforated and made of plastic. Advantages of LPP systems include the relatively low cost of installation for an alternative system and that septic systems can be used effectively with less than perfect site conditions.

SERIAL DISTRIBUTION



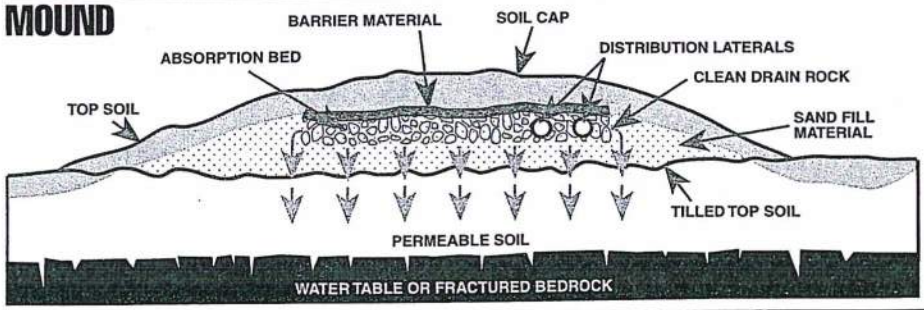
- **Serial Distribution Systems**—This alternative design is helpful for sloped sites where conventional drainfield designs are unsuitable. A series of trenches is dug across the slope so that each trench is higher than the next. Starting with the highest, each trench fills with wastewater completely, then overflows through a series of overflow pipes (as illustrated) or drop boxes (instead of a single distribution box). Discharge to each trench can be controlled through the overflow pipes or drop boxes.

- **Mound Systems**—These systems are helpful for sites where the water table is high, or the soil is too shallow or tight to provide adequate treatment.

  The drainfield is located in a man-made mound constructed of materials that will provide adequate treatment. The wastewater trickles through gravel beds or trenches located on top of a bed of sandy soil or fill, which is built on the plowed natural ground surface. With this design, a pump is necessary to

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MOUND



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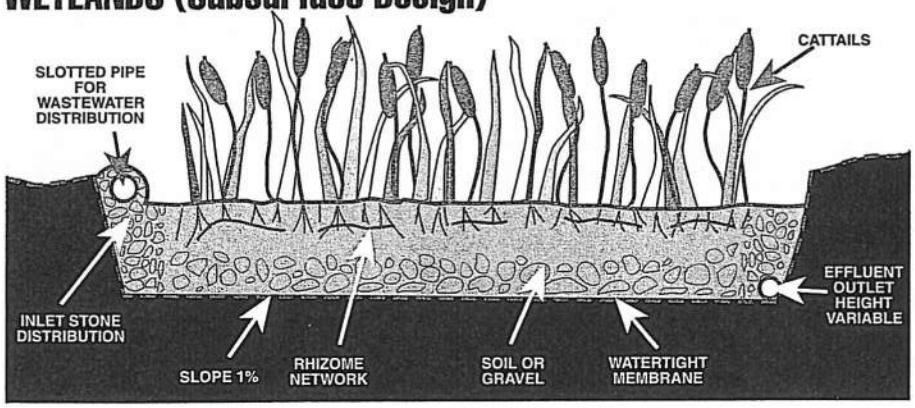
move the wastewater from the septic tank to the drainfield mound.

- **Constructed Wetlands**—These alternative drainfield systems are built to resemble small natural wetlands. Reeds and other aquatic vegetation are planted to provide a natural filtering process. For example, in a subsurface wetland design, a drainfield area is excavated and covered with a synthetic or clay waterproof liner, and then filled with rock, gravel, sand, and soil. Wastewater is treated by both the plants and the soil. Climate is an important consideration in wetland design, because certain plants will not perform well in cold weather. Usually, wastewater treated by wetlands require additional treatment, such as disinfection or discharge to a drainfield. These systems require a lot of land area, but can be a very beautiful use of the land, and are good for sites where the soil is not suitable for adequate absorption.

- **Sand Filters**—A sand filter consists of several layers of sand located under or above ground. The wastewater is pumped evenly, or dosed, over the sand filter, which also contains naturally occuring bacteria that aid the purification process. After this treatment, the wastewater usually needs to be discharged to a drainfield or, less commonly, disinfected before being discharged directly to a body of water. This design is used in areas that require the effluent (treated wastewater) to be very clean before being discharged.

There are several other alternative septic system designs available and successfully being used in small communities throughout the U.S. Some of these include drip and spray irrigation systems, gravelless systems, and contour trenches. Homeowners should contact their local health department for help in determining the most suitable septic system design to fit their needs. The National Small Flows Clearinghouse (NSFC) offers technical assistance and a variety of resources on septic system alternatives. *Refer to page 8 for a partial listing of resources, or contact the NSFC for more information.*

WETLANDS (Subsurface Design)



Fall issue of *Pipeline* to focus on septic system maintenance for homeowners

Everyone who owns a septic system should keep a copy of the next issue of *Pipeline* around the house. *Pipeline*'s fall issue will include all the information you need to properly care for your septic system so that it can serve you, trouble free, for many years to come. Regulations, inspection, pollution prevention, and other important issues for septic system owners will also be covered. If you are not already on our regular mailing list, call the National Small Flows Clearinghouse at (800) 624-8301 to request a free issue or subscription to *Pipeline*.



CONTACTS

Health Department

Homeowners with questions about regulations or location requirements for septic system construction and maintenance should contact their local health department (usually listed in the yellow pages).

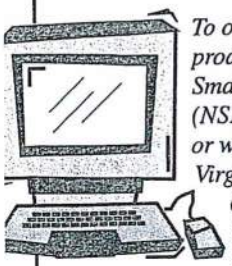
National Small Flows Clearinghouse (NSFC)

The National Small Flows Clearinghouse located at West Virginia University is also a good place for homeowners and community officials to contact for more information about septic systems and alternative systems. The NSFC is funded by the U.S. Environmental Protection Agency and offers technical assistance and a variety of free and low-cost products to help small communities with wastewater issues. Some of these NSFC products are listed on page 8.

Extension Services

Many universities have U.S. Department of Agriculture cooperative state extension service offices on campus and field offices in counties and other localities. Part of the mission of these extension services is to provide access to information and assistance to the public, and to help educate the public about federal wastewater policies and requirements. To locate the extension office in your area, contact the U.S. Department of Agriculture at (202) 720-3377, or NSFC at (800) 624-8301 and ask for Crystal Stevens in the technical assistance department.

RESOURCES AVAILABLE FROM NSFC



To order any of the following products, call the National Small Flows Clearinghouse (NSFC) at (800) 624-8301 or write to NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Be sure to request each item by title and item number. Please allow a minimum of $2 shipping and handling charges per order.

Onsite Wastewater Treatment: Septic Tanks
Septic tank functions, design, and geometry are discussed in this semi-technical, 15-page booklet available from the NSFC. Included are tables illustrating typical wastewater flows from commercial, institutional, and recreational services. Septic tank construction, operation, and maintenance are also addressed. The price is $1.20. Item #WWPCDM18.

Small Wastewater Systems: Alternative Systems for Small Communities and Rural Areas
This foldout poster describes 20 different alternative wastewater systems for small communities. It also includes an illustration of a sample community that details where each system would be appropriate. The price is $1. Item #WWBLPE02.

So . . . Now You Own a Septic System
This free brochure describes how homeowners should care for their septic systems. Item #WWBRPE20.

Your Septic System: A Guide for Homeowners
This 11-minute videotape discusses septic system operation and maintenance, covering 10 basic rules for homeowners to follow. The price is $27. Item #WWVTPE16.

Septic Systems—A Guide for Homeowners
Conventional septic systems and how they should be cared for are described in this free brochure. Tips for trouble-free operation are also provided. Item #WWBRPE17.

Septic Systems and the Sanitarian
This 10-minute videotape explains health department inspection procedures for septic tank systems. It also discusses common problems and suggests alternative solutions for the construction of septic tanks. It contains information of interest to homeowners and community officials. The price is $24.50. Item #WWVTGN11.

Septic System Information Packet for Homeowners
This information packet includes a variety of resources that no septic system owner should be without. The packet includes brochures, articles, and other materials on septic system design and the proper care and feeding of a septic system. The price is $3.80. Item #WWPCPE28.

Site Evaluation for Onsite Treatment and Disposal Systems
Critical site and soil characteristics and the use of soil surveys and necessary equipment are discussed in this semi-technical report on site evaluation. Price is $4.95. Item #WWBLDM12.

PIPELINE

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NATIONAL SMALL FLOWS CLEARINGHOUSE

Small Community Wastewater Issues Explained to the Public

MAINTAINING YOUR SEPTIC SYSTEM—A GUIDE FOR HOMEOWNERS

Out of sight and out of mind—does this describe your relationship with your septic system? If you are like most homeowners, you probably never give much thought to what happens to what goes down your drain. But if you rely on a septic system to treat and dispose of your household wastewater, what you don't know can hurt you. Proper operation and maintenance of your septic system can have a significant impact on how well it works and how long it lasts, and in most communities, septic system maintenance is the responsibility of the homeowner.

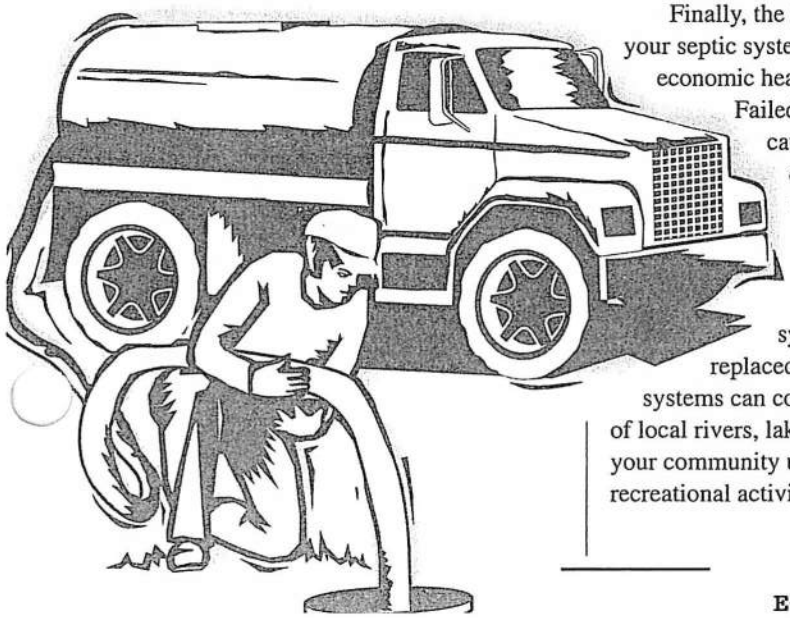
Why Maintain Your System?

There are three main reasons why septic system maintenance is so important. The first reason is money. Failing septic systems are expensive to repair or replace, and poor maintenance is a common cause of early system failures. The minimal amount of preventative maintenance that septic systems require costs very little in comparison. For example, it typically costs from $3,000 to $10,000 to replace a failing septic system with a new one, compared to approximately $50 to $150 to have a septic system inspected, and $150 to $250 to have it pumped.

The second and most important reason to maintain your system is to protect the health of your family, your community, and the environment. When septic systems fail, inadequately treated household wastewater is released into the environment. Any contact with untreated human waste can pose significant health risks, and untreated wastewater from failing septic systems can contaminate nearby wells, groundwater, and drinking water sources.

Chemicals improperly released through a septic system also can pollute local water sources and can contribute to system failures. For this reason it is important for homeowners to educate themselves about what should and should not be disposed of through a septic system.

Finally, the third reason to maintain your septic system is to protect the economic health of your community. Failed septic systems can cause property values to decline. Sometimes building permits cannot be issued or real estate sales can be delayed for these properties until systems are repaired or replaced. Also, failed septic systems can contribute to the pollution of local rivers, lakes, and shorelines that your community uses for commercial or recreational activities.



SEPTIC SYSTEM QUIZ

Can you answer the following questions?

- Where is your septic tank located? (see page 6)
- How often should you have your septic system inspected? (see page 4)
- Does it help to add yeast to your system? (see page 4)
- Do you know the last time your septic tank was pumped? (see page 6)
- How do household cleaners affect your system? (see page 6)
- How can you tell if your septic system has failed? (see page 2)

Even if you think you know the answers to all of these questions, you can probably learn something new about septic system maintenance in this issue of *Pipeline*. For a quick reference, see the list of do's and don'ts for septic system owners on page 5.

Why Many Systems Fail

Improper siting, construction, or design often contribute to septic system failures. But if your septic system has been properly designed, constructed, and installed, then you are the most likely remaining threat to the health and longevity of your septic system. Fortunately, it is easy to learn how to properly operate and maintain a septic system.

This issue of *Pipeline* focuses on educating homeowners about proper septic system operation and maintenance. Some of the topics include groundwater pollution, system inspections, and the use

Continued on page 2

Groundwater Pollution

IS YOUR SEPTIC SYSTEM FAILING?

Septic system owners should be alert to the following warning signs of a failing system:

- Slowly draining sinks and toilets
- Gurgling sounds in the plumbing
- Plumbing backups
- Sewage odors in the house or yard
- Ground wet or mushy underfoot
- Grass growing faster and greener in one particular area of the yard
- Tests showing the presence of bacteria in well water

None of these warning signs can be considered a sure indication that a system has failed, but the appearance of one or more of them should prompt homeowners to have their systems inspected. Septic system failures also can occur without any of these warning signals. For this reason, yearly inspection of your septic system is recommended and even required by some communities.

For more information about septic system inspections, see the article beginning on page 6.

Preventing groundwater pollution from failing septic systems should be a priority for every community. Contamination of the groundwater source can lead to the pollution of local wells, streams, lakes, and ponds—exposing family, friends, and neighbors to waterborne diseases and other serious health risks.

When a septic system fails, inadequately treated domestic waste can reach the groundwater. Bacteria and viruses from human waste can cause dysentery, hepatitis, and typhoid fever. Many serious outbreaks of these diseases have been caused by contaminated drinking water.

Nitrate and phosphate, also found in domestic wastewater, can cause excessive algae growth in lakes and streams called algae blooms. These blooms cause aesthetic problems and impair other aquatic life. Nitrate is also the cause of methemoglobinemia, or blue baby syndrome, a condition that prevents the normal uptake of oxygen in the blood of young babies.

In addition, hazardous household chemicals like paints, varnishes, waste oils, and pesticides pollute the groundwater and should never be disposed of through a septic system. They can also kill the microorganisms in the system that break down the waste.

See the list of do's and don'ts for septic system owners on page 5 for more about what should and should not be disposed of in a septic tank system.

FREE POSTER!

A new poster titled, "*Groundwater Protection Begins at Home,*" is available free from the National Drinking Water Clearinghouse (NDWC). The poster lists sources of hazardous waste in the home and includes guidelines for their safe disposal in an easy-to-read format. The importance of groundwater pollution prevention is also explained. The poster is a great reference source for every home with a septic system.

To order "*Groundwater Protection Begins at Home,*" call the NDWC at (800) 624-8301, and order Item #DWBLPE40. A shipping and handling charge will apply.



MAINTAINING YOUR SEPTIC SYSTEM—A GUIDE FOR HOMEOWNERS

Continued from page 1

of additives and cleaners. The issue also includes a handy reference list of important septic system do's and don'ts for homeowners.

You are encouraged to share, copy, or distribute any infomation in *Pipeline* with others in your community. The articles can be reprinted in local newspapers or included in flyers, newsletters, and educational presentations. We ask only that you send us a copy of the reprinted article for our files.

If you have any questions or require further information about any of the topics in this newsletter, please contact the National Small Flows Clearinghouse at (800) 624-8301.

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HOW TO MAINTAIN YOUR SEPTIC SYSTEM

Septic systems are a very simple way to treat household wastewater and are easy to operate and maintain. Although homeowners must take a more active role in maintaining septic systems, once they learn how their systems work, it is easy for them to appreciate the importance of a few sound operation and maintenance practices.

How Septic Systems Work

There are two main parts to the basic septic system: the septic tank and the drainfield.

The Septic Tank

Household wastewater first flows into the septic tank where it should stay for at least a day. In the tank, heavy solids in the wastewater settle to the bottom forming a layer of sludge, and grease and light solids float to the top forming a layer of scum (*refer to the graphic on this page*).

The sludge and scum remain in the tank where naturally occurring bacteria work to break them down. The bacteria cannot completely break down all of the sludge and scum, however, and this is why septic tanks need to be pumped periodically.

The separated wastewater in the middle layer of the tank is pushed out into the drainfield as more wastewater enters the septic tank from the house. If too much water is flushed into the septic tank in a short period of time, the wastewater flows out of the tank before it has had time to separate. This can happen on days when water use is unusually high (laundry day, for example), or more often if the septic tank is too small for the needs of the household.

The Drainfield

When wastewater leaves a septic tank too soon, solids can be carried with it to the drainfield. Drainfields provide additional treatment for the wastewater by allowing it to trickle from a series of perforated pipes, through a layer of gravel, and down through the soil. The soil acts as a natural filter and contains organisms that help treat the waste. Solids damage the drainfield by clogging the small holes in the drainfield pipes and the surrounding gravel, and excess water strains the system unnecessarily.

How To Care for Your System

Septic system maintenance is often compared to automobile maintenance because only a little effort on a regular basis can save a lot of money and significantly prolong the life of the system.

Sound septic system operation and maintenance practices include conserving water, being careful that nothing harmful is disposed of through the system, and having the system inspected annually and pumped regularly.

By educating everyone in your household about what is and what isn't good for septic systems, they can begin to develop good maintenance habits.

Use Water Wisely

Water conservation is very important for septic systems because continual saturation of the soil in the drainfield can affect the quality of the soil and its ability to naturally remove toxins, bacteria, viruses, and other pollutants from the wastewater.

The most effective way to conserve water around the house is to first take stock of how it is being wasted. Immediately repair any leaking faucets or running toilets, and use washing machines and dishwashers only when full.

In a typical household, most of the water used indoors is used in the bathroom, and there are a lot of little things that can be done to conserve water there.

For example, try to avoid letting water run while washing hands and brushing teeth. Avoid taking long showers and install water-saving features in faucets and shower heads. These devices can reduce water use by up to 50 percent. Low-flush toilets use one to two gallons per flush compared to the three to five gallons used by conventional toilets. Even using a toilet dam or putting a container filled with rocks in the toilet tank can reduce water use by 25 percent (*refer to the graphic on page 4*).

It is also important to avoid overtaxing your system by using a lot of water in a short time period, or by allowing too much outside water to reach the drainfield. Try to space out activities requiring heavy water use (like laundry) over several days. Also, divert roof drains, surface water, and sump pumps away from the drainfield.

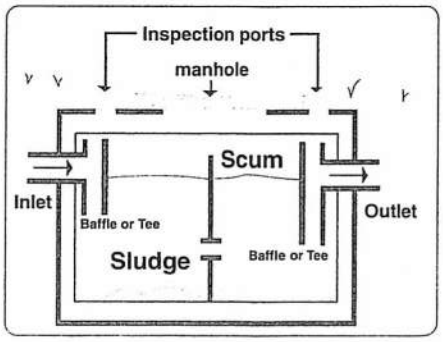
Know What Not To Flush

What you put into your septic system greatly affects its ability to do its job. As a general rule of thumb, do not dispose of anything in your septic system that can just as easily be put in the trash. Remember that your system is not designed to be a garbage disposal, and that solids build up in the septic tank and eventually need to be pumped out.

In the kitchen, avoid washing food scraps, coffee grinds, and other food items down the drain. Grease and cooking oils contribute to the layer of scum in the tank and also should not be put down the drain. Garbage disposals can increase the amount of solids in the tank up to 50 percent and are not recommended for use with septic systems.

The same common-sense approach used in the kitchen should be used in the bathroom. Don't use the toilet to dispose

Continued on page 4



Q&A

Do I need to add anything to my septic system to keep it working properly?

While many products on the market claim to help septic systems work better, the truth is there is no magic potion to cure an ailing system. In fact, most engineers and sanitation professionals believe that commercial septic system additives are, at best, useless, and at worst, potentially harmful to a system.

There are two types of septic system additives: biological (like bacteria, enzymes, and yeast) and chemical. Most biological additives are harmless, but some chemical additives can potentially harm the soil in the drainfield and contaminate the groundwater.

While there hasn't been extensive study on the effectiveness of these products, the general consensus among septic system experts is that septic system additives are unnecessary.

What type of toilet paper is best for septic tanks?

Contrary to popular belief, it is not necessary to sacrifice personal comfort to protect your septic tank. There are many types of toilet paper on the market that are perfectly safe for septic systems.

According to the National Sanitation Foundation (NSF), a nonprofit organization that tests products relating to health and the environment, the thickness and color of toilet tissue does not necessarily affect its biodegradability.

NSF subjects the toilet papers it certifies to rigorous testing, and the brands that pass carry the NSF mark stating that they are safe for use with septic systems. However, there probably are many brands without the NSF mark that are also safe.

HOW TO MAINTAIN YOUR SEPTIC SYSTEM

Continued from page 3

of plastics, paper towels, tampons, disposable diapers, condoms, kitty litter, etc. The only things that should be flushed down the toilet are wastewater and toilet paper. *(For a list of items, see "Do Not Flush" on page 5.)*

Avoid Hazardous Chemicals

To avoid disrupting or permanently damaging your septic system, do not use it to dispose of hazardous household chemicals. Even small amounts of paints, varnishes, thinners, waste oil, photographic solutions, pesticides, and other organic chemicals can destroy helpful bacteria and the biological digestion taking place within your system. These chemicals also pollute the groundwater.

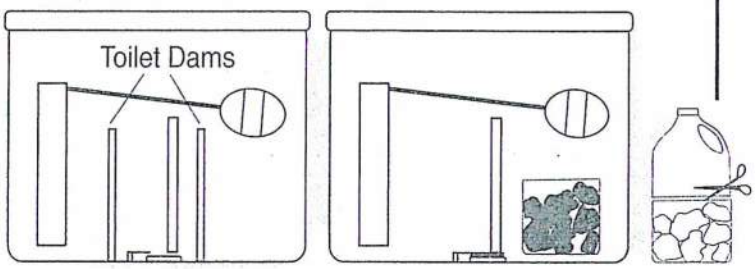
Some septic system additives that claim to help or clean your system also contain hazardous chemicals and should be avoided. (*See the Q&A on septic system additives at left.*)

Household cleaners, such as bleach, disinfectants, and drain and toilet bowl cleaners should be used in moderation and only in accordance with product labels. Overuse of these products can harm your system. It makes sense to try to keep all toxic and hazardous chemicals out of your septic tank system when possible. (*For more about the use of household cleaners, refer to the article on page 6.*)

To help prevent groundwater pollution, be sure to dispose of leftover hazardous chemicals by taking them to an approved hazardous waste collection center. For locations and more information, contact your local health department.

Pump Your Tank Regularly

Pumping your septic tank is probably the single most important thing you can do to protect your system. If the buildup of solids in the tank becomes too high and solids move to the drainfield, this could clog and strain the system to the point where a new drainfield will be needed.



A toilet dam (above left) or a rock filled milk container (above right) can reduce the amount of water flowing out of the toilet by up to 25 percent. *(Reproduced with permission from Massachusetts Cooperative Extension)*

Inspect Your System Annually

Inspecting your septic system annually is a good way to monitor your system's health. Inspections can reveal problems before they become serious, and by checking the levels of sludge and scum in your tank, you can get a more accurate idea of how often it should be pumped.

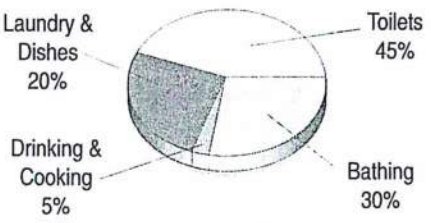
For a more detailed discussion of septic system inspections and recommended pumping frequencies and procedures, read the article "Pumping and Inspecting Your System—What To Expect" on page 6.

Protect Your System

Finally, it is important to protect your septic system from potential damage.

Don't plant anything but grass near your septic system—roots from shrubs and trees can cause damage—and don't allow anyone to drive or operate heavy machinery over any part of the system. Also, don't build anything over the drainfield. Grass is the most appropriate cover for the drainfield.

Water use around the home



SEPTIC SYSTEM DO's AND DON'Ts

DO's

Do learn the location of your septic tank and drainfield. Keep a sketch of it handy with your maintenance record for service visits.

Do have your septic system inspected annually.

Do have your septic tank pumped out regularly by a licensed contractor. (*See the table on page 6 for estimated pumping frequencies.*)

Do keep your septic tank cover accessible for inspections and pumpings. Install risers if necessary.

Do call a professional whenever you experience problems with your system, or if there are any signs of system failure.

Do keep a detailed record of repairs, pumpings, inspections, permits issued, and other maintenance activities.

Do conserve water to avoid overloading the system. Be sure to repair any leaky faucets or toilets.

Do divert other sources of water, like roof drains, house footing drains, and sump pumps, away from the septic system. Excessive water keeps the soil in the drainfield from naturally cleansing the wastewater.

WARNING

Be sure to exercise appropriate caution when inspecting a septic tank. Never allow anyone to inspect a septic tank alone or go down into a septic tank. Toxic gases are produced by the natural treatment processes in septic tanks and can kill in minutes—even just looking in the tank can be dangerous.

DON'Ts

Don't go down into a septic tank. Toxic gases are produced by the natural treatment processes in septic tanks and can kill in minutes. Extreme care should be taken when inspecting a septic tank, even when just looking in.

Don't allow anyone to drive or park over any part of the system.

Don't plant anything over or near the drainfield except grass. Roots from nearby trees or shrubs may clog and damage the drain lines.

Don't dig in your drainfield or build anything over it, and don't cover the drainfield with a hard surface such as concrete or asphalt. The area over the drainfield should have only a grass cover. The grass will not only prevent erosion, but will help remove excess water.

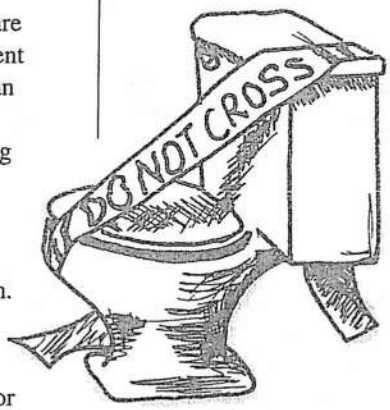
Don't make or allow repairs to your septic system without obtaining the required health department permit. Use professional licensed septic contractors when needed.

Don't use septic tank additives. These products usually do not help and some may even be harmful to your system.

Don't use your toilet as a trash can or poison your septic system and the groundwater by pouring harmful chemicals and cleansers down the drain. Harsh chemicals can kill the beneficial bacteria that treat your wastewater.

Don't use a garbage disposal without checking with your local regulatory agency to make sure that your septic system can accommodate this additional waste.

Don't allow backwash from home water softeners to enter the septic system.



Do not flush

coffee grinds
dental floss
disposable diapers
kitty litter
sanitary napkins
tampons
cigarette butts
condoms
fat, grease, or oil
paper towels





and hazardous chemicals, such as:

paints
varnishes
thinners
waste oils
photographic solutions
pesticides



These items can overtax or destroy the biological digestion taking place within your system.

Pumping and Inspecting Your System—What To Expect

Annual inspections of your septic system are recommended to ensure that it is working properly and to determine when the septic tank should be pumped. By inspecting and pumping your system regularly, you can prevent the high cost of septic system failure.

Inspecting Your System

Although a relatively simple inspection can determine whether or not your septic tank needs to be pumped, you should consider calling your local health department or hiring a professional contractor. A professional can do a thorough inspection of the entire system and check for cracked pipes and the condition of the tees or baffles and other parts of the system.

A thorough septic system inspection will include the following steps:

1. Locating the system—Even a professional may have trouble locating your system if the access to your tank is buried. One way to start looking is to go in your basement and determine the direction the sewer pipe goes out through the wall. Then start probing the soil with a thin metal rod 10 to 15 feet from the foundation. Once your system is found, be sure to keep a map of it on hand to save time on future service visits.

2. Uncovering the manhole and inspection ports—This may entail some digging in your yard. If they are buried, try to make access to the ports easier for future inspections. Install risers (elevated access covers) if necessary.

3. Flushing the toilets—This is done to determine if the plumbing going to the system is working correctly.

4. Measuring the Scum and Sludge Layers—There are two frequently used methods for measuring the sludge and scum layers inside your tank. The contractor may use a hollow clear plastic tube that is pushed through the different layers to the bottom of the tank. When brought back up, the tube retains a sample showing a cross section of the inside of the tank.

The layers can also be measured using a long stick. To measure the scum layer using a stick, a three-inch piece of wood is attached across the end of the stick to form a "foot," and the stick is pushed down through the scum to the liquid layer. When the stick is moved up, the foot meets resistance on the bottom of the scum layer, and the contractor marks the stick at the top of the layer to measure the total thickness. As a general guideline, if the scum layer is within three inches of the bottom of the inlet baffle, the tank should be pumped.

The sludge layer is measured by wrapping cloth around the bottom of the stick and lowering it to the bottom of the tank. This should be done either through a hole in the scum layer or through the baffle or tee, if possible, to avoid getting scum on the cloth. The sludge depth can be estimated by the length of sludge sticking to the cloth. If the sludge depth is equal to one third or more of the liquid depth, the tank should be pumped.

5. Checking the Tank and the Drainfield—The contractor will check the condition of the baffles or tees, the walls of the tank for cracks, and the drainfield for any signs of failure. If your system includes a distribution box, drop box, or pump, the contractor will check these too.

Tank size (gals.)	Household size (number of people)					
	1	2	3	4	5	6
500	5.8	2.6	1.5	1.0	0.7	0.4
750	9.1	4.2	2.6	1.8	1.3	1.0
900	11.0	5.2	3.3	2.3	1.7	1.3
1000	12.4	5.9	3.7	2.6	2.0	1.5
1250	15.6	7.5	4.8	3.4	2.6	2.0
1500	18.9	9.1	5.9	4.2	3.3	2.6
1750	22.1	10.7	6.9	5.0	3.9	3.1
2000	25.4	12.4	8.0	5.9	4.5	3.7
2250	28.6	14.0	9.1	6.7	5.2	4.2
2500	31.9	15.6	10.2	7.5	5.9	4.8

Estimated septic tank pumping frequencies in years. These figures assume there is no garbage disposal unit in use. *(Source: Pennsylvania State University Cooperative Extension Service)*

When To Pump

How often your tank needs to be pumped depends on the tank size, the number of people living in your home, and the habits of your particular house-

Continued on next page

How do household cleaners and detergents affect my system?

When used as recommended by the manufacturer, most household cleaning products will not adversely affect the operation of your septic tank. Drain cleaners are an exception, however, and only a small amount of these products can kill the bacteria and temporarily disrupt the operation of the tank.

If you are concerned about the effect of cleaning products on your septic system and the environment, there are some safe alternatives. Penn State University has developed a fact sheet listing alternative cleansers and their uses. The fact sheet is included in the septic system information packet for homeowners, described on page 8.

Inspections from the State Regulations

Septic system inspection regulations vary from one state to the next. Do you know what the laws are in your state?

A new report from the National Small Flows Clearinghouse (NSFC) provides this information in a single 128-page document, *"Inspections from the State Regulations."* It is a compilation of regulations for septic system inspections from the 23 states that have them on the books. This report includes a complete list of state regulatory contacts and references for all 50 states. The cost is $11.35. To order, call NSFC at (800) 624-8301 and request Item #WWPCRG40.

What some communities are doing

To protect public health and the environment, some communities are working to promote septic system maintenance through public education and the formation of septic system maintenance districts.

Septic system maintenance districts are areas in which local governments and health agencies monitor and regulate privately-owned septic systems on a regular basis. In a maintenance district, all residents must comply with the maintenance standards and must help pay for the cost of administration.

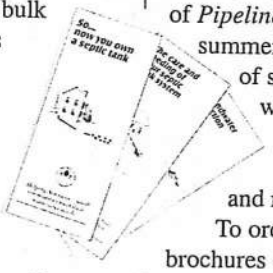
One of the advantages to this type of system is, because detailed records are kept on the condition of the individual systems, communities can identify problem areas and work with homeowners to develop solutions.

Another advantage is the opportunity to educate septic system owners individually about the proper operation and maintenance of their systems. Maintenance districts also make it easier to arrange inspections and pumpings at several houses in a neighborhood at one time, which can save money.

For more information about maintenance districts and other strategies for controlling septic system failures in your community, contact the National Small Flows Clearinghouse's technical assistance department at (800) 624-8301.

Septic system information available in bulk from NSFC

A series of educational materials that explain the operation and maintenance of septic systems are available in bulk from the National Small Flows Clearinghouse (NSFC). These materials are written for homeowners and would be useful for any community education program.



The NSFC's series of three septic system brochures has recently been revised, updated, and reprinted. The brochures include:

- So . . . now you own a septic tank,
- The care and feeding of your septic tank system, and
- Groundwater protection.

This issue and the summer 1995 issue of *Pipeline* are also available in bulk. The summer issue explains the advantages of septic tank systems, how they work, the importance of site evaluations, alternative septic system and drainfield designs, and resources for more information.

To order bulk copies of any of the brochures or either issue of *Pipeline*, please call the NSFC at (800) 624-8301. Up to 10 copies of each item are free except for shipping and handling charges. Orders of 11 or more will be charged a fee to cover printing and shipping.

Pumping and Inspecting Your System—What To Expect

Continued from previous page

hold. Garbage disposals and high-water-use technologies, such as a hot tub or whirlpool, also affect the pumping frequency.

To estimate how often you should have your tank pumped, refer to the table on page 6. This information combined with observations from annual inspections will help you to estimate your individual pumping schedule.

When it's time to pump out your tank, be sure to hire a licensed contractor. He or she will have the appropriate equipment and will dispose of the sludge at an approved treatment site. You can find listings for licensed pumpers and haulers in the yellow pages, or contact your local health department for assistance.

It's a good idea to be present when your tank is being pumped. Make sure the contractor uses the manhole, not the inspection ports, to pump the tank to avoid damaging the baffles or tees. Also make sure all of the material in the tank is removed. It is not necessary to leave anything in the tank to "restart" the biological processes, but it is also not necessary to scrub or disinfect the tank.



CONTACTS

Health Department

Homeowners with questions about regulations or requirements for septic system construction or maintenance should contact their local health department (usually listed in the yellow pages).

National Small Flows Clearinghouse (NSFC)

The National Small Flows Clearinghouse (NSFC) located at West Virginia University, is also a good place for homeowners and community officials to contact for more information about septic systems and alternative systems. The NSFC is funded by the U.S. Environmental Protection Agency and offers technical assistance and a variety of free and low-cost products to help small communities with wastewater issues. Some of these NSFC products are listed on page 8.

Extension Service

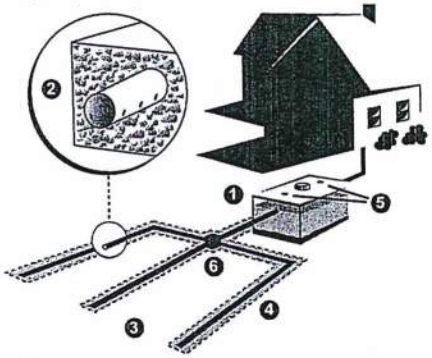
Many universities have U.S. Department of Agriculture cooperative state extension service offices on campus and field offices in counties and other localities. Part of the mission of these extension services is to provide access to information and assistance to the public, and to help educate the public about federal wastewater policies and requirements. To locate the extension office in your area, contact the U.S. Department of Agriculture at (202) 720-3377, or NSFC at (800) 624-8301, and ask for Crystal Stevens, the contacts and referrals assistant in the technical assistance department.

So . . . now you own a septic system

More than 25 million homes, encompassing almost 25 percent of the U.S. population, dispose of domestic wastewater through onsite (unsewered) systems. According to the American Housing Survey for the United States, in 1993 1.5 (million) out of every 4 (million) new owner-occupied home starts relied upon a form of onsite sewage disposal.

One of the major differences between owning an unsewered versus a sewered home is that unsewered wastewater treatment and disposal systems must be maintained by the homeowner. Treatment and disposal of wastewater should be one of the primary concerns of any homeowner in an unsewered area.

The most common way to treat and dispose of wastewater in rural homes is through the use of an onsite disposal system. The majority of onsite disposal systems in the United States are septic systems.



1. septic tank
2. 4" perforated pipe
3. absorption field
4. crushed rock or gravel lined trench
5. inspection ports
6. distribution box

Typical Septic System Fig. 1

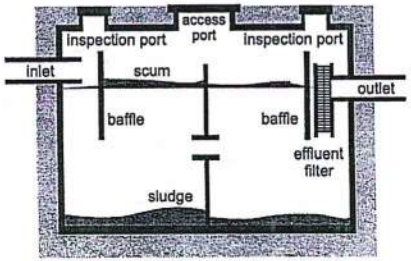
HOW IT WORKS

A typical septic system contains two major components: a septic tank and the absorption field (see Figure 1). Often, a distribution box is included as part of the system to separate the septic tank effluent evenly into a network of distribution lines that make up the absorption field. The septic tank is usually made of concrete, fiberglass, or plastic, is typically buried and should be watertight. All septic tanks have baffles (or tees) at the inlet and outlet to insure proper flow patterns (see Figure 2). Most septic tanks are single compartment; however, a number of states require two-compartment tanks or two single compartment tanks in series.

While typically designed to hold a minimum of 750–1000 gallons of sewage, the size of the tank may vary depending upon the number of bedrooms in the home and state and local regulatory requirements. The primary purpose of the septic tank is to separate the solids from the liquids and to promote partial breakdown of contaminants by microorganisms naturally present in the wastewater. The solids, known as sludge, collect on the bottom of the tank, while the scum floats on the top of the liquid. The sludge and scum remain in the tank and should be pumped out periodically (see Figure 2).

Solids that are allowed to pass from the septic tank may clog the absorption field. Keeping solids out of the absorption field not only prevents clogging, but also reduces potentially expensive repair or replacement costs and helps ensure the ability of the soil to effectively treat the septic tank effluent. Therefore, an additional safeguard in keeping solids out of the absorption field is the use of effluent filters on the outlet of the septic tank (see Figure 2).

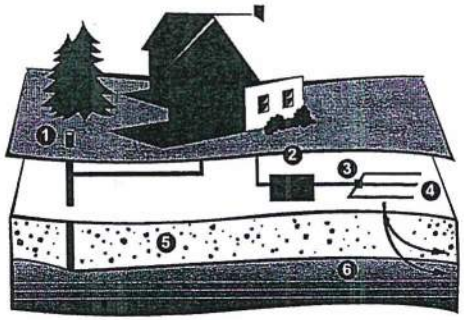
The wastewater (effluent) coming out of the septic tank may contain many potentially disease-causing microorganisms and pollutants (i.e., nitrates, phosphates, chlorides). The effluent is passed on to the absorption field through a connecting pipe or distribution box. The absorption field is also known as the soil drainfield, the disposal field, or the leachfield. The absorption field contains a series of underground perforated pipes, as indicated in Figure 1, that are



Cross-section of a two-compartment septic tank Fig. 2

sometimes connected in a closed loop system, as illustrated on the front cover, or some other proprietary distribution system

The effluent is distributed through the perforated pipes, exits through the holes in the pipes, and trickles through the rock or gravel where it is stored until absorbed by the soil. The absorption field, which is located in the unsaturated zone of the soil, treats the wastewater through physical, chemical, and biological processes. The soil also acts as a natural buffer to filter out many of the harmful bacteria, viruses, and excessive nutrients, effectively treating the wastewater as it passes through the unsaturated zone before it reaches the groundwater (see Figure 3).



1. drinking water well
2. septic tank
3. distribution box
4. absorption field
5. soil absorption (unsaturated zone)
6. groundwater (saturated zone)

Wastewater treatment and disposal in soil Fig. 3

Wastewater contains nutrients, such as nitrates and phosphates, that in excessive amounts may pollute nearby waterways and groundwater supplies. Excessive nutrients in drinking water supplies can be harmful to human health and can degrade lakes and streams by enhancing weed growth and algal blooms. However, the soil can retain many of these nutrients, which are eventually taken up by nearby vegetation.

What to Put In, What to Keep Out

- Direct all wastewater from your home into the septic tank. This includes all sink, bath, shower, toilet, washing machine and dishwasher wastewaters. Any of these waters can contain disease-causing microorganisms or environmental pollutants.
- Keep roof drains, basement sump pump drains, and other rainwater or surface water drainage systems away from the absorption field. Flooding of the absorption field with excessive water will keep the soil from naturally cleansing the wastewater, which can lead to groundwater and/or nearby surface water pollution.
- Conserve water to avoid overloading the septic system. Be sure to repair any leaky faucets or toilets. Use low-flow fixtures.
- Do not use caustic drain openers for a clogged drain. Instead, use boiling water or a drain snake to open clogs.
- Do not use septic tank additives, commercial septic tank cleansers, yeast, sugar, etc. These products are not necessary and some may be harmful to your system.
- Use commercial bathroom cleaners and laundry detergents in moderation. Many people prefer to clean their toilets, sinks, showers, and tubs with a mild detergent or baking soda.

continued . . .

- Check with your local regulatory agency if you have a garbage disposal unit to make sure that your septic system can accommodate this additional waste.
- Check with your local regulatory agency before allowing water softener backwash to enter your septic tank.
- Your septic system is not a trash can. Do not put grease, disposable diapers, sanitary napkins, tampons, condoms, paper towels, plastics, cat litter, latex paint, pesticides, or other hazardous chemicals into your system.
- Keep records of repairs, pumpings, inspections, permits issued, and other system maintenance activities.
- Learn the location of your septic system. Keep a sketch of it handy with your maintenance record for service visits.
- Have your septic system inspected every 1–2 years and pumped periodically (usually every 3–5 years) by a licensed inspector/ contractor.
- Plant only grass over and near your septic system. Roots from nearby trees or shrubs may clog and damage the absorption field.
- Do not drive or park over any part of your septic system. This can compact the soil and crush your system.

In summary, understanding how your septic system works and adhering to these few simple rules will ensure that your septic system is a safe and economical method for treating and disposing of your wastewater onsite.



For more information regarding the care of your septic system, contact your local health department.

More information about septic systems is available from the National Small Flows Clearinghouse (NSFC) through other brochures in this series:

Groundwater protection and your septic system,
Item #**WWBRPE21**

The care and feeding of your septic system,
Item #**WWBRPE18**

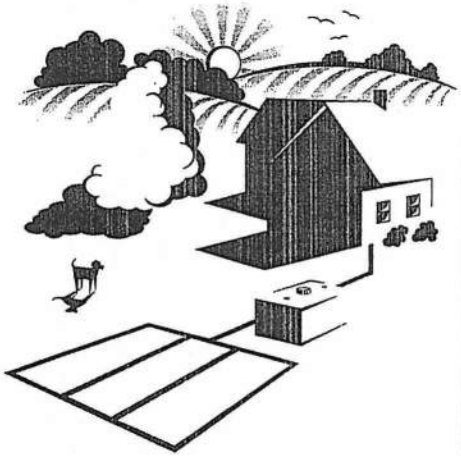
For more information about this or other NSFC products, please contact us by writing to:
National Small Flows Clearinghouse
West Virginia University
P.O. Box 6064
Morgantown, WV 26506-6064
or phone:
(800) 624-8301, (304) 293-4191
or fax: (304) 293-3161

www.nsfc.wvu.edu

Helping America's small communities meet their wastewater needs

So . . . now you own a septic system

One in a series of three brochures designed to aid you in caring for your septic system.



Helping America's small communities meet their wastewater needs

The care and feeding of your septic system

Septic systems are very much like automobiles. They need periodic inspections and proper maintenance to continue working properly. Also, like automobiles, they must be operated properly and cannot be overtaxed without the owner suffering consequences such as repair or replacement bills.

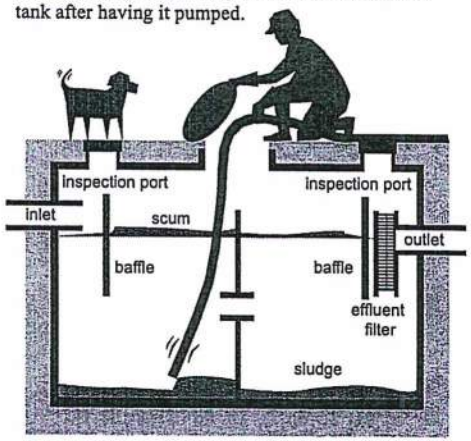
Often overlooked or neglected is the fact that a septic system should have a regular check-up to prevent problems. You should have your septic system inspected every 1-2 years by a professional and your tank pumped when necessary. The septic tank traps the solids in the wastewater and should be checked to determine whether or not it is time for it to be pumped out. The inspection port should be opened and the baffles (internal slabs or tees) should be checked to ensure that they are in good condition since the last check-up (see Figure 1). If you have a septic tank effluent filter, it should also be inspected. Effluent filters require periodic cleaning. Some filters are now equipped with alarm systems to alert the homeowner when the filter has become dirty and needs to be cleaned. Failure to keep the filter clean may result in a backup of wastewater in the home from a clogged filter. Septic systems that have mechanical parts such as a pump should be inspected at least once a year or more frequently as recommended by the manufacturer. The absorption field should be checked for sogginess or ponding, which indicates improper drainage, a clogged system, or excessive water use. The presence of damp or soggy areas or odors may indicate a leak in the system.

SEPTIC TANK

A properly designed septic system will have a septic tank with sufficient volume to accumulate solids for several years. As the level of solids rises in the tank, the wastewater has less time to settle properly and suspended solid particles flow into the absorption field. If the tank is not periodically pumped out, these solids will eventually clog the absorption field to the point where a new field will be needed.

When the tank is pumped, the contractor should pump the contents through the manhole, which is usually located in the center of the tank, rather than through the inspection ports. Pumping through one of the inspection ports could damage the baffles inside the tank (see Figure 1). Damage to the baffles could result in the wastewater flowing directly into the absorption field without the opportunity for the solids to settle.

Remember, commercial septic tank additives do not eliminate the need for periodic pumping and may be harmful to the absorption field. You should check your local health department regulations before using additives. Be sure when the septic tank is pumped that it is completely emptied. It is not necessary to retain any of the solids to restart the digestive process. You do not need biological or chemical additives for successful restart or continuous operation of your septic system, nor should you wash or disinfect the tank after having it pumped.



Cross-section of a two-compartment septic tank being pumped **Fig. 1**

When to Have Your Septic Tank Pumped

A specific determination of when it's time to pump out the solids can be made by having the depth of solids and level of scum buildup on top of the wastewater in the septic tank checked periodically. Two factors affect how often you should have your septic tank pumped. Whether you need to have your tank pumped every year, once every five years, or some other time interval is affected by these factors. The first factor is the size or capacity of the tank itself. If more people are living in the home than when the system was installed, or if new high water use appliances or technologies such as a hot tub or whirlpool bath are now in use, then the capacity may be too small. The more people using a system, the faster the solids will accumulate in the tank, and the more frequently the tank will need to be pumped. Also, the additional surge of water from hot tubs and whirlpool baths may wash solids out of the tank and into the absorption field. An inspection can determine whether the system is of adequate capacity to handle the volume of solids and flow from the number of people in the household and types of appliances used. A larger capacity system provides better treatment and requires less pumping.

The second factor is the volume of solids in the wastewater. If you have a garbage disposal, for example, you will have to pump out your system more frequently than persons disposing of their food wastes through other means. The use of a garbage disposal may increase the amount of solids in the septic tank by as much as 50 percent. Excessively soiled clothes may add solids to your septic tank. Sometimes, geographical location may also contribute to extra solids ending up in the septic tank. For example, systems in coastal areas may have an accumulation of sand in the septic tank from washing beach clothes.

Reducing the Flow of Wastewater

Generally, the more people, the more water will flow through the system. However, the use of water conservation devices such as low-flow toilets or shower fixtures greatly reduces the amount of wastewater thus prolonging the life of your septic system. For example, up to 53 gallons of water are discharged into your system with each load of laundry. If several loads are done in one day, it can put considerable stress on your system. A better practice would be to space your laundry washing throughout the week.

The new ultra low-flush toilets use between 1 and 1.6 gallons of water per flush and will provide as much as a 30 percent water savings. Low-flow faucet aerators on sink faucets and low-flow showerheads will save additional water. There are also low-flow washing machines which use much less water than standard washing machines.

ABSORPTION FIELD

An absorption field generally does not require any maintenance. However, to protect and prolong the life of the absorption field, follow these simple rules:

- Plant only grass over and near your septic system. Roots from nearby trees or shrubs may clog and damage the absorption field.
- Do not drive or park over any part of your septic system. This can compact the soil and crush your system.
- Direct all wastewater from your home into the septic tank. This includes all sink, bath, shower, toilet, washing machine and dishwasher wastewaters. Any of these wastewaters can contain disease-causing microorganisms or environmental pollutants.
- Keep roof drains, basement sump pump drains, and other rainwater or surface water drainage systems away from the absorption field. Flooding of the absorption field with excessive water will keep the soil from naturally cleansing the wastewater, which can lead to groundwater and/or nearby surface water pollution.

continued . . .

Septic System Health Tips

What you put into your septic system will have a direct effect on whether or not you have a healthy, long-lasting and trouble-free system. Your septic system is not a dispose-all.

- Conserve water to avoid overloading the septic system. Be sure to repair any leaky faucets or toilets. Use low-flow fixtures.
- Do not use caustic drain openers for a clogged drain. Instead, use boiling water or a drain snake to open clogs.
- Do not use septic tank additives, commercial septic tank cleansers, yeast, sugar, etc. These products are not necessary and some may be harmful to your system.
- Use commercial bathroom cleaners and laundry detergents in moderation. Many people prefer to clean their toilets, sinks, showers, and tubs with a mild detergent or baking soda.
- Check with your local regulatory agency if you have a garbage disposal to make sure that your septic system can accommodate this additional waste.
- Check with your local regulatory agency before allowing water softener backwash to enter your septic tank.
- Your septic system is not a trash can. Do not put disposable diapers, sanitary napkins, tampons, condoms, paper towels, facial tissues, plastics, cat litter, or cigarettes into your septic system. These items quickly fill your septic tank with solids, decrease the efficiency, and will require that you pump out the septic tank more frequently. They may also clog the sewer line to the septic system causing wastewater to back up into your home.
- Avoid dumping grease or fats down your kitchen drain. They solidify and the accumulation may contribute to blockages in your system.
- Keep latex paint, varnishes, thinners, waste oil, photographic solutions, pesticides, or other hazardous chemicals out of your system. Even in small amounts, these items can destroy the biological digestion taking place within your septic system.

Septic systems are a very simple way to treat household wastewater and are easy to operate and maintain. Although homeowners must take a more active role in maintaining septic systems, once they learn how their systems work, it is easy for them to appreciate the importance of a few sound operation and maintenance practices.



For more information regarding the care of your septic system, contact your local health department.

More information about septic systems is available from the National Small Flows Clearinghouse (NSFC) through other brochures in this series:

Groundwater protection and your septic system,
Item #**WWBRPE21**

So . . . now you own a septic system,
Item #**WWBRPE20**

For more information about this or other NSFC products, please contact us by writing to:
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or phone:
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or fax (304) 293-3161

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Helping America's small communities meet their wastewater needs

The care and feeding of your septic system

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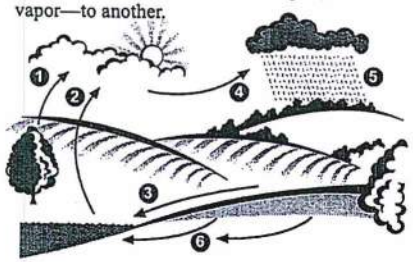


Helping America's small communities meet their wastewater needs

Groundwater protection and your septic system

WHAT IS GROUNDWATER?

Water in the saturated zone beneath the soil surface is commonly referred to as *groundwater*. Groundwater is but one stage, or form, through which water passes in the earth's *hydrologic cycle* (see Figure 1). The hydrologic cycle is the continual movement of water over, in, and through the earth and its atmosphere as it changes from one form—solid, liquid, or vapor—to another.



1. evapotranspiration
2. evaporation
3. runoff
4. water-vapor transport
5. precipitation
6. groundwater flow

Hydrologic cycle Fig. 1

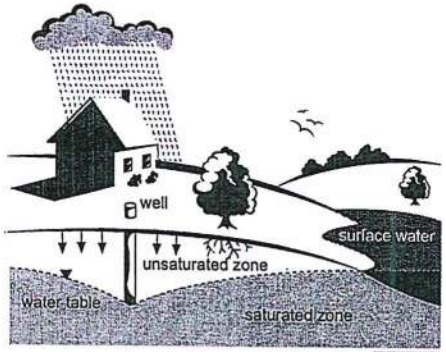
The water you use today may have evaporated from an ocean, traveled through the atmosphere, fallen back to the earth's surface, gone underground, and flowed through streams leading back to the oceans. Water is readily visible in many forms, including clouds, rain, snow, fog, lakes, streams, oceans, and polar ice caps. However, groundwater located beneath the soil surface is a vital resource for the success and survival of the entire ecosystem.

Groundwater has been tapped for thousands of years, but only recently have we started to understand its importance and how to manage this precious resource. Much remains to be discovered about groundwater, and wider public awareness of its nature and properties is an important first step.

Recharge

The process by which water—from rainfall, snowmelt, and other sources—flows into a water-bearing geologic formation (aquifer) is known as *recharge*. Water first passes through the *unsaturated zone*, where soil pores are filled partly with air and partly with water. The water then flows downward through the unsaturated zone into the *saturated zone*, where the soil pores are completely filled with water.

The boundary between these two zones is called the *water table* (see Figure 2). The water table rises when water enters the saturated zone and falls when water is discharged from the saturated zone either naturally (e.g., springs, lakes, or rivers) or by pumping (e.g., wells).



Water table Fig. 2

The unsaturated zone is important to the groundwater underlying it. As incoming water seeps down through the unsaturated zone, impurities are removed, helping to cleanse the water. Both the quantity and quality of groundwater is affected by the condition of the unsaturated zone in a recharge area.

SEPTIC SYSTEMS

A properly designed, installed, and maintained septic system poses no threat to groundwater. However, inadequately functioning and/or failing septic systems can contribute to the contamination of groundwater. Wastewater from septic systems may include many types of contaminants, such as nitrates, harmful bacteria, and viruses.

Trace amounts of metals may be contributed to the system from persons using some medications. Also, commonly used chemical substances, such as pesticides, paints, varnishes, and thinners, can contaminate the groundwater if they are not disposed of properly. Some chemicals, even in small amounts, can be dangerous to both the environment and public health.

Through physical, chemical, and biological processes, the soil acts as a natural buffer to remove bacteria and viruses in the unsaturated zone. However, various geologic conditions, such as fractured bedrock and shallow groundwater tables, may allow these bacteria and viruses to be transported very rapidly and could contaminate nearby drinking water supplies.

Therefore, it is critical that your drinking water well is properly sited, has a sealed casing, and the required distances from nearby septic systems are maintained. This will help prevent contaminants from seeping into and mixing with your drinking water (see Figure 3).

Separation Distances

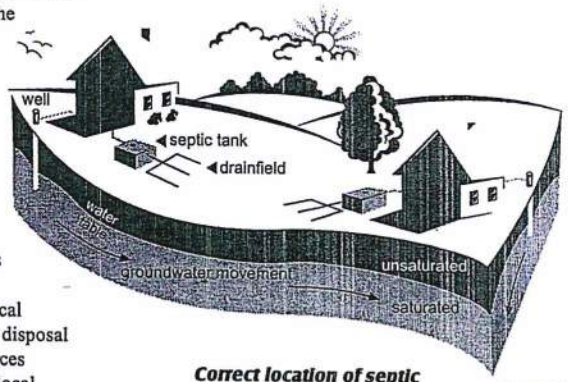
A septic system must be located a certain distance away from drinking water wells, streams, lakes, and houses. These distances are referred to as *horizontal separation distances*. Figure 4 (see back) shows a typical layout of a conventional onsite wastewater disposal system. Actual horizontal separation distances have been established and are specified in local regulations.

In order to maintain aerobic digestion processes and remove contaminants effectively, the absorption field must be adequately separated from the groundwater or other limiting layer. This is known as the *vertical separation distance* and is also specified by local regulations.

Determining System Size and Water Usage

Water use in rural households can be predicted from the house plan, depending on the number of bedrooms, water-using appliances, and potential additions. Although the actual number of residents determines water use in a house, the house plan determines the potential number of residents (e.g., number of bedrooms), water usage, and subsequent wastewater flow.

Typical wastewater flow rates range from 60–120 gallons per person per day. Typical minimum septic tank sizes range from 750–1000 gallons. The flow estimate, plus the soil permeability estimate (i.e., how easily water moves through the soil), is used to determine the area of the absorption field needed for the system. Installing a drainfield of sufficient size is critical to the proper functioning of your septic system. Local regulations should always be reviewed before installing a septic system.



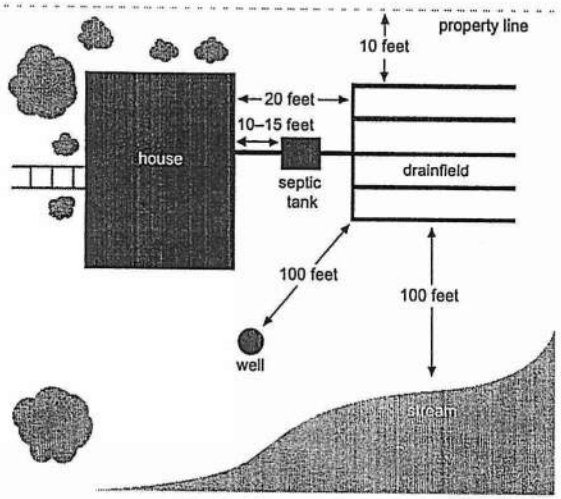
Correct location of septic systems and drinking water wells Fig. 3

Are Contaminants Reaching the Water?

Signs that wastewater from your septic system could be reaching water sources include:

- **Unpleasant odors (e.g., persistent rotten egg smell), soggy soil, liquid waste flow, or excessive grass growth over the soil absorption area.** These symptoms often indicate failure of the system and the need for repairing, expanding, or replacing the absorption area.

continued . . .



Typical layout of a septic system **Fig. 4**

- **Excessive weed or algae growth in the water near shorelines.** Nutrients leaking from septic systems could be a cause of this type of growth.
- **Health department test results of well water indicate the presence of contamination.** These tests may show the presence of indicator bacteria (e.g., total coliform, fecal coliform) in the water. Nitrate testing is not commonly performed and may need to be requested. Although wastes from septic systems are not the only source of these contaminants, they can be likely suspects.
- **Indicator dye put into your septic system reaches nearby ditches, streams, lakes, or drinking water supplies.** Special dyes are available from your local health department that may help find problems that otherwise are difficult to detect. This method can also help verify the other symptoms listed above.

How to Prevent Problems

- Before installation is complete, have the septic tank tested for watertightness.
- Maintain your septic system by having it inspected and pumped regularly.
- Conserve water in your home by using low-flow fixtures and by implementing water conservation practices to avoid hydraulic overload of your septic system.
- Redirect surface water flow away from your soil absorption field.
- Do not drive vehicles or heavy equipment over the absorption field. This will compact the soil and reduce its ability to absorb water.
- Plant a greenbelt (grassy strip or small, short-rooted vegetation) between your soil absorption field and the shoreline of any nearby surface water body.
- Keep chemicals and other hazardous wastes out of the septic system.
- If you have a drinking water well, have it tested yearly for contaminants. If you suspect a contamination problem, have it tested more often.



For more information regarding the care of your septic system, contact your local health department.

More information about septic systems is available from the National Small Flows Clearinghouse (NSFC) through other brochures in this series:

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Item #WWBRPE20

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Item #WWBRPE18

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Pipeline

Summer 1997
Vol. 8, No. 3

NATIONAL SMALL FLOWS CLEARINGHOUSE

Small Community Wastewater Issues Explained to the Public

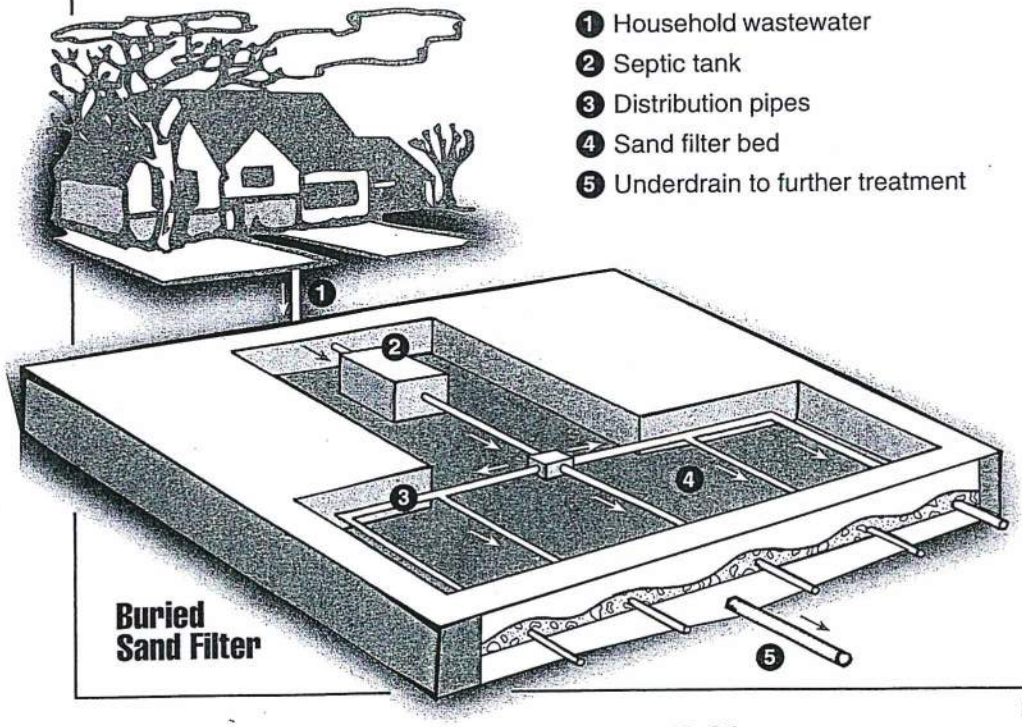
Sand Filters Provide Quality, Low-Maintenance Treatment

Thanks to a technology that was developed more than 100 years ago, countless homes, schools, businesses, and small communities in rural areas have an alternative to centralized wastewater treatment.

Sand filters treat wastewater using naturally occurring physical, biological, and chemical processes. They are one of the best options for additional onsite treatment where septic tank/soil absorption systems have failed or are restricted due to high groundwater, shallow bedrock, poor soils, or other site conditions. They also can be a good choice for homes, businesses, institutions, and small residential developments and communities in areas where centralized treatment is unavailable or too expensive.

Sand filters usually are used as the second step in wastewater treatment after solids in raw wastewater have been separated out in a septic tank, aerobic unit, or other sedimentation tank. Wastewater treated by sand filtration is usually colorless and odorless and, depending on local environmental conditions and regulations, sometimes can be disinfected and discharged directly to surface water. When discharged to soil, sand filter effluent can receive further treatment in a soil absorption field, even at some sites where conventional septic tank/soil absorption systems cannot be used.

Over the years, sand filters have proven to be a reliable technology when they are properly designed, constructed, and maintained. Their performance is consistent and they have low operation and maintenance requirements. In addition, overall treatment costs often compare favorably with other alternative systems.



Buried Sand Filter

Why Consider Sand Filters?

Small Community Officials:

- Sand filters cost less to construct than centralized treatment systems.
- They are energy-efficient.
- They have low maintenance requirements and often can be operated by part-time staff or volunteers.
- They can provide higher quality treatment than other systems.

Homeowners:

- Sand filters may enable development or use of difficult sites.
- They can remedy an existing malfunctioning system.
- They can be a good option for homes in environmentally sensitive areas.

This issue of *Pipeline* provides an overview of three types of sand filters, their design, how they work, and their advantages and disadvantages for homes and small communities. Operation and maintenance issues also are discussed.

Readers are encouraged to reprint *Pipeline* articles in local newspapers or include them in flyers, newsletters, or educational presentations. Please include the name and phone number of the National Small Flows Clearinghouse (NSFC) on the reprinted information and send us a copy for our files.

If you have any questions about reprinting articles or about any of the topics discussed in this newsletter, please contact the NSFC at (800) 624-8301 or (304) 293-4191.

How Do Sand Filters Work?

More goes on inside a sand filter than meets the eye. On one hand, sand filters are simple in design and easy to operate and maintain. What is surprising about them are the complex processes that take place in them naturally, which, together, result in wastewater treatment.

What Are Sand Filters?

Sand filters are constructed beds of sand or other suitable granular material usually two to three feet deep. The filter materials (called media) are sometimes contained in a liner made of concrete, plastic, or other impermeable material. Depending on the design, the filter may be situated above ground, partially above ground, or below ground, and the filter surface may be open or covered.

Partially treated wastewater is applied to the filter surface in intermittent doses and receives treatment as it slowly trickles through the media. In most sand filters, the wastewater then collects in an underdrain and flows to further treatment and/or disposal.

Sand filter units are constructed or assembled onsite by a licensed contractor—preferably one who has specific sand filter experience. Most materials are available locally, sometimes with the exception of filter media. If the appropriate media cannot be obtained nearby, it must be shipped in, which can greatly increase the filter's cost.

Suitable filter media can be purchased from aggregate companies or other suppliers. The media must be as clean and uniform in size as possible to allow the wastewater to flow correctly through it. If not, smaller grains will settle in the spaces between the larger grains, leaving no place for the wastewater to flow. (*A typical flow pattern is shown in the graphic on this page.*)

There are different sand filter types and designs. Some are better suited for small communities, clusters of homes, large businesses, or institutions, while others are more appropriate for individual homes and small businesses. (*A few common sand filter types are described in this issue beginning with the articles on page 3.*)

Sand Filter Basics

There are a few basic operating and design principles common to every type of sand filter system.

First, to prevent the filter from clogging, the wastewater must be pretreated to remove solids and scum. Pretreatment usually takes place in a septic tank, Imhoff tank, or aerobic unit. Screens or filters are sometimes used in the pretreatment tank as an additional step to ensure that no solids carry over to the filter in times of heavy water use.

After the solids have been removed, a pump equipped with an adjustable timing mechanism or a siphon doses the wastewater to the filter in timed intervals or when the tank becomes full. Applications are spaced intermittently to allow the filter media to drain between doses. This ensures that oxygen is introduced in the filter with every dose of wastewater. Oxygen is critical to the biological and chemical treatment processes that take place inside the filter.

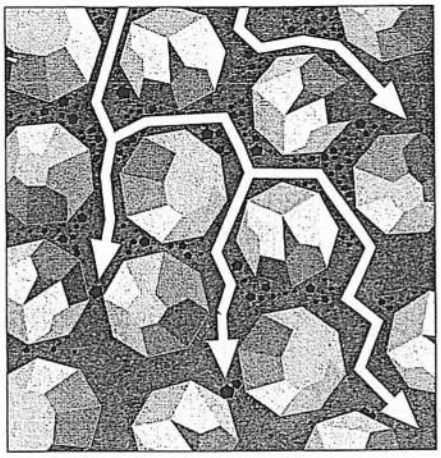
It also is important that the wastewater be applied evenly across the filter surface. This is accomplished either by flooding the surface completely with a thin layer of wastewater, or spraying or applying the wastewater evenly through a network of distribution pipes.

How Treatment Occurs

As the wastewater percolates slowly through the filter media, natural physical, biological, and chemical processes combine to provide treatment. Most treatment occurs in the first 6 to 12 inches of the filter surface.

Some of the organic matter breaks down in the filter. Particles stick to grain surfaces or get caught in crevices or voids on grains or in spaces between grains. In addition, negatively charged grain surfaces can attract positively charged waste particles and bond with them through a process called adsorption. Chemical bonding also takes place as certain particles in the wastewater come in contact with and react with the media.

Probably the most interesting thing about sand filters is that they accomplish much of the treatment through biological processes. Like the soil in every backyard, sand filters are home to a variety of organisms, many of which contribute to treatment by consuming organic matter in the wastewater. Bacteria are the most abundant organisms in the filters, and they do most of the work. There are other beneficial life forms found in the filters, such as protozoa and worms, which also contribute to treatment.



Typical Flow Pattern Through Filter Media

After the filter has had a chance to mature—usually after a period of approximately two weeks—a miniature ecological system develops as the organisms multiply and rely on each other to survive.

The most significant part of the filter ecosystem is a thick layer called the biomat, which eventually forms near the surface of the filter. This layer contains bacteria which consume particles in the wastewater. In turn, protozoa feed on the bacteria and help prevent the biomat from becoming so dense that it clogs the filter. This balance between the various life forms and the physical and chemical processes that take place in the sand filter results in extremely efficient wastewater treatment requiring minimal operation and maintenance.

Eventually, the biomat in some filters does become clogged, and the top layer of sand needs to be raked or removed as part of regular filter maintenance.

Common Sand Filter Designs

Sand filters are a versatile technology and there are many possible sand filter system designs. Intermittent sand filters receive and treat wastewater in doses. Three of the most common types of sand filters—buried, open, and recirculating—are intermittent designs. (*See page 5 for a discussion of recirculating sand filters.*)

Buried Sand Filters

The most common sand filters used for homes, small businesses, and other small flows require little maintenance and work completely underground.

Buried sand filters are constructed onsite and usually require an excavation of four to five feet. Before construction, a thorough site evaluation is needed to ensure the filter bed will be level. The filter also must be sited to avoid contact with groundwater and excess surface water runoff. (*Refer to the graphic on page 1 for an example of a buried sand filter.*)

Depending on local regulations and site conditions, the entire buried filter unit may be contained in an impermeable membrane liner. Underdrain pipes and a graded layer of washed gravel or crushed rock are placed at the bottom of the filter bed—with the finer gravel on top of the coarser gravel to keep the media grains from washing into the underdrains.

The filter media is then placed on top of the layer of fine gravel. As with all sand filters, the depth of the media depends on the size of the grains and other factors, but normally ranges from 24 to 36 inches.

Another graded layer of gravel is placed on top of the media bed and surrounds a network of distribution pipes. However, the order is reversed this time and the finer gravel is placed under the coarser gravel closest to the media bed. A geotextile fabric is placed on top of the entire filter bed and then is covered with backfill material.

Most buried sand filters are dosed twice a day or as often as is naturally dictated by

Continued on page 4

Many Factors Affect Sand Filter Performance

Pretreatment

Pretreatment is very important to sand filter performance. Solids in the wastewater must be removed by some method of pretreatment or primary treatment or else they will clog the filter. Septic tanks, aerobic units, screens, and other pretreatment methods should operate properly and receive regular maintenance.

Septic tanks are the most common and usually the least expensive pretreatment method for sand filters.

Media

The composition, size, uniformity, and depth of the media all affect sand filter performance.

In some areas where sand is not available locally, other materials, such as crushed glass, anthracite, garnet, mineral tailings, or bottom ash, have been used for filter media. Characteristics of the media's composition, such as its solubility, acidity, and hardness, must be considered in the filter design. It also is extremely important that the media be washed. It should be inspected for cleanliness by an engineer or other qualified individual before it is used in the filter.

The size and uniformity of the grains also affect performance, filter depth, and the amount of wastewater that can be treated at one time.

The media grains are sorted and measured through a series of mechanical sieves. The grains should be relatively uniform in size to prevent clogging. "Effective size" and "uniformity coefficient" are measurements used to express these characteristics. Effective sizes for sand filter media range from 0.3 mm to 3 mm in diameter. Each sand filter type has its own media size range requirements. (*Refer to the table on page 4 for more information.*) A uniformity coefficient of four or less is recommended for all filter media.

In addition, the media should be neither too coarse nor too fine. Coarse media may allow wastewater to pass too quickly through the filter without receiving adequate treatment, while very fine media can slow down treatment too much, is prone to clogging, and can keep oxygen from reaching certain parts of the filter.

Filter depth depends on the type of filter and media size, but normally ranges from 24 to 36 inches. Most treatment occurs in the first 6 to 12 inches, but a few additional inches improves overall performance, pathogen removal, and allows for maintenance.

Organic Loading Rate

Organic loading rate depends on the strength of the wastewater. Depending on its source, wastewater may contain more or less organic material requiring treatment. Strong wastewater containing high levels of organic material can reduce the filter's performance over time and increase the need for maintenance.

Hydraulic Loading Rate

Hydraulic loading rate is the amount of wastewater applied to the filter in one day. Sand filters are less effective at removing certain pathogens and other wastes from wastewater at high hydraulic loading rates. The appropriate rate is determined based on the dosing pattern, the size of the media, and the organic loading rate.

Dosing Method and Frequency

Careful dosing and even distribution of the wastewater across the filter surface are needed to ensure consistent treatment. Uneven distribution may cause one part of the filter to become overloaded, and wastewater can be flushed through the filter before receiving adequate treatment. Too frequent dosing causes similar problems. Doses should be spaced to allow the filter adequate time to drain and reaerate.

Climate and Temperature

All wastewater treatment methods that rely on natural processes are affected by temperature. Treatment slows down in cold temperatures, so organic loading rates must be lower to maintain treatment. Freezing also can be a problem with certain filter designs, such as recirculating filters and open filters, and some designs may be inappropriate for cold climates. Sometimes adjusting hydraulic loading rates and dosing frequencies can help filter performance in low temperatures.

Common Sand Filter Designs

Continued from page 3

household water use. After the wastewater receives treatment, it collects in the underdrains and then usually either flows to disinfection in a chlorination unit and to surface discharge or directly to a soil absorption field for further treatment and subsurface discharge.

The underdrains are sloped toward the outlet and vented at the surface at the upstream end. If possible, the surface vent should be located away from residences to minimize possible odor problems.

Buried sand filters are designed to receive hydraulic loads of approximately 1.2 to 1.5 gallons per square foot per day. This is a relatively low rate compared with other sand filters, which helps to ensure that the filter does not become overloaded or clogged and that it can work up to 20 years without maintenance.

Due to this low hydraulic loading rate, buried filters usually require more surface area to treat the same amount of wastewater as other sand filters. However, with good landscaping techniques, the land used for buried sand filters can be available for other aesthetic uses.

And, although the filter itself does not require maintenance, regular maintenance is essential for the septic tank or other pretreatment tank to prevent solids from clogging the filter. (*Refer to the sidebar on page 6.*) Maintenance is also important for screens, pumps, siphons, timers, disinfection units, and components of soil absorption fields.

How Well Do Sand Filters Perform?

Depending on the system design, sand filters are capable of reducing five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) in wastewater to 10 milligrams per liter or less.

Both BOD_5 and TSS are indicators used by regulatory agencies to assess treatment and its potential impact on the environment. BOD_5 is a measure of the amount of oxygen microorganisms need to consume and break down organic matter. TSS is a measure of the amount of waste particles suspended in the wastewater.

Sand filters also remove many pathogens, such as viruses and harmful bacteria. However, disinfection or further treatment may be necessary before the effluent can be returned safely to the environment.

One disadvantage of sand filters is that they are not very effective at removing phosphorus from wastewater. Therefore, additional treatment may be required in some phosphorus sensitive areas.

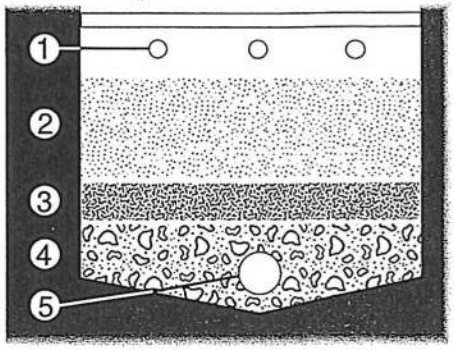
Sand filters are not permitted in all areas. Regulations concerning their use and final treatment and disposal of their effluent vary widely. Check with your local health department or state regulatory agency for permit requirements in your area. (*Refer to page 7 for contact information.*)

Open Sand Filters

Open sand filters—which are often simply called intermittent sand filters—are a practical option for treating wastewater from small communities, residential developments, recreational areas, shopping centers, and institutions. They are used most often for sources generating up to 120,000 gallons of wastewater per day.

Open sand filters are similar in design to buried sand filters, except they always are at least partially above ground. Depending on local regulations, site conditions, and the size of the filter, they may be contained in an impermeable synthetic liner or concrete. (*Refer to the graphic above for an example of an open sand filter design.*)

Open Sand Filter



① Distribution pipes
② Filter media
③ Fine gravel
④ Coarse gravel
⑤ Underdrain

Because the filter surface is accessible and easy to maintain, open sand filters are more practical than buried filters for treating large volumes of wastewater. Hydraulic loading rates for open filters typically range from two to five gallons per square foot per day and could be higher in some cases.

In addition, open filters usually have two or more beds that can be operated in parallel or in series, which allows parts of the filter to be rested while others are working.

In spite of their name, many open sand filters have removable covers to insulate them from extreme cold weather, minimize maintenance, and reduce odors, which can be a nuisance.

Because odors are generated when septic tank effluent is dosed to the filter surface, open sand filters should be sited downwind from residences and businesses. Where this is impractical, other options should be considered, such as using a recirculating sand filter.

Typical Design Values for Sand Filters*

Design Factor	Buried	Open	Recirculating
Pretreatment	Must include settling/removal of solids		
Media			
Material	Washed, Durable Granular Material		
Effective size	0.3–1 mm	0.3–1 mm	0.8–3 mm
Unif. Coeff.	<4.0	<4.0	<4.0
Depth	24–36 inches	24–36 inches	24–36 inches
Hydraulic Loading	<1.5 gpd/ft^2	2–5 gpd/ft^2	3–5 gpd/ft^2 (based on forward flow only)
Organic Loading	<5 x 10^{-3} lbs. BOD_5/day/ft^2		
	<2.4 x 10^{-2} kg. BOD_5/day/m^2		
Media Temperature	>5° C	>5° C	>5° C
Dosing Frequency	<2 per day	>2 per day	5–10 min./30 min.
Recirculation Ratio	NA	NA	3:1 to 5:1

*The values above only show typical design criteria for sand filters and do not represent all possibilities.
Adapted from: Anderson et al. 1985. "Technology Assessment of Intermittent Sand Filters." U.S. Environmental Protection Agency.

Recirculating Sand Filters: An Innovative Solution

In the late 1960s, two engineers with the Illinois Department of Health, Michael Hines and R. E. (Tony) Favreau, set out to solve a common problem facing their area. Although sand filters were the best treatment option for many local sites with poor soils or other limiting conditions, the odors associated with them made them unsuitable for more developed areas.

In response to this challenge, the two developed an innovative sand filter design—the recirculating sand filter—which has been widely adapted and used ever since for schools, homes, businesses, recreational areas, and small communities.

Recirculating sand filters eliminate odors by ensuring an adequate supply of oxygen to the wastewater. (*Refer to the graphic below for an example of a recirculating sand filter design.*)

The ratio of sand filter effluent that is recirculated ranges from 3:1 to 5:1. How this amount is controlled varies with individual system designs. Weirs, moveable gates, and other devices can be used to direct part of the flow from the sand filter underdrains to the recirculation tank.

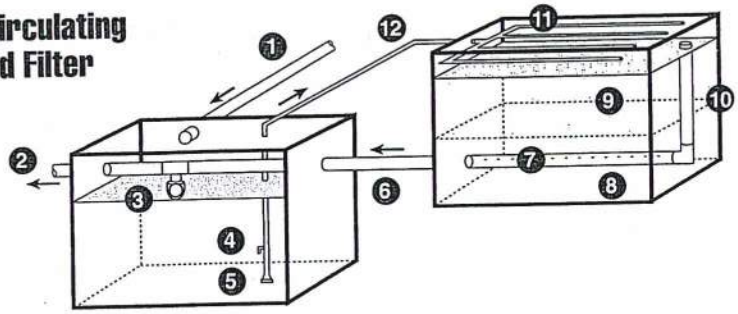
In the example shown in the graphic below, an upside-down tee pipe in the recirculation tank connects to the sand filter underdrains. A rubber ball in a screened cage rises with the water in the tank and plugs the tee when the tank reaches a certain level. When this happens, the remaining sand filter effluent bypasses the recirculation tank and flows directly to disinfection or further treatment and/or disposal.

However recirculation is achieved, the result is that the wastewater applied to the sand filter is weaker and contains more oxygen than straight septic tank effluent, which eliminates odors. The final sand filter effluent also is of higher quality and ranges from 2 to 5 milligrams per liter BOD, and from 3 to 5 milligrams per liter TSS.

Recirculating sand filter media ranges from an effective size of 0.8 mm to 3 mm, which is somewhat coarser than other sand filter media and, therefore, less prone to clogging. Hydraulic loading rates typically range from three to five gallons per square foot per day, meaning that less land area is generally needed to treat the same amount of wastewater than with other sand filter designs. Energy and routine maintenance requirements are more than for other sand filters but are still minimal and much less than is required for extended aeration package plants.

One drawback to recirculating sand filters is they are more sensitive to cold temperatures and prone to freezing than systems that are regularly dosed with warm septic tank effluent. This problem sometimes can be offset by adjusting the dosing frequen and the recirculation ratio or by covering the sand filter bed.

Recirculating Sand Filter



1. From pretreatment
2. To disinfection/discharge
3. Float valve
4. Bleed line
5. Submersible pump
6. Filter effluent line
7. Perforated underdrain piping
8. Layered support gravel
9. Filter media
10. Riser pipe
11. Distribution piping
12. Recirculation pump discharge

In a recirculating sand filter, wastewater flows by gravity from a septic tank to a recirculation tank, which is equipped with a pump, a timing mechanism, and float valves. The wastewater is pumped to the filter when it reaches a certain level in the tank or in timed doses.

After receiving treatment in the sand filter, the wastewater collects in underdrains and a portion of it is directed back to the recirculation tank, where it mixes with the septic tank effluent and is recirculated to the sand filter. The remaining sand filter effluent bypasses the recirculation tank and goes directly to disinfection or further treatment.

How Much Do Sand Filters Cost?

Exact costs for sand filter construction, operation, and maintenance depend on the filter design and local costs for labor and materials. Costs for pretreatment and additional treatment and disposal also need to be factored in when evaluating the overall system costs.

Construction of the sand filter units usually is economical because the filters can be constructed or assembled onsite using local labor and materials. Another advantage is their low operation and maintenance requirements. Operating costs are limited to the small amount of electricity used by the pump (usually around 0.28 horsepower per hour per 1,000 gallons), and most maintenance can be performed by homeowners or unskilled staff.

The two most significant factors that affect the cost of sand filter treatment are land and media costs. In areas where media is expensive or needs to be hauled a long distance, costs are much higher.

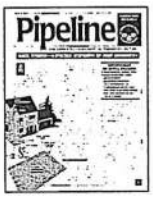
Initial costs for sand filters are sometimes higher than those for extended aeration package plants and other treatment options. However, in the long run, sand filters' low energy costs, low operating costs, and high performance often make them the most cost-effective choice.

Sand Filters Are Simple To Operate, Maintain

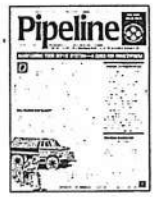
Pretreatment Tanks Need Maintenance Too

Sand filters performance depends on pretreatment tanks working properly. The following *Pipeline* issues contain useful information about the siting, design, construction, installation, operation, and maintenance of septic tanks and aerobic units—two common pretreatment methods for sand filter systems.

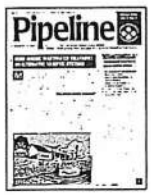
- Summer 1995 *Pipeline*: "Septic Systems: A Practical Alternative for Small Communities." Item #SFPLNL02.



- Fall 1995 *Pipeline*: "Maintaining Your Septic System: A Guide for Homeowners." Item #SFPLNL03.



- Winter 1996 *Pipeline*: "Home Aerobic Wastewater Treatment: An Alternative To Septic Systems." Item #SFPLNL04.



Pipeline *back issues can be ordered from the National Small Flows Clearinghouse (NSFC) for $0.20 each plus shipping and handling by calling (800) 624-8301 or (304) 293-4191, fax (304) 293-3161, or e-mail nsfc_orders@estd.wvu.edu. Please request each item by number and title.*

Pipeline *is available online at NSFC's website at http://www.nsfc.wvu.edu.*

Most operation and maintenance requirements for open and recirculating sand filter beds are simple and can be performed by homeowners, unskilled staff, or volunteers. Exactly how much maintenance is needed varies by system design and can be best determined after working with the filter over a period of a year or more. Buried sand filter beds are the exception and can work up to 20 years without maintenance.

Routine maintenance of open and recirculating sand filter beds includes periodic leveling and raking the surface and raking or removing the surface layer when it begins to clog. How often clogging occurs will depend on organic loading rates and the filter media size.

For example, sand filters receiving septic tank effluent may need more frequent attention than those receiving aerobic unit effluent, because the organic strength of the septic tank effluent is higher. In addition, because recirculating sand filters use coarser media and receive lower organic loading rates, they tend to clog less frequently.

Sometimes simply raking the filter surface will not suffice and the top half-inch to one-inch layer of media must be removed. Most sand filters are designed to be deep enough to allow several layers to be removed before the media needs to be replenished or replaced.

Filter beds that are exposed to sunlight should be weeded regularly and may develop algal mats that need to be removed.

Maintenance for other parts of the system may include periodic inspection and service by a qualified professional. For example, pretreatment tanks and disinfection units need to be inspected and pumped, and electrical components, such as pumps and timers, need to be checked and serviced according to manufacturer recommendations.

Pumps often are designed to last from 10 to 25 years, but eventually need to be replaced. Pipes, valves, and other system components need to be checked regularly, and screens and filters need to be cleaned. (*Refer to the sidebar at left and the table below for more information.*)

Many larger sand filters are operated in sections to allow portions of the filter bed to rest by switching the sections to be dosed. It also is sometimes necessary to regulate hydraulic loading rates to prevent the filter from being overloaded or to prevent the filter surface from freezing.

Another cold-weather operating strategy entails raking the filter bed in a pattern of ridges and furrows and flooding the surface until an ice sheet forms. The filter can then be loaded below the insulating sheet of ice.

General maintenance requirements for both open and recirculating sand filters are summarized in the table below.

Sand Filter Maintenance

Item	Requirement
Pretreatment	Depends on process (septic tank, aerobic unit, etc.)
Dosing chamber	
Pumps and controls	Check every 3 months.
Timer sequence	Check and adjust every 3 months.
Appurtenances	Check every 3 months.
Filter media	
Raking	Check every 3 months. If drainage time between doses has increased significantly, rake top 3 in. (for surface filters only).
Replacement	Skim media when heavy incrustations occur. Add new media when depth falls below 24 in. Rest when ponded continuously. Replace top 2–3 in. media when surface ponds more than 12 in. deep. Rest while alternate unit in operation (60 days).
Other	Weed as required.
	Maintain distribution device as required.
	Protect against ice sheeting.
	Check high water alarm (for open sand filters only).

Adapted from: U.S. Environmental Protection Agency. 1980. Design Manual. *Onsite Wastewater Treatment and Disposal Systems*

Maryland County Explores New Filter Designs

Anne Arundel County, Maryland, has hundreds of miles of shoreline along the Chesapeake Bay and its tributaries. In this environmentally sensitive area, homes on very small lots using septic systems are common. Many sites have soils that are slowly permeable with high groundwater levels.

In 1987, the county began using small recirculating sand filters that produce a high-quality effluent with reduced nitrogen levels. Since then, more than 250 recirculating filters have been installed at local residences.

"The use of recirculating sand filters for individual homes has been very challenging," explains Richard Piluk, an engineer with Anne Arundel County who designed many of the systems. "Our goal is to ensure a high level of wastewater treatment for the area by designing systems that are appropriate for local site conditions and that require very little maintenance on the part of the homeowner."

To achieve this goal, the county has experimented with several innovative design features for recirculating sand filters. For example, the surface area of a typical single-residence recirculating filter in Anne Arundel County is only 45 square feet, making it suitable for small lots. In addition, most of the filter units are above-ground in concrete liners to allow recirculation and gravity flow to shallow soil absorption fields with the use of a single pump.

Originally, all of the filters were designed to use sand media with an effective size of 1 mm. However, recent filters are using an experimental expanded shale media with an approximate size of 9 mm. The coarser media provides similar treatment and should be less prone to clogging.

"The expanded shale also weighs much less than the sand," says Piluk. "Because of this, we are now designing a filter unit for individual homes that can be completely constructed and assembled off-site using precast concrete containers. The lighter media makes it feasible to load the whole unit on a truck for delivery to the site."

This newest innovation could translate into substantial savings, not only for local residents, but for homeowners in every part of the country.

Other innovative features with potential national relevance are being monitored in residential systems in Anne Arundel County as part of the National Onsite Demonstration Project (NODP). Data from the demonstration sites will be included in a report to Congress later this year.

For information about the NODP, contact the National Small Flows Clearinghouse at (800) 624-8301 or (304) 293-4191.

NSFC Resources Provide Latest Information

The National Small Flows Clearinghouse (NSFC) continuously updates its databases and other resources to provide the latest information about sand filters and other wastewater technologies and issues.

The NSFC's Manufacturers/Consultants Database, for example, recently was reorganized to make it more useful and efficient for callers, who can now request searches by more than 80 products or 34 service categories, including sand filters. Homeowners, community officials, and engineers who want up-to-date information about local sand filter manufacturers, suppliers, and consultants who specialize in sand filters can contact the NSFC and order a customized search of the database.

Another valuable resource at the NSFC is the Bibliographic Database. New research from periodicals is always being added to the database, and callers can request searches for abstracts of the latest articles on sand filters and other subjects.

The NSFC also offers an updated Contacts and Referrals list of agencies, organizations, and programs that provide a variety of assistance and services to small communities concerning wastewater projects.

In addition, the NSFC maintains a Facilities Database, which provides communities with contacts and information about other communities using specific wastewater systems or technologies.

For more information about the NSFC's resources or to request a customized database search, contact an NSFC technical assistance specialist at (800) 624-8301 or (304) 293-4191.

CONTACTS



National Small Flows Clearinghouse (NSFC)

The NSFC offers a variety of technical assistance and free and low-cost information and materials about wastewater technologies for small communities. Just a few of the NSFC's many resources and services are mentioned in this newsletter. Call the NSFC at (800) 624-8301 or (304) 293-4191 for more information.

Local Health Departments

Residents of small communities interested in sand filters and other wastewater systems should contact their local health departments for more information about local regulations and requirements. Health departments are usually listed in the government section or blue pages of local phone directories.

Extension Service Offices

Many universities have U.S. Department of Agriculture Extension Service offices on campus and in other locations that provide a variety of services and assistance to small communities. Contact the NSFC for the number of the office in your area, or call the U.S. Department of Agriculture at (202) 720-3377.

Rural Community Assistance Program (RCAP)

RCAP is a network of nonprofit organizations that provide assistance to rural and low-income communities concerning almost every aspect of planning wastewater projects. Call RCAP's national office at (703) 771-8636 or the NSFC for the number of your regional RCAP office.

National Rural Water Association (NRWA)

NRWA is a nonprofit association organized to represent small water and wastewater utilities in each state and to meet their needs with operation, maintenance, management, funding, and political concerns. It offers a variety of assistance and services. Contact the NSFC for the number of your state RWA office.

RESOURCES AVAILABLE FROM NSFC

To order products listed as available from the National Small Flows Clearinghouse (NSFC), call (800) 624-8301 or (304) 293-4191, fax (304) 293-3161, e-mail nsfc_orders@estd.wvu.edu, or write NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Please request each item by number and title. A shipping and handling charge will apply.

New Onsite Systems Report Available

In 1994, the NSFC began a massive effort to request information from as many local onsite and health agencies as possible about the status of onsite systems. Approximately 3,500 agencies were contacted, and their responses have been compiled in a new report: *National Onsite Wastewater Treatment: A National Small Flows Clearinghouse Summary of Onsite Systems in the United States, 1993.*



The 414-page report includes information about the types and number of new onsite systems permitted, reasons for permit denial, permit costs, construction/installation costs, inspection and maintenance practices, and reasons for system failures.

Local agencies identified system age, unsuitable soils, lack of maintenance, high groundwater, and excessive water use as the most common problems leading to onsite system failure. The price is $17.50. Item #WWBKGN89.

Onsite Wastewater Treatment and Disposal Systems

Published by the U.S. Environmental Protection Agency (EPA), this 410-page design manual contains important technical information about several onsite technologies including sand filters and soil absorption fields. The price is $45.00. Item #WWBKDM35.

Sand Filter Technology Package

This newly updated package provides an overview of sand filter design and use. A case study, technology assessment, and cost comparisons are included. The price is $12.10. Item #WWBKGN29.

Computer Search on Sand Filters

NSFC's Bibliographic Database contains abstracts of more than 250 articles on sand filter design, costs, operation and maintenance, performance, and other related issues. Many articles are available through the NSFC. (Call the NSFC for price.) Item #WWBLCM08.

EPA Technology Assessment of Intermittent Sand Filters

Information about sand filters and their design, capabilities, limitations, costs, operation, and maintenance is included in this EPA document. Comparisons with equivalent technologies also are offered. The price is $4.50. Item #WWBLDM20.

Video: Sand Filter Technology

This video describes buried, open, and recirculating sand filters and their advantages, design, costs, operation and maintenance. The price is $10.00. Item #WWVTPE03.

PIPELINE

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Pipeline

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Small Community Wastewater Issues Explained to the Public

BASIC WASTEWATER CHARACTERISTICS

Do you know what happens to your wastewater after you take a shower, wash dishes, or flush the toilet? Where exactly does it go? What is in it? How does it affect the environment? And why should you care?

If you are like most people, you never give much thought to what happens to the wastewater from your home and community. But whether you think about it much or not, wastewater continues to affect your life even after it disappears down the drain.

How Wastewater Affects You

The water we use never really goes away. In fact, there never will be any more or any less water on Earth than there is right now, which means that all of the wastewater generated by our communities each day from homes, farms, businesses, and factories eventually returns to the environment to be used again. So, when wastewater receives inadequate treatment, the overall quality of the world's water supply suffers.

Locally, the amount of wastewater homes and communities produce, its characteristics, and how it is handled can greatly impact residents' quality of life. Wastewater has the potential to affect public health, the local economy, recreation, residential and business development, utility bills, taxes, and other aspects of everyday life.

Because small community residents, in particular, are more likely to be directly responsible for making decisions about their wastewater, it is important that they know something about its characteristics (that is, its components, strength, volume, and flow) and how certain characteristics can affect their lives.

This issue of *Pipeline* answers some basic questions about wastewater characteristics and their potential impact on public health and the environment. Some methods for testing and treating wastewater also are discussed. The information can be used as an introduction to wastewater for new community officials and staff or as a tool to educate homeowners and the general public.

Readers are encouraged to reprint *Pipeline* articles in local newspapers or include them in flyers or educational presentations. Please include the name and phone number of the National Small Flows Clearinghouse (NSFC) on the reprinted information and send us a copy for our files.

If you have any questions about reprinting articles or about any of the information in this newsletter, please contact the NSFC at (800) 624-8301 or (304) 293-4191.

Wastewater characteristics are important for:

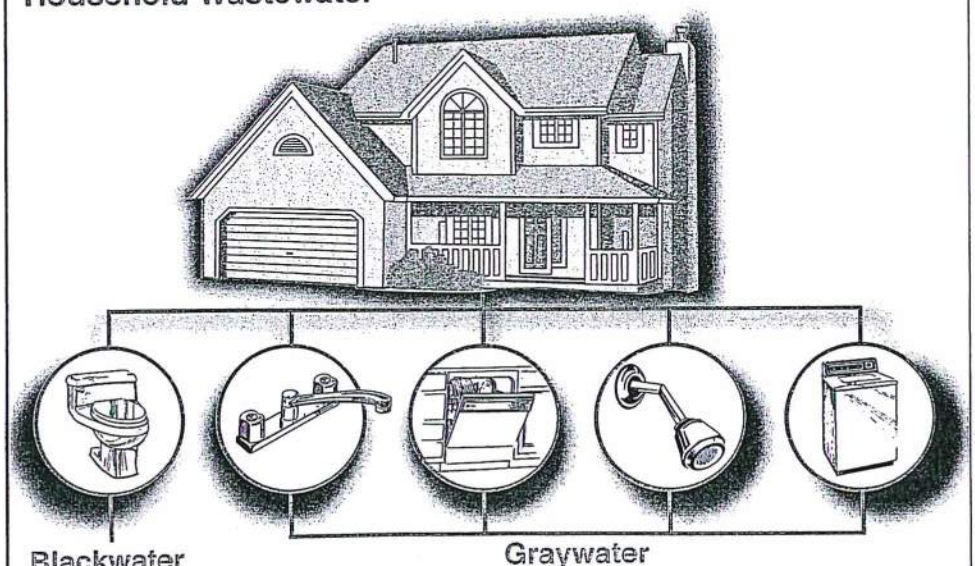
community officials

- Certain wastewater components can degrade water quality and endanger public health *(see page 3)*.
- Treatment plant workers can be harmed by hazardous substances in wastewater *(see page 4)*.
- Reducing community wastewater flows can save money *(see page 5)*.
- System operators and others can be held liable for pollution from untreated wastewater *(see page 2)*.

homeowners

- Certain hazardous household substances may pollute local wells and drinking water sources *(see page 4)*.
- Reducing household wastewater saves money *(see page 5)*.
- Pollution from malfunctioning onsite systems can harm family, friends, and neighbors *(see page 2)*.

Household Wastewater



Adapted from: Siegrist, R. L. 1977. "Waste Segregation to Facilitate Onsite Wastewater Disposal Alternatives." ASAE publication 5-77.

What is wastewater?

Did You Know . . .

that wastewater treatment is a relatively recent practice? Prior to the mid 1800s, human and other wastes usually were just dumped or conveyed to the nearest body of water without treatment.

As a result, groundwater and other sources for drinking and bathing were regularly contaminated with sewage. Epidemics of cholera, typhoid, dysentery, and other waterborne diseases killed thousands, and outbreaks were especially devastating in densely populated areas.

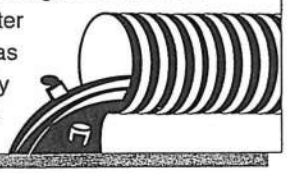
After 1854, when the connection between a cholera outbreak and sewage-contaminated water was first discovered, better attempts were made to treat and dispose of sewage separately from drinking water.

However, until the latter part of this century, many U.S. communities still allowed discharges of untreated or inadequately treated wastewater from homes, industries, and combined storm and sanitary sewers. Treatment standards often varied from town to town, and as population grew, damage to the environment and risks to public health were reaching dangerous levels nationally.

Then in the 1970s, Congress passed legislation that led to the establishment of national water quality standards and limits for the discharge of pollutants. Recent amendments to the Clean Water Act have transferred implementation of pollution control to individual state governments.

Today, community leaders are responsible for ensuring that state standards for wastewater treatment and water quality are met consistently—not only at inspection time, but always to protect public health and the environment. In some cases, treatment plant operators and community leaders may be held personally liable for noncompliance.

Homeowners also are personally liable for malfunctioning onsite systems. Onsite systems must be properly operated and maintained to protect groundwater and other drinking water sources, as well as the health of family and neighbors.



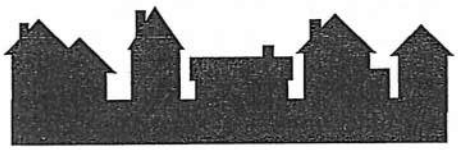
Wastewater is sewage, stormwater, and water that has been used for various purposes around the community. Unless properly treated, wastewater can harm public health and the environment.

Most communities generate wastewater from both residential and nonresidential sources.

Residential Wastewater

Although the word *sewage* usually brings toilets to mind, it actually is used to describe all types of wastewater generated from every room in a house.

In the U.S., sewage varies regionally and from home to home based on such factors as the number and type of water-using fixtures and appliances, the number of occupants, their ages, and even their habits, such as the types of foods they eat. However, when compared to the variety of wastewater flows generated by different nonresidential sources, household wastewater shares many similar characteristics overall.



There are two types of domestic sewage:

- blackwater—wastewater from toilets, and
- graywater—wastewater from all sources except toilets.

Sources of blackwater and graywater are illustrated on page 1.

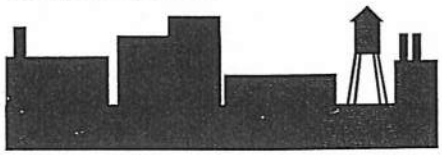
Blackwater and graywater have different characteristics, but both contain pollutants and disease-causing agents that require treatment.

However, some areas in the U.S. permit the use of innovative systems that safely recycle household graywater for reuse in toilets or for irrigation to conserve water and reduce the flow to treatment systems.

See the article on page 6 and the list of resources on page 8 for more about water conservation methods and graywater reuse.

Nonresidential Wastewater

Nonresidential wastewater in small communities is generated by such diverse sources as offices, businesses, department stores, restaurants, schools, hospitals, farms, manufacturers, and other commercial, industrial, and institutional entities. Stormwater is a nonresidential source and carries trash and other pollutants from streets, as well as pesticides and fertilizers from yards and fields.



Because of the variety of nonresidential wastewater characteristics, communities need to assess each source individually or compare similar types of nonresidential sources to ensure that adequate treatment is provided.

For example, public restrooms may generate wastewater with some characteristics similar to sewage, but usually at higher volumes and at different peak hours. The volume and pattern of wastewater flows from rental properties, hotels, and recreation areas often vary seasonally as well.

Laundries differ from many other nonresidential sources because they produce high volumes of wastewater containing lint fibers. Restaurants typically generate a lot of oil and grease. It may be necessary to provide pretreatment of oil and grease from restaurants or to collect it prior to treatment, for example, by adding grease traps to septic tanks.

Wastewater from some nonresidential sources also may require additional treatment steps. For example, stormwater should be collected separately to prevent the flooding of treatment plants during wet weather. Trash and other large solids from storm sewers often are removed by screens.

In addition, many industries produce wastewater high in chemical and biological pollutants that can overburden onsite and community systems. Dairy farms and breweries are good examples—communities may require these types of nonresidential sources to provide their own treatment or preliminary treatment to protect community systems and public health.

Information about nonresidential wastewater is available through National Small Flows Clearinghouse (NSFC) resources, some of which are listed on page 8. Contact the NSFC for more details.

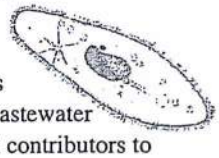
What is in wastewater?

Wastewater is mostly water by weight. Other materials make up only a small portion of wastewater, but can be present in large enough quantities to endanger public health and the environment.

Because practically anything that can be flushed down a toilet, drain, or sewer can be found in wastewater, even household sewage contains many potential pollutants.

The wastewater components that should be of most concern to homeowners and communities are those that have the potential to cause disease or detrimental environmental effects.

Organisms



Many different types of organisms live in wastewater and some are essential contributors to treatment. A variety of bacteria, protozoa, and worms work to break down certain carbon-based (organic) pollutants in wastewater by consuming them. Through this process, organisms turn wastes into carbon dioxide, water, or new cell growth.

Bacteria and other microorganisms are particularly plentiful in wastewater and accomplish most of the treatment. Most wastewater treatment systems are designed to rely in large part on biological processes.

Pathogens

Many disease-causing viruses, parasites, and bacteria also are present in wastewater and enter from almost anywhere in the community. These pathogens often originate from people and animals who are infected with or are carriers of a disease.

For example, graywater and blackwater from typical homes contain enough pathogens to pose a risk to public health. Other likely sources in communities include hospitals, schools, farms, and food processing plants.

Some illnesses from wastewater-related sources are relatively common. Gastroenteritis can result from a variety of pathogens in wastewater, and cases of illnesses caused by the parasitic protozoa *Giardia lambia* and *Cryptosporidium* are not unusual in the U.S. Other important wastewater-related diseases include hepatitis A, typhoid, polio, cholera, and dysentery. Outbreaks of these diseases can occur as a result of drinking water from wells polluted by wastewater, eating contaminated fish, or recreational activities in polluted waters. Some illnesses can be spread by animals and insects that come in contact with wastewater.

Even municipal drinking water sources are not completely immune to health risks from wastewater pathogens. Drinking water treatment efforts can become overwhelmed when water resources are heavily polluted by wastewater. For this reason, wastewater treatment is as important to public health as drinking water treatment.

For a detailed discussion of the health risks associated with wastewater, refer to the Summer 1996 (vol. 7, no. 3) Pipeline, *Item #SFPLNL06.*

Organic Matter

Organic materials are found everywhere in the environment. They are composed of the carbon-based chemicals that are the building blocks of most living things. Organic materials in wastewater originate from plants, animals, or synthetic organic compounds, and enter wastewater in human wastes, paper products, detergents, cosmetics, foods, and from agricultural, commercial, and industrial sources.

Organic compounds normally are some combination of carbon, hydrogen, oxygen, nitrogen, and other elements. Many organics are proteins, carbohydrates, or fats and are biodegradable, which means they can be consumed and broken down by organisms. However, even biodegradable materials can cause pollution. In fact, too much organic matter in wastewater can be devastating to receiving waters.

Large amounts of biodegradable materials are dangerous to lakes, streams, and oceans, because organisms use dissolved oxygen in the water to break down the wastes. This can reduce or deplete the supply of oxygen in the water needed by aquatic life, resulting in fish kills, odors, and overall degradation of water quality. The amount of oxygen organisms need to break down wastes in wastewater is referred to as the biochemical oxygen demand (BOD) and is one of the measurements used to assess overall wastewater strength.

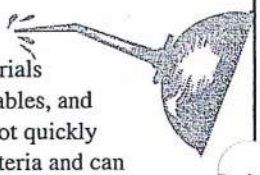
For an explanation of BOD and testing wastewater, refer to the article on page 6.

Some organic compounds are more stable than others and cannot be quickly broken down by organisms, posing an additional challenge for treatment. This is true of many synthetic organic compounds developed for agriculture and industry.

In addition, certain synthetic organics are highly toxic. Pesticides and herbicides are toxic to humans, fish, and aquatic plants and often are disposed of improperly in drains or carried in stormwater. In receiving waters, they kill or contaminate fish, making them unfit to eat. They also can damage processes in treatment plants. Benzene and toluene are two toxic organic compounds found in some solvents, pesticides, and other products.

New synthetic organic compounds are being developed all the time, which can complicate treatment efforts.

Oil and Grease



Fatty organic materials from animals, vegetables, and petroleum also are not quickly broken down by bacteria and can cause pollution in receiving environments.

When large amounts of oils and greases are discharged to receiving waters from community systems, they increase BOD and they may float to the surface and harden, causing aesthetically unpleasing conditions. They also can trap trash, plants, and other materials, causing foul odors, attracting flies and mosquitoes and other disease vectors. In some cases, too much oil and grease causes septic conditions in ponds and lakes by preventing oxygen from the atmosphere from reaching the water.

Onsite systems also can be harmed by too much oil and grease, which can clog onsite system drainfield pipes and soils, adding to the risk of system failure. Excessive grease also adds to the septic tank scum layer, causing more frequent tank pumping to be required. Both possibilities can result in significant costs to homeowners.

Petroleum-based waste oils used for motors and industry are considered hazardous waste and should be collected and disposed of separately from wastewater.

See the article on page 4 for information about safely disposing of hazardous wastes.

Continued on page 4

What is in wastewater?

Continued from page 3

Inorganics

Inorganic minerals, metals, and compounds, such as sodium, potassium, calcium, magnesium, cadmium, copper, lead, nickel, and zinc are common in wastewater from both residential and nonresidential sources. They can originate from a variety of sources in the community including industrial and commercial sources, stormwater, and inflow and infiltration from cracked pipes and leaky manhole covers. Most inorganic substances are relatively stable, and cannot be broken down easily by organisms in wastewater.

Large amounts of many inorganic substances can contaminate soil and water. Some are toxic to animals and humans and may accumulate in the environment. For this reason, extra treatment steps are often required to remove inorganic materials from industrial wastewater sources.

Heavy metals, for example, which are discharged with many types of industrial wastewaters, are difficult to remove by conventional treatment methods. Although acute poisonings from heavy metals in drinking water are rare in the U.S., potential long-term health effects of ingesting small amounts of some inorganic substances over an extended period of time are possible.

Nutrients

Wastewater often contains large amounts of the nutrients nitrogen and phosphorus in the form of nitrate and phosphate, which promote plant growth. Organisms only require small amounts of nutrients in biological treatment, so there normally is an excess available in treated wastewater.

In severe cases, excessive nutrients in receiving waters cause algae and other plants to grow quickly depleting oxygen in the water. Deprived of oxygen, fish and other aquatic life die, emitting foul odors.

Nutrients from wastewater have also been linked to ocean "red tides" that poison fish and cause illness in humans. Nitrogen in drinking water may contribute to miscarriages and is the cause of a serious illness in infants called methemoglobinemia or "blue baby syndrome."

Solids

Solid materials in wastewater can consist of organic and/or inorganic materials and organisms. The solids must be significantly reduced by treatment or they can increase BOD when discharged to receiving waters and provide places for microorganisms to escape disinfection. They also can clog soil absorption fields in onsite systems.

• *settleable solids*—Certain substances, such as sand, grit, and heavier organic and inorganic materials settle out from the rest of the wastewater stream during the preliminary stages of treatment. On the bottom of settling tanks and ponds, organic material makes up a biologically active layer of sludge that aids in treatment.

• *suspended solids*—Materials that resist settling may remain suspended in wastewater. Suspended solids in wastewater must be treated, or they will clog soil absorption systems or reduce the effectiveness of disinfection systems.

• *dissolved solids*—Small particles of certain wastewater materials can dissolve like salt in water. Some dissolved materials are consumed by microorganisms in wastewater, but others, such as heavy metals, are difficult to remove by conventional treatment. Excessive amounts of dissolved solids in wastewater can have adverse effects on the environment.

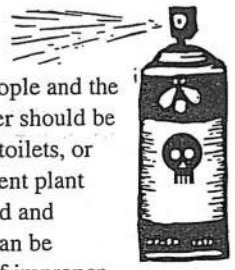
Gases

Certain gases in wastewater can cause odors, affect treatment, or are potentially dangerous.

Methane gas, for example, is a byproduct of anaerobic biological treatment and is highly combustible. Special precautions need to be taken near septic tanks, manholes, treatment plants, and other areas where wastewater gases can collect.

The gases hydrogen sulfide and ammonia can be toxic and pose asphyxiation hazards. Ammonia as a dissolved gas in wastewater also is dangerous to fish. Both gases emit odors, which can be a serious nuisance. Unless effectively contained or minimized by design and location, wastewater odors can affect the mental well-being and quality of life of residents. In some cases, odors can even lower property values and affect the local economy.

Dispose of Household Hazardous Wastes Safely



Many household products are potentially hazardous to people and the environment and never should be flushed down drains, toilets, or storm sewers. Treatment plant workers can be injured and wastewater systems can be damaged as a result of improper disposal of hazardous materials.

Other hazardous chemicals cannot be treated effectively by municipal wastewater systems and may reach local drinking water sources. When flushed into septic systems and other onsite systems, they can temporarily disrupt the biological processes in the tank and soil absorption field, allowing hazardous chemicals and untreated wastewater to reach groundwater.

Some examples of hazardous household materials include motor oil, transmission fluid, antifreeze, paint, paint thinner, varnish, polish, wax, solvents, pesticides, rat poison, oven cleaner, and battery fluid.

Many of these materials can be recycled or safely disposed of at community recycling centers.

For information about hazardous waste disposal and recycling in your area, call the NSFC or the U.S. Department of Agriculture for the number of your local Extension Service office. Contact information is listed on page 7.



Thank You For Your Input!

The many wonderful comments and suggestions we received in response to the *Pipeline* readership survey have been encouraging. So far, we have heard from well over 1,000 readers, and more responses trickle in every day.

Currently, we are in the process of tallying all the information, so we can begin to implement some of the article ideas in upcoming issues. The results will be reported in the next issue of *Pipeline*.

In the meantime, it's still not too late to respond. If you have any questions about the survey, please contact the National Small Flows Clearinghouse.

Other Important Wastewater Characteristics

In addition to the many substances found in wastewater, there are other characteristics system designers and operators use to evaluate wastewater. For example, the color, odor, and turbidity of wastewater give clues about the amount and type of pollutants present and treatment necessary.

The following are some other important wastewater characteristics that can affect public health and the environment, as well as the design, cost, and effectiveness of treatment.

Temperature

The best temperatures for wastewater treatment probably range from 77 to 95 degrees Fahrenheit. In general, biological treatment activity accelerates in warm temperatures and slows in cool temperatures, but extreme hot or cold can stop treatment processes altogether. Therefore, some systems are less effective during cold weather and some may not be appropriate for very cold climates.

Wastewater temperature also affects receiving waters. Hot water, for example, which is a byproduct of many manufacturing processes, can be a pollutant. When discharged in large quantities, it can raise the temperature of receiving streams locally and disrupt the natural balance of aquatic life.

pH

The acidity or alkalinity of wastewater affects both treatment and the environment. Low pH indicates increasing acidity, while a high pH indicates increasing alkalinity (a pH of 7 is neutral). The pH of wastewater needs to remain between 6 and 9 to protect organisms. Acids and other substances that alter pH can inactivate treatment processes when they enter wastewater from industrial or commercial sources.

Flow

Whether a system serves a single home or an entire community, it must be able to handle fluctuations in the quantity and quality of wastewater it receives to ensure proper treatment is provided at all times. Systems that are inadequately designed or hydraulically overloaded may fail to provide treatment and allow the release of pollutants to the environment.

To design systems that are both as safe and as cost-effective as possible, engineers must estimate the average and maximum (peak) amount of flows generated by various sources.

Because extreme fluctuations in flow can occur during different times of the day and on different days of the week, estimates are based on observations of the minimum and maximum amounts of water used on an hourly, daily, weekly, and seasonal basis. The possibility of instantaneous peak flow events that result from several or all water-using appliances or fixtures being used at once also is taken into account.

The number, type, and efficiency of all water-using fixtures and appliances at the source is factored into the estimate (for example, the number and amount of water normally used by faucets, toilets, and washing machines), as is the number of possible users or units that can affect the amount of water used (for example, the number of residents, bedrooms, customers, students, patients, seats, or meals served).

According to studies, water use in many homes is lowest from about midnight to 5 a.m., averaging less than one gallon per person per hour, but then rises sharply in the morning around 6 a.m. to a little over 3 gallons per person per hour. During the day, water use drops off moderately and rises again in the early evening hours.

Weekly peak flows may occur in some homes on weekends, especially when all adults work during the week. In U.S. homes, average water use is approximately 45 gallons per person per day, but may range from 35 to 60 gallons or more.

Peak flows at stores and other businesses typically occur during business hours and during meal times at restaurants. Rental properties, resorts, and commercial establishments in tourist areas may have extreme flow variations seasonally.

Estimating flow volumes for centralized treatment systems is a complicated task, especially when designing a new treatment plant in a community where one has never existed previously. Engineers must allow for additional flows during wet weather du... to inflow and infiltration of extra water into sewers. Excess water can enter sewers through leaky manhole covers and cracked pipes and pipe joints, diluting wastewater, which affects its overall characteristics, and increasing flows to treatment plants sometimes by as much as three or four times the original design load.

See the articles and table on page 6 for information about wastewater quality and measurements.

Reducing Wastewater Saves Money

Reducing wastewater by conserving water is a good idea for a number of reasons. Not only does it lower monthly water bills, but it also can reduce the money that homeowners and communities spend for wastewater treatment.

Community-wide water conservation programs can result in increased wastewater treatment plant efficiency and savings on energy costs. Significant reduction in wastewater flows also can save on personnel costs, such as overtime, and can eliminate or postpone the need to upgrade or expand facilities.

For homeowners, community savings can translate into lower sewer charges, lower taxes, and more community dollars available for schools, roads, and other community projects.

Water conservation also directly benefits homeowners with onsite systems. Simply by reducing water use, homeowners can extend the life of their systems for many years, prevent system failures, and minimize maintenance costs, potentially saving hundreds of dollars.

However, the most important reason to reduce water use is to protect water quality. Many pollutants in wastewater are not removed by treatment or by the natural cleansing abilities of the environment. The best way to ensure that enough clean water will be available in the future is to pollute as little as possible in the first place.

Most water use can be reduced simply and inexpensively. For example, in homes, toilets, showers, and faucets together account for about two-thirds of total water use. In some cases, fixing leaks, installing low-flow fixtures and appliances, and using

Continued on page 7



How is treatment achieved?

The goal of wastewater treatment is to remove as much of the floating and biodegradable pollutants and disease-causing agents in wastewater as possible to minimize the risks to public health and impact on the environment.

In many small communities, wastewater treatment often takes place in onsite systems, such as septic systems. It also may be collected and transported through a network of sewers to small decentralized treatment systems or to a central community treatment plant. Some communities use a combination of options.

Most systems achieve treatment through a series of stages. The primary stage often includes separating trash and large solid materials from the rest of the wastewater by screens and/or mechanically grinding them into finer materials. The remaining solids, oils, and greases are allowed to settle or separate from the rest of the stream in a septic tank, clarifier tank, or pond.

The settled materials form a biologically active bottom layer of sludge. In all systems, the sludge accumulates and eventually needs to be removed, treated, and disposed of as well.

The secondary stage of treatment uses a combination of biological and physical processes to reduce the amount of organic wastes. This can be achieved by filtering the wastewater through biologically active media, such as trickling filters, sand filters, other specially designed filters, or soil (the most common method used with septic systems). Or, community systems commonly use an activated sludge process, in which wastewater is exposed to both oxygen and the biologically active sludge, either through wind action or mechanical means, such as mixing and aeration.

Disinfection is often the final step after secondary or tertiary treatment and helps to kill most remaining viruses and bacteria.

A variety of advanced (or tertiary) treatment methods are sometimes required to reduce nutrients, toxic substances, or excessive amounts of dissolved materials in wastewater.

Testing and Measuring Wastewater

System operators, designers, and regulatory agencies use tests to evaluate the strength of wastewater and the amount of treatment required, the quality of effluent at different stages of treatment, and the quality of receiving waters at the point of discharge. Tests also determine whether treatment is in compliance with state, local, and federal regulations.

In small communities, operators and health officials often are trained to collect samples and perform some or all wastewater tests themselves. An option that sometimes is more economical for small systems is to send samples away to a lab for testing.

The following are a few important tests:

BOD–biochemical oxygen demand

The BOD test measures the amount of dissolved oxygen organisms are likely to need to degrade wastes in wastewater. This test is important for evaluating both how much treatment wastewater is likely to require and the potential impact that it can have on receiving waters.

To perform the test, wastewater samples are placed in BOD bottles and are diluted with specially prepared water containing dissolved oxygen. The dilution water is also "seeded" with bacteria when treated wastewater is being tested.

The amount of dissolved oxygen in the diluted sample is measured, and the samples are then stored at a constant temperature of 20 degrees Celsius (68 degrees Fahrenheit). Common incubation periods are five, seven, or twenty days—five days (or BOD_5) is the most common. At the end of the incubation period, the dissolved oxygen is measured again. The amount that was used (expressed in milligrams per liter) is an indication of wastewater strength.

Refer to the table below for some typical BOD amounts.

TSS–total suspended solids

In addition to BOD, estimating the amount of suspended solids in wastewater helps to complete an overall picture of how much secondary treatment is likely to be required. It also indicates wastewater clarity and is important for assessing the potential impact of wastewater on the environment.

After larger solids are removed in primary treatment, TSS is measured as the portion of solids retained by a 2.0-micron filter.

Refer to the table below for some typical TSS amounts.

Total Coliforms and Fecal Coliforms

Coliform tests are useful for determining whether wastewater has been adequately treated and whether water quality is suitable for drinking and recreation.

Because they are very abundant in human wastes, coliform bacteria are much easier to locate and identify in wastewater than viruses and other pathogens that cause severe diseases. For this reason, coliform bacteria are used as indicator organisms for the presence of other, more serious pathogens. Some coliforms are found in soil, so tests for fecal coliforms are considered to be the most reliable. However, tests for both total coliforms and fecal coliforms are commonly used.

There are two methods for determining the presence and density of coliform bacteria. The membrane filter (MF) technique provides a direct count of colonies trapped and then cultured. The multiple tube fermentation method provides an estimate of the most probable number (MPN) per 100 milliliters from the number of test tubes in which gas bubbles form after incubation.

Typical Domestic Wastewater Characteristics (in milligrams per liter)

	weak	medium	strong	minimum treatment requirements
BOD_5	110	220	400	30
TSS	100	220	350	30
Nitrogen (N)	20	40	85	variable
Phosphorus (P)	4	8	15	variable

**Minimum national pollution discharge and elimination system (NPDES) standards. State and local requirements vary and often are more stringent. For information about local NPDES requirements, contact your regional EPA permit office or the National Small Flows Clearinghouse.*
Source: Metcalf and Eddy, Inc. 1991. *Wastewater Engineering Treatment, Disposal, and Reuse.* 3rd ed. McGraw-Hill, Inc.

Reducing Wastewater Helps CA Resort

Situated approximately halfway between San Francisco and Los Angeles near the coastal town of Paso Robles, California, the Nacimiento Resort has no problem attracting visitors.

On a busy summer weekend, as many as 3,000 people can be found boating, fishing, or swimming at the lake or eating at the resort restaurant. Summer occupancy of campgrounds and rental units averages around 1,200.

Because of its increasing popularity, the resort wanted to expand its facilities by adding 40 new condominiums. But to obtain a permit from the regional water quality authority, it first needed to find a way to accommodate the additional wastewater flows anticipated from the new units.

Nacimiento was already close to reaching its maximum amount of permitted flows of 36,000 gallons per day. During the busiest summer months, public restrooms, showers, and other facilities at the resort are in constant use.

The resort either had to find a way to decrease the amount of wastewater it generated or expand its current wastewater system. A consulting firm was retained to evaluate the situation and offer cost-effective options. Simple water conservation, it turned out, was the most economical solution to the problem.

"Wastewater system capacity is often a limiting factor for projects in our area," says Rob Miller, P.E., an engineer with John L. Wallace and Associates, the firm hired by the resort. "Because of limited water resources, most local communities and developments already employ low-flow fixtures. Nacimiento was unique because they had a relatively small number of older fixtures that were heavily used, which is an ideal opportunity for retrofitting."

The results were dramatic. Old high-flow toilets were replaced by ultra low-flush models using 1.6 gallons of water per flush. Showers that used 5 gallons per minute received new showerheads that use 2 gallons per minute. Each new fixture saved hundreds of gallons of water per day, reducing peak wastewater flows 10,000 gallons per day.

"It was an immediate success, with measurable results on the first busy weekend after the fixtures were replaced," says Miller. "It also lowered costs for water pumping and treatment and deferred costs for capital improvement."

The total reduction of peak wastewater flows was 10,000 gallons per day, which is enough to accommodate the additional flows from the expansion anticipated by the regional water quality board.

Reducing Wastewater Saves Money

Continued from page 5

simple common sense can conserve household water use by as much as 50 percent.

The following are some ways to reduce water use around the home:

- Reduce water pressure.
- Limit shower time.
- Install low-flow showerheads or shower flow control devices.
- Turn off faucets while shaving and brushing teeth.
- Install reduced-flow faucets or water-saving faucet inserts or aerators.
- Run washing machines and dishwashers only when full, or adjust cycle settings to match loads.
- Use front-loading washing machines.
- Fix leaking or dripping faucets and running toilets.
- Replace old high-flow toilets (4 to 7 gallons per flush) with water-saving (3.5 gallons) or ultra low-flush toilets (1 to 2 gallons).*
- Install dams in toilet tanks, or fill a milk jug or plastic container with rocks and place it in the toilet tank.
- Use graywater recycling/reuse systems for toilet flushing, irrigation, and other uses where permitted and appropriate.

**Plumbing in some buildings may not be adequately designed to accommodate certain low-flush toilets.*

CONTACTS



National Small Flows Clearinghouse (NSFC)

The NSFC offers a variety of technical assistance and free and low-cost information and materials about wastewater technologies for small communities. Just a few of the NSFC's many resources and services are mentioned in this newsletter. Call the NSFC at (800) 624-8301 or (304) 293-4191 for more information.

Local Health Departments

Small communities and homeowners interested in wastewater treatment options should contact their local health departments for more information about local regulations and requirements. Health departments usually are listed in the government section or blue pages of local phone directories.

Extension Service Offices

Many universities have U.S. Department of Agriculture Extension Service offices on campus and in other locations that provide a variety of services and assistance to small communities. Contact the NSFC for the number of the office in your area, or call the U.S. Department of Agriculture at (202) 720-3377.

Rural Community Assistance Program (RCAP)

RCAP is a network of nonprofit organizations that provide assistance to rural and low-income communities concerning almost every aspect of planning wastewater projects. Call RCAP's national office at (703) 771-8636 or the NSFC for the number of your regional RCAP office.

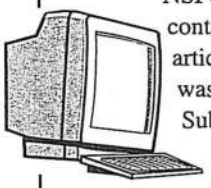
National Rural Water Association (NRWA)

NRWA is a nonprofit association organized to represent small water and wastewater utilities in each state and to meet their needs with operation, maintenance, management, funding, and political concerns. It offers a variety of assistance and services. Contact the NSFC for the number of your state RWA office.

RESOURCES AVAIL E FROM NSFC

To order products listed as available from the National Small Flows Clearinghouse (NSFC), call (800) 624-8301 or (304) 293-4191, fax (304) 293-3161, e-mail nsfc_orders@estd.wvu.edu, or write NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Please request each item by number and title. A shipping and handling charge will apply.

Computer Search on Wastewater Characteristics



NSFC's Bibliographic Database contains abstracts of nearly 100 articles with information about wastewater characteristics. Subjects include residential and community wastewater, flow reduction, effectiveness of various treatment methods, and graywater recycling. Many of these articles are available through the NSFC. The price is $10.65. Item #WWBLCM10.

Graywater Information Package

Articles from various sources on the use of household graywater are compiled in this information package from NSFC. The package is updated annually and includes design, performance, and public health information and case studies. The package also includes computer searches of articles and graywater system manufacturers from NSFC's databases. The price is $21.00. Item #WWPCGN82.

Wastewater Treatment/Disposal for Small Communities

Published by the U.S. Environmental Protection Agency (EPA), this 118-page manual includes a chapter on wastewater characteristics and related information. Both residential and nonresidential wastewater are discussed. The price is $16.50. Item #WWBKDM70.

Conservation Effects on Onsite Systems

Water Conservation Effects on Onsite Wastewater Treatment Technology Package includes articles from NSFC's newsletters and Bibliographic Database that are of interest to officials, wastewater professionals, and the general public. The price is $10.80. Item #WWBKGN68.

Regulations for Wastewater Flow Rates

Wastewater Flow Rates from the State Regulations is a compilation of regulations for establishing wastewater flow rates used to determine onsite system size. The package is updated annually and a list of contacts is included. Call NSFC for price information. Item #WWBKRG21.

Graywater Systems Regulations

Graywater Systems from the State Regulations presents sections of state onsite regulations concerning the design and construction of graywater systems. Updated annually. Call NSFC for price information. Item #WWBKRG24.

Video: The Alternative Is Conservation

Water conservation is presented in this 20-minute videotape as a method for lowering overall wastewater volume and demands on water supplies. Low-flow devices also are discussed. The price is $10.00. Item #WWVTGN13.

PIPELINE

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Small Community Wastewater Issues Explained to the Public

SPRAY AND DRIP IRRIGATION FOR WASTEWATER REUSE, DISPOSAL

Did you ever wonder how golf courses keep their large fairways looking so lush, healthy, and green all season long? The answer may surprise you.

In many communities in the U.S. and around the world, treated wastewater is reused to irrigate golf courses, lawns, landscaping, forests, and even crops. Because water is such a precious commodity, recycling wastewater can have both economic and environmental benefits for communities. Irrigation also can be the most practical and environmentally-friendly way communities can dispose of treated effluent from wastewater treatment plants and individual home systems.

Better for the Environment

Currently, the most common way community treatment plants dispose of wastewater after treatment is to discharge it to surface waters. However, as populations grow, the burden to local streams and rivers is increasing. Reusing wastewater to irrigate land can help protect precious surface water resources by preventing pollution and by conserving potable water for other uses.

Another benefit of applying wastewater to land is that the soil provides additional treatment through naturally occuring physical, biological, and chemical processes. Irrigating with wastewater also adds nutrients and minerals to soil that are good for plants, and it helps to recharge valuable groundwater resources.

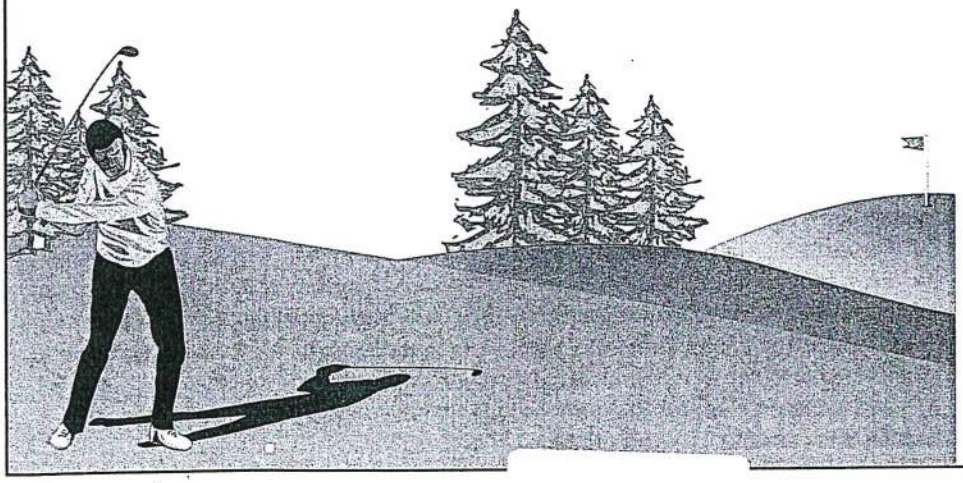
A Solution for "Problem" Sites

Irrigation systems often can be used in place of soil absorption fields (drainfields) to provide final treatment and disposal of wastewater from individual onsite systems, such as septic systems and home aerobic treatment units. As the demand for land in rural areas is increasing, more sites are being developed in places previously considered unsuitable for onsite systems. Irrigation sometimes is permitted as an alternative wastewater disposal method for difficult sites, such as areas with slowly permeable soils, shallow soils, or complex topographies.

This *Pipeline* issue provides a brief overview of two types of wastewater irrigation systems—spray systems and subsurface drip systems—how they work, their advantages and disadvantages, and when they may be a good option for homes, businesses, and communities. Operation and maintenance issues also are discussed.

Treated wastewater can be reused to irrigate . . .

- lawns;
- parks;
- landscaped areas around offices and industrial developments;
- landscaped areas around residences;
- pasture grass;
- highway medians;
- golf courses;
- cemeteries;
- forests;
- trees, corn, alfalfa, and other feed, fodder, and fiber crops; and
- food crops.



Readers are encouraged to reprint *Pipeline* articles in local newspapers or include them in flyers, newsletters, or educational presentations. Please include the name and phone number of the National Small Flows Clearinghouse (NSFC) on the reprinted information and send us a copy for our files.

If you have any questions about reprinting articles or about any of the topics discussed in this newsletter, please contact the NSFC at (800) 624-8301 or (304) 293-4191.

Is irrigating with wastewater a good option for your home or community?

If you live in an area where water must be conserved or is expensive, or where other options for disposing of wastewater are restricted, then reusing wastewater for irrigation may be a good option for your home, farm, business, or community. It also can be a good choice simply because it is an efficient use of local resources.

In arid climates, such as in Arizona, New Mexico, and parts of California, for example, or where the demand for water threatens to exceed the supply, as it does in parts of Florida, many homes and businesses could not afford to maintain grass lawns or landscaped areas without reusing wastewater. In Hawaii, treated wastewater is used to irrigate pineapples and sugar cane to save money and conserve fresh water for other uses.

Irrigation also can serve as an alternative onsite disposal method for lots deemed unsuitable for conventional septic tank/soil absorption systems. Because irrigation systems are designed to deliver wastewater slowly at rates beneficial to vegetation, and because the wastewater is applied either to the ground surface or at shallow depths, irrigation may be permitted on certain sites with high bedrock, high groundwater, or slowly permeable soils. Irrigation systems also can be designed to accommodate sites with complex terrains.

Local governments sometimes choose to reuse wastewater from community treatment plants for irrigation, rather than discharging all of it to local surface waters. Irrigation can help communities to save money or avoid exceeding surface discharge permit limits, while preserving the quality of local water resources for drinking water, aquatic life, and recreation. Some communities even have two separate distribution systems—one for potable water and another for reclaimed water for watering lawns and other irrigation needs.

Is it safe?

Irrigating with wastewater is safe when all federal, state, and local regulations regarding its treatment and use are strictly followed. When regulatory requirements are met, the wastewater returned to the environment after irrigation usually is higher quality than the wastewater discharged from treatment plants due to the additional treatment provided in the soil.

Regulations protect public health and the environment by requiring that wastewater always be pretreated prior to irrigation and by restricting its quality, use, and the manner and location of its application. Cumulative levels of nutrients, salts, heavy metals, and disease-causing organisms also must be monitored in the soil at some sites.

Regulations Vary

Wastewater reuse is not permitted everywhere. Regulations vary from state to state and sometimes from community to community. State and local governments may have additional or more stringent requirements than the federal regulations.

Community residents can contact local health agency officials to find out about regulations in their area. The National Small Flows Clearinghouse (NSFC) also offers information about federal and state regulations. *(Refer to the contacts list on page 7 and the products information on page 8.)*

Pretreatment Is Required

After wastewater receives primary and sometimes secondary treatment in a community treatment plant or individual onsite treatment system, additional treatment steps often are required prior to irrigation to reduce the amount of suspended solids and organisms in the wastewater. Both can pose a threat to public health and clog systems. Microorganisms, such as bacteria, can collect or multiply and create slime that clogs systems. Pretreatment also minimizes odors in wastewater, so there is less potential for creating a public nuisance and attracting animals that can spread diseases.

Different degrees of pretreatment are required for the wastewater depending on how it will be used and the intended method of irrigation. For example, standards are more rigorous for surface irrigation methods, such as spray irrigation, and when irrigating food or feed crops or land intended for public use. Biological pretreatment to remove organic matter from the wastewater is followed by filtration, to remove small particles from the wastewater, and disinfection.

Subsurface drip irrigation systems also employ filters mainly to protect against system clogging. Additional treatment may be necessary to protect the receiving environment and may include secondary treatment plus disinfection. This adds to the cost of building, operating, and maintaining systems, which should be considered when determining whether irrigation is a practical wastewater disposal option.

Site Conditions Are Important

Not all sites are appropriate for wastewater application. Communities wishing to dispose of wastewater from treatment plants through irrigation sometimes must purchase or lease suitable land for disposal or enter into cooperative arrangements with local farmers or landowners. Sites near surface water or high groundwater often are restricted, especially when these are used as drinking water sources. Regulations typically require minimum separation distances or buffer zones from ground and surface water resources and public areas to minimize contact with wastewater.

Other important site selection criteria include the type of soil, soil wetness, slope, drainage patterns, and local climate, including rainfall amounts and evaporation rates. In areas that have cold or wet weather part of the year, wastewater often must be stored in lagoons or holding tanks until irrigation is needed. Some irrigation equipment also can freeze in very cold weather.

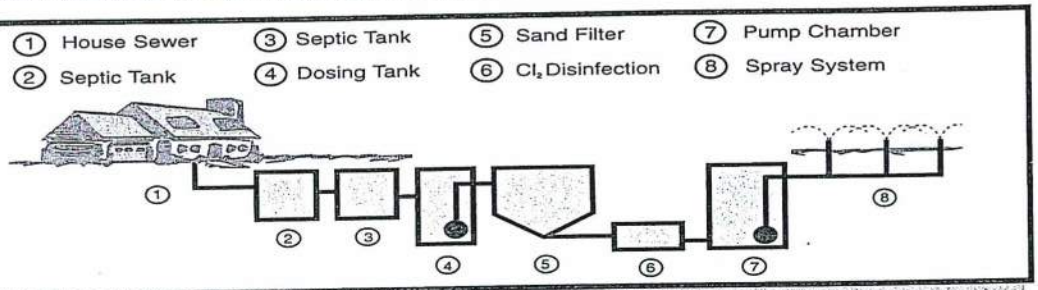
Maintenance Is Necessary

All systems, including irrigation systems, have operation and maintenance requirements. These include periodic checking and cleaning of filters, checking valves, pumps, and timers, and, in some cases, monitoring wastewater quality and its impact on soils. Large systems serving farms, businesses, or communities often have operators, but most systems are at least partially automated.

Although spray and subsurface drip irrigation systems serving individual homes may only need maintenance about once or twice per year, homeowners should consider that these systems will require more attention than conventional onsite systems.

Spray Systems Irrigate Lawns, Parks, Crops

Example residential spray system schematic



Spray irrigation is an efficient way to nourish plants and apply reclaimed wastewater to land. Some spray systems are very similar to potable-water sprinkler systems used to irrigate lawns. Others are specifically designed for agricultural applications.

While there are many possible spray system designs, they all work by distributing treated wastewater across the soil surface. Systems should be designed by qualified professionals who have specific experience working with irrigation systems.

System Design

Because spray systems apply effluent above-ground, the wastewater must be treated to a high enough level to protect public health and reduce odors. In general, regulations require that effluent used for surface irrigation at least meet secondary treatment standards plus disinfection.

With spray systems, therefore, after primary treatment in a septic tank or community treatment plant, the wastewater usually goes to a home aerobic treatment unit, sand filter, recirculating sand filter, or other filter, and then to a dosing tank or pump chamber. The wastewater is then disinfected with chlorine, ozone, or ultraviolet light before it is stored in a lagoon or holding tank for later use or just prior to its application to land. In some community systems, aerated or facultative lagoons provide treatment as well as additional storage area for the wastewater.

After treatment, filtration, and disinfection, a pump equipped with timers sends the wastewater under pressure through the mains and lines of the spray distribution system at preset times and rates as needed for irrigation. The area to be irrigated (the spray field) can be sloped up to 30 percent, depending on local regulatory requirements, but must be vegetated and landscaped to minimize runoff and erosion.

Chlorination is the most common disinfection method used with spray irrigation. One common chlorinator design accepts chlorine tablets or powder; another doses liquid chlorine into the wastewater. With chlorination, adequate contact time is necessary to allow the chlorine time to kill harmful bacteria and other pathogens.

A holding tank or lagoon is another necessary component in most spray systems, because storage space allows operators to adjust application rates, if needed. In some onsite systems that employ a recirculating sand filter, the recirculation tank serves as the storage tank. However, spray systems in cold or wet climates may need to store 130 days of design flow or more. Systems may be permitted to apply wastewater only certain months of the year, or they may be required to include subsurface drainage to help prevent runoff and erosion during wet weather.

Large community systems sometimes reduce the amount of storage area they need by obtaining controlled discharge permits, which allow them to release wastewater to surface water in winter or during times of high stream flows.

Spray Equipment

There is an impressive array of high-tech spray equipment available for irrigating crops. Some consist of series of sprinkler heads mounted to elevated distribution pipes, which move across fields either laterally, by means of drive units at both ends of the pipe (called linear move), or in a circular motion from one fixed end (called pivot move). The height and amount of pressure with which the spray nozzles emit wastewater can be adjusted. Systems even can be programmed to adjust application rates for different parts of the field and to shut off automatically during rain or high winds. And some can be operated remotely.

Another design used to irrigate row crops, called a portable irrigation reel, is a little less high-tech. It consists of a hard plastic hose wound to a drum reel. One end of the hose is attached to a portable sprinkler cart, which is pulled away from the reel during setup, and the other end of the hose is attached to a hydrant. A motor or turbine rewinds the reel and crops are irrigated as the sprinkler cart moves along the uncultivated irrigation paths, which must be kept clear for this purpose.

There also is a variety of sprinkler designs for irrigating smaller field crops, lawns, and landscaping, which are similar to potable-water lawn sprinkler systems. The sprinklers can be fixed (called solid set) or moveable, buried or above-ground, and some designs are telescoping to adjust the height of application to fit the height of the plants. Other variations exist in the amount of pressure and manner in which the wastewater is released from the sprinklers—examples include full circle, partial circle, gun, and microspray. Different pressure amounts are appropriate for irrigating different plant types. Individual home systems use low trajectory sprinklers to minimize aerosol production.

Fixed, buried sprinkler systems usually are among the most expensive designs to purchase and install, but they have certain advantages. They are less likely to be vandalized or accidently damaged and they make maneuvering farm equipment and lawn mowers easier. However, some moveable system components can be stored indoors in the winter. Most spray system designs include valves and controls that allow operators or homeowners to adjust the flow to certain areas of the spray field. Some larger systems have both automated and manual controls.

continued on page 4

Some Advantages of Spray Systems Include . . .

- When properly designed, installed, and operated, most spray systems provide uniform distribution of wastewater to plants and eliminate discharge to streams.
- Above-ground irrigation is needed for some germinating plants.
- Spray irrigation increases levels of nitrogen, phosphorus, and minerals in the soil.
- Above-ground spray system components are easier to inspect, control, and service than subsurface drip irrigation components.
- When performed during the heat of the day it has a cooling effect on some crops and decorative landscape plants.
- Evaporation contributes to the rate of wastewater disposal.

Some Disadvantages of Spray Systems Include . . .

- Spray systems generate aerosols, which can pose a threat to public health. Therefore, regulations typically require large minimum setback distances, buffers, and other restrictions that make spray systems inappropriate for small lots.
- Wet soil surface promotes weed growth, making some crops and landscaping difficult to maintain.
- Wet soil surface makes weeding, harvesting, and operating lawn mowers and farm equipment more difficult.
- Applications of insecticides and fungicides to crops must be scheduled carefully between spray irrigation applications to allow maximum contact/exposure times.
- Above-ground spray equipment is exposed to the elements and can be accidentally damaged or vandalized.
- Bacteria tends to survive better in wet, cool soil conditions.

Spray Systems Irrigate Lawns, Parks, Crops

continued from page 3

Setbacks and Buffer Zones

To guard against the possibility that drifting aerosols and runoff created by spray irrigation systems will reach and contaminate nearby public areas and water resources, regulations typically require considerable minimum setback distances or buffer zones to nearby residences, property lines, public areas, wells, streams, rivers, lakes, and wetlands. Minimum setbacks of as much as 150 to 500 feet from neighboring residences and water sources are not unusual, depending on local regulations. Buffers also may be required from water lines, embankments, drains, drainage ditches, and public rights of way. A minimum vertical separation distance to the water table also applies.

Because of these setback requirements, spray systems tend to be mainly practical for irrigating crops, fields, and larger land areas or home lots.

Operation and Scheduling

Unlike traditional irrigation systems whose sole purpose is to deliver water to plants, several additional factors must be considered when managing wastewater irrigation systems. The timing and rate of wastewater application must be designed so that plants benefit as much as possible from the nutrients and other constituents in the wastewater without being overwhelmed by them. In addition, there is the potential that certain wastewater constituents may accumulate in the soil and plants over time and become toxic to the plants, clog the soil, or alter the soil structure.

For example, too much nitrogen can result in nitrate accumulation in crops, but too little can result in reduced yields. If evaporation regularly exceeds precipitation, too much salt may remain in the soil, which can damage roots. The particular characteristics of the wastewater must be considered in relation to such factors as climate and the individual nutrient requirements of the crops, grass, or landscape plants selected.

In addition, the need to dispose of the wastewater has to be balanced with the needs of the plants during various stages of growth and the hydraulic capacity of the soil and its ability to effectively provide treatment.

Farmers must schedule irrigation times and rates carefully, always adjusting for different rainfall and evaporation amounts. Some use devices, such as tensiometers, to measure soil wetness, and rain gauges and pan evaporation tests to keep track of irrigation needs. Spray irrigation of crops also needs to be scheduled around applications of pesticides and fungicides to plants.

Scheduling the irrigation of other types of spray fields is usually less complicated. Unrestricted public access sites, such as the lawns of homes or businesses, landscaping, parks, highway medians, and golf courses, often are irrigated only at night or during off-hours to minimize the potential for public contact with the wastewater. Small systems and systems serving individual homes often are designed to apply a set amount of wastewater twice a week or so at predetermined rates and times. The system designer estimates the amount needed based on records showing average precipitation and evaporation rates in the area. Homeowners usually can adjust or override the pump settings if needed.

If a system is designed and sized primarily for wastewater disposal, the loading rates permitted for the wastewater may be below the irrigation needs of the plants. Therefore, additional water may be required for irrigation with some systems.

Monitoring and Maintenance

The pump, disinfection system, and spray heads in spray irrigation systems require regular maintenance. For example, the chlorine tablets in chlorinators need to be replenished regularly—approximately once per month for home systems. Open pipes and spray heads can become damaged, plugged, or frozen. Any changes in pressure in the system can alter the spray patterns in the field, so spray patterns should be tested to ensure that the system still complies with all setback requirements.

Other monitoring requirements vary depending on state and local regulations, public access to the site, and system size. In some systems, regular daily or weekly monitoring is needed to check influent and effluent quality, system storage capacity, wind speed and direction, signs of ponding or runoff in the spray field, and depth to water table. Cumulative levels of nutrients, heavy metals, fecal coliforms, and other wastewater constituents must be monitored in the soils (and groundwater) at some sites once or twice per year.

Subsurface Drip Irrigation Systems Have Many Advantages

Drip irrigation systems (also known as "trickle" systems) are another efficient and proven technology many small communities can chose to recycle and dispose of wastewater. Drip irrigation technology using treated wastewater is used in Israel and throughout the world as a way to conserve water resources. These systems require less water than spray systems to irrigate plants, and the technology has been used for more than 30 years for various agricultural and landscape applications.

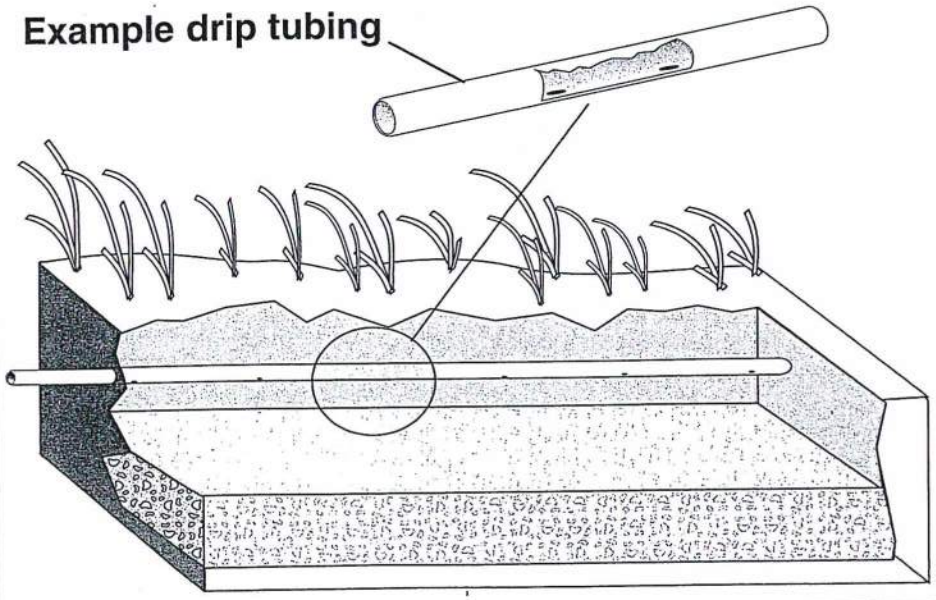
Subsurface Drip Systems Deliver Effluent to Plant Roots

With drip systems, treated wastewater is applied to soil slowly and uniformly from a network of narrow tubing (0.5- to 0.75-inch diameter), usually plastic or polyethylene, placed either on the ground surface or below ground at shallow depths of 6 to 12 inches in the plant root zone. The wastewater is pumped through the tubes under pressure, but drips out slowly from a series of evenly-spaced openings. The openings may be simple holes or, as is the case in most subsurface systems, they may be fitted with turbulent flow or pressure-compensating emitter devices. These emitter designs are proprietary and vary depending on the manufacturer of the system. *(The graphic below is meant to illustrate a generic subsurface drip tube design.)*

Drip system emitters are designed to ensure that the wastewater is always released at the same slow rate at atmospheric pressure, even though the water pressure inside the tubes can range from 5 to 70 pounds per square inch (psi) during a dosing cycle. However, most systems are engineered to maintain relatively consistent pressure inside the tubes, usually about 20 psi. The pressure-compensating feature of emitters allows drip irrigation lines to be installed at different elevations at a site while maintaining uniform flow.

Because subsurface drip systems release wastewater below-ground directly to plant roots, they irrigate more efficiently and have advantages different from those of surface irrigation systems. For example, the soil surface tends to stay dry, which means there is less water lost to evaporation and there is almost no opportunity for the wastewater to come in contact with plant foliage, humans, or animals. Also, percolation losses are reduced because the wastewater is applied to a wide area of soil at a slow rate directly to plant roots.

In addition, in drip systems the wastewater is delivered to the most biologically active part of the soil, which enhances treatment and minimizes the possibility of groundwater contamination. The constant moisture in the root zone also may increase the availability of nutrients to plants, reducing the delivery of nitrogen to groundwater. *(Refer to page 6 for a list of some advantages and disadvantages of subsurface drip systems.)*



Other System Design Elements

As with spray irrigation systems, wastewater must be pretreated prior to drip irrigation to protect public health and the environment and to prevent systems from clogging. Settleable and floatable solids are removed by primary treatment, which may take place in a community treatment plant or lagoon or on individual home lots in a septic tank or home aerobic treatment unit. Primary treatment always is followed by filtration in a particle-size filter to protect the tubing from clogging.

In most systems, effluent flows to a tank or pump chamber equipped with controls, where it is stored until a predetermined dosing volume is reached. All drip systems are equipped with a filtration system before the distribution system, such as a series of disc filters or mesh screen filter membranes, to remove small suspended solid materi from the wastewater that can clog tubes and emitters. Some systems also include a disinfection step to protect public health.

The U.S. Environmental Protection Agency approves the use of the chemical trifluralin to prevent root intrusion into emitters, although some states may not permit it. One manufacturer of drip system tubing incorporates a chemical barrier to root intrusion directly into the tubing material itself. However, the consistently wet conditions in the soil and the pressure compensating emitter design discourages root growth into the distribution lines.

The distribution system in subsurface drip systems usually includes a mainline, submain, and narrow drip laterals with emitters. The total length of drip tubing will depend on the restrictiveness of the site, the area needing irrigation, and the amount of storage space available. The laterals normally are installed in narrow trenches (approximately 10 centimeters wide) dug with a vibratory plow. Because of the flexibility of the laterals and their shallow placement, drip lines can be la around trees and other topographic feat with little disturbance to the site.

continued on page 6

Advantages of Subsurface Drip Systems Include . . .

- Water and nutrients are delivered directly to plant roots.
- Less water is required when irrigating with drip systems than with spray systems and other suface irrigation methods.
- Wastewater is distributed more evenly with drip systems than spray systems and open irrigation trenches.
- Evaporation losses and weed growth are reduced because the soil surface remains dry.
- Operating lawnmowers and farm equipment is easier because system components are buried and the soil surface stays dry.
- There is no aerosol generation and no wastewater contact with plant foliage.
- Crops irrigated with drip systems can be harvested sooner than when irrigated with spray systems.
- Fewer problems exist with odors, ponding, and runoff.
- There is less chance of wastewater carrying additional chemicals, such as pesticides and fungicides, from the ground surface to groundwater.
- Studies suggest nitrogen in wastewater may be better absorbed by plants and less likely to pollute groundwater when applied directly to plant roots.
- In some cases, fewer pretreatment steps are required for wastewater with drip systems.
- It is less likely that subsurface drip components can be accidently or intentionally damaged.
- Flexible tubing can accommodate sites with complex topographies.
- There are generally fewer operation and maintenance requirements than with spray systems.

Disadvantages of Subsurface Drip Systems Include . . .

- Emitters can potentially clog, affecting the uniformity of application.
- Temporary use of sprinklers or other surface irrigation may be necessary during plant germination period.
- It is difficult to monitor and correct potential emitter clogging.
- Effects of freezing temperatures on drip systems and applying wastewater to frozen ground is still the subject of study and debate.

Subsurface Drip Systems Have Many Advantages

continued from page 5

The submains supply the amount of water required by the individual laterals it feeds, and valves are located between the main and the submains to control the flow of water to different parts of the system.

Clogging

Drip system emitter clogging was more of a problem in the past than it is today. Root intrusion into the drip tubing and internal clogging from the buildup of sediment, suspended solids, algae, and bacterial slime have been diminished greatly by better pretreatment, filtration, disinfection, and new tubing and emitter designs. Most systems allow weekly or biweekly forward flushing of the tubes to scouring velocity to remove slime and sediment buildup.

The size of the emitter orifices also is important to prevent clogging and should range from four to six times the maximum size of the particles that can pass through the mesh of the filter screen preceding the distribution system. For example, a system using a filter screen size of 115 microns (140 mesh) should have emitters approximately 800 microns in diameter to achieve about a six-to-one ratio.

When even a few emitters do clog, it can affect the pressure inside the tubes and the uniformity of wastewater distribution in the field. It also may be difficult to identify and service buried emitters that clog. And like traditional soil absorption systems used with septic systems, saturation of the soil around the emitters of a drip system can eventually lead to the formation of a biological clogging mat, which can cause system failure. However, in general, subsurface drip systems are considered to be a manageable and reliable technology.

Filters on all drip systems need to be checked and periodically backflushed or cleaned. Backflushing reverses the water flow through the lines and the filters to release trapped sediments. Some systems can be set up to backwash automatically at preset intervals, or operators can do it manually as needed. The wastewater flow needs to checked periodically to determine if any emitters are plugging. If a scale buildup develops on emitters, an acid treatment may be necessary.

Setbacks and Buffer Zones

As with spray irrigation systems, regulations typically require that drip systems be installed at minimum distances from nearby residences, property lines, public areas, wells, surface water resources, and groundwater. However, because drip systems deliver wastewater below ground and do not produce aerosols, buffer zones of 25 to 50 feet are generally required to neighboring residences—considerably less than is required for spray systems, making drip disposal more practical for smaller home lots.

Operation, Maintenance, and Scheduling

As with spray systems, drip irrigation must be scheduled so that plants benefit from the nutrients and other constituents in the wastewater without being overwhelmed by them, and the needs of the plants must be balanced with the capacity of the soil to treat the most restrictive components in the wastewater. These concerns must be balanced in turn with climate and other site factors.

Less labor usually is required for operating and maintaining fixed subsurface drip system components as compared to spray systems and surface drip systems with moveable components. For small and individual home systems, the pattern of flow may be fixed or adjusted manually or automatically by the homeowner or operator, depending on the system design and sophistication. In general, the best care for subsurface drip systems is provided by following the individual manufacturer recommendations.

Some communities may require homeowners and small system owners to maintain a service contract with an authorized manufacturer's representative to ensure appropriate monitoring and maintenance. Larger systems often have full-time operators to maintain and service systems and to control the pattern of wastewater flow to irrigate different crops or fields. Some systems can be operated and monitored remotely through telemetry.

Refer to the list of NSFC documents on page 8 and the list of contacts on page 7 for more detailed information on subsurface drip systems.

Wisconsin Drip System Is an "Educational Opportunity"

If you were to pinpoint the center of Wisconsin on a map, you just might find Nasonville Elementary School. Located in the rural Marshfield School District, in the middle of dairy country, Nasonville has plans to consolidate with another local school adding 67 students to the 95 currently enrolled. But before health officials would approve the additional students, the school needed to upgrade its old wastewater system.

"In our part of Wood County, we have some of the densest clay soils ever seen," explained Paul Rodenbeck, the school district's building and grounds director. "For years, the school's wastewater system consisted of a septic tank that discharged across an open field. Because of the difficult local site conditions (heavy silt loam over massive clays), our options for upgrading were somewhat limited."

Holding tanks are the only new onsite wastewater systems being permitted in the area. But Rodenbeck, a former municipal wastewater treatment plant operator, was inspired to research possible onsite wastewater treatment alternatives for the school.

One option that may have been appropriate for Nasonville was a mound system, but the school was not keen on the way it might look on the school grounds, the earthwork involved, or the prospect of having to mow it. Repair costs were another concern. "Even if only one part of the system needs to be repaired, the mound has to be dug up," Rodenbeck said.

Rodenbeck's inquiries led him to work with Duane Grueul of the Wood County Planning and Zoning Department. Grueul suggested several area design firms that have experience with onsite systems. He also introduced Rodenbeck to Dr. James Converse of the University of Wisconsin's Small Scale Waste Management Project, one of the first research programs in the country to study onsite systems.

The firm the school chose for the project, Ayres and Associates of Madison, worked together with Dr. Converse, Grueul, and Rodenbeck to design a solution for the site—namely, a subsurface drip system. The system was installed in August 1998 and is part of the University of Wisconsin's research project.

"Because we are working with the university, we were able to get an experimental permit for a drip system," Rodenbeck said. "Graduate students from the university regularly monitor the system's performance, which is good for us and an educational opportunity for them."

Nasonville's new system is sized to handle 2,500 gallons of wastewater flows per day, which is enough to accommodate approximately 350 students. Rodenbeck estimated the system size needed by checking daily water use at other area schools. The system consists of a 3,000-gallon septic tank equiped with a Zabel™ filter at the outlet. From the septic tank the wastewater flows to a recirculation tank where the wastewater is pumped to a recirculating gravel filter. After treatment in the gravel filter, the wastewater returns to the recirculation tank and then flows to an intermediate settling tank equipped with another Zabel™ filter at the outlet. Next, the wastewater flows to a dosing tank where it is sent to the drip distribution system.

"The system is designed to dose over a 24-hour period," explained Rodenbeck. The drip system itself has four zones or cells and takes up about one acre of the 10-acre school lot.

Rodenbeck said that the system has been working well. "Due to mechanical problems, the gravel filter was taken out of service during the winter, and we had to bypass the filter all together," he said. "The university requested that we not fix this problem, but, instead, operate the system with just the septic tank effluent going through the drip system filters and then to the drip lines. The system has been working fine this way. None of the emitters have plugged and I haven't even had to clean the filters. The gravel filter will be modified and be online for the start of school."

The university students continually monitor the performance of the system and levels of bacteria in the soil as well as investigate the effect of temperature on the levels of bacteria in the soil.

To learn more about Nasonville's system and the University of Wisconsin study, contact Dr. Converse at (608) 262-1106.



CONTACTS

The National Small Flows Clearinghouse (NSFC)

The NSFC offers technical assistance and free and low-cost information about onsite and small community wastewater technologies and issues, including spray and drip irrigation, wastewater reuse, and state and federal regulations. Only a few of the NSFC's many resources and services are mentioned in this issue. Visit the NSFC's Web site at www.nsfc.wvu.edu, or call (800) 624-8301 or (304) 293-4191 for assistance or to request a free catalog.

Local and State Health Agencies

For more information about spray and drip irrigation, local regulations, or permit requirements, community residents should contact their local or county health department officials. Community leaders who wish to evaluate irrigation as an alternative to direct discharge should contact their state health agency. State and local agencies usually are listed in the government section or blue pages of local phone directories.

Extension Service Offices

Many universities have U.S. Department of Agriculture Extension Service offices on campus and in other locations, which provide a variety of services and assistance to individuals and small communities. For the number of the Extension Service office in your area, check the government pages of your local phone directory, call the NSFC, or call the U.S. Department of Agriculture directly at (202) 720-3377.

The Irrigation Association (IA)

The IA is the irrigation industry's trade organization and has members who can provide professional assistance in all aspects of irrigation. IA members include researchers, technicians, manufacturers, distributors, dealers, system designers, consultants, installers, and contractors. Visit its Web site at www.irrigation.org to conduct a search of IA's membership or for consumer information, including how to hire an irrigation contractor Or, contact IA headquarters in Fairfax, Virginia, at (703) 573-3551 for assistance.

RESOURCES AVAILABLE FROM NSFC

To order any of the following products, call the National Small Flows Clearinghouse (NSFC) at (800) 624-8301 or (304) 293-4191, fax (304) 293-3161, e-mail nsfc_orders@estd.wvu.edu, or write NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Be sure to request each item by number and title. A shipping and handling charge will apply.

Spray and Drip Irrigation Technology Package

A selection of useful articles about spray and drip irrigation with wastewater is presented in this publication. The articles are chosen from the NSFC's Bibliographic Database. Onsite irrigation systems and the application of wastewater to forest lands and parks are among the topics discussed. Case studies also are included. The price is $16.25. Request Item #WWBKGN53.

Guidelines for Water Reuse

This EPA manual presents federal guidelines for implementing a water reuse system and how to evaluate water reclamation and reuse opportunities. Chapters are devoted to each of the technical, financial, legal, institutional, and public involvement considerations that a reuse planner might examine.The price is $30.00. Request Item #WWBKDM72.

Computer Search: Drip Irrigation

This booklet is a compilation of article abstracts on drip irrigation compiled from a search of the NSFC's Bibliographic Database. Complete copies of the articles can be ordered from the NSFC. The price is $2.75. Request Item #WWBLCM18.

Computer Search: Spray Systems

Spray systems as an alternative to conventional methods of wastewater disposal is the topic of this NSFC Bibliographic Database search. Abstracts of spray system articles are included. The price is $6.75. Request Item #WWBLCM19.

Manufacturers and Consultants Database

Customized searches of the NSFC's Manufacturers and Consultants Database are available upon request. Contact the NSFC and ask to speak with a technical assistance specialist to request a search of irrigation system manufacturers, dealers, designers, consultants, and operators in your area. The price varies. Request Item #WWPCCM16.

Guide to State Level Onsite Regulations

This guide provides information about state regulations regarding onsite wastewater systems. Contacts, keywords, and definitions are included. The price is $12.50. Request Item #WWBKRG01.

Free Brochure: Water Reuse Via Dual Distribution Systems

This free brochure examines the benefits of a wastewater reuse system and includes information on system operation, design, cost, and public acceptance issues. Request Item #WWBRGN15.

PIPELINE

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Small Community Wastewater Issues Explained to the Public

MOUNDS: A SEPTIC SYSTEM ALTERNATIVE

Ancient Americans began building mounds starting around 700 B.C.E. While they apparently were constructed throughout eastern North America, the highest concentrations seem to have been in what are now the Midwestern states of Ohio, Illinois, Iowa, and Wisconsin. Archaeologists tell us that these mounds were used to bury the dead.

If, somehow, these mound builders were to magically return—nearly 3,000 years later—they might be pleased to see that mounds are still being constructed in their old stomping grounds. The reason for the new mounds, however, is slightly different: they contain an above-ground wastewater treatment method known as a "mound septic system."

Why a mound system?

Mounds were developed to overcome three natural conditions: (1) slow or fast permeable soils, (2) shallow soil cover over creviced or porous bedrock, or (3) a high water table. A site that has any one of these three conditions (or a combination of them) is not suited for a conventional septic system. Because acceptable soil conditions are not always found below the surface, the mound allows the conditions to be created above the surface.

The mound system was developed in North Dakota in the 1940s by the U.S. Department of Health, Education, and Welfare. Originally called the "NODAK disposal system," after its state of origin, the design featured an above-ground gravel mound with distribution pipes running its length and width.

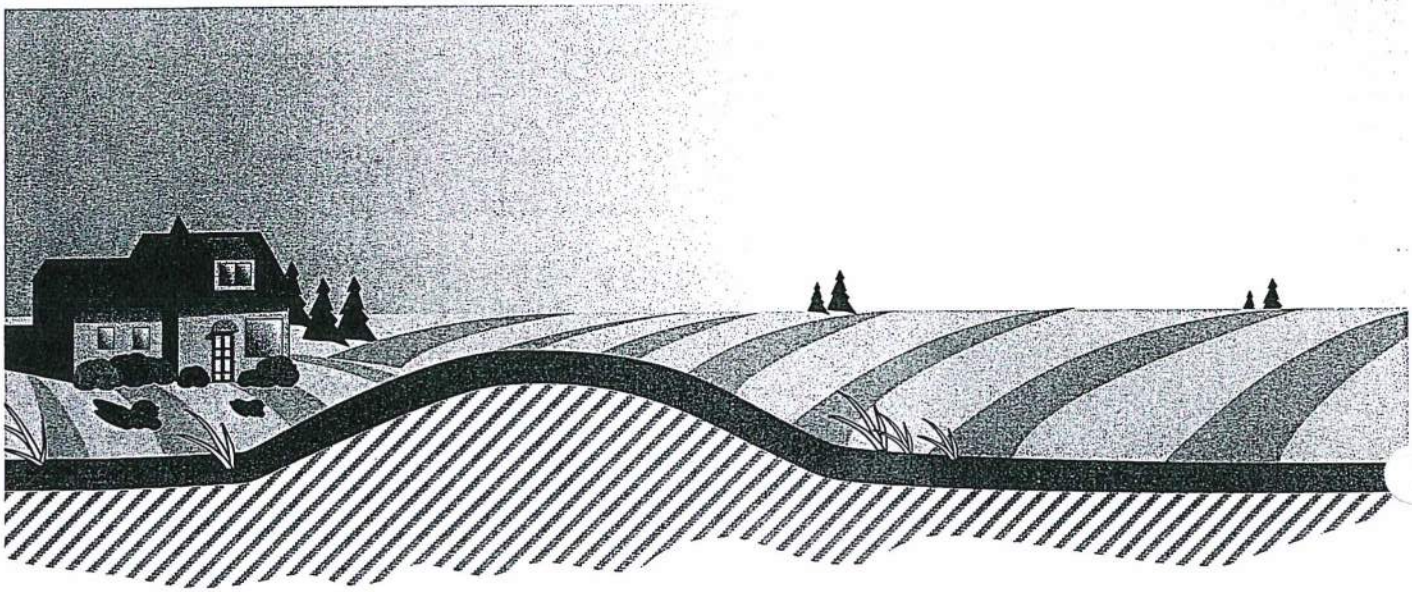
Conditions That Indicate a Mound System

Mound septic systems are designed to address certain site restrictions. Typically, a mound is used when there are:

1. Slow or fast permeable soils,
2. Shallow soil cover over creviced or porous bedrock, or
3. A high water table.

NODAK systems were typically constructed as a circular mound, covered with topsoil and seeded with grass. The systems were designed to overcome failure of conventional septic systems—mainly due to slow permeable soils—and to perform adequately in the state's varying site conditions and harsh climate.

continued on page 2



Advantages and Disadvantages of Mound Systems

As with any endeavor, mound septic systems have advantages and disadvantages. While the disadvantages may seem great, remember that an above-ground system may be the only viable option in some areas.

Advantages

- The mound system enables use of land that would otherwise be unsuitable for in-ground or at-grade onsite systems.
- The natural soil used in a mound system is usually the top layer, which is typically the most permeable.
- A mound system does not have a direct discharge to a ditch, stream, or other body of water.
- If care is taken, construction damage can be minimized since little excavation is required in the mound area.
- Mounds can be used in most climates.

Disadvantages

- Construction costs are typically much higher than those of conventional systems.
- Since there is usually limited permeable topsoil available at mound system sites, extreme care must be taken not to damage this layer with construction equipment.
- The location of the mound may affect drainage patterns and limit land use options.
- The mound may have to be partially rebuilt if seepage or leakage occurs.
- All mound systems require pumps or siphons.
- Mounds may not be aesthetically pleasing in some cases.

Source: Environmental Technology Initiative Fact Sheet WWFSGN105.

continued from page 1

The most common type of mound design used today was modified from the NODAK design by extension personnel at the University of Wisconsin-Madison in the 1970s. Their design consisted of gravel trenches set into a mound of sand. The distribution pipes were placed in the gravel trenches and the wastewater was pressure-dosed to insure uniform distribution. A soil cover provided climatic protection and allowed certain types of vegetation to be planted on the mound, thus preventing erosion or other threats to it.

The Wisconsin Mound, as it came to be known, was incorporated into that state's code as an alternative septic system in the 1980s. Today, a number of states have adopted this mound design—or some variation thereof—and it can be found from Washington to Virginia.

How does the system work?

There are three main components to a mound system: (1) a septic tank or pretreatment unit, (2) a dosing or pump chamber, and (3) the elevated mound. (See page 3 for an illustration of a typical mound system.)

The Septic Tank

The septic tank (or pretreatment unit) is a large, buried container, typically constructed of concrete, fiberglass, or polyethylene. Wastewater from the home flows into the tank. Heavy solids—called sludge—settle to the bottom where bacterial action partially decomposes them. Most of the lighter solids—called scum—rise to the top.

The wastewater then leaves the septic tank and flows, by gravity, to the pump chamber. The wastewater leaving the septic tank is a liquid known as effluent.

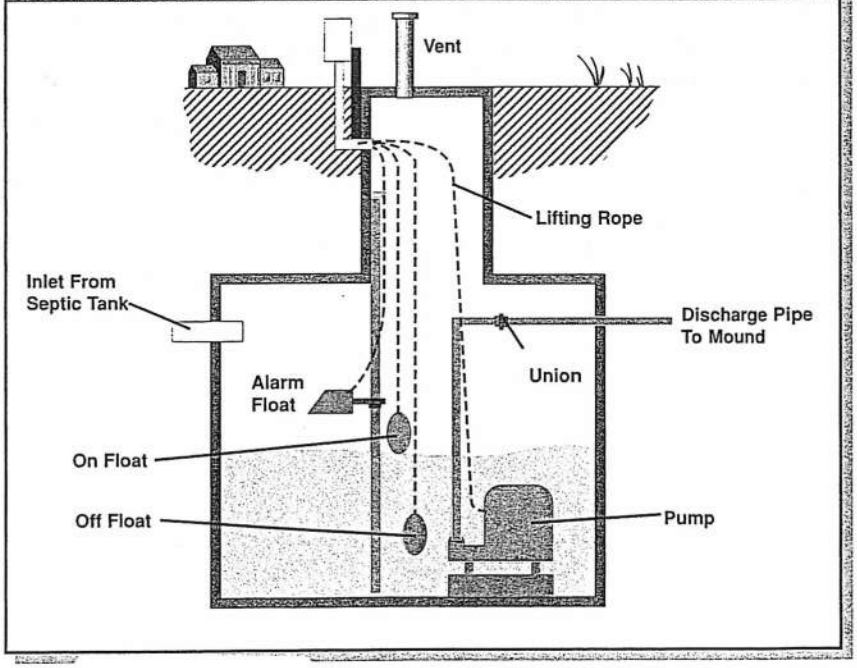
The Dosing Chamber

Also made of concrete, fiberglass, or polyethylene, the dosing chamber is a container that collects the septic tank effluent. The chamber—also called a pump chamber—contains a pump, pump control floats, and a high-water alarm float.

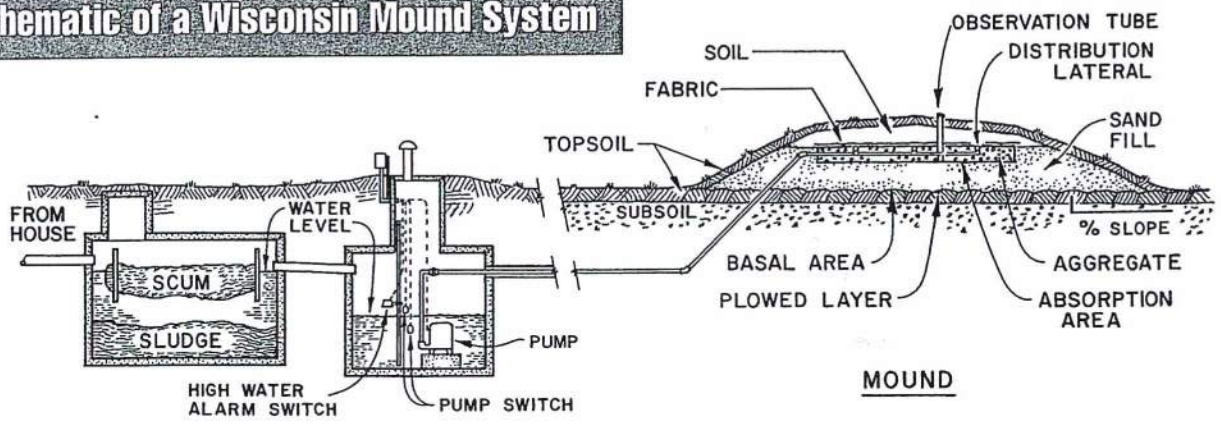
When the effluent rises to the "on" float, the pump delivers a set amount of effluent to the mound. (See schematic below.) Once a sufficient amount of effluent has been discharged, the level returns to the

continued on next page

Schematic of a Dosing Chamber



Schematic of a Wisconsin Mound System



Source: Converse and Tyler, copyright © 1987 by the American Society of Agricultural Engineers, reprinted with permission

continued from previous page

"off" float and the pump stops. The control floats are adjustable so that a specific amount of effluent can be sent to the mound.

Most dosing chambers are now equipped with an "alarm" float to warn of pump or system problems. The float is set so that an alarm goes off if the effluent rises above the "on" float. Experts recommend that the alarm consist of a buzzer and an easily visible light, and that it be wired to a circuit separate from that of the pump.

Experts also recommend that the pump discharge pipe have a union or other quick disconnect coupler so that the pump can be easily removed. A piece of nylon rope should be secured to the pump for taking it out of the chamber.

The Mound

The mound is a drainfield that is raised above the natural soil surface. The mound is composed of a sand fill that has a gravel-filled bed and a network of small diameter pipes known as the distribution system.

From the pump chamber, effluent is pumped through the pipes in controlled, low pressure doses so that uniform distribution is achieved throughout the bed. The effluent comes out of the pipes through small holes and trickles downward through the gravel bed and into the sand. Treatment occurs as the effluent moves through the sand and returns to the natural soil.

Design Criteria

The first step in designing a mound is to have a certified soil tester complete an analysis of soil characteristics of the site. This test is required in several states and is a good idea everywhere.

Once the flow rate is established, the size and configuration of the mound is determined by the manner of effluent movement and the rate at which it moves away from the mound. These factors are calculated based on many years of experience with different soil and site types. All mound construction must leave the topsoil in place as much as possible and use coarse sand fill based on distribution specifics. (See table on page 4.)

In most states, a new mound is required to also have a designated replacement area. This area is similar in size to the existing mound and must be maintained should the existing system need an addition or repairs.

Soil Depth, Percolation, and Loading

Before the effluent reaches the limiting condition (e.g., bedrock, high water table, slowly permeable soil layer), there must be a suitable depth of soil. Although the depth varies from place to place, most effluent is sufficiently treated after passing through one to four feet of soil.

In some areas, percolation tests are used to estimate soil permeability because they are related to the loading rate (i.e., how much effluent can be handled). Loading rates should be based on soil texture, structure, and consistency, with the percolation test used to confirm soil analyses. Loading rates should also be in accordance with state and local regulations.

High Water

The high water table is determined by direct observation, soil boring, interpretation of soil mottling, and other criteria. The underlying bedrock is then classified as crevice, non-crevice, semi-permeable, or non-crevice impermeable. This classification indicates the depth of the sand media used in the mound.

Siting and Design

While the most common image of a mound is an oval-shaped "bump" on a relatively flat piece of land, these systems can be constructed in different shapes and on different terrain. For example,

continued on page 4

Ten Maintenance Procedures To Keep Your Mound In Good Shape

Because it is more complex and more costly than conventional systems, regular maintenance is even more important for mound systems. You can avoid expensive repairs—not to mention headaches—if you follow recommended maintenance procedures.

1. If the system is not currently equipped with observation tubes, install them. Observation tubes allow inspection of the tank without unearthing and removing the access port.
2. Routine pumpings of the septic tank and dosing chamber should be done at least once every three to five years, depending on the size of the septic tank. Tanks should be routinely inspected on a yearly basis to determine the rate of sludge accumulation.
3. Regularly inspect both the septic and dosing tanks using the observation tubes. Any progressive increase in the depth of the water in the tanks could indicate a problem.
4. Equip the dosing chamber with a high-water alarm to alert the homeowner to potential serious or sudden problems with the system.
5. Maintain grass or other vegetative cover over the mound to maximize water uptake and prevent erosion.
6. Avoid traffic and construction on the mound or on its slope. This could compact the soil, thus reducing the absorptive capacity of the soil.
7. Grease, oil, solvents, and toxic chemicals should never be poured or flushed down the drain, as these materials may damage the system.
8. Take steps to reduce household water use. Avoid putting any solids, such as food, plastics, and paper, in the wastewater system.
9. Discharge of water from house gutters should be directed away from the absorption mound.
10. Keep a diagram showing the location of the septic tank, dosing tank, and absorption field in relation to the house.

Source: Virginia Cooperative Extension Service.

continued on page 4

mounds may be built on sites with slopes up to 25 percent.

There are, however, several places where it isn't a good idea to construct a mound system. A U.S. Environmental Protection Agency fact sheet titled "Mound Systems" has this to say about their siting and design:

Mounds should not be installed in flood plains, drainage ways or depressions unless flood protection is provided. Another siting consideration is maintaining the horizontal separation distances from water supply wells, surface waters, springs, escarpments, cuts, the boundary of property, and the building foundation. Sites with trees and large boulders also make it difficult in preparing the site. Trees should be cut to ground surface with tilling around the stumps. The size of the mound should be increased to provide sufficient soil to accept the effluent when trees and boulders occupy a significant amount of the surface area.

The actual design of a mound system consists of estimating the sand fill loading rate, soil (basal) loading rate, and the linear loading rate. Once these values are established, the mound can be sized for the lot. (See Resources on the back page for information about how to order this fact sheet.)

How's the performance?

After more than 50 years of monitoring mound system performance, the simple answer is that mounds perform very well. In Wisconsin, for example, the success rate of these systems is greater than 95 percent. As with any onsite system, proper design, installation, and operation greatly enhance the system's ability to function correctly.

The selection of sand fill material is critical to the performance of the mound. A suitable sand is one that can be loaded at a reasonable rate and adequately treat the effluent. The sand should contain 20 percent or less material greater than 2.0 millimeters (mm) and 5 percent or less finer than 0.053 mm. It should also have a size distribution that meets certain sieve analysis specifications, ASTMC-33 specifications, or meets limits for effective diameter and coefficient of uniformity.

Proper design is also critical to mound performance. For residential mounds, the daily wastewater volume is usually determined by the number of bedrooms in the house.

continued on page 4

Recommended Soil and Site Criteria for the Wisconsin Mound System

Parameter	*Value*
Depth to high water table (permanent or seasonal)	10 in.
Depth to crevice bedrock	2 ft.
Depth to non-crevice bedrock	1 ft.
Permeability of top 10 in.	Moderately low
Site slope	25%
Filled site	Yes[a]
Over old system	Yes[b]
Flood plains	No

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

Source: Converse and Tyler, used with permission

continued from previous page

Typical design flow requirements for individual homes are up to 150 gallons per day (gpd) per bedroom. Mounds for businesses—especially those with higher strength wastes—have different criteria, including pretreatment and lower loading rates.

Mound failures are most often due to overloading the system's original capacity. The result of overloading is clogging and seepage problems.



Photo by Josette Schwarz

While a new septic system is often a cause for celebration, experts recommend against allowing a mariachi band to perform on your mound.

A well-documented case in the Midwest provides a valuable lesson in how to avoid a failure. In the 1970s, a Wisconsin firm expanded from a staff of 65 to more than 160 employees. This expansion resulted in a hydraulic overload of the system.

Originally designed to handle a flow of 750 gpd, the additional employees resulted in flows of up to 2,600 gpd. To solve the problem, the company expanded the mound system and instituted a water conservation program.

After two failures, one might guess that the firm had learned their lesson. Apparently they didn't because another hydraulic overload occurred after the firm had grown to 215 employees and an average daily flow of 3,000 gpd. By now, there was no more space available to expand the mound system itself, so the firm redesigned the dosing chamber to avoid large peak flows, allowing the mound system to receive optimum dosing without overload.

If significant growth occurs—as in the case of the Wisconsin firm or when, for example, a family adds a hot tub to their home—the mound system must be considered. A little foresight can save big money down the road.

How To Properly Maintain Your Mound System

If the mound system has been properly designed and if a few simple maintenance procedures are followed, it will last for many years. (See sidebar on page 4.) As with any septic system, poor maintenance can result in system failure.

The septic tank and dosing chamber should be checked for sludge and scum buildup and pumped, as needed, to avoid carryover of solids into the mound. Screens or filters can be used to prevent large solids from escaping the septic tank.

The dosing chamber, pump, and floats should be checked annually and replaced or repaired as needed. It is imperative that the septic tank and dosing chamber be water-tight. Electrical parts and conduits should be checked for corrosion. Flushing of the laterals is also recommended each year.

Follow all of the manufacturer's operation and maintenance instructions. All equipment must be tested and calibrated according to manufacturer specifications. (See the list of resources on the back page for a "Homeowner Record Keeping Folder" that allows for easy tracking of system operation and maintenance.

continued on page 6



INTERNET INFO

Mound System Information on the Internet

A wealth of good information about mound septic systems can be found on the World Wide Web. Search using the terms "mound septic system" or "septic system, mound" to see a listing of hundreds of sites. Several university extension service sites also provide extensive information about mound septic systems. Here are five:

University of Minnesota
http://locutus.mes.umn.edu/

University of Wisconsin
http://www1.uwex.edu/

North Dakota State University
http://www.ext.nodak.edu/

Virginia Polytechnic Institute and State University
http://www.ext.vt.edu/

Ohio State University
http://www.ag.ohio-state.edu/

The U.S. Environmental Protection Agency offers a seven-page article—available only on the Internet—that discusses mound system applicability, advantages and disadvantages, design criteria, performance, operation and maintenance requirements, and costs. To download the document, go to: *http://www.epa.gov/OWM/mtb/mound.pdf.*



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Extension Service Offices

Land Grant universities have U.S. Department of Agriculture's (USDA) Extension Service offices on campus and in other locations that provide a variety of services and assistance to individuals and small communities. For the phone number of the extension office in your area, check the government pages of your local phone directory, call the NSFC at the number listed above, or call the USDA directly at (202) 720-3377.

State and Local Health Departments

Homeowners and residents of small communities who want more information about mound septic systems—including local regulations, permit requirements, and guidelines—should contact their state or local health department. These agencies are usually listed in the government section or blue pages of the local phone directory.

continued from page 5

What if the alarm goes on?

If the effluent level in the pump chamber reaches the alarm float, the alarm light and buzzer will activate. Sometimes the alarm will go on due to a faulty pump, problems with the floats, or a tripped circuit breaker. Before calling a repair service, the Washington State Department of Health suggests that you check to see if the problem could be:

1. A circuit breaker has been tripped or a fuse blown. The pump should have a separate circuit with its own breaker or fuse. If the pump is on a circuit with other equipment, that equipment can trip the breaker.
2. A pump or float switch power cord has come unplugged. If electrical connections are of the plug-in type, be sure that the switch and pump plugs are making good contact in their outlets.
3. The control floats are tangled. The floats or other parts in the dosing chamber such as the electrical power cord, the lifting rope, or the pump screen, can become tangled. Make sure the floats operate freely in the chamber.
4. Debris is on the floats and support cable, causing the pump to switch off. Lift the floats out of the chamber and clean them thoroughly.

Make sure to turn off the power supply at the circuit breaker and unplug all power cords before handling the pump or floats. Do not enter the dosing chamber: gases inside are poisonous and the lack of oxygen can be fatal. Turn the alarm off by pushing the reset light on the alarm panel.

By using water conservatively (e.g., postpone baths, showers, and clothes washing), the reserve storage in the dosing chamber should allow enough time to correct the problem.



Photo by Jim vonMeier, Septic Protector

A budding septic system inspector? Fifteen-month-old Austin Richard Ahner looks down the observation tube of a septic system in Zimmerman, Minnesota.

What's the final word?

A prime concern for anyone needing a septic system is the price tag. Obviously, the cost of a mound system will differ depending on site characteristics and home size. Several sources peg the average cost at $9,000 for a system serving a three-bedroom home. The largest part of this cost is the mound construction itself. Annual operation and maintenance costs will typically be less than $100. Experts recommend using locally available, good quality materials to ensure performance and hold costs down.

As for our mound-building ancestors, who knows? Maybe those aren't burial places, maybe septic technology is a lot older than we think.

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Landscaping Mound Septic Systems

So, all the conditions at your site point to the need for a mound septic system. One of the first questions many people ask is "What am I going to do with a large mound in my backyard?" Granted, having a hill that is typically three or four feet high and can be as long as 90 feet offers a unique challenge to the landscaper. There are, however, several things you can do to help protect the mound and make it visually appealing at the same time.

The right vegetation cover helps keep the mound intact, as well as making it more attractive. But, the wrong cover can do irreparable damage to the mound. Do not plant trees, shrubs, or any plant with an extensive root system on the mound. The roots will interfere with and possibly destroy the distribution system. The mound can be framed with trees or shrubs, but they should be at least 20 feet away. It is also ill-advised to plant vegetables or herbs on the mound.

The best things to plant on the mound are low-maintenance grasses—a mixture of creeping red, hard, and sheep's fescues works well—or perennial flowers, such as daylilies and peonies. (See the sidebar at right for some ideas about what can be planted successfully on a mound.) Because the mound will tend to be dry on top, plant grasses and other ground cover that are resistant to water stress there. Cool-season grasses and other plants may be planted on the sides of the mound. Be sure to wear gloves when landscaping the mound.

Use minimal tilling when planting and establish a cover as quickly as possible to limit erosion. The topsoil on the mound should be at least six inches, but no more than 30 inches deep. Keep traffic on the mound to a minimum; if you plant a lawn grass, plan to mow it only two or three times a year. If you have pets or young children, you may need to erect a fence around the area. Do not irrigate or water the mound once you have vegetation on it.

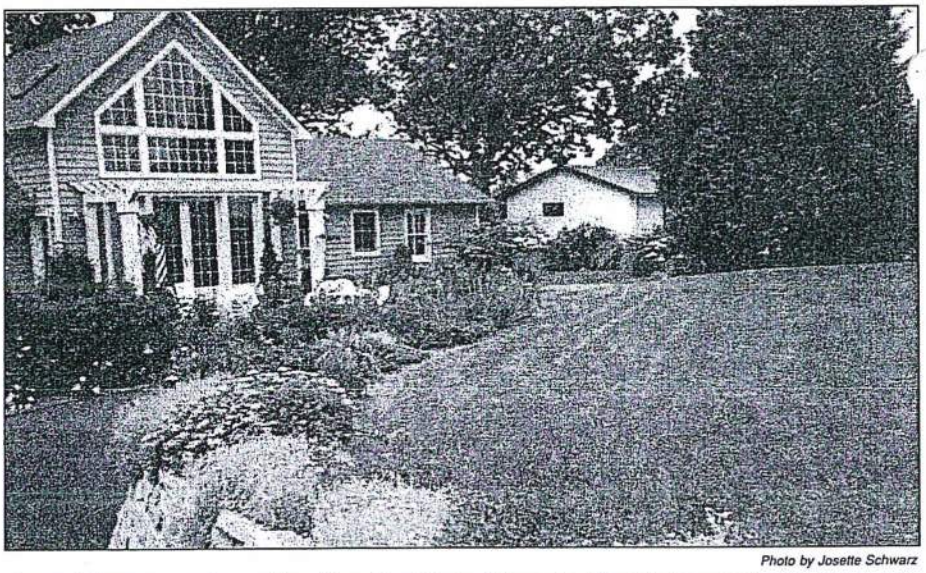


Photo by Josette Schwarz

Josette Schwarz, a master gardener from Forest Lake, Minnesota, shows that a mound septic system can be attractively landscaped. Note the grass on the mound itself, with a stone wall and a decorative edging of perennials around the sides and "toe" of the mound.

The actual shape of the mound may be changed to suit individual landscaping and site needs. Constructing a contoured mound works well for hillsides. One built at a right angle can be used in the corner of a property. A rectangular mound is most often used when there is plenty of room and uniform slope. Landscaped areas around the mound can serve as a privacy barrier, a windbreak, or as a screen to block unsightly views.

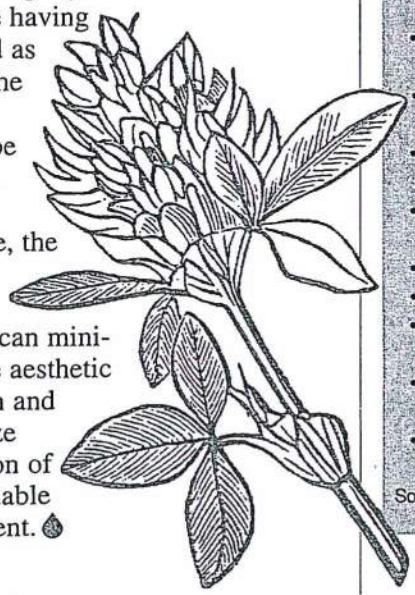
While having a mound as part of the home's landscape isn't always desirable, the right landscaping can minimize the aesthetic intrusion and maximize protection of this valuable investment.

Suggested Plants for Use on Septic Mounds

Here are 15 plants that grow well on a mound septic system and require little maintenance. Check with your local extension office to see which plants will grow in your climatic region.

- Prairie smoke (*Geum triflorum*)
- Prairie onion (*Allium stellatum*)
- Pussytoes (*Antennaria neglecta*)
- Butterflyweed (*Asclepias tuberosa*)
- Prairie clover (*Dalea*)
- Pale purple coneflower (*Echinacea angustifolia*)
- Rattlesnake master (*Eryngium yuccifolium*)
- Rough blazing star (*Liatris aspera*)
- Wild bergamot (*Mondarda fistulosa*)
- Oxeye daisy (*Helianthus helianthoides*)
- Heath Aster (*Aster ericoides*)
- Bigleaf Aster (*Aster macrophyllus*)
- Pennsylvania sedge (*Carex Pennsylvanica*)
- Wild geranium (*Geranium maculatum*)
- Violets (*Viola*)

Source: University of Minnesota Extension Service



Prairie clover (*Dalea*)

RESOURCES AVAILABLE FROM NSFC

To order any of the following products, call the National Small Flows Clearinghouse (NSFC) at (800) 624-8301 or (304) 293-4191, fax (304) 293-3161, e-mail nsfc_orders@mail.estd.wvu.edu, *or write NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Be sure to request each item by number and title. A shipping and handling charge will apply.*

New Homeowner Recordkeeping Folder

The National Small Flows Clearinghouse (NSFC) has developed a method to help homeowners keep track of their onsite systems. The "Homeowner Onsite System Recordkeeping Folder" includes sections for recording permit and local health department information, a checklist for information about different system components and accessories, a place to record household information, and a grid for sketching out the layout of the system. The price for the folder is 40 cents. Item #WWBLPE37.

Fact Sheet: Mound Systems

This fact sheet is intended to help those who are weighing treatment options by giving a general overview of mound systems and how they are used in wastewater treatment. The fact sheet briefly describes the basic components of a mound system and how it works. General information is provided about performance, advantages and disadvantages, operation and maintenance, and cost. References used to develop the fact sheet are included and can provide additional information. The price for the fact sheet is 30 cents. Item #WWFSGN105

Wisconsin Mound Soil Absorption System Siting, Design, and Construction Manual

A brief history of the mound system precedes an in-depth report on the system's function, design, construction, and operation and maintenance in this design manual. System advantages and sample calculations are included. The price for the manual is $5.90. Item #WWBLDM09.

Computer Search: Mound Systems

This search of the NSFC's Bibliographic Database contains 138 abstracts of articles about mound septic systems. Issues addressed include design, construction procedures, site selection, planning, cost-effectiveness, and community sewerage. The price is $10.10. Item #WWBKCM06.

Free NSFC Catalog

The 1998-99 *Products Guide*, lists and describes the many products and services that the NSFC offers. The catalog may also be downloaded from the NSFC Web site at *http://www.nsfc.wvu.edu* or is available free upon request. Item #WWCAT.

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NATIONAL SMALL FLOWS CLEARINGHOUSE

Small Community Wastewater Issues Explained to the Public

SITE EVALUATIONS

You've decided on the perfect home design, located property, and initiated plans with a building contractor. But before you can begin any construction on a new home, you must address water and sewage disposal first.

Homes built in areas with public water and sewage merely need to hook into the water and sewage systems. However, when people choose to build in areas outside the reach of public systems, tapping into a water source and planning for onsite wastewater disposal must be arranged before dreams of a home can become a reality.

A site evaluation is the first step toward installing an appropriate wastewater disposal system. Site evaluations determine the characteristics of the building site and the soil's ability to treat and dispose of wastewater.

A good site evaluation provides enough information about the area to install the correct system from the possible options. While most or all of this work will be done by the site evaluator, the landowner benefits from understanding the process.

Ordinarily, a septic tank followed by a conventional subsurface soil absorption system is the preferred treatment and disposal method. Soil has a considerable capacity to transform and recycle wastewater. This method of treatment is reliable and the least expensive disposal option. However, if soils are found to be unsuitable (shallow depth to bedrock or a high groundwater table), then other treatment and disposal methods must be considered. *(See figure 1 on page 2.)*

The site evaluation entails gathering detailed information about the lot and the surrounding area. This information should include the physical properties of the soil, how existing water is distributed and moves in the soil, the depth to an underground limiting layer, and other conditions that describe whether wastewater treatment and disposal by the soil is possible.

More than one-fourth of Americans use some type of onsite wastewater treatment system, and thousands of new onsite permits are issued each year. With that many onsite systems in use, site evaluations continue to be the best way to make sure that wastewater leaving a house won't pollute groundwater or surface water.

This issue of *Pipeline* explains the importance of a site evaluation and how the testing determines the type of onsite system that is appropriate for a particular site. Who performs the evaluation, what steps are taken in the process (including the percolation test), and how the evaluator uses the test results are detailed in the following pages. This *Pipeline* is not intended to serve as a comprehensive guide to conducting a site and/or soil evaluation, but serves as an overview to give the public insight into the process.

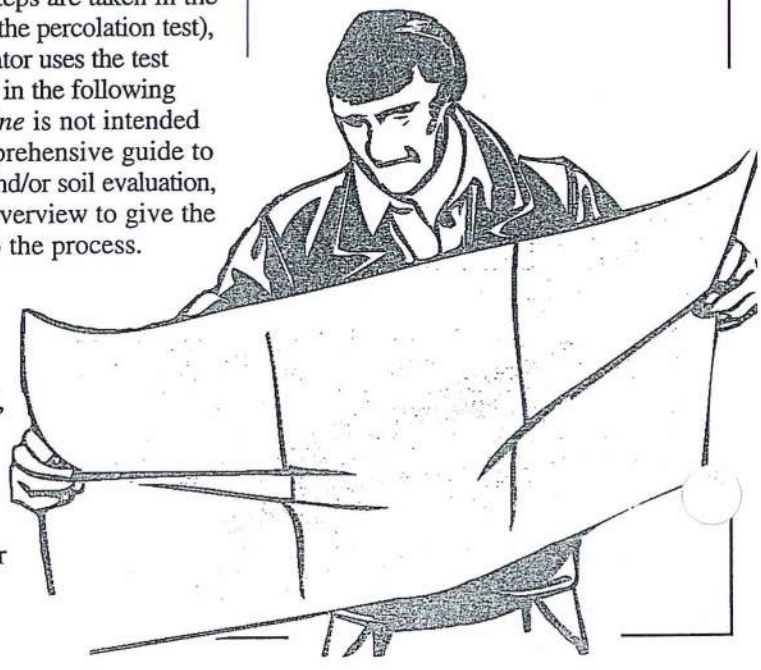
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Helpful tips to prepare for a site evaluation:

- Remove heavy brush or plant undergrowth blocking:
  (1) the view of proposed buildings or drainfield locations and
  (2) the view of your lot's position with neighboring lots.
- Clearly mark your property lines.
- Clearly mark your proposed house location.

From the Virginia Department of Health



Planning for an Onsite System

Preliminary site evaluation

Following the application process, whereby a landowner files for an onsite system permit with the local health department or other local permitting agency, a representative of the organization begins working with the landowner to produce a preliminary evaluation.

The evaluator examines any published maps or reports that include data about soils, geology, and the topography of the area. Records of local soil tests, successful onsite system designs, and reported problems with existing onsite systems in the area are reviewed.

Soil surveys outline an area

The National Resource Conservation Service (formerly known as the U.S. Soil Conservation Service) and the state's geological survey office keep soil surveys. These surveys consist of aerial photographs of the mapped area (most often a county) that note the types and distribution of soils, plus the potential use of each soil, whether for farming, woodlands, recreation, engineering uses, or other nonfarm practices. Usually drawn to a scale of four inches to one mile, the surveys include a detailed description of each soil series (those with similar characteristics) found in the area.

Map symbols give the names of the soil series, slope, and degree of erosion. A two-letter symbol (the first upper case and the second lower case) represents the soil series name. An upper case letter, ranging from A (for flat) through F (for steep), indicates the slope of the land. Slightly eroded to severely eroded classes of soil are noted by numbers from one (the least eroded) to three (most eroded).

Tables in the text of the survey list possible uses for each soil series. How suitable the soil may be for subsurface absorption systems is shown, as are engineering properties, including depth to bedrock, seasonally high water tables, percolation rates and shrink-swell potential of the soils, and drainage potentials. Profile descriptions of each mapping unit also discuss possible flooding hazards.

These soil surveys provide good information to start the evaluation process, however they cannot be substituted for a field study of the actual property and surrounding areas. Surveys do not show enough detail to replace onsite testing.

Soil test reports and records of failed local onsite systems also may provide helpful insights. Soil tests show soil types and the differences that may exist in a particular area. This initial information indicates what to expect when the actual field evaluation takes place. Governing agencies, such as the local

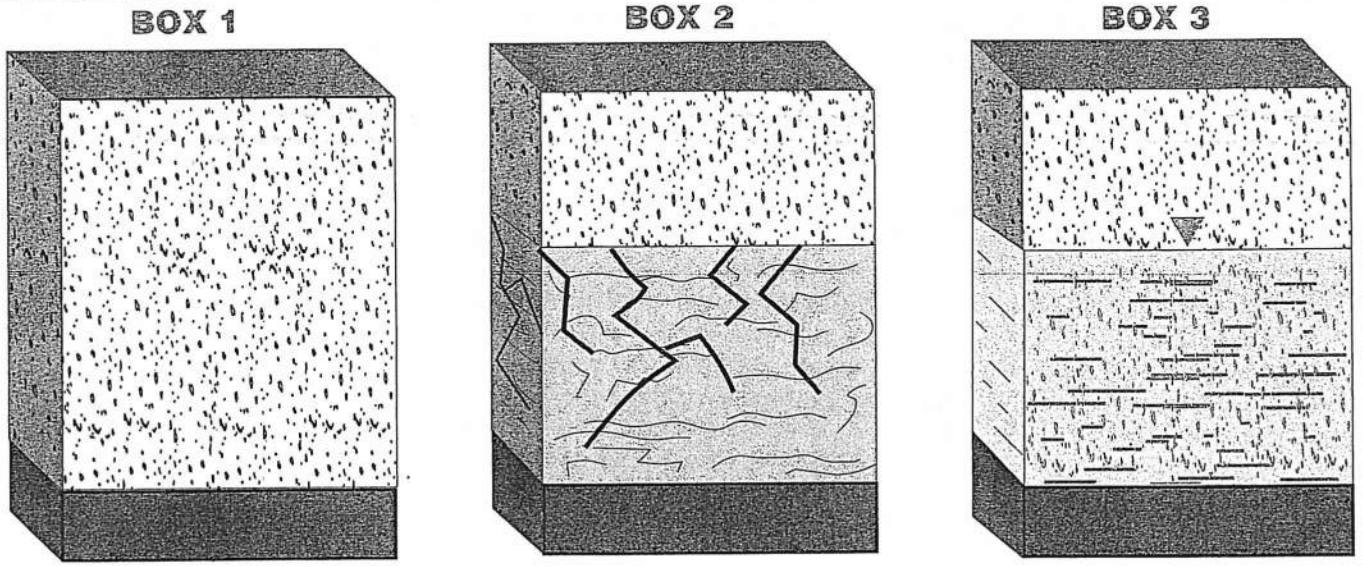


FIGURE 1

These three types of subsurface conditions show ideal to unsuitable soils for treating wastewater with a conventional onsite system. **Box 1** shows ideal conditions: adequate soil depth before a limiting layer causes lateral movement of water. **Box 2** shows fractured bedrock that could allow partially treated wastewater to mingle with groundwater. **Box 3** shows conditions where a high water table would also allow wastewater and groundwater to mix.

This local information reveals general land features and potential issues that should be investigated when planning an onsite system. A diagram (plot plan) of the building lot and the properties adjacent to it should be drawn to a scale that is large enough to display the information gathered in this and later steps. All existing buildings and other man-made features need to be included in the drawing.

health department, often have records of onsite system failures that may help the evaluator determine which type of onsite system might be suitable for the area.

Field testing provides the most information

The most valuable information for siting an onsite system is gathered through testing the soil and drainage conditions on the parcel of land itself.

When evaluators first visit a site, they begin by looking around the property and determining areas that appear suitable for a subsurface soil absorption system. They consider land features like slopes, rock outcrops, watercourses, surface drainage paths, traffic areas, and the types of existing natural vegetation.

They will note low spots, gullies, steep areas, surface puddling, roads, buildings, and other visible factors. The evaluator checks for compacted areas on the property, such as places that might indicate an old road bed. Compaction renders the ground unsuitable for adequate absorption. Also, an onsite system cannot be built on any part of the lot at risk for flooding. As a preliminary indicator, soil borings using a hand auger or a soil probe help in assessing the soil's characteristics.

Size and species of vegetation growing on the land provide helpful information about soil conditions. A soil's depth and drainage affect whether certain plants will grow, so the evaluator identifies plants in the vicinity of the proposed drainfield and determines their growing conditions. Large tree roots can interfere with a conventional system's performance, and therefore some trees may need to be removed to allow for the drainfield.

Landscape contour and subsurface drainage

The slope of a lot affects how well an onsite disposal system operates. Measuring slope is important because knowing the land form and landscape contour at the site helps the evaluator estimate surface and subsurface drainage patterns. Hill tops, ridge lines, and side slopes ordinarily have good drainage above and below ground. Low spots (depressions) and foot slopes are likely to have poor drainage. *(See figure 2 for landscape contours.)*

The type and degree of slope can indicate what surface drainage problems may occur. Convex (outcurving) slopes allow for run-off of rain, and concave (incurving) slopes may catch and hold water.

Wastewater (and precipitation) flowing into the subsoil eventually leaves the absorption field. The water may travel vertically downward for a few feet ultimately reaching the water table. At this point, both existing groundwater and effluent will move laterally in the direction of the slope of the water table or the hydraulic gradient. Normally this gradient is parallel to the ground surface. Where the water table breaks the surface, typically at the bottom of a slope, it may form a spring or become the source of a pond or lake.

Groundwater moving beneath the lot also influences the performance of the onsite system. A flat lot in a flat landscape, such as in a floodplain, is perhaps not an ideal location for effluent dispersal. Little hydraulic gradient exists to move the groundwater from the site, resulting in a water table that is already near the surface, leaving li tle capacity for additional effluent.

A moderate grade of five to 15 percent presents the ideal situation: enough slope exists to move the effluent away at a reasonable depth below the surface; basement plumbing can readily be serviced; and a gravity flow system can

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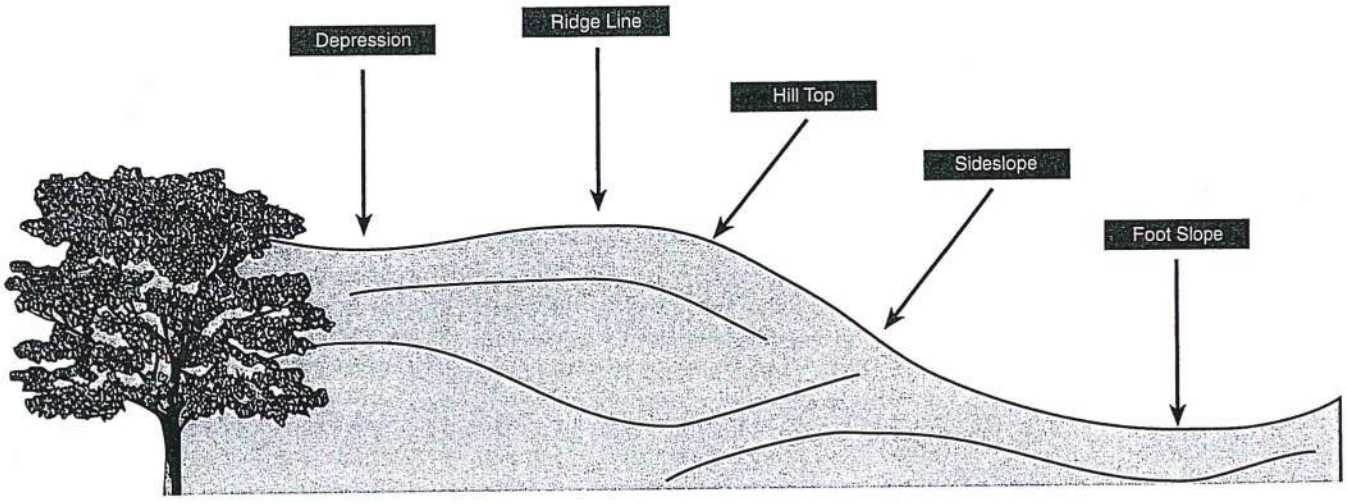


FIGURE 2 Landscape contours help estimate surface and subsurface drainage patterns. Hilltops and side slopes drain well, whereas depressions and foot slopes drain poorly.

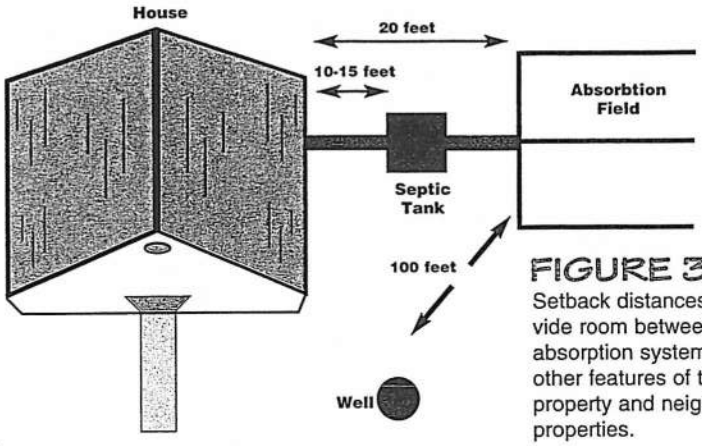


FIGURE 3
Setback distances provide room between the absorption system and other features of the property and neighbors' properties.

continued from page 3

be used so pumping won't be required.

Steeper grades of 15 to 25 percent present more of a construction challenge. These systems can be designed to prevent breakout at the surface by following natural contours and distributing effluent along and between the absorption field trenches.

Rock outcrops signal minimal soil cover over bedrock. When locating an onsite system, avoid these areas because untreated effluent entering fractured bedrock can contaminate wells located hundreds of feet away.

In addition to the previous surface features, horizontal setbacks must be considered. *(See figure 3 above for typical setback distances.)* These setbacks maintain specified distances between the soil absorption field and wells, surface waters, buildings, and property lines. Required setback distances, which differ from state to state, can usually be found in state and/or local regulatory codes.

Soil tests yield more information

Once evaluators visually determine a potential location for an onsite system, they perform a detailed assessment of soil characteristics. This process can best be accomplished by digging a pit (or pits) within the perimeter of the proposed absorption area. (*Contact local utilities before any digging to prevent cutting underground lines.*) An experienced evaluator can possibly perform the soil inspection adequately using a hand auger or probe. However, to be thorough, both methods (soil borings and test pits) are usually employed.

Each pit is excavated to a minimum depth of four feet below the estimated depth of the intended disposal system. The hole must be wide enough to allow natural sunlight to shine directly on the exposed face of the pit wall. To prevent cave-in accidents, the evaluator may take samples from the soil in the backhoe's bucket and inspect the sides of the hole from ground level instead of climbing down into the hole. (*Safety note: the wall of any pit dug four feet deep or more must be shored [supported] if people will be entering the confined space.*)

The pits must be deep enough for the evaluator to determine that enough depth of unsaturated soil (as specified in local governing regulations) exists below the proposed bottom of the absorption area. If the evaluator finds several different soil conditions, more pits may need to be dug.

What does the evaluator look for in the soil?

The evaluator will look at soil texture, soil structure, and soil color. As far as water movement within the soil is concerned, the evaluator determines any seasonal soil saturation, the soil's hydraulic conductivity (the measured rate that water moves through soil), and the soil's potential evaporation capabilities in the event that an evapotranspiration system might need to be used. (Refer to the winter 2000 *Pipeline* issue on evapotranspiration systems.)

Soil texture

Soil texture relates to pore size, pore size distribution and pore continuity. Simply put, texture indicates the various sizes of solid particles in the soil and the proportion of spaces that exist between those particles.

Soils are classified from sandy to sandy loam, loam, silt loam, clay loam, and clay. Sand has the largest particles, and clay has the smallest.

Different classes of soil have different textures. Soil with a high proportion of sand, for instance, is loose, and has single grains that feel gritty. If a dry, sandy soil ball is squeezed in the hand, the mass falls apart when the pressure is released.

Water flows between soil particles, not through them. In most cases, the larger the particles, as with sand, the more quickly water moves through the soil. Soil with a high degree of mixed particles filters out most bacteria, viruses, and other potential disease-causing organisms (pathogens) from effluent. The number of feet of soil beneath the drain bed determines how thoroughly the effluent is treated. This layer of soil acts as a hostile environment to pathogens, greatly reducing their numbers over time.

The evaluator observes the pit's sidewalls in bright, natural daylight. Sidewalls should display obvious texture changes in the different layers of soil, which are called "horizons." The evaluator marks and records depth, thickness, and texture of each horizon.

Soil structure

Structure pertains to how the soil particles group themselves into clusters called "peds." The individual peds are loosely joined but have surfaces of weakness. These weak planes, which open as pores between the peds, are often seen as cracks in the soil.

A soil's structure strongly helps absorb and move water. Well-structured soils with large spaces between peds transmit water more quickly than structureless soils of the same texture, especially if the soil is dry. Conse-

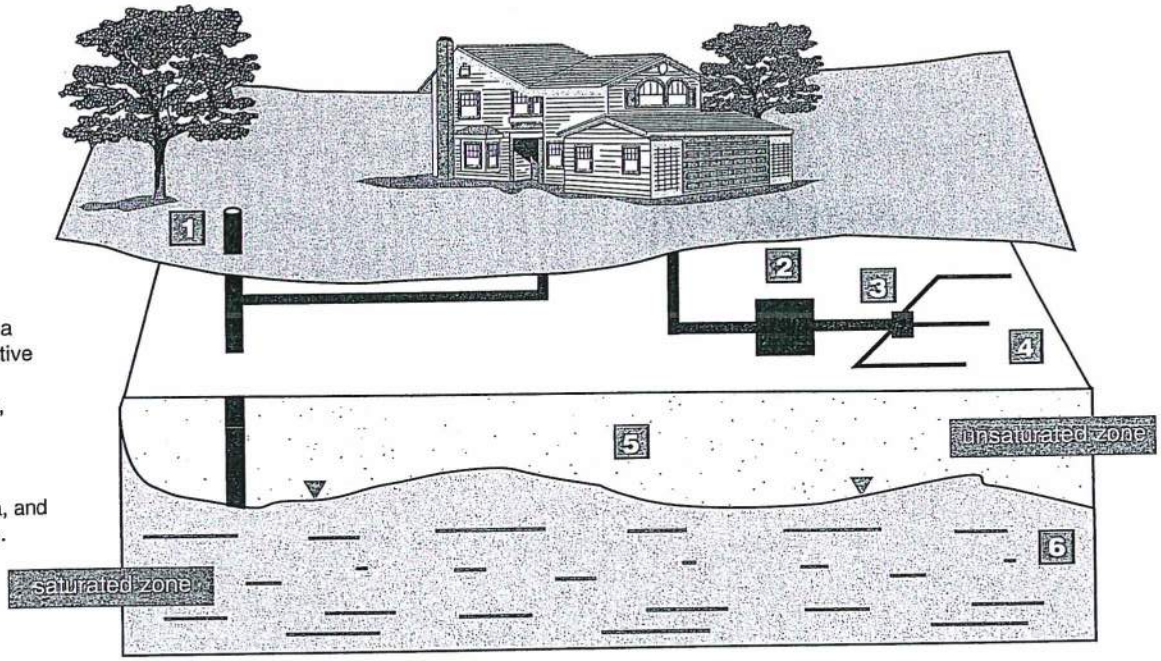


FIGURE 4
An expanded view of a property showing relative positions for the (1) drinking water well, (2) septic tank, (3) distribution box, (4) absorption field, (5) soil absorption area, and (6) groundwater table.

quently, water percolates very slowly through fine-textured, "massive" soils with little structure, such as clay or clay loam.

Because structure can significantly affect water movement through soil, the evaluator may need detailed descriptions of structure.

Soil properties and water movement

A soil's physical properties, the location of a plot of ground in the landscape, and climate all influence how water moves in the soil. *(See figure 4 for positioning a conventional soil absorption system.)* Color and color patterns also reveal whether soil drains sufficiently. Interpreting color helps to identify conditions where soils drain well or where soils remain saturated, affecting that tract of land's ability to absorb and treat wastewater. Again, soil must be examined in bright daylight, not under artificial light, to show true color.

Dark colored—brown or reddish—soils indicate good drainage. Gray coloring indicates poorly drained soil. "Mottling" refers to spots of color often intermingled with gray. This characteristic may indicate seasonally saturated soils. Soil borings made during wet seasons of the year can show whether or not the ground remains saturated.

Observation wells may help determine if drainage problems exist within the proposed absorption field. The evaluator digs these wells into the soil level (horizon) with suspected drainage problems, and monitors the wells for standing water over the course of a normal wet season. If water remains in a well for several days, a conventional onsite system will not function properly in that location. Then, other locations or treatment and disposal options need to be investigated.

A soil's bulk density, or the volume of a mass of dry soil plus its air spaces, indicates porosity and water movement. Soils with high bulk density are less porous and less permeable. For instance, clay soils have high bulk density. Their minute particles are tightly packed with minimal air spaces between them. Clays that swell when they become wet seal off soil pores further and, thus, can virtually stop the flow of water.

This wet condition interferes with effluent moving from the absorption field into the natural soils. During saturated periods, water will not flow as it does when unsaturated. Instead, the water may puddle on the ground's surface above the soil absorption system or back up into the house.

What a site evaluation means to you

The goal of a site evaluation is simple even though the process may seem fairly complex. The evaluator comes to the property, observes site conditions, tests the soils, and determines from the results what onsite system may be most appropriate.

All of this investigating and testing leads to an assurance that a conventional onsite system will adequately treat and dispose of wastewater. If the testing indicates that a conventional soil absorption system won't work, proven alternative systems exist. *(The NSFC offers information about a number of alternative onsite systems that may be helpful. Check the resources on page 8.)*

Once the site evaluation is completed, a builder has the go-ahead to excavate for the onsite system and the house. These initial excavations of home building, plus locating a source of drinking water, compose the basis for the eventual property development.

During construction, heavy equipment *must* not be parked or driven over the area where the onsite system will be located.

As a builder or property owner, the site evaluation will help you feel confident that your onsite system's location won't allow polluting substances to make their way from your home into any of the area's clean water supplies.

Percolation testing for soil drainage evaluation

You've probably heard of a percolation test, or "perc test" as it is commonly called. *(See figure 5 below.)* But what is this test, and how is it used in the process of installing an onsite system?

The theory behind the percolation test is that the rate of water absorbing into the soil of an excavated test hole relates to the amount of water flowing through an onsite system and to how rapidly the system's soil absorbs it. Results of the test are used to help determine if a site can accept an onsite system and the size that the absorption area needs to be.

The "perc" test procedure

Evaluators usually set up three percolation tests spaced uniformly within the proposed absorption area. If the results vary widely, more testing may be needed.

Under one protocol, six-inch diameter test holes are dug or bored to the depth at which the absorption system is to be placed or to the most limiting soil horizon. The sides of the hole need to be roughened to expose the natural soil surface. Loose soil is removed and two inches of one half- to three-quarter-inch gravel is placed in the bottom of the hole to prevent scouring when the water is added.

The hole is filled with at least 12 inches of clear water. This depth is maintained for at least four hours and longer if clay soil is predominant. Soaking helps to saturate the soil, causing it to swell, and leading to more accurate results.

Sandy soils with little or no clay won't need to be soaked. If after the evaluator fills the hole twice with 12 inches of water, and the water seeps away in less than 10 minutes each time, he or she will proceed immediately with the test.

Except in sandy soils, percolation rate measurements are made for at least 15 hours, but no more than 30 hours, after the soaking period begins. Any soil that falls down to the bottom of the hole needs to be removed, and the water level adjusted to six inches above the gravel (or eight inches above the bottom of the hole). The water level must not rise more than six inches above the gravel.

After these adjustments, the water level is measured from a fixed reference point to the nearest one-sixteenth inch at 30-minute intervals. The test continues until two successive water level drops do not vary by more than one-sixteenth inch. At least three measurements are taken. After each one, the water level is readjusted to the six-inch level.

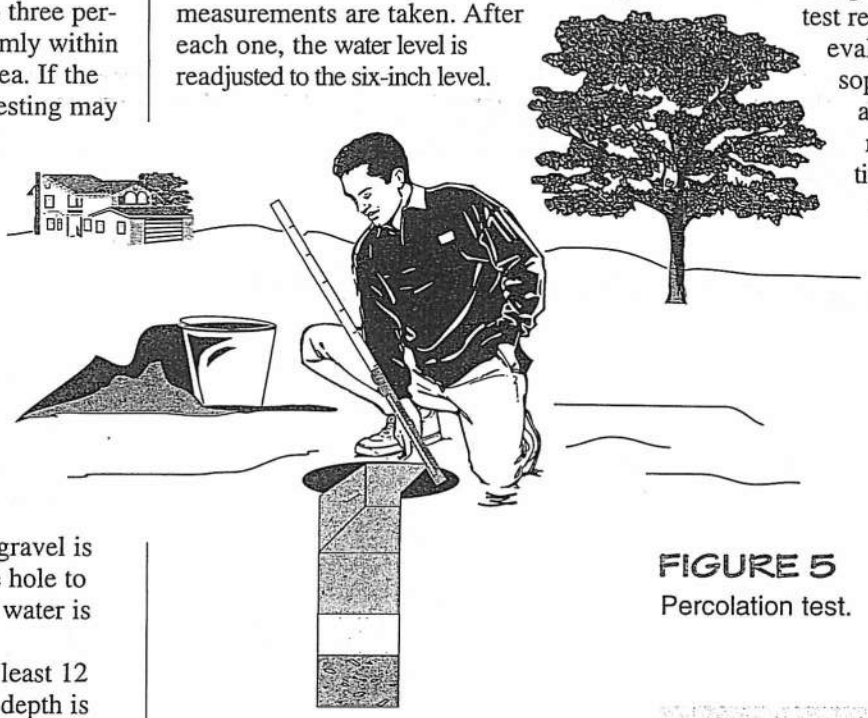


FIGURE 5
Percolation test.

The last water level drop is used to calculate the percolation rate.

The results

Water level measurements are made at 10-minute intervals for one hour in sandy soils or in soils where the first six inches of water added after the soaking period seeps away in less than 30 minutes. The last water level drop is used to calculate the percolation rate.

This calculation of minutes per inch is made for each test hole by dividing the time interval used between measurements by the magnitude of the last water level drop. To determine the percolation rate for the area, the rates obtained from each hole are averaged. If tests vary by more than 20 minutes per inch, soil types may be significantly different throughout the area. Therefore, percolation rates should not be averaged, and additional tests may be necessary.

The percolation test may produce widely varying results depending on the soil's present condition and is best used along with soil boring test results. Detailed soil evaluations and more sophisticated permeability tests are replacing percolation tests in many states because they are more accurate and reliable.

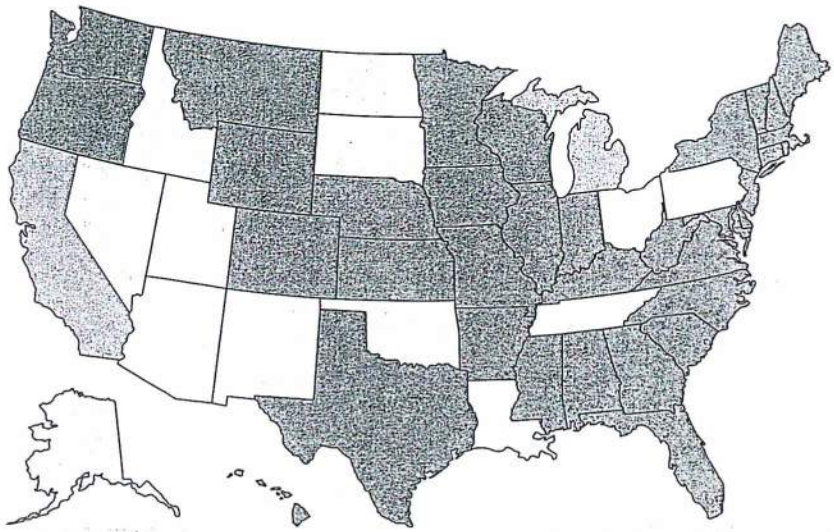
Correction

The Fall 1999 issue of *Pipeline* included a column called "Funding Expert Offers Advice" from Donald Roecker, P.E. Roecker's consulting business' location was incorrectly listed. He operates from Plymouth, Wisconsin, rather than Sheboygan.

You may contact Roecker at (920) 893-8877 or *roecker@compuserve.com* for information about funding issues.

State Level Onsite Regulations/Codes

Many states suggest, and some require, that site evaluations be performed before installing onsite treatment and disposal systems.



❑ site evaluations discussed within state regulations
site evaluations not discussed within state regulations
❑ information not available

Suggested Site Evaluation Procedures

Step	Data Collected
Property owner contacts health department	• Location and description of lot • Intended land use • Volume and characteristics of wastewater
Preliminary evaluation	• Resource information (soil maps, geology, topography) • Records of onsite systems in the area
Field testing of site	• Topography and landscape features • Soil profile characteristics • Hydraulic conductivity of the soil
Other site characteristics	• Site suitability for evaporation or discharge to surface waters (if needed)
Organization of field information	• Compile all collected data



CONTACTS

National Small Flows Clearinghouse (NSFC)

The NSFC offers technical assistance and a variety of free and low-cost publications and materials about wastewater technologies for small communities. Just a few of the NSFC's many resources and services are mentioned in this newsletter. Call the NSFC at (800) 624-8301 or (304) 293-4191 or visit our Web site at *www.nsfc.wvu.edu* for more information.

Extension Service Offices

Land grant universities have U.S. Department of Agriculture (USDA) Extension Service offices on campus and in other locations that provide many services and assistance to small communities. For the number of the extension office in your area, check the government pages of your local phone directory, contact the NSFC at the number listed above, or call the USDA directly at (202) 720-3377.

State and Local Health Departments

Homeowners and residents of small communities who need to have a site evaluation or information about wastewater systems should contact their state or local health department for more information about regulations and requirements. These agencies are usually listed in the government section of local phone directories.

Free State Regulatory Contacts

A list of contacts is free from the NSFC and lists the name, department, address, and phone number of a contact for each state that has onsite wastewater regulations. To order, request item #WWBLRG34. A shipping and handling charge may apply. (Refer to page 8 for more information about ordering NSFC products, including NSFC's guides to state onsite regulations.)

RESOURCES AVAILABLE FROM NSFC

To order any of the following products, call the National Small Flows Clearinghouse (NSFC) at (800) 624-8301 or (304) 293-4191, fax (304) 293-3161, e-mail nsfc_orders@mail.estd.wvu.edu, *or write to NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Be sure to request each item by number and title. A shipping and handling charge will apply.*

New Homeowner Recordkeeping Folder

The NSFC has developed a method to help homeowners keep track of information related to their onsite systems. The "Homeowner Onsite System Recordkeeping Folder" includes sections for recording permit and local health department information, a checklist for information about different system components and accessories, a place to record household information, and a grid for sketching the layout of the system. The price of the folder is $0.40. Item #WWBLPE37.

Site Evaluation for Onsite Treatment and Disposal Systems

This semi-technical report discusses critical site and soil characteristics, the use of soil surveys, and necessary equipment. Factors affecting the percolation test are also covered. The price of the design manual is $5.65. Item #WWBLDM12.

Site Evaluation Technology Package

This book contains several discussions about how site evaluations and soil testing can determine whether a traditional drainfield or an alternative system should be installed in a particular situation. The price of the book is $13.95. Item #WWBKGN83.

Onsite Wastewater Treatment and Disposal Systems

Published by the U.S. Environmental Protection Agency, this 432-page design manual contains important technical information about site evaluation procedures, characteristics of wastewater, different treatment and disposal methods, and management of onsite systems. The price is $45. Item #WWBKDM35.

Site Evaluations and Inspections

NSFC technical assistance specialists have compiled information about regulations governing site evaluations and onsite wastewater inspections from each state in these regionally divided documents. Southeast—Item #WWBKRG60, $11.25; Southwest—Item #WWBKRG61, $4.35; Northwest—Item #WWBKRG62, $4.50; and Northeast—Item #WWBKRG63, $13.20.

Guide to State-Level Onsite Regulations

This newly updated NSFC publication is a guide to state onsite system regulations. The guide includes a glossary, citations from state regulations, state regulatory contacts, a matrix (chart) showing which states address particular onsite issues and technologies in their state regulations, and a list of additional resources. The price is $12.50. Item #WWBKRG01.

PIPELINE

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Summer 2000
Vol. 11 No. 3

Pipeline

Small Community Wastewater Issues Explained to the Public

ALTERNATIVE TOILETS Options for Conservation and Specific Site Conditions

How often do we think about toilets? Probably pretty rarely, and why would we? Toilets provide a convenience most Americans take for granted.

But the standard porcelain fixture we're accustomed to has been changing in these times of water quality protection and conservation. Manufacturers are designing alternative toilets that use much less water and some models that use no water at all.

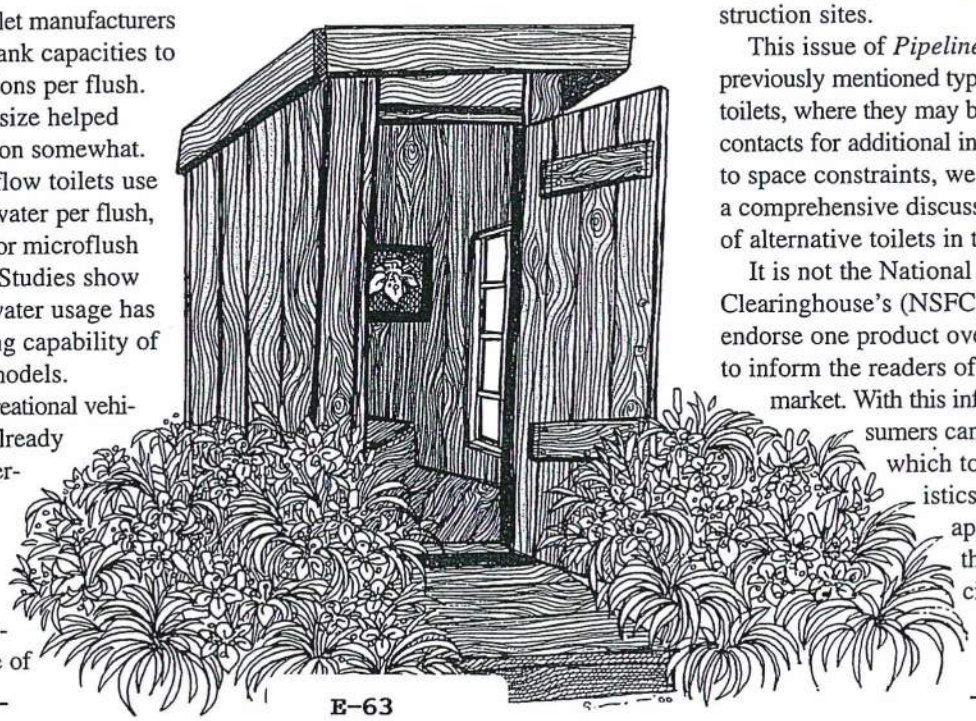
Old-fashioned, water-guzzling toilets of the past consumed up to five gallons of water per flush. (*See table 1 on page 2.*) Many households still use these dinosaurs. Obsolete toilet designs contribute to the estimated 9,000 gallons of potable water that a person uses to flush away 130 gallons of human waste a year. That's an awful lot of good, clean water swirling down the commode.

Twenty years ago toilet manufacturers began to reduce their tank capacities to a maximum of 3.5 gallons per flush. This reduction in tank size helped lower water consumption somewhat. Today's standard low-flow toilets use a mere 1.6 gallons of water per flush, and the ultra-low-flow or microflush designs use even less. Studies show that this reduction in water usage has not reduced the flushing capability of these toilets in many models.

Owners of boats, recreational vehicles, and campers are already familiar with some alternative toilet systems. Ultra-low-flow, vacuum, and chemical toilets have been used for years in these limited spaces. Today some of these toilet designs have developed beyond their use in vacation and travel vehicles. They have become part of a strategy to reduce the amount of potable water used for waste disposal.

Water conservation isn't the only reason that toilet alternatives have evolved. Certain site conditions or lack of a water supply may make the traditional septic tank and soil absorption field unsuitable for a home or public restroom facility's wastewater (effluent) disposal. These problems force a landowner to explore other effluent disposal methods.

In addition to alternative effluent treatment processes, a variety of efficient, low-flow or waterless toilet systems are available that can resolve the dilemma of unsuitable site conditions. Toilet options include composting, incinerating, chemical, and oil flush toilets, and privies.



Readership Survey

We have included a readership survey in this issue of *Pipeline*. Your feedback helps us know if we're satisfying readers' needs and decide on topics for future issues. Please take a few moments to answer these questions so that we may better serve you.

Each toilet has certain features that may make one design more appropriate than another for a family's lifestyle. Some toilets are better suited for infrequent-use situations, such as in vacation cottages or recreational vehicles. And some, like the composting toilet, require a commitment to maintain and remove composted waste material from the storage tank. Privies and portable toilets are most often used in parks, at large outdoor gatherings, or on construction sites.

This issue of *Pipeline* discusses the previously mentioned types of alternative toilets, where they may best be used, and contacts for additional information. Due to space constraints, we cannot present a comprehensive discussion of all types of alternative toilets in this newsletter.

It is not the National Small Flows Clearinghouse's (NSFC) intention to endorse one product over another, but to inform the readers of options on the market. With this information, consumers can better decide which toilet characteristics may be most appropriate in their individual circumstances.

Toilet Options: Ultra-low-flow



Figure 1. This ultra-low-flow toilet from Microphor in Willits, California, uses 0.5 gallons of water per flush.

Ultra-low-flow toilets

Water conservation awareness prompted manufacturers to begin making more efficient toilets in the early 1980s. The federal government established a national manufacturing standard in 1994 mandating that new toilets sold in the U.S. use a maximum of 1.6 gallons of water for flushing.

Studies across the country show that these low-flow toilets reduce water use by 23 to 46 percent, saving an average 10.5 gallons of water per person daily. According to the U.S. Environmental Protection Agency's Office of Water, through the use of water-efficient toilets in new construction and normal replacement, the U.S. is expected to save 7.6 billion gallons of water per day by 2020.

Some toilet manufacturers have taken water reduction further with ultra-low-flow models. (*See figure 1.*) These toilets can use as little as 0.25 gallons per flush. Products vary in that they may have narrower bowls with a smaller water surface, manually controlled water flow (via a foot pedal) into the bowl, or water pumps to assist in bowl emptying and cleaning.

One model eliminates the "S" trap of a conventional toilet design, enabling waste to be washed down using less water. Another product flushes by opening a hinged flap to let wastes and a small amount of water fall into a lower chamber. After several seconds the flap reseals, and a blast of compressed air forces the wastewater over the trap and out a discharge line from the toilet.

Public parks, restaurants, hotels, and other public facilities, such as roadside rest areas, are installing these ultra-low-flow toilets to help reduce water consumption and subsequent wastewater disposal. Ultra-low-flow toilets also enable business construction in areas where restrictions may limit sewage disposal capacity.

For example, many resort areas and municipalities place restrictions on sewage capacity flowing into publicly maintained systems. Ultra-low-flow toilets may make building in these areas possible. Similarly, facilities (like resort hotels) facing expansion difficulties due to the size of their existing onsite systems may install ultra-low-flow toilets, thus enabling their present onsite systems to adequately treat the reduced wastewater flow. (*Note: This reduction in wastewater quantity does not reduce the organic loading rate to the system.*)

Advantages:

- Ultra-low-flow toilets reduce water consumption and costs to the consumer.
- They contribute to preserving the environment by protecting ground water from depletion and possible contamination.

Disadvantages:

- Some ultra-low-flow models may require flushing more than once to adequately clean the toilet bowl.

Important!

Toilet systems in buildings without access to public sewage that discharge human waste must have some treatment system in place, whether a holding tank for subsequent pumping and disposal or an onsite sewage treatment system. Homes and facilities using toilets that do not discharge wastewater, still need to have a treatment system in place to treat and dispose of all other household wastewater.

Readers are encouraged to reprint this issue or any *Pipeline* articles in flyers, newspapers, newsletters, or educational presentations. We request that you include the name and phone number of the NSFC on the reprinted information and send us a copy for our files.

If you have questions about reprinting articles or about the topics discussed in the newsletter, please contact the NSFC at (800) 624-8301 or (304) 293-4191.

TABLE 1. Annual Total Water Usage by Toilets*

Water Consumption by Toilets gal/flush	Water Consumption by Number of People in Household gal/year				
	1	2	3	4	5
1.5	2,190	4,380	6,570	8,760	10,950
3.5	5,110	10,220	15,330	20,440	25,550
5.0	9,125	18,250	27,375	36,500	45,625
7.0	10,220	20,440	30,660	40,880	51,100

* Assumes four flushes per day per person for 365 days.

Toilet Options: Composting

Composting toilets

A number of designs for composting toilets exist, but the process for waste treatment is basically the same in each of them. (*See figure 2 for an example of a composting toilet system.*) Human waste is biologically decomposed in a relatively moist environment by naturally occurring microorganisms. A typical system consists of a composting reactor tank or bin (sized according to frequency of use and number of users) connected to one or more waterless toilets in the house or other structure.

The reactor bin contains and controls the decomposition of excrement, toilet paper, and any organic (carbon-based) bulking agents. Bulking agents may include wood chips (other than cedar or redwood), straw, hay, or grain hulls. No liquid is added to the collected material inside the bin except for urine. This condition promotes the growth of aerobic (air-requiring) organisms that decompose the waste.

Temperature within the reactor also plays a role in composting. The process itself creates heat in the material being composted. High temperatures may inhibit growth of beneficial organisms, thereby slowing decomposition. Low temperatures (less than 41° F) may stop the composting process until temperatures increase enough for biological decomposition to resume. Composting activity is best between 78° F and 113° F.

An exhaust system (which is usually driven by a fan) vents odors, carbon dioxide, and moisture from the reactor bin to the outdoors. Air must also be drawn into the system so oxygen is available for growth of the aerobic organisms. Screening should tightly cover the exterior vent pipe opening to prevent flies and/or other insects from entering the composting system.

During the composting process, naturally occurring aerobic bacteria and fungi break down organic materials. Bulking agents need to consist of materials that break down quickly to avoid filling the bin with these substances.

Urine usually keeps the composting waste material moist enough—50 to 70 percent moisture is fine for thorough decomposition. But, decomposition nearly stops if the moisture level drops below 40 percent. To remedy an over-dry condition, some designs have a sprayer built in that draws liquid collected in the bottom of the reactor to rewet the pile.

As in any composting action, the decomposing material needs to be turned periodically to break up the mass. This action helps the pile to remain porous and aerated so that the aerobic organisms can accomplish their work.

A correctly sized and maintained composting toilet system produces a final material that is 10 to 30 percent of its original volume. The product that remains, called "humus," resembles soil, but legally must be either buried or removed by a licensed septage hauler, depending on state and local regulations.

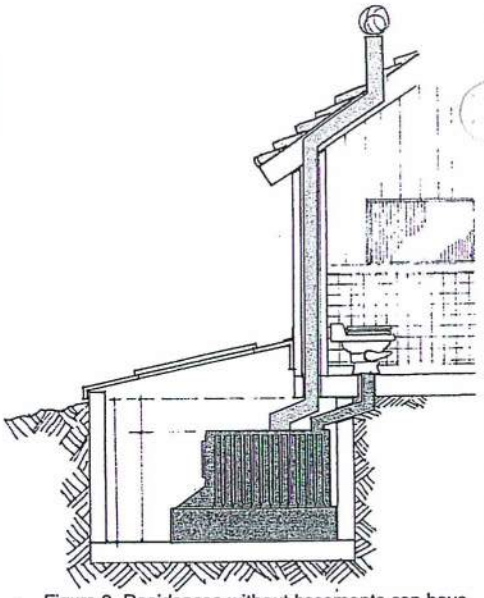


Figure 3. Residences without basements can have a composting reactor bin built in a water tight structure adjacent to the house beneath the ground's surface. *Clivus Multrum illustration.*

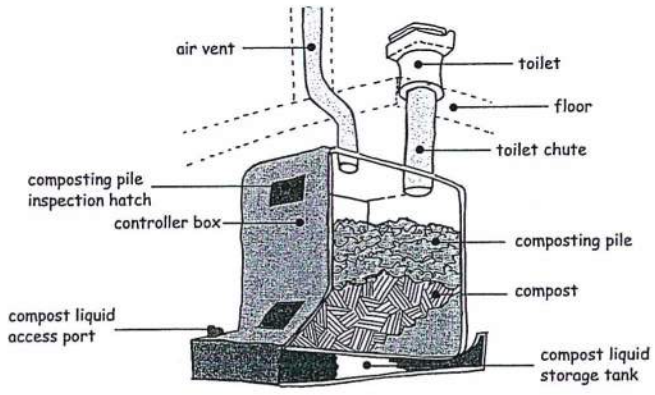
The composting bin and the toilet stool or seat can be constructed as a self-contained unit. (*See figure 4.*) Self-contained systems, because of their small size, are most suitable for vacation cottages or very small families. Daily residential use may overload these smaller toilet systems, so the consumer should consider purchasing a system with extra capacity.

Alternatively, composting toilets can be connected to a centralized tank reactor located in a basement of a home or built beneath the toilets, as in a public restroom. (*See figure 3 for an example.*) These larger composting reactors can be built with rotating drums, as mentioned earlier, to encourage waste decomposition. Or, they may be built with a sloped bottom where fresh wastes remain at the top of the slope as the bottom of the pile ages. Heat and a fan-powered exhaust system help remove excess moisture and speed the composting process in some models.

The composted end-product can be produced in either a single-chambered, continuous process or in multi-chamber batch units. A continuous composting system has a single chamber for con-

continued on page 4

Figure 2. A typical single-chambered composting toilet system. *Illustration based on the Clivus Multrum system.*



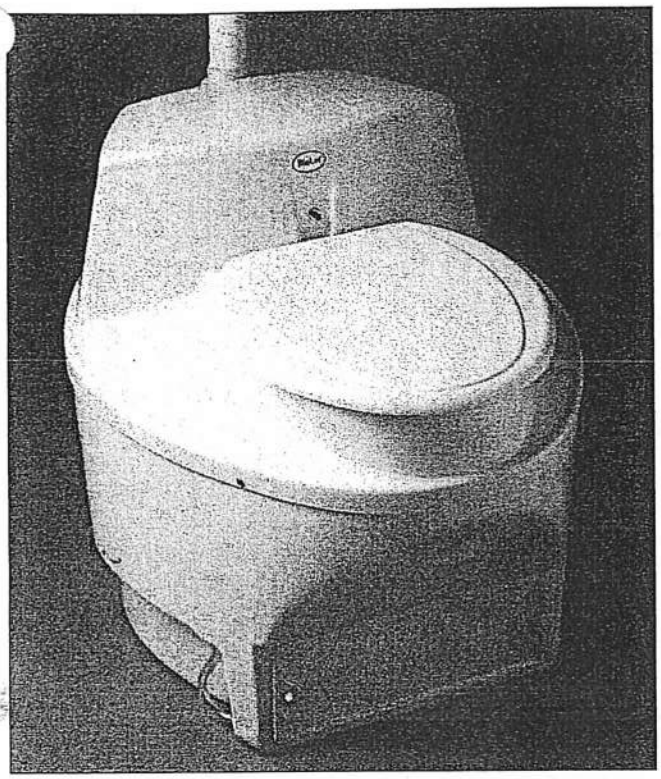


Figure 4. A self-contained composting toilet unit. The composting bin is located under and behind the toilet seat. Photo courtesy of BioLet U.S.A.

continued from page 3

taining the waste material, which is added to the top of the unit, and the finished compost is removed from the bottom.

A batch composter has at least two chambers. When one chamber is filled, the waste stored inside is left to break down, and the system is switched to use the other chamber. These systems segregate the older waste material from fresh material, thus reducing the risk of finding living disease organisms (pathogens) in the finished compost.

Composting systems may also have active or passive reactor bins. Passive systems use a simple, moldering or crumbling process, whereby the waste material accumulates and decomposes without added heat, electric fans, or mechanical mixing. Active systems may have any or all of the following features: automatic mixers, pile-leveling devices, tumbling drums, thermostatically controlled heaters, and fans.

Advantages:

- Composting toilets do not require water for flushing, thereby reducing household water consumption.
- They reduce the amount and strength of wastewater to be disposed of onsite.
- They are well suited for remote sites where conventional onsite systems are not feasible.
- They have low power consumption.
- Composting toilets productively recycle human waste back into the environment.
- They can compost selected kitchen waste, reducing household garbage.
- They may allow a property owner to install a reduced-size soil absorption system for graywater disposal, minimizing costs and disruption to the landscape. (*Check local and state regulations.*)

Disadvantages:

- Maintenance of composting toilets requires a high level of responsibility and commitment by owners.
- Removing the end-product is an unpleasant job if the system is not properly installed or maintained.
- Composting toilet systems must be used in conjunction with a graywater system where other plumbing fixtures are in place.
- Smaller units may have limited capacity for accepting peak loads.
- Improper maintenance makes cleaning difficult and may lead to health hazards and odor problems.
- Using an inadequately treated end-product as a soil amendment may have possible health and environmental consequences.
- Composting excrement may be visible in some systems.
- Too much liquid in the composter can disrupt the process if it is not drained and properly managed.
- Most composting toilet systems require a power source.

Composting Toilet Do's and Don'ts

Do:

* Keep the toilet seat cover down and the waste valve closed when not in use to prevent odors from escaping.
* Put toilet paper into the toilet.
* Add organic bulking material to the toilet occasionally.
* Clean the seat area with mild soap.
* Determine the proper disposal means according to state and local regulations.

Don't:

* Throw any trash (sanitary products, diapers, paper-towels, etc.), cigarettes, matches, or burning material into the toilet.
* Use harsh chemicals, chlorine bleach or toxic chemicals on or in the toilet.
* Pour quantities of water into the toilet.
* Empty compost from bin until it is decomposed.
* Remove compost from a filled external composter unless it has been composting for six to 12 months or longer.

From *The Composting Toilet Book.*

County Park Solves Restroom Problem

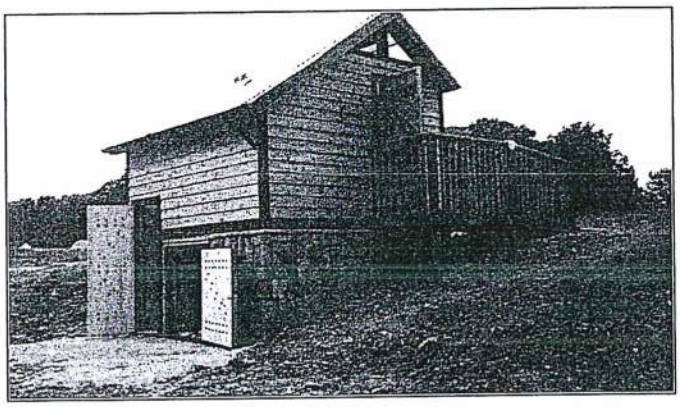
Two restrooms recently built at the new Quail Ridge Park in St. Charles County, Missouri, are considered both ecologically and user friendly. These restrooms require no public water or sewage connections.

The park uses a composting toilet system design, wherein human waste decomposes through the work of the natural elements of air, sunshine, and pine chips. A fan powered by solar-energized batteries sucks air downward from the toilet, virtually eliminating the odors that plague most outhouses.

Curt Loupe, director of the St. Charles County Parks and Recreation Department, said he and his staff researched composting toilets because the Quail Ridge Park site does not yet have access to public sewer lines.

Loupe heard from other park directors and employees from around the country that they had encountered "the cleanest, neatest restrooms they had ever been in" at the Grand Canyon National Park. This information prompted Loupe to contact the National Park Service for a list of companies that install restrooms in isolated parts of public parks. Loupe checked out the alternatives and decided on the composting system.

Two plastic tanks, roughly eight feet tall, sit in a basement area under each of the restrooms. Kevin Mills, who provided the composting toilet system at Quail Ridge Park, explained that waste material is deposited onto pine chips in the bin. Solar-heated air from roof-mounted collectors is forced downward through pipes into the system to increase the decomposition rate. Moreover, the basement is insulated to maintain a constant temperature conducive to composting.



This restroom facility is located at Quail Ridge Park in St. Charles, Missouri. The basement holds two composting reactor tanks. Solar radiation provides both heat and electricity to the building. *Photo courtesy of Kevin Mills.*

The composting wastes are stirred periodically by tines that rotate by turning a crank from outside the container. An automatic sprayer, using fluids collected in the bottom of the reactor bin, maintains the proper degree of moisture in the composting material.

Mills explained that a 200-gallon tank holds collected rainwater for the sinks and to clean the building. The solar collector panels in the roof charge batteries that operate all of the electrical equipment including the pump that provides the pressure for the wash-down hose and the sprinkler system.

"This is a pretty complex little building," Mills said. "It's got solar heating, solar electricity, rainwater catchment for clean-up water, self-closing toilet seats, a clear roof, on and on. It's very nice."

The end product of the composting process is collected in a plastic tray containing about two cubic feet of material that is "kind of like topsoil" that can be used in an ornamental garden or spread in a nearby field (depending on state and local regulations).

Portions of this material were taken from an article in the May 22, 1999, St. Louis Post-Dispatch.

Historic Town Leaps into 21st Century

Virtually everyone who visits Old Town Spring in the extreme northern part of Harris County, Texas, comes to take a step back in time and to have a great experience. This village features many antique stores, specialty shops, and a variety of restaurants. The atmosphere is pleasant and easy going.

Until recently, the village lacked one vitally important feature—a public restroom. Because centralized sewers don't extend to Old Town Spring, an onsite system was the appropriate choice for wastewater treatment.

The onsite system that was designed for the village uses waterless urinals and ultra-low-flow 0.5-gallon toilets. The wastewater runs through a series of several septic tanks followed by an aerobic treatment system. Effluent is disinfected and pumped to a high pressure sand filter. This wastewater is then recycled to flush the toilets. The water is colored with a blue-green tint so people will know it is not potable water.

At the end of the recycling process, the effluent is distributed to a small 5,000-square-foot drainfield that provides landscaping around the public restroom building and an adjacent small museum. The system is designed so that, on average, a gallon of wastewater is recycled and reused five times before it is sent to the disposal field.

"This system is a real blessing for the area because more than 1,000 people come to visit and shop here on a typical weekend," John Blount, manager of the Harris County Engineering Office onsite wastewater program, said. "Obviously they needed a public restroom because so many of the shops are small and lack such facilities. In fact, people were so excited when this [facility] was built two years ago that community leaders hosted and participated in a 'potty parade' to celebrate the opening of the system."

Information courtesy of Texas Onsite Insights *(August 1997), on the Web at* http://twri.tamu.edu/twripubs/Insights.

Toilet Options: Incinerating

Incinerating toilets

Incinerating toilets are self-contained, waterless systems that don't discharge any effluent. They rely on electric power, oil, natural gas, or propane to burn human waste to a sterile ash. When properly installed, an incinerating toilet is safe and relatively easy to maintain.

An electric-powered incinerating toilet (*see figure 5*) is designed with a paper-lined upper bowl to hold newly deposited waste. This paper liner is replaced after each use. "Flushing" is accomplished by pressing a foot pedal, causing an insulated chamber cover to lift and swing to the side while the bowl halves separate. The paper liner and its contents drop into the incinerating chamber. When the foot pedal is released, the chamber cover reseals, and the bowl halves return to the closed position.

The system is designed to burn individual deposits, while outside surfaces remain cool to the touch. Burning begins with a press of the "start" button located on the frame of the toilet. An electric heating unit cycles on and off for 60 minutes while a blower motor draws air from the incineration chamber over a heat-activated catalyst to remove odors. The air then flows (with help from a fan) to the outdoors through a vent pipe. The fan continues to run after the heating cycle finishes to cool the incinerating unit. The entire cycle of burning waste to a small amount of ash takes from 1.5 to 1.75 hours.

Maintenance of the electric incinerating toilet includes:

- regular emptying of the ash collection pan,
- cleaning the outer surfaces including the upper bowl halves,
- periodic (every 90 days) cleaning of the blower motor and occasional replacement of the blower wheel,
- cleaning and lubricating the foot pedal mechanism, and
- annual inspection of the odor-removing catalyst.

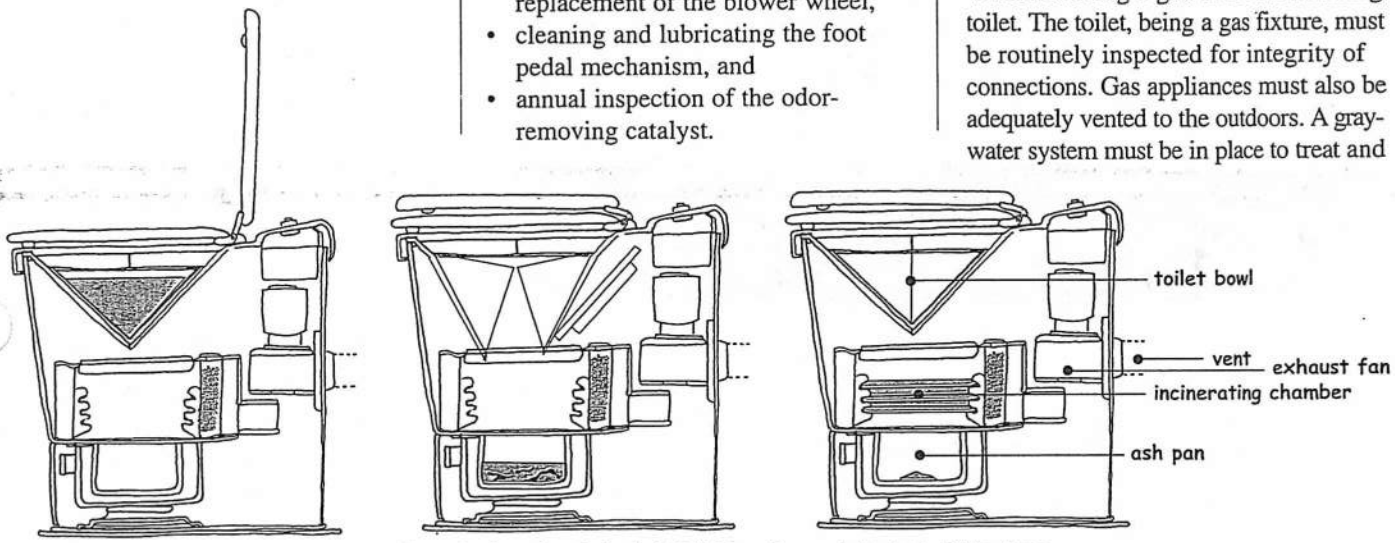


Figure 5. An electric incinerating toilet system. *Illustration based on the Incinolet toilet from Research Products, Dallas, Texas.*

A gas-fired incinerating toilet can be installed anywhere that has a propane or natural gas source. The toilet unit has an integral storage tank that can accommodate 40 to 60 uses before beginning the incinerating cycle. According to the only manufacturer of gas-fired incinerating toilets, Storburn International Inc., these systems can accommodate eight to 10 workers in an average work day or six to eight people in a cottage or residence in a normal-use day.

Gas-fired incinerating toilets do not have a toilet bowl. The waste drops into a holding chamber directly beneath the seat of the unit. An aerosol masking foam can be used to reduce odors and cover wastes between incineration cycles.

Before the burning process begins, an anti-foaming agent must be added to the heating chamber to reduce the likelihood of liquid wastes boiling over during incineration. The toilet seat is lifted and a cover plug is inserted over the chamber opening to act as a fire wall.

A timer is set according to the recommended duration for the load size. A gas valve is turned to the pilot position and ignited by pressing a button. The pilot light ignites the burner, which automatically locks down the unit (similar to a self-cleaning oven), so the toilet cannot be used during the burning cycle. The complete incinerating cycle takes from 1.5 to 4.5 hours, depending on the waste load.

Several factors must be considered when installing a gas-fired incinerating toilet. The toilet, being a gas fixture, must be routinely inspected for integrity of connections. Gas appliances must also be adequately vented to the outdoors. A gray-water system must be in place to treat and dispose of all other wastewater produced in the home or building. An air space must be provided beneath the unit to ensure proper drafting/airflow during the incineration cycle. Rugs and carpets should not be installed under the unit. And, intake air vents may need to be installed if the incinerating toilet is installed in an enclosed, air-tight room.

Advantages:

- Units are self-contained and use no water.
- No effluent is discharged.

Disadvantages:

- A power source must be available.
- Ash must be removed and the incinerating unit must be cleaned.
- Units cannot be used during the incinerating cycle.
- Incinerating toilets are not practical for public use.

Toilet Options: Other Alternatives

Other toilet alternatives

Several additional alternative toilet designs can be purchased and installed for home use or public restrooms, depending on needs and individual preferences. One, the oil-flush toilet, uses a closed-loop system that employs mineral oil to flush wastes from the toilet bowl. The waste flows to a gravity separation tank where the oil floats to the top and the heavier wastes sink. The oil is then drawn off the top, filtered, and recirculated to the toilet. The oil remains clear and odorless. Wastes are drained from the bottom of the collection tank and are then incinerated, composted, or removed by a licensed septage hauler.

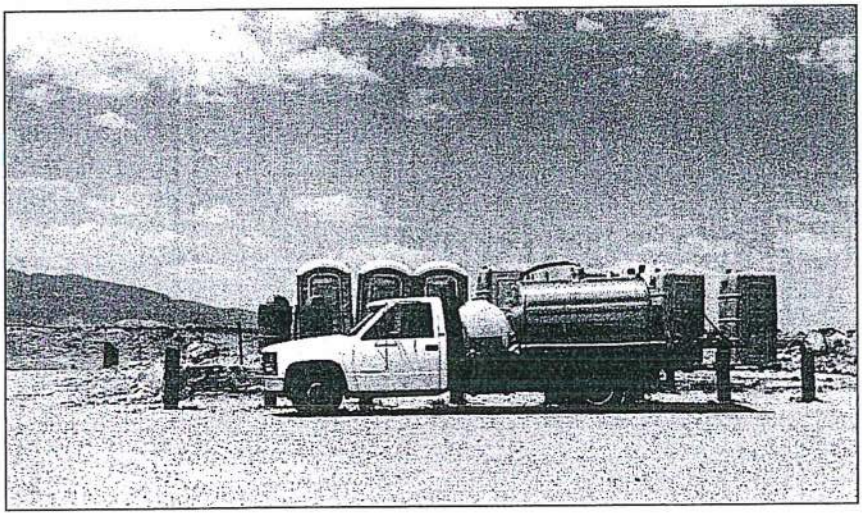


Figure 6. Portable toilets, like these at Four Corners, where Colorado, Arizona, New Mexico, and Utah meet, must be pumped out frequently by a sanitation service tank truck.

Chemical toilets are similar to other models that store wastes in a holding tank. Water mixed with chemical preservatives is the medium for holding wastes. These substances stop biological activity and prevent decomposition. The volume of waste and organic strength are not reduced. A valve opens to drain the holding tank in some models, or the entire holding tank lifts out in other models. Chemical toilets, like the portable toilets shown in figure 6, require

- onsite storage of chemicals and waste,
- regular waste removal by a licensed hauler, and
- the waste must be treated at a sewage treatment facility. (*Note: Chemical toilets may upset or inhibit the biological processes used in conventional treatment plants, so the facility must be designed to accept these wastes.*)

Vacuum toilets are used most often in boats. They consume about 0.25 gallons of water per flush. A vacuum is maintained in the system at all times. Water is drawn into the bowl by lifting a lever in one model, then flushing is accomplished by pressing the lever. The change in pressure in the vacuum tank activates the vacuum pump, which pulls the wastewater down through the system and deposits it in the holding tank.

Privies or outhouses still have a place in today's world. Some public parks, homes, and cottages in remote areas still use pit privies to contain human wastes. These facilities may seem primitive, but when properly constructed and maintained, they can adequately resolve the problem of sanitary human waste disposal. State and local guidelines must be followed in constructing privies.

An open pit privy consists of a small building situated above a hole in the ground. Privies should not be located on soils with a high water table, on a flood plain, or in an area where bedrock is close to the ground's surface. Solid wastes decompose into humus in the pit, and liquids seep into the soil.

A sealed vault privy, which is more likely to be seen in state and national parks, has a holding tank set into the ground below the privy building.

The tank, which should be capable of holding up to 1,000 gallons of waste, must be pumped out periodically, depending on frequency of use. The tank must be air and water tight, except for the waste entry hole and a vent stack that extends above the roof of the privy. Some regulations require a self-closing door. As with open pit privies, vault privies should not be installed on a flood plain or where a high seasonal water table occurs.

FYI

The Environmental Services and Training Division has re-established their online discussion boards in a new form. Please check them out and contribute at the following Web sites:

http://www.estd.wvu.edu/forum/nsfc

http://www.estd.wvu.edu/forum/ndwc

http://www.estd.wvu.edu/forum/netc

http://www.estd.wvu.edu/forum/nodp

Correction Spring 2000 *Pipeline*

The map on page seven of the spring 2000 *Pipeline* incorrectly indicated that site evaluations are not discussed in Idaho state regulations. We apologize for this inaccuracy.

RESOURCES AVAILABLE FROM NSFC

To order any of the following products, call the National Small Flows Clearinghouse (NSFC) at (800) 624-8301 or (304) 293-4191, fax (304) 293-3161, e-mail nsfc_orders@mail.estd.wvu.edu, *or write to NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Be sure to request each item by number and title. A shipping and handling charge will apply.*

Alternative Toilets Technology Package

This book lists addresses, telephone numbers, and product literature for manufacturers of alternative toilet systems such as composting, incinerating, low-flush, and portable toilets. Product brochures from 12 manufacturers are included. The price is $7.20. Item #WWBKGN09.

Computer Search: Composting Toilets

Eight abstracts are included in this NSFC computer search on composting toilets. Description, applicability, treatment capacity, operation, maintenance requirements, cost, and design are discussed. Cost for the booklet is $5.35. Item #WWBLCM02.

Customized Bibliographic Database Search

Individual computer searches of the NSFC's bibliographic database are available by request. Call the NSFC and ask to speak with a technical assistance specialist to request a search. A per-page charge will be assessed. Item #WWPCCM12.

Computer Search: Low-Flush Toilets

Included in this booklet are lists of article citations and abstracts on the topic of low-flush toilets from the NSFC's bibliographic database. Cost for the booklet is $2.75. Item #WWBLCM21.

Alternative Toilets from the State Regulations

This book is a compilation of each state's onsite regulations related to no-flow toilets (composting toilets, incinerating toilets, privies, recycling systems, and chemical toilets). A list of state regulatory contacts is provided. The price is $15.40. Item #WWBKRG23.

The Alternative is Conservation

This 20-minute video discusses water conservation as a way to lower demands on water supply and lower wastewater volume. It also discusses the use of low-flow devices and composting equipment. The price of the video is $10. Item #WWVTGN13.

PIPELINE

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NATIONAL SMALL FLOWS CLEARINGHOUSE

Small Community Wastewater Issues Explained to the Public

Water Softener Use Raises Questions for System Owners

Parts of the U.S. have what is commonly referred to as "hard water," and people who live in these areas battle the problems that hard water creates. The most common defense against hard water, which is a nuisance but not a health hazard, is to install a home water softener.

Water softening involves exchanging calcium and magnesium minerals present in the water—which cause the hardness—with sodium. As the water softener processes gallon after gallon of hard water on a daily basis, the treatment capability of the softener becomes depleted and must be recharged or regenerated. (*The complete water softening process is explained beginning on page 2.*)

Regenerating the unit uses a large quantity of sodium-rich water, called "brine," that must be disposed of. In homes with onsite septic systems, this brine flows into the septic tank and eventually makes its way to the system's drainfield.

People using home water softeners often wonder whether these units might cause problems for their onsite septic systems. Some common questions consumers ask are:

- Do water softeners hurt the bacteria that work in a septic tank?
- Does the additional amount of water from water softener regeneration affect a septic system's performance?
- Does the concentrated salt water used in regeneration decrease the drainfield's ability to absorb wastewater?

Unfortunately, experts don't all agree on the answers to these questions. Research has been done that resulted in acceptable conclusions to many people in the industry, but some authorities believe that more studies are needed to determine what impact, if any, brine has in a septic system.

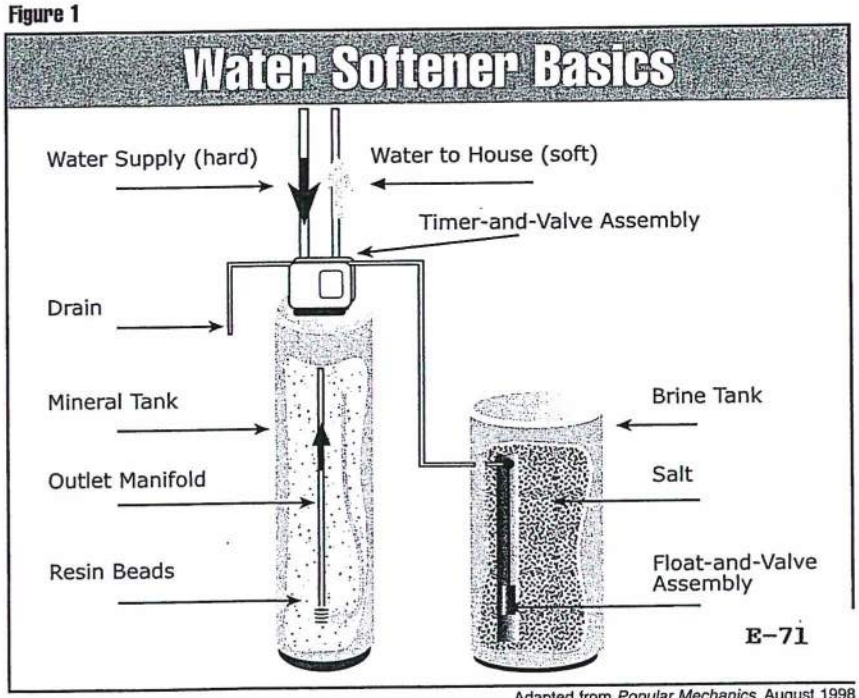
Because of these differences of opinion, this *Pipeline* issue is unlike most others. Ordinarily we offer information that gives readers concrete answers. But because water softener brine disposal remains somewhat controversial, *Pipeline* will provide opinions on the research that has been done to date.

We know people want information about this subject. At this point, our mission is to help readers become better educated consumers so that they can make informed decisions when trying to resolve their hard water problems. Some steps that homeowners can take to minimize their concerns about the safe operation of their onsite sewage systems are included.

Readers are encouraged to reprint this issue or any *Pipeline* articles in flyers, newspapers, newsletters, or educational presentations. Please include the name and phone number of the National Small Flows Clearinghouse (NSFC) on the reprinted information and send us a copy for our files.

If you have questions about reprinting articles or about the topics discussed in the newsletter, please contact the NSFC at (800) 624-8301 or (304) 293-4191.

Figure 1



Adapted from *Popular Mechanics*, August 1998

What makes water hard?

And how does it become soft?

As water flows through layers of rock underground, it picks up loose particles and dissolves minerals from its surroundings. Because of this characteristic and the kind of rock common in many aquifers, calcium and magnesium minerals are frequently found in household water. Water with substantial amounts of calcium and magnesium is referred to as "hard water."

Hard water minerals reduce water's ability to function effectively in our homes. For instance, bath soap combines with the minerals and forms a pasty scum that accumulates on bathtubs and sinks. Homeowners must use more soap and detergent in washing, so expense for these products increases.

These minerals also combine with soap in the laundry, and the residue doesn't rinse well from fabric, leaving clothes dull. Hard water spots appear on everything that is washed in and around the home—from dishes and silverware to the family car.

Hard water not only affects household cleaning, but the minerals also can build up on the inside of pipes in the plumbing system. And in water heaters, the minerals settle on the heating element, the walls of the tank, in the hot water pipes, and in faucets where they produce a scale (similar to the original rock) that reduces the efficiency and life of the hot water system.

Water Softeners Make Water Work Better

Water softeners combat this nuisance by eliminating the minerals that cause hard water. The most common kind of water softener is a mechanical appliance plumbed directly into the home's water supply intake. (*See figure 1 on page 1.*) The water softener exchanges calcium and magnesium with sodium in a process called ion exchange.

The water softening system consists of a mineral tank and a brine tank. The water supply pipe is connected to the mineral tank so that water coming into the house must pass through the tank before it can be used.

The mineral tank holds small beads (also known as resin) that carry a negative electrical charge. The positively charged calcium and magnesium (called ions) are attracted to the negatively charged beads. This attraction makes the minerals stick to the beads as the hard water passes through the mineral tank. (*See figure 3 on page 3.*)

continued on next page

Home septic systems

Knowing how a septic system works helps homeowners understand why adding something like water softener regeneration brine may cause problems.

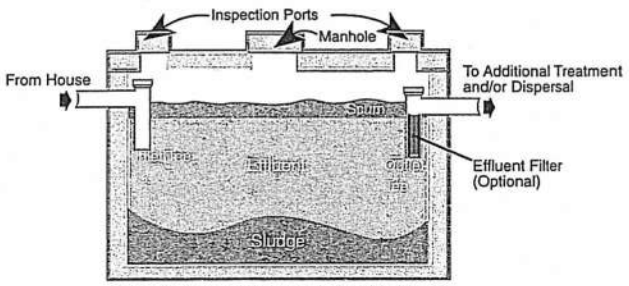
A conventional septic system consists of a septic tank, a distribution box, and a drainfield, all connected by pipes. When wastewater flows from the house, it is temporarily held in the septic tank where heavy solids (sludge) settle to the bottom. Lighter materials float on the surface of the water in the tank and are called the scum layer. This separation is known as *primary treatment.*

The solids that collect in the bottom of the tank and the materials that float in the scum layer are partially decomposed with the help of bacteria that occur naturally in human waste. The liquid between the solids and the scum flows out of the tank through a baffle (or a tee) and into a distribution box. The distribution box evenly separates the flow into a network of drainfield pipes. Each pipe has holes in its underside that allow the water to drain into gravel-filled trenches. The water slowly seeps into the soil beneath the trenches where it is further treated. This process is called *secondary treatment.*

Important note: As sludge accumulates in the bottom of the tank and its level rises, new wastewater coming from the house has less time for suspended particles to settle into the sludge layer. These suspended particles can flow into the absorption field.

The septic tank must be pumped out periodically to remove the accumulated sludge and scum and to prevent clogging the drainfield.

Conventional Septic Tank



Single Compartment Septic Tank

continued from previous page

Eventually the surfaces of the beads in the mineral tank become coated with the calcium and magnesium minerals. To clean the beads, a strong sodium (salt) solution held in the brine tank is flushed through the mineral tank. Sodium ions also have a positive electrical charge, just not quite as strong as that of calcium and magnesium. This large volume of sodium ions overpowers the calcium and magnesium ions and drives them off of the beads and into the solution. The sodium solution carrying the minerals is then drained out of the unit. Some sodium ions remain in the tank attached to the surfaces of the beads.

The Softening Process

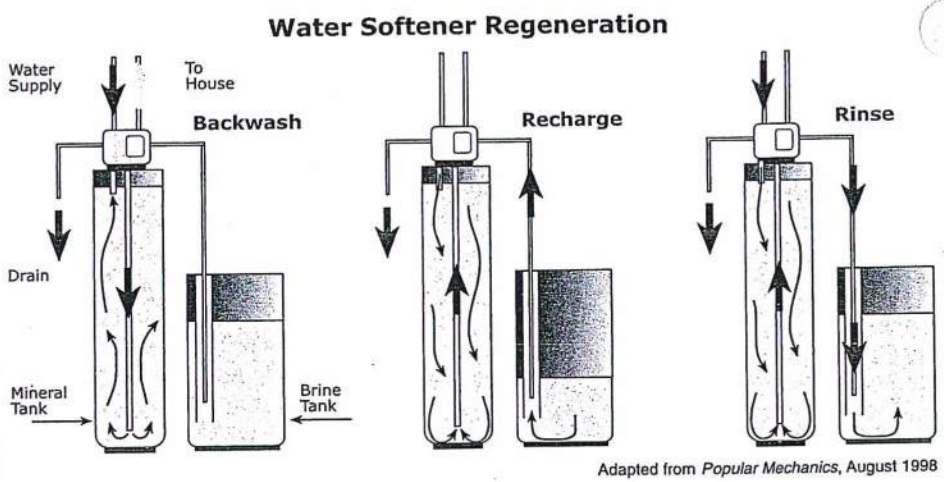
The normal water softening cycle operates like this:

Hard water enters the mineral tank. Inside the tank, the calcium and magnesium ions carried in the water attach themselves to the beads. The surfaces of the beads eventually hold their limit of calcium and magnesium and can't remove any more from the water. At this point the water softener must be "regenerated." (*See figure 2 this page.*) The three-step regeneration cycle can be scheduled according to a timer or by a flow detection meter.

The first step, called the backwash phase, reverses the water's flow and flushes any accumulated dirt particles out of the tank and down the drain. Next, in the regeneration or recharge phase, the sodium-rich brine solution flows from the brine tank into and through the mineral tank. The brine washes the calcium and magnesium off the beads. In the final phase, the mineral tank is flushed of the excess brine, which now also holds the calcium and magnesium, and the solution is disposed of down the drain.

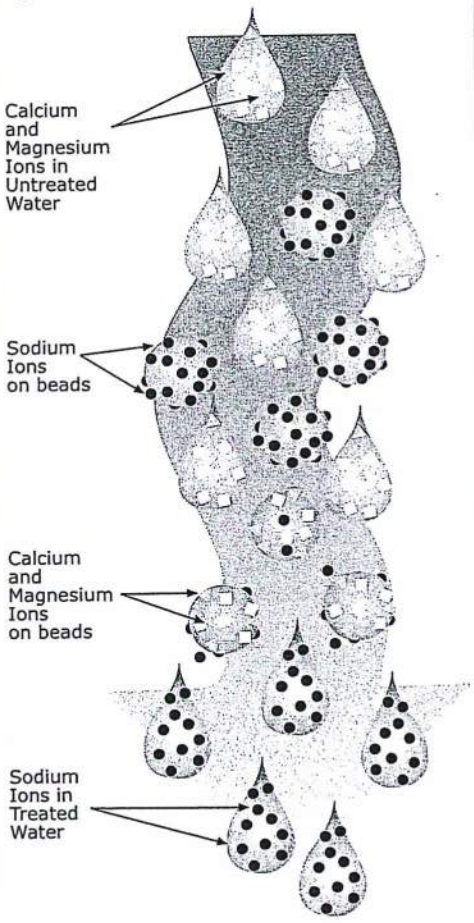
Sodium ions from the previous regeneration cycle cling to the beads. Now when the hard water flows into the mineral tank, the calcium and magnesium ions change places with the sodium ions on the resin. The displaced sodium ions remain dissolved in the water.

Figure 2



Adapted from *Popular Mechanics*, August 1998

Figure 3



Reducing regeneration brine flow

- Install a water softener whose backwash/regeneration cycle is based on need, not on a timer. A water softener operated by a time clock regenerates the mineral tank on a regular schedule, regardless of how much water has been used. A softening unit that is regulated by a flow detection meter measures the amount of water that has been used and regenerates the water softener accordingly. These units can cost $100 to $450 more than timer-regulated water softeners.
- Buy a water softener with a large mineral tank. The larger tank may cost more initially, but it will not have to be recharged as frequently as a smaller tank.
- Be more conservative with household water use. Less water used in the home means that less water will be measured going through the softener process; therefore, a unit with a flow detection meter won't have to regenerate as often.

Researchers Look for Answers

The Water Quality Research Council and the Water Quality Association (WQA) supported two studies in the late 1970s: one by the National Sanitation Foundation (NSF International) in Ann Arbor, Michigan, and the other conducted by the Small Scale Waste Management Project (SSWMP) at the University of Wisconsin in Madison. Both studies compared the performance of home sewage treatment systems with and without added water softener brine.

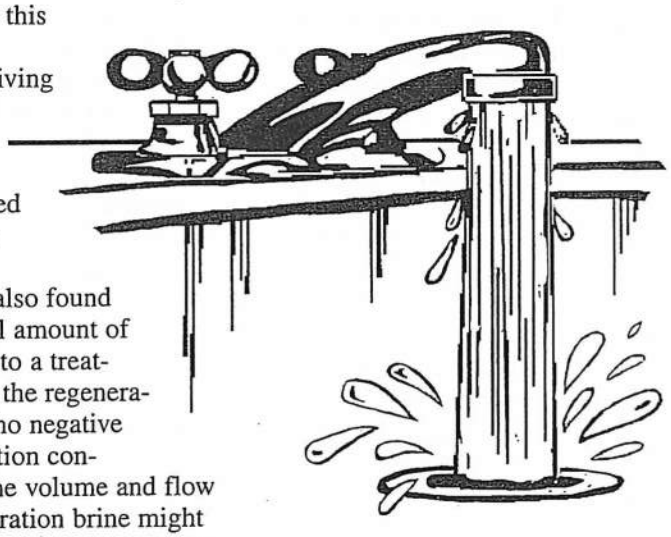
The two studies were designed to help answer questions consumers ask about their water softeners. The SSWMP research sought to determine if a water softener's brine affects a drainfield's ability to absorb wastewater. NSF investigated whether the influx of brine from a water softener's regeneration phase affects the processes that occur in a sewage treatment tank. Researchers also wanted to find out if the additional water discharged during backwash and regeneration (up to an extra 50 gallons) plus that water's flow rate into the septic tank interfere with the settling and floatation processes.

NSF's researchers used individual aerobic wastewater treatment units to study possible effects the brine might have on treatment processes in the tank. (*See the Winter 1996* Pipeline *for details about aerobic treatment units.*) The normal performance of both septic tanks and aerobic tanks depends on the presence of active bacteria living in the system. These bacteria help break down the solids in the wastewater.

An aerobic treatment system uses bacteria that require oxygen to live; whereas, an anaerobic system, such as a conventional septic tank, treats wastewater by using bacteria that thrive in conditions lacking air. If high doses of sodium from water softener regeneration and other household products flow into the tank, the bacteria could be affected. If the bacteria are negatively affected, the system might not operate at its full potential, and some of the solids might not fully decompose.

Research Results

Researchers from NSF found that brine wastes had no negative effects on the bacterial population living in the aerobic treatment tank, even when the system was loaded with twice the normal amount of brine. The tests determined that water softener wastes actually help with treatment processes. WQA's final report states that the wastewater has "a beneficial influence on a septic tank system by stimulating biological action in the septic tank and caused no operational problems in the typical anaerobic or the new aerobic septic tanks." In other words, the researchers in this study found that microorganisms living and working in a home aerobic treatment system are not harmed by water softener salts.



Researchers also found that the additional amount of water discharged to a treatment tank during the regeneration process had no negative impact. The question concerned whether the volume and flow rate of the regeneration brine might overload the system and cause carryover of solids into the drainfield. The study found that the volume of water discharged was comparable to or less than that from many automatic washing machines and other household appliances. Researchers also found that the wastewater flowed into the treatment tank slowly enough so that it caused minimal disturbance.

The study at the University of Wisconsin-Madison examined whether regeneration brine affected the soil in a septic system's drainfield. This research was prompted by the common knowledge that sodium causes some soil particles to swell, thereby reducing water's ability to seep readily through the soil. Researchers found that the water softener regeneration brine did not reduce the percolation rate of water in the absorption field of a normally operating septic system. This conclusion was reached because the brine contains sodium, but it also includes significant amounts of calcium and magnesium. The calcium in the brine acts similarly to gypsum, a calcium-rich substance routinely used to increase the porosity of clay soils in agriculture. The research report stated that calcium, therefore, helps counteract any negative effects of the sodium.

Most manufacturers and many industry experts agree with the WQA's position.

Some Experts Don't Agree

As with most scientific research, these two studies answered each of the proposed questions under the specific conditions of the research project. Because other variables exist that weren't part of the study's setup (e.g., problems that might occur because of a poorly functioning home water softening unit) some people feel that more research needs to be done to completely resolve the disputed issues.

The NSF study, for example, used an aerobic treatment tank rather

than an anaerobic tank (a conventional septic tank). Conventional septic systems are much more common than aerobic treatment units. An aerobic system often has a pretreatment tank to settle out much of the solids. Aerobic systems require air to be injected into the tank to support the growth of the suspended aerobic bacteria that digest solids in the wastewater. The wastewater in the tank is constantly stirred to mix in the air.

On the other hand, a conventional septic tank separates solids from wastewater by settling. In a properly functioning conventional system, most of the solids sink to the bottom of the tank leaving the liquid portion relatively clear. The anaerobic bacteria do their work without the wastewater in the tank being agitated.

Would the same results have been found if a conventional septic tank had been used? National Small Flows Clearinghouse Senior Engineering Scientist David Pask remains skeptical. He tells of residential drainfield failures that he has seen where the distribution pipes were plugged with "a noxious fibrous mass" that, under microscop- ic inspection, appeared to be made up of grease and cellulose fibers—identical to fibers from toilet paper.

Pask said the homes all had ion exchange water softeners connected to their water supplies, and softener brine discharged into each home's septic system. His discussion of the situation with colleagues led him to question if the sodium in the "plug flow" of brine might cause metabolic shock to the bacteria in the septic tank. This shock could cause the bacteria to be less able to digest the cellulose fibers, which then might be carried over into a septic system's drainfield.

"I still believe that the case for discharge of softener wash to the septic tank is unproven and that some research is justified," Pask said. "As for research needs . . . I would add to the list the effects of plug flow of brine on the digestion of cellulose and scum components in a standard septic tank."

Terry Bounds, an engineer and respected expert in the wastewater industry, also would like to see more research done before any conclusive statements are made about the effects of water softener regeneration brines in septic systems. In the summer 1994 issue of *Small Flows* (the precursor of the *Small Flows Quarterly* magazine) Bounds stated that in his work he has seen noticeable differences between septic tanks with and without water softener brine discharges in septic tank effluent pump (STEP) systems (an alternative wastewater collection and treatment method) and in conventional systems. Bounds said that in the tanks with added water softener discharge, he saw reduced scum layer development, carryover of solids and grease to the pressure sewer collection system, and a less distinguishable "clear zone" that might mean solids remain suspended instead of settling in the tank.

Today, Bounds contends that research has focused on water softener discharge of regeneration brine under ideal conditions. Water softeners that malfunction or are not used correctly (i.e., timed to regenerate too frequently) may cause septic system problems.

"Our experience with regard to the operation and maintenance of systems that discharge water softener backwash to septic tanks is that it has a detrimental effect on the effluent that is discharged," Bounds said. "As a researcher, I believe that when 'all' the variables and processes are evaluated and monitored, measured performance and science will share close results. So far, I have seen no research that compares to typical environmental engineering sciences in anaerobic digesters. Most of the reports that I've seen suggest that this research still needs to be done."



CONTACTS

National Small Flows Clearinghouse (NSFC)

The NSFC offers a variety of technical assistance and free and low-cost information and materials about wastewater technologies for small communities. Just a few of the NSFC's many resources and services are mentioned in this newsletter. Call the NSFC at (800) 624-8301 or (304) 293-4191 or visit our Web site at *www.nsfc.wvu.edu* for more information.

Water Quality Association

The Water Quality Association (WQA) is the international trade association representing the household, commercial, industrial, and small community water treatment industry. WQA is a resource of information, product testing, and professional certification for all water users. Contact the WQA at (630) 505-0160 or visit their Web site at *www.wqa.org*.

NSF International
(formerly called the National Sanitation Foundation)

NSF International is a private, nonprofit organization devoted to research, education, service, and training. NSF tests and publishes standards for products related to public health and the environment. Contact them at (800) 673-6275 or visit their Web site at *www.nsf.org*.

Thank You!

Thank you to all who responded to *Pipeline's* readership survey. Your answers, observations, and suggestions will help determine how we can best serve you in the future.

Michelle Moore, Editor

An Alternative to Softening with Sodium

If you are concerned about water softening brine and its possible effects on your septic system (and the environment), an alternative chemical can be used. Potassium chloride is as effective as sodium chloride for water softening in both residential and commercial processes. Plus, using potassium chloride has several benefits: it reduces the amount of sodium in drinking water; the treated water contributes potassium to people's diets; and it eliminates the addition of sodium from water softeners into a household's septic system tank and drainfield.

Potassium chloride works exactly the same way that sodium does in the water softening process. The mineral tank is flushed with potassium (instead of sodium) from the brine tank to coat the resin beads. With its positive electrical charge, the potassium clings to the negatively charged resin beads in the tank. As hard water passes through the softener's mineral tank, the calcium and magnesium in the water change places with the potassium on the beads.

The treated water now has a small amount of potassium in it. The mineral tank will eventually need to be regenerated when most of the potassium adhering to the resin beads has been exchanged for the calcium and magnesium carried in the water.

The regeneration process flushes the mineral tank with a potassium chloride solution that drives the calcium and magnesium minerals off the resin beads. The excess potassium-, calcium-, and magnesium-rich water in the tank is then discharged into the home's drain pipes and into the septic system.

The regeneration brine mixes with the standing water in the tank, then eventually flows into the system's drainfield. Potassium is an essential mineral for plants; whereas, sodium can damage plant tissues. Because sodium is replaced by potassium, this diluted wastewater is beneficial to a grass-covered drainfield.

"Sodium really has no redeeming value in the environment outside of saltwater or brackish water ecosystems. If alternatives to sodium chloride for water treatment can be developed, they should be used. Potassium chloride is a logical choice to reduce sodium discharge from water softening systems, to provide additional potassium in human diets, and to serve as a nutrient source for plants."

From "Potassium Chloride: Alternative Regenerant for Softening Water" by Dr. Kim Polizotto and Dr. Charles Harms

Wastewater from water softeners that use potassium chloride in their regeneration brine can be recycled to irrigate agricultural land. An article titled "Potassium Chloride . . . Alternative Regenerant for Softening Water," written by Dr. Kim Polizotto and Dr. Charles Harms for the Potash and Phosphate Institute's *Better Crops with Plant Food* (Fall 1993), suggests using potassium in water softening units and then recycling the diluted wastewater as an alternative to disposing of it.

Polizotto and Harms mention that several cities in California, Florida, and Michigan have called upon the water softener industry to help reduce sodium and chloride discharge into municipal sewage treatment facilities. Reduction of these chemicals is necessary to meet discharge standards set to decrease groundwater pollution in those communities.

These researchers also tell of other towns that want to develop secondary markets for their wastewater, such as selling it to farmers for irrigation purposes. Because sodium may harm some plants' growth, wastewater from treatment plants might not be marketable if sodium chloride is the predominant salt used for water conditioning in the community.

Cost may be the only drawback in switching from the standard sodium chloride used in most water softeners to potassium chloride. Both can be found in most retail home improvement centers, but the potassium chloride can cost up to twice as much (even more on the West Coast) as the sodium chloride. The average price of sodium chloride (in the East) is around $4 for a 40- pound bag, and potassium chloride costs approximately $9 for 40 pounds. However, consumer group studies show that, for many potential users, the health and environmental benefits of potassium chloride outweigh the price difference.

Priddis Greens Golf Course Case Study

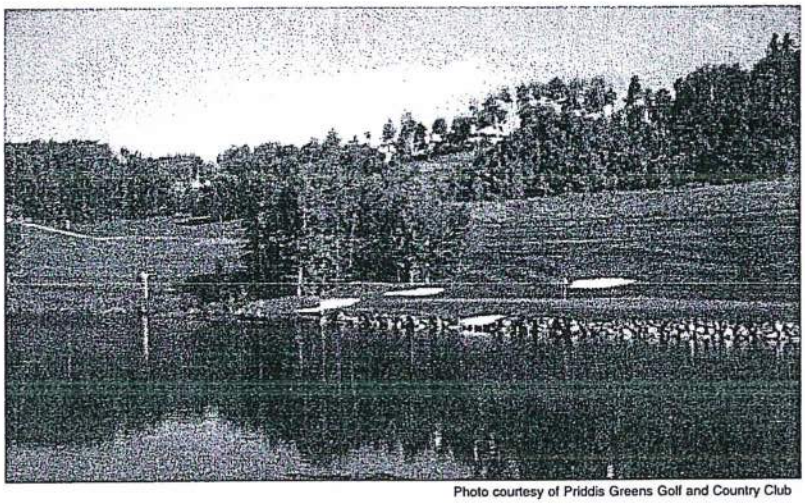


Photo courtesy of Priddis Greens Golf and Country Club

One of Canada's premier golf courses, Priddis Greens Golf and Country Club near Calgary, Alberta, was having trouble keeping its north course greens up to par. The grass growing on this nine-hole stretch of the golf course just wasn't growing as well as the turf on the rest of the property.

The water supply for the golf community comes from nearby Priddis Creek and from an aquifer-fed well on the property. Some of the greens also are irrigated from a 7.2 million-gallon holding pond located at the golf course. It was discovered that the poorly growing grass on the north course was being watered from this pond.

The holding pond contains recycled water collected from the 116 homes bordering the golf course. The golf community's small sewage treatment plant upgrades the quality of the residential wastewater to a standard that is suitable for irrigation.

The golf course superintendent checked a water analysis from the pond and found a high proportion of sodium in the water, 376 milligrams per liter (mg/L). In contrast, well water on the property had a sodium content of 35 mg/L. The superintendent suspected that sodium discharge from residential water softeners caused the sodium problem in the irrigation water, which in turn caused the problems with the north course's turf.

Priddis Greens maintains a cooperative service arrangement between the residents and the golf course, and they knew the quality of the irrigation water had to improve. They decided that individual water softening units in the golf community's homes significantly added to the buildup of sodium in the recycled water due to these factors:

- using older, inefficient water softener models;
- setting softeners to regenerate more frequently than necessary; resulting in excess sodium being discharged; and
- using timers instead of demand-initiated regeneration.

The service management of Priddis Greens decided to remove all the water softeners from the individual homes in the golf community. Instead, a central softening system at their water utility plant would supply residents and the club house with soft water. And with the change to a central softening system, Priddis Greens began softening their water with potassium chloride instead of sodium chloride.

Soil and water samples were taken before the switch to potassium chloride and again three years after the change. These tests showed a decline in sodium content in the irrigation water from the treatment plant, as well as in the water from the well on the golf course property. (*See figure 4.*) The sodium content in the softened water dropped slightly also, indicating that the potassium on the resin of the softening system was removing some sodium from the well water.

Ultimately, the change from the less efficient residential water softeners to a central softening system, plus the switch from sodium chloride to potassium chloride, helped this golf community. People living in the community—and the grass growing on the north course—had less salt added to their diets, which is beneficial to both. And since potassium is a major plant nutrient, the golf course greens now receive additional potassium when they are irrigated with the recycled water from the homes. This nutrient contribution has subsequently reduced the golf course's fertilizer program cost.

Information taken from "Priddis Greens Golf and Country Club Recycled Water Irrigation Research Project" presented at the Pacific Water Quality Association mid-year conference, May 2000.

Figure 4

Analysis of Irrigation Water for Priddis Greens' North Course

Component (mg/L)	Before KCl	After KCl	Surface Water
Chlorine	486	68	33
Sodium	376	66	14
Potassium	35	107	12
Calcium	81	42	74
Magnesium	28	11	22
Total dissolved solids	1586	738	475

(KCl=Potassium chloride)

RESOURCES AVAILABLE FROM NSFC

To order any of the following products, call the National Small Flows Clearinghouse (NSFC) at (800) 624-8301 or (304) 293-4191, fax (304) 293-3161, e-mail nsfc_orders@mail.estd.wvu.edu, *or write NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Be sure to request each item by number and title. A shipping charge will apply.*

Wastewater Products Catalog



This newly updated catalog lists and describes the many products and services that the NSFC offers. The catalog may also be downloaded from the NSFC Web site at *http://www.nsfc.wvu.edu* or is available free upon request. Item #WWCAT.

Potential Effects of Water Softener Use on Septic Tank Soil Absorption Onsite Wastewater Systems

These two research projects were performed to see if the salt-brine discharge from water softener regeneration is harmful to bacteria in septic tanks and if the brine reduces the percolation of water through the soil in drainage fields. Both studies found that water softener recharge wastes caused no adverse effects to onsite treatment systems. The cost for the 100-page book is $7.60 cents. Item #WWBKRE21.

Your Septic System: A Guide for Homeowners

This 11-minute video discusses conventional septic system components, operation, and maintenance. It covers 10 basic rules for homeowners to follow.The videotape costs $10. Item #WWVTPE16.

The Care and Feeding of Your Septic System

This free NSFC brochure describes septic tanks and absorption fields and provides guidelines to prolong their usefulness, such as when to have your septic tank pumped and ways to reduce the flow of wastewater. Item #WWBRPE20.

Groundwater Protection and Your Septic System

Along with ways to prevent contaminants from reaching the groundwater, this free brochure discusses groundwater protection based on proper septic system sizing and location. Item #WWBRPE21.

Your Septic System: A Reference Guide for Homeowners

This free brochure for homeowners describes a conventional septic system and how it should be cared for to achieve optimal results. Tips for trouble-free operation are provided. Item #WWBRPE17.

PIPELINE

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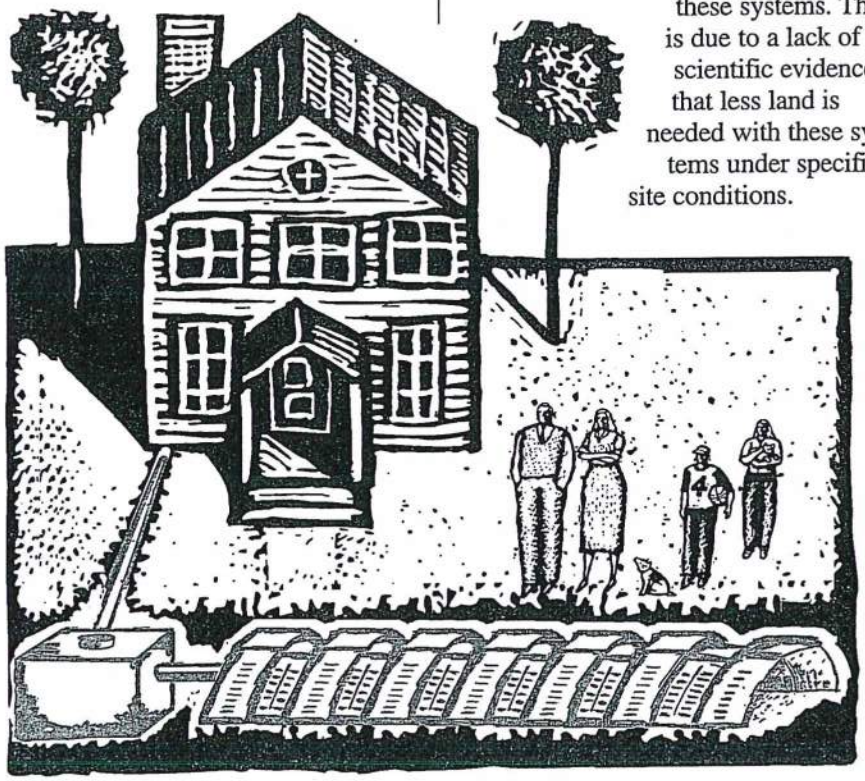
Small Community Wastewater Issues Explained to the Public

Gravelless and Chamber Systems: Alternative Drainfield Designs

Because they are simple, stable, and inexpensive, subsurface soil absorption fields (also called drainfields or leachfields) usually are considered to be the best method for treating and dispersing effluent from septic tanks and other onsite wastewater treatment systems. Residents and health officials in small communities and rural areas are familiar with conventional septic tank/drainfield systems, their advantages, and their limitations.

One limitation of conventional onsite systems, and a reason some potential homesites fail to qualify for onsite wastewater permits, is the quantity and quality of land needed for the drainfield. Depending upon the drainage patterns, soil characteristics, and topography of the lot, homesites sometimes lack enough suitable land for installing conventional drainfield beds or trenches.

Property owners facing land limitations may hear claims that certain alternative drainfields require less land to provide the same level of treatment as do conventional systems. While it is true that gravelless and chamber systems have advantages and can perform at least as well as conventional drainfields, the U.S. Environmental Protection Agency and several state health agencies stop short of endorsing land area reductions for these systems. This is due to a lack of scientific evidence that less land is needed with these systems under specific site conditions.



In this issue, learn . . .

- how drainfields disperse and help treat wastewater (page 2),
- the advantages and disadvantages of conventional systems (page 2),
- the importance of conducting a proper site evaluation before installing an onsite system (page 3),
- how gravelless systems differ from conventional drainfields (page 3),
- when gravelless drainfields may be preferable (page 3),
- how to size gravelless drainfields (page 4),
- the advantages and disadvantages of chamber systems (page 5), and
- state regulations regarding gravelless systems (page 6).

This *Pipeline* issue highlights facts about gravelless and chamber soil absorption systems. It explains how these systems differ from conventional drainfields and their advantages and disadvantages. The regulatory requirements of each state regarding the use of gravelless and chamber systems also are listed.

Readers are encouraged to reprint any *Pipeline* articles in flyers, newspapers, newsletters, or educational presentations. Please include the National Small Flows Clearinghouse's (NSFC) name and phone number on the reprinted information, and send us a copy for our files.

If you have questions about reprinting articles or about any of the topics discussed in this newsletter, please contact the NSFC at (800) 624-8301 or (304) 293-4191.

Conventional Gravel-Filled Drainfields Provide Simple, Affordable Treatment

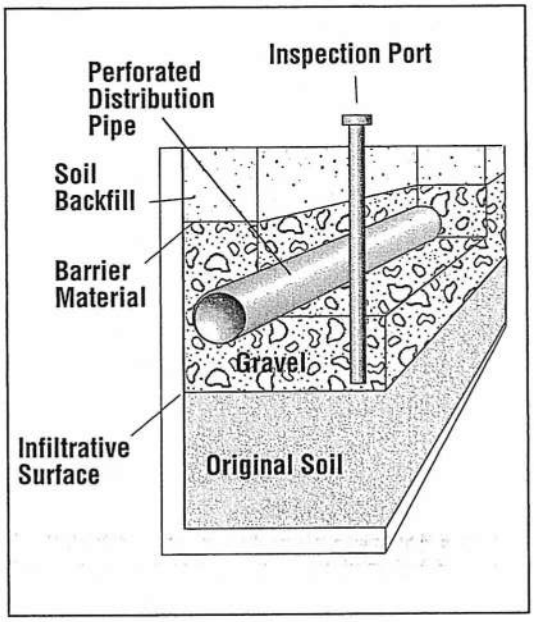
In areas where sewer systems are unavailable or impractical, onsite wastewater treatment units, such as septic tanks, sand filters, and home aerobic treatment units, pretreat of the wastewater that individual homes and businesses generate. Raw sewage flows from a building into a septic tank or other pretreatment unit, where solids, oils, and greases separate from the rest of the wastewater. Some onsite systems, such as sand filter systems, incoporate additional preliminary treatment steps.

In areas where it is permitted, after sufficient pretreatment, the effluent can be disinfected and discharged to the ground surface or to a surface water source. In the vast majority of installations, however, the effluent receives final treatment and dispersal underground via a subsurface drainfield system.

Conventional Drainfield Design

Drainfields usually are constructed as a series of level trenches or beds lined with gravel or coarse sand and buried 1 to 3 feet below ground surface. Perforated pipes or drain tiles run through the trenches to distribute the wastewater over the gravel media before it enters the soil. The gravel helps to disperse the effluent, to support the sidewalls of the drainfield trenches, to prop up the pipe or tiles so they don't lie directly on the soil, and to provide a storage area during times of peak wastewater flows.

Additional gravel is placed over the pipe, and the trench or bed is covered with a semipermeable barrier, such as a geotextile fabric, so the finer backfill material doesn't filter in *(see the graphic above)*. The septic tank effluent is treated as the wastewater effluent slowly trickles from the pipes, through the gravel, and down through the soil.



How Treatment Occurs

As the wastewater percolates or moves down through the soil, a variety of complex physical, biological, and chemical processes combine to provide treatment. Particles in the wastewater are filtered by, adhere to, or chemically bond or react with the the soil. Bacteria and other organisms in the soil consume the organic matter in the wastewater and perform most of the treatment. Although some treatment also may occur in the gravel layer, most of the work is accomplished in the soil.

As a drainfield matures, organisms in the wastewater and soil multiply and form a dark layer called the biomat on or near the infiltrative surface. The biomat is a miniature ecological system. If oxygen is present, organisms such as worms and parasites, feed on the bacteria as well as material in the wastewater. The biomat is also where most pathogen removal occurs. When the drainfield system is in balance, these organisms prevent the biomat from becoming so thick that it clogs the system completely, but rather, allow the wastewater to flow through the soil below at a slow, but steady rate.

The biomat also aids the treatment process in medium and coarse soils by maintaining unsaturated conditions in the soil layers below the drainfield and above the groundwater.

The Drainfield Advantage

According to the U.S. Environmental Protection Agency, where site conditions are suitable, subsurface soil absorption is usually the best way to disperse wastewater dispersal to the environment because of its simplicity and low cost.

Potential Drawbacks of Gravel-Lined Drainfields

Gravel is traditionally used in soil absorption system construction, because it is relatively inexpensive and readily available in most areas, not necessarily because it outperforms other materials as a treatment media. In fact, there may be a few drawbacks to gravel-lined systems.

Although many contractors recognize the importance of only using washed gravel in drainfield systems, dust or "fines" (very fine particles) can remain in the gravel or can be created when it is installed in the drainfield trenches. These fines may clog the infiltrative surface.

Another potential problem with gravel-lined trenches is that the soil layer can be compacted from the weight of the gravel and the machinery used to transport and install it. Wastewater may have difficulty percolating through the compacted soil. In addition, as the gravel settles against the soil, some say that it may "mask" or "shadow" (block) a significant percentage of the soil surface area that could otherwise contribute to biomat formation and treatment.

Advantages of Gravelless Systems

As the name suggests, a gravelless system is an onsite system that does not use gravel in its drainfield trenches or beds. Instead, these systems may use alternative materials in place of gravel, such as rubber, sand, fiber membrane, plastic, glass, or expanded clay, shale, or polystyrene foam chips.

The alternative media in gravelless systems can function similarly to gravel. It can support the sidewalls of the drainfield trenches and prop up the perforated drainfield pipes so they don't lie directly on the soil and clog. When soil is saturated from the weather or surge wastewater loadings occur, the effluent can be stored in the media until the soil absorbs it. Like gravel, the alternative media also can help to distribute the wastewater along the length of the trenches.

Gravelless Pipe Systems

In some gravelless drainfields, wrapped or slitted corrugated pipe is used instead of an alternative media material.

One gravelless drainfield design consists of large corrugated plastic pipes, with inside diameters of 8 to 10 inches, covered with a geotextile fabric or a spun bonded nylon filter fabric. *(Refer to Figure B on page 4.)* The effluent infiltrates the areas of the soil that come in contact with the fabric.

Gravelless pipe systems should include a cleanout to allow the pipe to be inspected and for any sludge that may accumulate in the pipe to be flushed out.

Chamber systems, which are discussed in more detail beginning on page 5, are another popular type of gravelless system.

When Are Gravelless Systems a Good Choice?

Like conventional drainfields, gravelless systems can be designed to work on a variety of homesites and under most conditions. Some studies suggest that they may perform better than gravel-lined drainfields. These systems also require the same maintenance as traditional drainfields.

Homeowners should first check with their local health department about local and state regulatory requirements *(refer to the contacts list on page 7 and to page 6 for state requirements)*. Also, most communities require a professional site evaluation be performed to assess the appropriateness of the site for any onsite system *(see the sidebar at right for more information)*.

Why Gravelless May Be Better In Some Cases

- **Cost**—Although gravel is a common natural resource and is usually fairly inexpensive, high-quality gravel is not readily available in every community. In certain parts of the country, the cost of transporting a heavy shipment of gravel can raise the cost of onsite system construction considerably. In these areas, using a light-weight or locally available alternative media may be preferable. However, in many areas, gravel-lined systems are still the most economical systems to construct.
- **Easier To Handle**—Because some alternative media materials are light weight, heavy equipment may not be needed to haul the media to the installation site. This can help minimize the disruption to property that machinery can cause. Also, the lighter weight media is easier to handle, which can reduce labor costs and allow the systems to be constructed in areas inaccessible to heavy machinery. The pipe in gravelless pipe systems is lightweight and flexible, allowing it to easily conform to sloped or curved trenches.

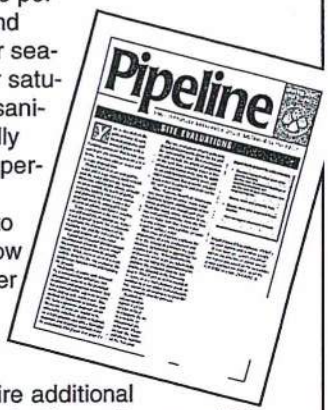
continued on page 4

Site Evaluations

In most communities, before a homeowner or developer can obtain a permit to install any type of onsite wastewater system, a professional site evaluation of the lot is required. In a site evaluation, a sanitarian, soil scientist, or other wastewater professional examines the characteristics of the soils, landscape features, and past surveys of the site. He or she also may consult public records, such as soil surveys or maps prepared by the National Resource Conservation Office or by a state geological survey office.

Before approving a site for onsite treatment, the evaluator notes the location of nearby drinking water wells, neighboring homes and onsite wastewater systems, and the minimum vertical and horizontal separation distances to these and other features as required by law. He or she also examines the slope of the land and the depth to groundwater and impermeable layers, such as bedrock. The evaluator also considers the natural drainage patterns and boundaries of the lot.

An important feature of a site evaluation is a thorough study of the soil. The sanitarian digs an observation pit at the most likely location of the soil absorption field to examine the soil layers for texture, structure, and color patterns, which give clues regarding its permeability and potential for seasonal water saturation.The sanitarian usually performs a percolation or "perc" test to measure how quickly water moves through the soil. Some states require additional methods for testing soil permeability.



For a detailed look at site evaluations, see the Spring 2000 Pipeline *(vol. 11, no. 2). Contact the National Small Flows Clearinghouse (NSFC) and request Item #WWPLNL21. The price is $0.40. Or, visit the NSFC's W site at* www.nsfc.wvu.edu *and download the entire issue for free.*

Advantages of Gravelless Drainfields

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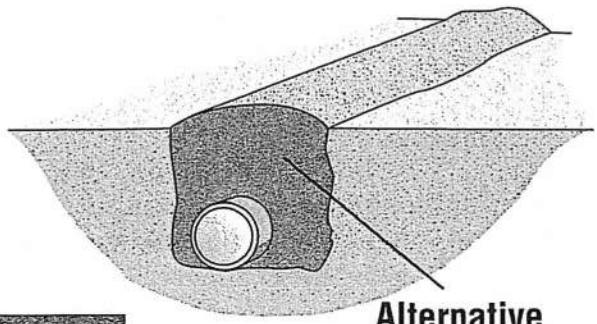


Figure A

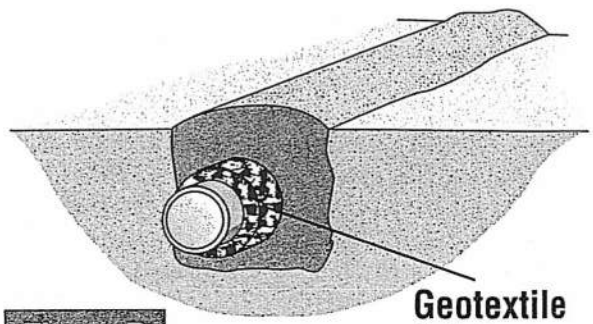


Figure B

- **Easier on Soils**—Gravelless systems may be a good choice in areas that have soils susceptible to "smearing" or other structural damage. Soil structure can be impacted by the weight of gravel itself or by construction and heavy machinery on the site.

  Constructing a typical gravel-filled drainfield requires several tons of gravel and numerous trips up and down the sides of trenches with a front loader or gravel truck. This can cause the soil around the drainfield to compact, reducing its permeability.
- **Avoids Dust and Fines**—Another disadvantage of using improperly washed gravel as media is the possibility that dust and other fine materials from the gravel will find its way into the system as the gravel is dumped and shoveled during installation. The dust and debris can clog the soil. Problems with fines can be minimized or avoided completely by using such alternative media as plastic.
- **Simple To Maintain**—In general, gravelless drainfields are as easy to maintain as gravel-lined drainfields. Many are proprietary designs, and, therefore, homeowners should follow manufacturer recommendations concerning operation and maintenance.

  Proper onsite system maintenance begins inside the home or business. Solids and greases, such as food scraps, coffee grounds, and leftover cooking oils, should be disposed of in the garbage rather than down the drain. Cigarette butts and items other than toilet paper should not be flushed down the toilet. Allowing extra solids and greases into the system can overburden the septic tank. If the septic tank becomes too full, solids sometimes will be discharged into the drainfield. For this reason, onsite systems should be inspected regularly or pumped every three to five years.

  In addition, system owners should take care to fix leaky faucets and running toilets immediately to conserve water and to avoid overloading the septic tank and the drainfield. It is important to maintain a grass cover over the drainfield to keep the soil adequately aerated. Also, homeowners should prevent anyone from driving or placing heavy materials on the drainfield.

  For more information, contact the National Small Flows Clearinghouse (see the contacts list on page 7) and request the Pipeline *issue* Maintaining Your Septic System: A Guide for Homeowners, *Item #SFPLNL03.*

Sizing Gravelless Drainfields

The term *infiltrative surface* refers to places in a drainfield where effluent is absorbed into the soil. Some researchers believe that gravel and other media may mask as much as 50 to 75 percent of the potential infiltrative surface in a drainfield. In other words, by lying against the soil, the media may create areas where the effluent does not pass through into the soil and the biomat does not form.

Some gravelless system proponents claim that because less masking occurs with certain gravelless systems, these systems can be sized significantly smaller than conventional drainfields. While some state regulations do allow reductions in gravelless drainfield size *(refer to page 6)*, the U.S. Environmental Protection Agency and others advise caution before doing so due to a lack of sufficient scientific evidence backing up this practice and the increase of organic loading that may occur as a result. Instead, drainfield size should always be based upon the amount of wastewater flow the household generates and the amount of effluent the soil can effectively receive (its hydraulic capacity).*

It should be noted that adding secondary treatment or a gravelless or chamber drainfield system does not change the overall hydraulic capacity of a lot. It may be possible to reduce the overall area of the trenches required with a system, but not the overall length of the system across the slope of a lot.

Chamber Systems Are Easy To Install

Chamber systems, sometimes called leaching chambers, are a type of gravelless drainfield becoming increasingly popular. *Chamber* refers to the open-bottomed pipes used in these systems. They are commercially available and usually constructed of high-density plastic. Chambers also may be constructed of fiberglass, block, or brick.

The chambers are molded into a dome-like shape (refer to the figure below and on page 1). Their design usually is proprietary and manufacturer recommendations should be followed regarding system installation, design, operation, and maintenance.

How Chamber Systems Work

Leaching chambers are manufactured in widths varying from 15 to 40 inches. Although some chamber systems are constructed of light-weight material, they are strong enough to support a soil cover and normal backyard activities. However, as with any onsite system, homeowners should prevent anyone from driving, paving, building, or placing heavy materials on top of the system.

Because some chamber panels are light weight, installers can manually carry and place them in level trenches. Chamber panels are designed to interlock, and they may be fastened by screws at the interlocking connections. Some designs interlock without the use of screws or other fasteners, further reducing installation time and costs.

Backfill, composed of native soil or other porous material the manufacturer suggests, is placed along the sides of the chambers and usually is compacted just enough to add support to the dome structure. Each system should include at least one inspection port to allow water levels in the chamber to be monitored.

A 4-inch pipe transports effluent from the septic tank or other treatment unit to the chambers. Although some systems are designed with perforated distribution pipes within the chambers *(see the graphic below)*, pipes are not necessary within the chambers themselves. Geotextile fabric also is not needed around the chambers or pipes. The wastewater enters the chambers and is absorbed and treated by the soil below.

A chamber system is appropriate for any site where a conventional drainfield is appropriate. These systems also can be used on sloped and wooded sites inaccessible to heavy equipment. Distribution devices can channel wastewater between chamber segments at different elevations as is possible with gravel-lined systems.

Chamber System Advantages

Because they are easy to install, chamber systems often are an attractive choice for homeowners who wish to minimize the type of damage to landscaping that heavy machinery can cause. In addition to being light weight, some chambers are stackable, making them less expensive to transport. Their easy installation also may reduce labor costs.

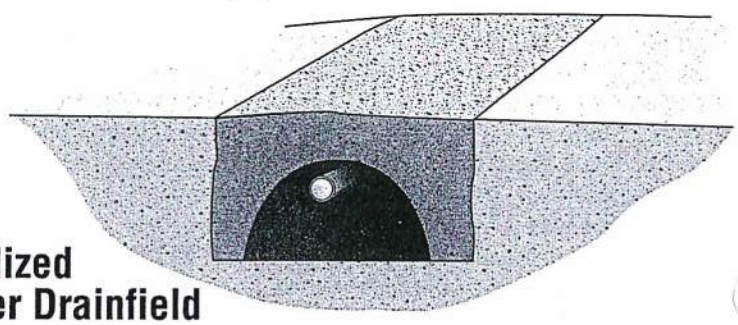
Chamber systems have many of the same advantages as other types of gravelless systems. For example, there are no problems with clogging from dust and fines because gravel is not used. Chamber systems also are very flexible. They can be reconfigured and adapted to different features of the lot, and the systems can be easily expanded and even relocated if necessary—an option not easily available with conventional systems.

Perhaps the most significant advantage of chamber systems is they can store a large amount of effluent. This feature becomes especially important for onsite systems that frequently experience surge or shock loadings (for example, from running toilets or leaky fixtures, extra house guests, or periods of heavy rains). However, while a large storage capacity is helpful when dealing with shock loadings, prolonged periods of effluent storage can be detrimental to soil performance.

In addition, several states allow drainfield size reductions for chamber systems even when they do not allow them for other types of gravelless systems *(refer to page 6)*. Smaller drainfields mean lower construction costs. This is an important advantage for property owners with small lots.

Possible System Drawbacks

Cost is the most significant drawback with chamber systems. Except in those areas where high-quality gravel is expensive or hard to come by, gravel-lined systems usually cost less overall. However, reduced labor and transportation costs may offset higher material costs with chamber systems. Homeowners who are considering installing any type of gravelless system should first compare prices with those for conventional gravel-lined systems.



Generalized Chamber Drainfield

State Regulations for Gravelless and Chamber Systems*

State	Gravelless System Allowed	Chamber System Allowed	Reduction Allowed
Alabama		Yes	Yes
Alaska	Yes	Yes	None
Arizona	Yes	Yes	Yes
Arkansas		Yes	Some reduction is allowed
Colorado	Yes	Yes	Yes
Connecticut	No	Yes	Yes
Delaware	Yes	Yes	Yes
Florida		Yes	Yes
Georgia	Yes	Yes	Yes for chamber systems; none for gravelless systems
Hawaii	No	Yes	17 to 20% for specific manufacturers of chamber systems
Idaho	Yes	Yes	Yes
Illinois	Yes	Yes	county by county approval for chamber systems
Indiana	Yes	Yes	Yes
Iowa	Yes	Yes	Yes for chamber systems; 8" gravelless pipes require additional 20% length, and 10" gravelless pipes receive 24" wide credit.
Kansas	Yes	No	Yes for chamber systems on a county by county approval process
Kentucky	Yes	Yes	Yes for chamber systems; no reduction for 8" diameter gravelless, and 30% reduction on 10" as experimental only
Louisiana	Yes	Yes	Some reduction is allowed
Maine	Yes	Yes	Yes
Maryland	Yes	Yes	None
Massachusetts	Yes	Yes	Yes
Minnesota	Yes	Yes	Yes for chamber systems
Mississippi	Yes	Yes	Yes for chamber systems
Missouri	Yes	Yes	Yes
Nebraska		Yes	Yes
Nevada		Yes	Yes
New Hampshire	Yes	Yes	Yes for chamber systems; gravelless-sizing is approved on a product-specific basis
New Jersey	Yes	Yes	sizing is product specific
New York	Yes	Yes	
North Carolina	Yes	Yes	Yes for chamber systems
North Dakota	Yes	Yes	None
Ohio	Yes	Yes	None
Oklahoma	Yes	Yes	Some reduction is allowed
Oregon		Yes	Some reduction is allowed
Pennsylvania	(as experimental only)	Yes	Yes for chamber systems
Rhode Island	No	Yes	Yes for chambers systems in trenches and repairs only
South Carolina	Yes	Yes	Yes for chamber systems under "Provisional & Demonstration Protocol."
South Dakota		Yes	Yes for chamber systems
Tennessee	No	Yes	Yes for standard chamber systems
Texas	Yes	Yes	Yes for chamber system and gravelless systems
Utah		Yes	None
Vermont	Yes	Yes	None
Virginia	Yes	Yes	None
Washington	Yes	Yes	Reductions based on soil condition
West Virginia	Yes	Yes	Yes for chamber systems; gravelless receive no reduction
Wisconsin		Yes	Some reduction is allowed
Wyoming	Yes	No	Some reduction is allowed

*This information first appeared in the Fall 2000 issue of Small Flows Quarterly magazine. Because regulations change, readers should contact their regulatory authority to ensure that these systems are approved.

Three Schools Choose Chamber Systems

As players in the outfield at John Cornwall Elementary await the next hit, little do they know that just beneath their feet a chamber drainfield is busy treating and dispersing the school's wastewater.

John Cornwall is one of three schools in Hampshire County, West Virginia, that chose to install state-of-the-art recirculating sand filter/chamber drainfield systems. Alan Cox, the school district's director of maintenance, explains that these systems are a big improvement for the district.

"We used to have failing package plants that were discharging into intermittent streams," said Cox. "I was getting frequent visits from our local department of environmental protection officer, and we were like two cats in a sack. Now we're good friends, and when he does come by, he usually brings someone to tour our system."

Cox says John Cornwall's system was a hard sell at first due to its $100,000 price tag, but the school needed an upgrade, and unlike other systems, this one can be easily expanded as enrollment grows.

"The school district has been very happy with the two systems that are in the ground," says Cox. "A third sand filter/chamber system is being built at Springfield Elementary. All will be remotely monitored by the contractor, so if a problem arises, it can be addressed immediately."

Choosing chambered drainfields also reduced installation costs. And because flows from the school are heavy during the day, the extra storage capacity in the chambers is helpful. Cox says effluent is stored in the recirculation tank and dosed throughout the day. The size of the drainfield trenches were not reduced even though chambers were used.

For information about this project, contact Cox at (304) 822-3121.

www.nesc.wvu.edu Offers Environmental Information and Services for Small Communities

When you're looking for community water and wastewater information on the Web, be sure to visit the National Environmental Services Center's (NESC) newly redesigned Web site. At *www.nesc.wvu.edu* you can learn about treatment technologies, management and financial strategies, current and changing environmental regulations, training, and other issues related to running a small community water or wastewater system.

Formerly West Virginia University's Environmental Services and Training Division, NESC is made up of four national programs:

- National Drinking Water Clearinghouse (NDWC) *www.ndwc.wvu.edu*,
- National Small Flows Clearinghouse (NSFC) *www.nsfc.wvu.edu*,
- National Environmental Training Center for Small Communities (NETCSC) *www.netc.wvu.edu*, and
- National Onsite Demonstration Program (NODP) *www.nodp.wvu.edu*.

Each partner maintains its own section of the Web site.

The new NESC Web site offers online services, such as access to free environmental magazines and newsletters, hundreds of free and low-cost products, online discussion groups, database searches, and technical assistance. Visit the NESC Web site and let us help you and your community find answers to drinking water, wastewater, and environmental training questions.

CONTACTS



Local Health Agencies

Property owners interested in alternative drainfield designs and other onsite wastewater treatment options should first contact their local health department or state health agency. Health officials are familiar with local onsite wastewater regulations and which options are appropriate and permitted in their jurisdictions. These agencies are usually listed in the government section of local phone directories.

National Small Flows Clearinghouse (NSFC)

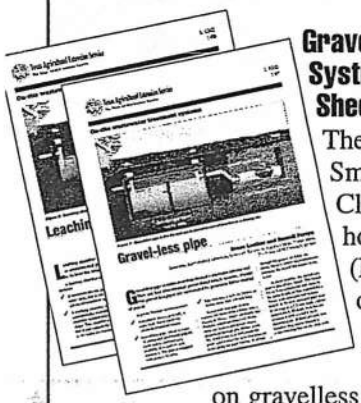
The NSFC offers technical assistance and free and low-cost information about wastewater technologies for small communities. Only a few of the NSFC's many resources and services are mentioned in this newsletter. Call the NSFC at (800) 624-8301 or (304) 293-4191 or visit our Web site at *www.nsfc.wvu.edu* for more information.

National Onsite Wastewater Recycling Association, Inc.

The National Onsite Wastewater Recycling Association, Inc. (NOWRA) is a national professional organization created to advance and promote the onsite wastewater industry. NOWRA members include government and regulatory personnel, installers, field practitioners, suppliers, distributors, engineers, research professionals, designers, consultants, manufacturers and educators. Call NOWRA at (301) 776-7468 or visit their Web site at *www.nowra.org.*

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Gravelless System Fact Sheets

The National Small Flows Clearinghouse (NSFC) offers two, two-page fact sheets on gravelless drainfield systems. Published by the Texas Agricultural Extension Service, the fact sheets describe the characteristics, advantages, disadvantages, maintenance needs, and estimated costs of each gravelless system. Available in both English and Spanish, the price is $1 each.

- *On-Site Wastewater Treatment Systems: Leaching Chambers.* Request Item #WWFSGN163. (English version), or #WWFSGN164 (Spanish version).
- *On-Site Wastewater Treatment Systems: Gravelless.* Request Item #WWFSGN165 (English version), or #WWFSGN166 (Spanish version).

Gravelless Drainfields Technology Package

This 68-page NSFC document is a compilation of research papers, articles, abstracts, case studies, and product information about gravelless and chamber soil absorption systems. It is geared toward engineers, researchers, public health officials, contractors, developers, and planners. The price is $10.80. Request Item #WWBKGN74.

Alternative Onsite Systems Technology Package

This package gives homeowners a general overview of the many alternative onsite wastewater technologies that can be used in areas not suitable for conventional septic tank/soil absorption systems. The price is $5.50. Request Item #WWBKGN87.

Onsite Wastewater Treatment Systems: Conventional Septic Tank/Drainfield

Produced by the Texas A&M University of Agricultural Extension Service, this fact sheet details the characteristics, advantages, disadvantages, maintenance, and costs for a conventional septic tank/soil absorption system. It includes illustrations. Price is $1. Item #WWFSGN131.

CD-ROM Offers the Best of the NSFC

This CD-ROM titled *Wastewater Resources for Small Communities* includes articles, documents, fact sheets, brochures, and a complete catalog of NSFC products. The price is $14.95. Request Item #WWCDGN162.

PIPELINE

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Pipeline

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Small Community Wastewater Issues Explained to the Public

Soil Characteristics – Demystifying Dirt

Soil is the foundation of conventional onsite wastewater treatment. The drainfields used with onsite systems work because the soil around the trenches acts as a filter and removes organic matter, some of the nutrients present in wastewater, bacteria, and other pollutants before the water returns to the groundwater. Every site has unique soil characteristics that are critical in determining the size and type of onsite wastewater treatment system required.

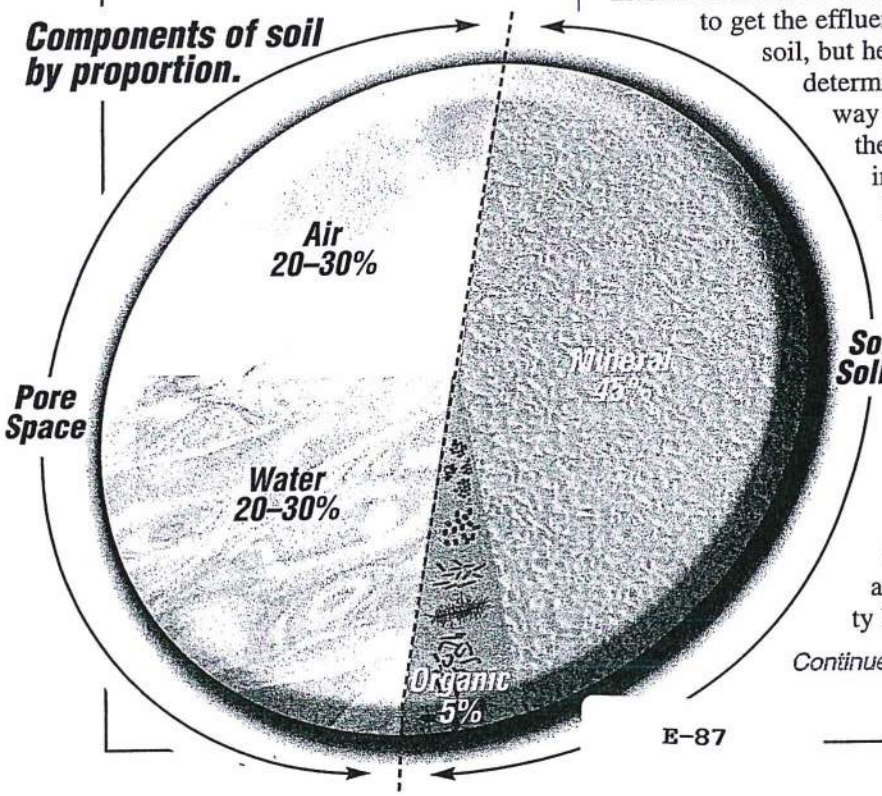
Soil conditions are one of the most important elements in site evaluation and system design. Other restricting site parameters include the topography, separation distances, owner's preferences, existing water sources, depth to any limiting layer, and landscape position. But the ability of the soil to accept and transmit the effluent from the disposal system is the most crucial element.

It is necessary to evaluate the soil to ensure that a drainfield is designed properly and will not fail prematurely. Information about the depth of the soil and how quickly it will absorb water determines the suitability of the dispersal area. Soils that accept water too quickly will not treat wastewater adequately, and soil conditions that do not allow the effluent to move quickly enough into and through the soil also create problems.

In a site evaluation, the designer must be concerned with not just how to get the effluent into the soil, but he must also determine the best way to introduce the effluent into the soil horizon, how will it move across the site, and in what condition the effluent will be in when (or if) it moves across property lines.

Continued on Page 2

Components of soil by proportion.



Glossary

Drainfields – an area of perforated piping that carry wastewater from the septic tank to the soil providing both disposal and treatment of the effluent, also referred to as the leachfield or dispersal field

Separation distance – the physical space between the bottom of the trench and the limiting layer

Limiting layer – anything that changes the normal flow of water through the soil profile, such as bedrock or the water table

Effluent – clarified wastewater from the septic tank

Topography- the configuration of a surface in relation to natural and man-made features, described in terms of differences in elevation and slope; in other words, the lay of the land

Nutrients- elements including nitrogen and phosphorus, necessary for plant growth

Percolation rates – indicates how fast the water will move down through the soil

Soil texture – determined by the proportions of the different-sized soil particles

Soil structure – relates to the grouping or arrangement of soil particles

Soil horizons – layers of soil composed of different minerals and amounts of organic matter; each layer exhibits similar color and texture; horizons make up the soil profile as seen in the test pit

Hydraulic conductivity or permeability - the ability of a porous media or soil to conduct water through its pore spaces

Permeameter - an instrument used to measure hydraulic conductivity of soil

Continued from previous page

Soil consists of four components in various proportions: mineral particles, organic particles, water, and air. See the figure on Page 1 for a simple pie chart representing these proportions. Note that only about half of the soil volume consists of solid material; the other half consists of pore spaces filled with air or water.

Soil types are a result of the underlying rock types, climate, native vegetation, topography, and weathering. Not much remedial work can be done to change these factors. But, by identifying the soils present, it becomes easier for wastewater professionals to predict which dispersal technology will be most effective and reliable over time.

This issue of *Pipeline* explains how different soil types are classified and how these differences impact onsite wastewater treatment.

Soil characteristics

A site evaluation is the first step toward installing an appropriate wastewater disposal system. Site evaluations determine soil characteristics at the building site and the soil's ability to treat and dispose of wastewater. The Spring 2000 issue of *Pipeline* presents a complete overview of the site evaluation process (See page 8 for more information.) *Small Flows Quarterly*, summer 2002, issue has a discussion on techniques used to determine soil characteristics.

When a landowner applies to have his site evaluated before his onsite wastewater treatment system is approved, a representative from the local health department or permitting agency reviews the soil surveys that the National Resource Conservation Service (formerly known as the U.S. Soil Conservation Service) provides. Table 1 lists the procedures performed by a soil evaluator.

A soil survey is the systematic examination, description, classification, and mapping of soils in an area. These surveys consist of aerial photographs of the mapped area that note types and distribution of soils. The survey indicates the soil's suitability for subsurface absorption systems, as well as other important engineering properties, such as how far it is to bedrock, if seasonally high water tables are probable, average percolation rates, and drainage potential.

A skilled soil evaluator will be able to estimate the hydraulic conductivity or permeability of the soil horizons by noting the structure and texture of the soil. From this, he or she will be able to determine the layout and format of the drainfield so that it provides adequate dispersion of the effluent into the soil horizons and provide the degree of treatment required to preserve the environment. This is essentially a judgement call based on a thorough examination of soil properties and the evaluator's past experience.

A soil evaluation begins with a simple soil probe or hand auger, to retrieve samples of soil at different depths. To determine if there is enough unsaturated soil below the proposed bottom of the absorption area, the evaluator will then dig a larger test pit within the perimeter of the proposed absorption area.

Some new technologies ,such as a permeameter, are on the horizon that may provide even more precise measurements of soil properties. These techniques and technologies my be faster and more reliable than some of the ones currently in use.

The soil pit should be about three feet deep and about a yard wide to

Table 1

Soil evaluation procedures

Describe soil horizons

List soil horizon features:

- ✓ Depth of horizon, thickness
- ✓ Moisture content
- ✓ Color
- ✓ Volumetric percentage of rock
- ✓ Size, shape, type of rock
- ✓ Texture of <2mm fraction of horizon
- ✓ Presence/absence of mottling
- ✓ Soil structure by grade
- ✓ Level of cementation
- ✓ Presence/absence of carbonates
- ✓ Soil penetration resistance
- ✓ Abundance, size,distribution of roots

Determine soil changes in soil profile across proposed site

Interpret results by identifying limiting depths

- ✓ Check vertical separation distances
- ✓ Identify mottled layers, concretions
- ✓ Determine depth to saturation
- ✓ Measure depth to confining layer
- ✓ Identify highly permeable layers

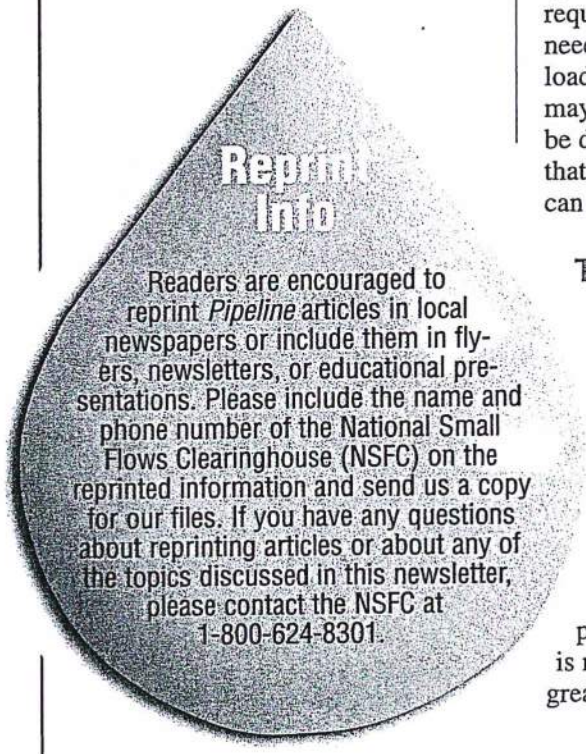
Issue site report

Develop system type, size location, and installation recommendations

expose the soil layers called horizons. Horizons vary in thickness and have irregular boundaries, but generally parallel the land surface. The vertical section exposing the texture changes in the different layers of soil is termed a soil profile. Road cuts and other open excavations expose soil profiles and serve as a window to the soil.

Horizons begin to differentiate as materials are added to the upper part of the profile and other materials move to deeper zones. Organic matter from decomposed plant leaves and roots tends to accumulate in the uppermost horizons, giving these layers a darker color than the lower ones. These horizons are generally referred to as the topsoil.

The next layers contain less organic matter and are composed of silicate clays, iron and aluminum oxides, gypsum or calcium carbonate accumulated from the horizons above. These lower layers are referred to as subsoil. The characteristics of subsoil greatly influence most land-use activities. Roots can't penetrate impermeable subsoil and water can't move through it.



Poor drainage in the subsoil can result in waterlogged conditions in the topsoil.

Limiting layer

A factor known as the "limiting layer" occurs in the subsoil. This limiting layer impedes or interferes with the natural flow of water. It might be a seasonal water table (high in winter and spring then falling in summer and fall), a layer of solid rock, or a gravel bed. The depth between the bottom of the dispersal trench and this limiting layer is important—the greater the depth or distance between them the better it is for effective wastewater treatment. States or regions have various restrictions on this depth. The local permitting authority will have information on restrictions, if any exist.

Where there is a permanently high water table, it is sometimes possible to use subsurface drains to lower the water table and keep it far enough below the trenches so that effluent is treated adequately. Seasonal high water tables may require that loading rates be decreased during wet winter and early spring periods. For septic systems, this means more land area is required for the larger drainfields needed during wet periods, when loading rates need to be reduced. It may also mean that effluent should be diverted to alternate drain lines, so that biological clogging of the soil can be avoided.

Texture

Most of the soil's solid framework consists of mineral particles. These particles in different size ranges and porportions determine the soil texture. The larger soil particles, which include stones, gravel, and coarse sands, are generally different kinds of rock fragments. Most smaller particles are composed of a single mineral. Any soil is made up of particles that vary greatly in both size and composition.

Help your soil be its best!

- Keep heavy equipment off the soil absorption system area both before and after construction. Soil compaction can result in premature failure of the system.
- Avoid installing the septic tank and soil absorption system when the soil is wet. Construction in wet soil can cause puddling, smearing, and increased soil compaction. This can greatly reduce soil permeability and the life of a system.
- Divert rainwater from building roofs and paved areas away from the soil absorption system. This surface water can increase the amount of water the soil has to absorb and cause premature failure.

Sand grains are the most familiar mineral particles. They are large enough to be seen by the naked eye and feel gritty when rubbed between the fingers. Sand particles do not stick to one another; therefore sands do not feel sticky. Silt particles are somewhat smaller — too small to see without a microscope or to feel individually, so silt feels smooth but not sticky, even when wet. The smallest class of mineral particles are the clays, which form a sticky mass when wet and hard clods when dry.

Terms such as sandy loam, silty clay, and clay loam are used to identify the texture. See Table 2 on Page 4 for a complete list of textures and how they react when wet and dry.

As effluent from a drainfield passes through a silty soil, particulates are filtered out in a relatively short distance. Most bacteria, viruses, or other potential disease-causing organisms cannot pass through long distances of dry soil; they remain within the first few feet. In saturated soils, organisms may travel greater distances. Water moves very slowly through soils with a high clay

Continued on next page

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content, and consequently, clay soils require a large areas in order to treat the effluent.

When effluent enters gravel with little or no fine material (silt and clay particles), it will pass through the empty spaces in the soil unfiltered so quickly that pathogens can travel hundreds of feet. Slower travel gives opportunity for good contact between soil particles and effluent, thus providing more effective purification of the water.

Soil structure

Soil structure refers to how soil particles are arranged relative to each other. Soil particles tend to group themselves into blocks or clusters called "peds." If these peds have a characteristic shape, the soil is said to have structure. The space between these peds and how they are aligned influence how water moves within the soil. Structure is considered more important than texture for determining water movement in soils.

Soil structure can be adversely altered if compressed or compacted by heavy equipment during construction. Homeowners need to protect the proposed drainfield site from this type of damage.

Soil color

Color and color patterns may provide clues that help estimate how well a soil will absorb and transmit water. Much of soil color is due to the presence of iron. When there is no air in the soil, as in waterlogged soil, iron is

Continued next page

Table 2

Textural properties of mineral soils – feeling and appearance

Soil Class	*Dry*	*Moist*
Sandy gravel	Loose stones and single grains that feel gritty. Squeezed in the hand, the soil mass falls apart when the pressure is released.	Squeezed in the hand, it forms a cast that crumbles when touched. Does not form a ribbon when rubbed between thumb and forefinger.
Silty sand	Aggregates easily crushed; very faint velvety feeling initially, but with continued rubbing, the gritty feeling of sand soon dominates.	Forms a cast that bears careful handling without breaking. Does not form a ribbon between the thumb and forefinger.
Sandy silt	Aggregates are crushed under moderate pressure; clods can be quite firm. When pulverized, soil has velvety feel continued rubbing. Casts bear careful handling.	Casts can be handled quite freely without breaking. Very slight tendency to ribbon between the thumb and forefinger. Rubbed surface is rough.
Clayey silt	Aggregates are firm but may be crushed under moderate pressure. Clods are firm to hard. Smooth, flour-like feel dominates when soil is pulverized.	Cast can be freely handled without breaking. Slight tendency to ribbon between thumb and forefinger. Rubbed surface has a broken or rippled appearance.
Silty clay	Very firm aggregates and hard clods that strongly resist crushing by hand. When pulverized, the soil takes on a somewhat gritty feeling due to the harshness of the very small aggregates.	Cast can bear much handling without breaking. Pinched between the thumb and forefinger, it forms a ribbon whose surface tends to feel slightly gritty when dampened and rubbed. Soil is plastic, sticky, and puddles easily.
Clay	Aggregates are hard; clods are extremely hard and strongly resist crushing by hand. When pulverized, it has a grit-like texture due to the harshness of numerous very small aggregates which persist.	Casts can bear considerable handling without breaking. Forms a flexible ribbon between thumb and forefinger and retains its plasticity when elongated. Rubbed surface has a very smooth, satin feeling. Sticky when wet and easily puddled.

Table 3

Selection of Dispersal Methods Under Various Site Constraints

	Soil Permeability			Depth to Bedrock			Depth to Water Table	
	Very Rapid	Rapid-Moderate	Slow-Very Slow	Shallow and Porous	Shallow and Non-Porous	Deep	Shallow	Deep
Trenches		◆	◆			◆		◆
Beds		◆				◆		◆
Pressure/Low-Pressure Pipe System		◆	◆		◆	◆	◆	◆
Contour Trench		◆	◆	◆	◆	◆	◆	◆
Drip Irrigation	◆	◆	◆	◆	◆	◆	◆	◆
Spray Irrigation		◆		◆	◆	◆	◆	◆
Gravelless/Chamber System		◆				◆		◆
Mound System	◆	◆	◆	◆	◆	◆	◆	◆
At-Grade System	◆	◆	◆	◆	◆	◆	◆	◆
Evapotranspiration Trench	◆	◆	◆	◆	◆	◆	◆	◆
Evapotranspiration-Absorption Trench		◆	◆			◆		◆

Source: Table adapted and updated from EPA, 1980, table 2-1.

lost from the soil and the soil becomes grayish. When the soil drains well, allowing air to enter, the iron oxidizes to brown, yellow, or red. Dark colors generally indicate higher organic content. Interpreting color helps to identify conditions where soils drain well or where soils remain saturated.

The soil in the pit should be examined in bright daylight and compared to the Munsell® color system, the universally accepted standard for identifying soil color. While soil color is easily seen and an excellent indicator of the soil's aeration status, temperature, mineral content, vegetation, and position in the soil profile can modify color. Soil color must be used in conjunction with the other soil features to form a complete analysis.

Typically, well-drained soils are red or brown in color, and poorly drained soils are a splotchy gray. A mottled appearance, where spots of color intermingle with the gray, usually indicates seasonally saturated soils.

Density

A soil's bulk density relates to the volume of mass of dry soil plus its air spaces. Soils with high bulk density are less porous and less permeable. For instance, clay soils have high bulk density. Their particles are tightly packed with minimal air spaces between them. Clays that swell when they become wet, seal off soil pores further, and can virtually stop the flow of water.

Approximately half of the volume of the soil consists of different-sized pore spaces. When water enters the soil, it displaces air. If you think of the network of soil pores as the ventilation system connecting airspaces to the atmosphere, it is easy to understand that when the smaller pores fill with water, the ventilation system becomes clogged.

The right design for the site

The proper onsite wastewater system must be able to handle the projected wastewater volume and composition, work within the design boundaries of the receiving environment, the performance requirements for the environment and the needs and desires of the owner. Table 3 presents a simple chart of site conditions and some alternative dispersal technologies effective under those conditions.

All of the above soil characteristics together with the percolation tests make up the site evaluation, and the site evaluation identifies the critical design boundaries. Soil characteristi are at the basis of this evaluation procedure.

The Scoop

What is soil?

The unconsolidated mineral or organic material on the immediate surface of the earth

What determines the soil's ability to treat wastewater?

Texture, structure, depth, color, and density

What determines these properties?

They are a result of underlying materials, climate, native vegetation, topography, and the time of weathering

Indiana soils challenge standard designs

"Until you dig that test pit, you never know what is lurking under there,"

says David Pask, engineering scientist, with the National Environmental Services Center.

At the request of the Indiana State Department of Health, Pask was invited to investigate some failing systems built in Wells and Allen Counties, located in the northeastern part of the state. The terrain of this region is gently rolling.



Photo courtesy of D. Pask

David Pask, engineering scientist, with the National Environmental Services Center, advises evaluators and system designers to look at the whole picture when evaluating a site.

This part of Indiana has been farmed intensely for years and much of the area is artificially drained with ceramic tile lines. Often these artificial drains improve the hydraulic functioning of the soil, but as in this case, it can never be counted on to completely relieve the problem of saturated or impermeable soils or high water tables.

Three sites were examined: two were lots for new construction and the third was a two-acre site with a two-bedroom home. The homeowner reported that effluent had been discharging onto the surface of the drainfield since the system had been installed.

Test pits dug at the three different sites showed subsoils to be essentially impermeable. The soils are essentially clays and silty clays beneath the shallow organic topsoil. Pask noted that the only available route for the dispersion of the effluent is in the nine-inch depth of the topsoil through evapotranspiration.

Although this area is not within the traditionally accepted climate where evapotranspiration exceeds precipitation, it appears that evapotranspiration is the principle route of water loss in these soils is rather than filtering down to the watertable. Evidence showed that during rain even these fine textured topsoils absorb the first quarter to half inch of water to create an impervious surface. The remainder of the stormwater stays on the surface and becomes runoff to the nearest drainage channel. This was corroborated by observations that good grain and vegetable crops were dependant on regular (weekly) rainfall.

From these indicators, only the top nine inches of soil is capable of effluent dispersal. Unfortunately, Indiana state code dictates that the trenches lie deeper than this. In the case of the one existing home with the failing drainfield, sandier soils were found at the western boundary of the property and could easily accommodate an additional disposal trench.

Pask is hoping that an improved layout of shallow soil absorption trenches will be able to contain the effluent beneath the surface without breakout, even under storm conditions. This drainfield will be installed initially as an experimental system with the hope that codes allowing for shallow lines may be put in place some time in the future.

Pask advises that evaluators and system designers look at the whole picture when evaluating a site. The characteristics of the soil must be carefully examined and put into the equation with the topography. And there is no quick and dirty recipe for this procedure. Every location is different and regulators and designers must looks at the whole picture when choosing an appropriate technology.

New Onsite Wastewater Manual Available from the NSCEP

The U.S. Environmental Protection Agency (EPA) recently published a new Onsite Wastewater Treatment Systems Manual, which can only be ordered from the National Service Center for Environmental Publications (NSCEP).



This manual provides up-to-date information about onsite wastewater treatment system siting, design, installation, maintenance, and replacement. It discusses significant advances that can help onsite systems become more cost-effective and environmentally protective, particularly in small, suburban, and rural areas.

The manual promotes a performance-based approach to selecting and designing onsite systems. This approach will enable states and local communities to design onsite wastewater programs that fit local environmental conditions and communities' capabilities.

Please note that this manual is only available from the NSCEP–the National Small Flows Clearinghouse (NSFC) does not offer it at this time. To order, contact the NSCEP via:

Phone
(800) 490-9198 or (513) 489-8190
Fax
(513) 489-8695
Web site
http://www.epa.gov/ncepihom/ordering.htm

Be sure to specify EPA document number 625/R-00/008 when ordering.

Pipeline topics from the past

Here's a list of *Pipeline* topics previously covered. Any issues of interest may be ordered by calling the National Small Flows Clearinghouse at (800) 624-8301 or by email at nsfc_orders@mail.nesc.wvu.edu. A shipping and handling charge will apply. Request each item by number and title.

Please feel free to share with us any ideas you might have for future topics. As the editor, I can be reached at the above number or by email at mnoah@mail.wvu.edu.

Combined Sewer Overflows – A Priority for Small Communities
Spring, 1995, SFPLNL01

Septic Systems – A Practical Alternative for Small Communities
Summer 1995, SFPLNL02

Maintaining Your Septic System – A Guide for Homeowners
Fall 1995, SFPLNL03

Home Aerobic Units for Wastewater Treatment
Winter 1996, SFPLNL04

Management Programs Can Help Small Communities
Spring 1996, SFPLNL05

Wastewater Treatment Protects Small Community Life, Health
Summer 1996, SFPLNL06

Alternative Sewers – A Good Option for Many Communities
Fall 1996, SFPLNL07

Choose the Right Consultant for Your Wastewater Project
Winter 1997, SFPLNL08

Lagoon Systems Can Provide Low Cost Wastewater Treatment
Spring 1997, SFPLNL09

Sand Filters Provide Quality, Low Maintenance Treatment
Summer 1997, SFPLNL10

Basic Wastewater Characteristics
Fall 1997, SFPLNL11

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Winter 2001, SFPLNL24

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Spring 2001, SFPLNL25

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Paying for Onsite System Management
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Graywater: Safe Reuse and Recycling
Spring 2002, SFPLNL28

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Site Evaluation for Onsite Treatment and Disposal Systems

Produced by Rural Systems Engineering, this semi-technical design manual discusses site evaluations. Critical site and soil characteristics, the use of soil surveys, and necessary equipment are described. Factors affecting the percolation test also are discussed. Item #WWBLDM12, cost is $11.70.

Site Evaluations

The Spring 2000, Volume 11, Number 2 issue of *Pipeline* explains the importance of a site evaluation prior to installing an onsite wastewater system, and how the testing determines which type of onsite system is appropriate for a particular site. The newsletter discusses planning for an onsite system, including the preliminary site evaluation; soil surveys; field testing; landscape contour and subsurface drainage; soil test, texture, structure, and other soil properties, as well as water movement. Suggested site evaluation procedures and tips are offered. Item # SFPLM21, cost is $0.40.

Subsurface Soil Absorption System Design Work Session: New Development at Stump Creek

This Rural Systems Engineering design module consists of three phases of a subsurface soil absorption system design for the Stump Creek subdivision. Phase 1 is a feasibility assessment for determining potentially suitable areas for subsurface soil absorption, site limitations, and the types of systems that can be used. Phase 2 includes a soil survey, outlining areas suitable for subsurface soil absorption, selecting the best type of system for each area, and making a rough analysis of hydraulic capacity. Phase 3 is the description of the mound design that is being used in a cluster system. Item #WWBLDM16, cost is $6.85.

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National Small Flows Clearinghouse

Small Community Wastewater Issues Explained to the Public

Alternative Dispersal Options

Overcoming the challenges of providing an onsite sewage system on a not-quite-perfect building site takes some thought, but by careful analysis of the site characteristics and constraints, a number of alternative systems are possible choices for the homeowner.

The choices are also narrowed down by each individual states' regulations and by the prohibitive costs of some alternative systems. But as prime building sites become scarce, wise engineers and designers keep current on treatment technologies for wastewater where site conditions are not ideal.

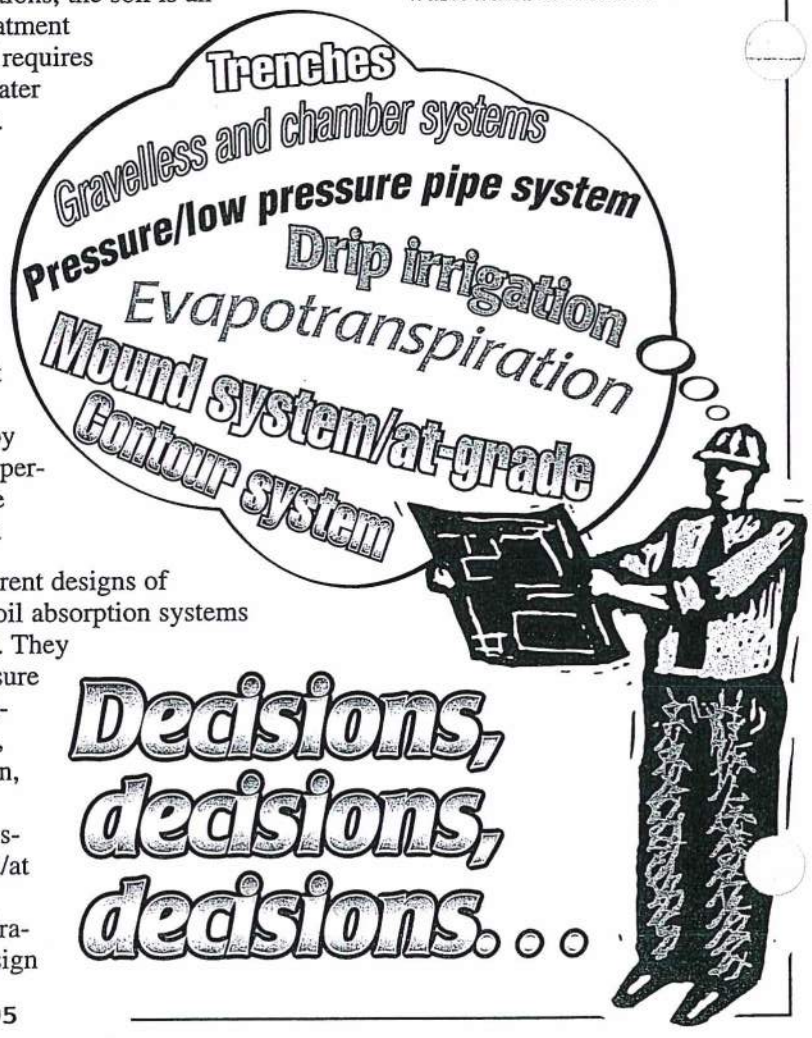
Certain site conditions or constraints influence the type of onsite system considered for the lot. The four most influential are: slope, vertical separation distances, soil characteristics and permeability (the ability of water to move through spaces in the soil). Horizontal separation distances from property lines, bodies of water, buildings, etc., also need to be met. Each state's minimum site requirements for installation of a conventional septic system are different and may vary from the criteria listed above.

These tight site parameters become less restrictive when the designer and homeowner consider a wider range of dispersal technologies. Once wastewater undergoes primary treatment in the septic tank, the clarified effluent flows to the dispersal area (drainfield) for final treatment and dispersal. Since the site characteristics limit the method of dispersal more than other components, the disposal component should be selected first, followed by selection of pretreatment and advanced wastewater components.

Where site conditions are suitable, subsurface soil absorption is usually the best method of wastewater dispersal for single dwellings. It is simple, stable and low cost. Under the proper conditions, the soil is an excellent treatment medium and requires little wastewater pretreatment. Partially treated wastewater is discharged below the ground surface where it is absorbed and treated by the soil as it percolates to the groundwater.

Several different designs of subsurface soil absorption systems may be used. They include pressure systems, contour systems, drip irrigation, chambers, gravelless systems, mound/at grade, and evapotranspiration. The design selected depends on the site characteristics encountered. Critical site factors include soil profile characteristics and permeability, soil depth over water tables or bedrock, slope, and size of the area.

This issue of *Pipeline* presents descriptions and technical drawings of various dispersal designs and technologies that can be used to overcome site limitations for onsite wastewater treatment.



Trenches

The most commonly used system, the conventional septic system, consists of two main parts: a septic tank and a soil absorption system. The septic tank is a watertight tank that holds the wastewater discharged from the house for 24 to 48 hours, allowing sludge and scum to separate from the wastewater. Effluent passes (usually by gravity flow) from the septic tank to the soil absorption system, which can be either a bed or trenches.

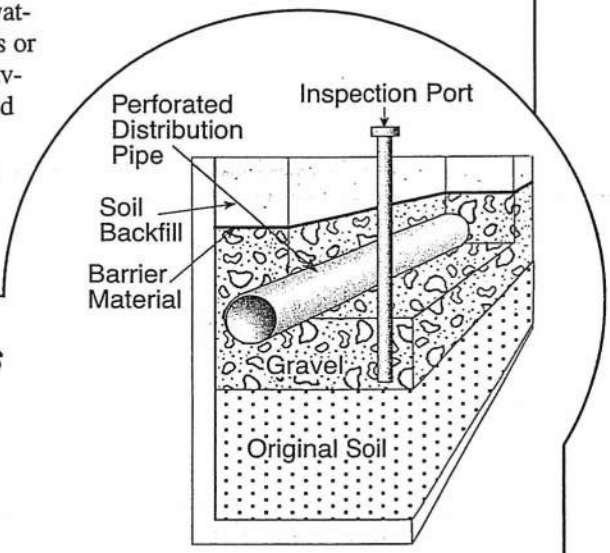
The effluent is treated in both the soil absorption system and the surrounding soil. Septic systems generally require minimal routine maintenance, are relatively inexpensive to install, and if properly designed and constructed, are reliable for a relatively long period of time.

For beds or trenches the following general criteria usually apply:

- Slope—0 to 25 percent (0 to 5 percent for beds)
- Vertical separation distances—2 to 4 feet of unsaturated soil between the bottom of the system and the seasonally high water table or bedrock
- Soil—sandy or loamy textures are best with bright, uniform colors
- Percolation rate—between 1 and 60 min/in (based on an average of at least three perc tests).

The trench system consists of shallow, level excavations, usually 1 to 5 feet deep and 1 to 3 feet wide. The excavated area is usually filled with 6 inches or more of porous medium, such as gravel. Next, a distribution network is laid out over the media. A single line of perforated distribution pipe is laid in each trench. A semi-permeable barrier such as building paper or straw is placed on top of the network before the system is covered with soil. The wastewater trickles through the network, through the media, and into the soil. Treatment of the wastewater occurs in both the media and soil sections of the trench system.

Bed systems consist of an excavated area, normally wider than 3 feet and 1 to 5 feet deep. The excavated bed is filled with gravel, the distribution pipe laid in and covered with an impermeable layer like the trench system before being buried with topsoil.



nches

Geometry, orientation, and configuration considerations for Subsurface Wastewater Infiltration Systems

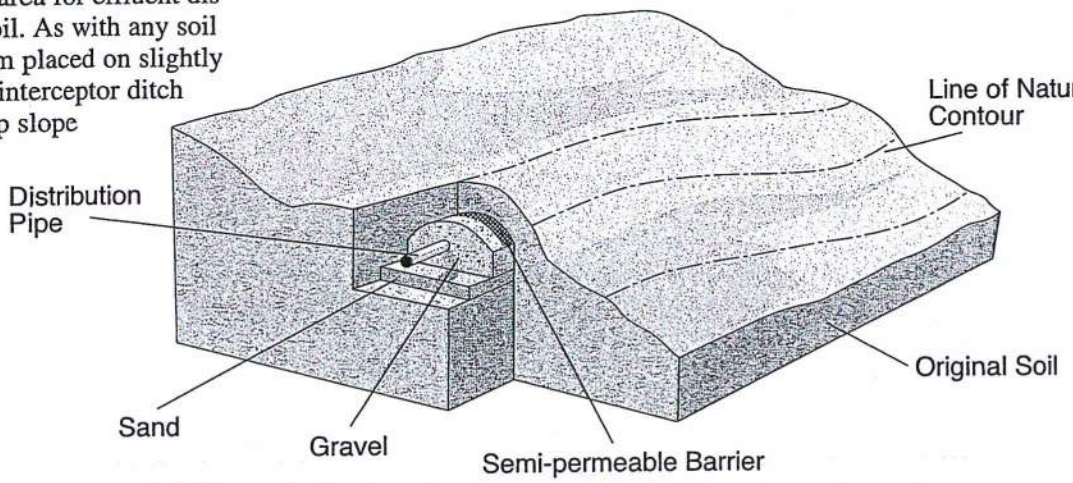
Design type	Design considerations
Trench	
Geometry	
Width	Preferably less than 3 feet. Design width is affected by distribution method, constructability, and available area.
Length	Restricted by available length parallel to site contour, distribution method, and distribution network design.
Sidewall height	Sidewalls are not considered an active infiltration surface. Minimum height is that needed to encase the distribution piping or to meet peak flow storage requirements.
Orientation/ configuration	Should be constructed parallel to site contours and/or water table or restrictive layer contours. Should not exceed the site's maximum linear hydraulic loading rate per unit of length. Spacing of multiple, parallel trenches is also limited by the construction method and slow dispersion from the trenches.
Bed	
Geometry	
Width	Should be as narrow as possible. Beds wider than 10 to 15 feet should be avoided.
Length	Restricted by available length parallel to site contour, distribution method, and distribution network design.
Sidewall height	Sidewalls are not considered an active infiltration surface. Minimum height is that needed to encase the distribution piping or to meet peak flow storage requirements.
Orientation/ configuration	Should be constructed parallel to site contours and/or water table or restrictive layer contours. The loading over the total projected width should not exceed the estimated downslope maximum linear hydraulic loading.

Taken from Table 4-4, USEPA Onsite Wastewater Treatment Systems Manual, 2002

Contour system

In this gravity-fed system, a connecting line leads to several feet of perforated distribution pipe set in one shallow trench that follows the contour of the land. Sand and gravel, together with a geotextile covering, are placed in the trench. This system provides a large area for effluent dispersal into the soil. As with any soil absorption system placed on slightly sloping land, an interceptor ditch may be placed up slope from the dispersal trench to help divert surface runoff away from the trench.

The use of a contour system is advantageous because the effluent is spread over a much broader front, but there may be distinct disadvantages also. In situations where trenches have to be over150 feet long, the system must be pressurized. Depending on the underlying geology of the site, ensuring the levelness of thebottom of the trench can be difficult.

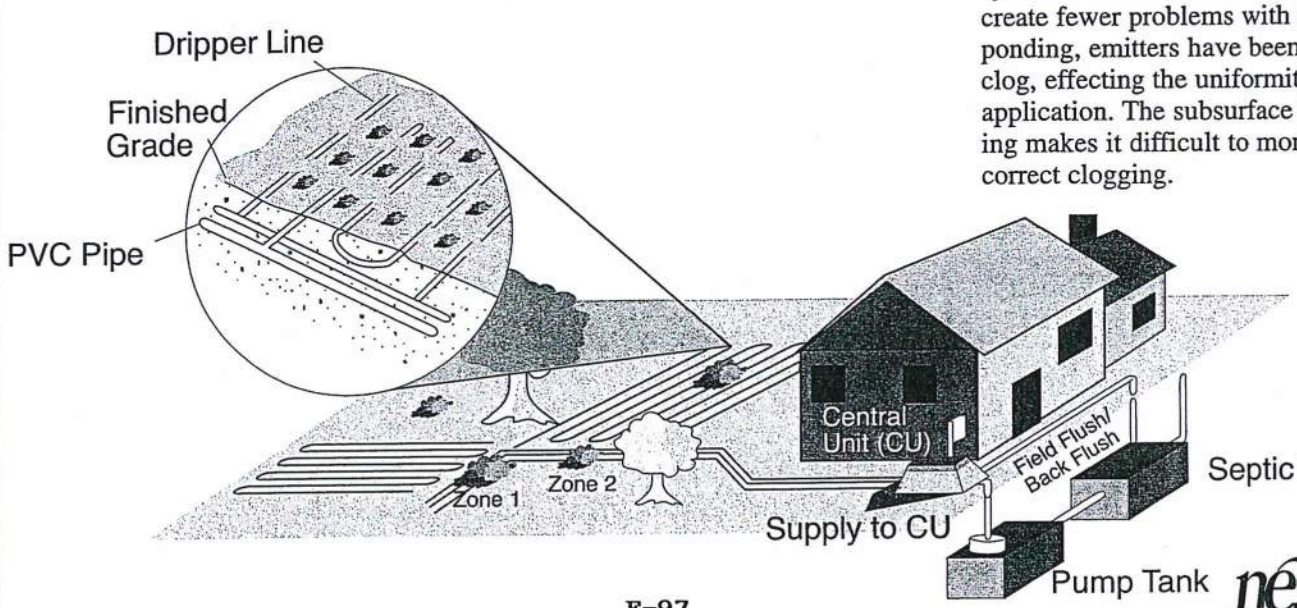


Drip irrigation

Drip irrigation systems (also known as "trickle" systems) apply treated wastewater to soil slowly and uniformly through a network of thin, flexible tubing placed at shallow depths in the soil. Wastewater is pumped through the tubes and drips slowly from a series of openings directly to plant roots. The automated Central Unit controls the system.

To protect public health and to prevent the system from clogging, the wastewater must be pretreated and filtered. One advantage of drip irrigation is minimal site disturbance due to the flexible tubing that can be placed around trees and shrubs.

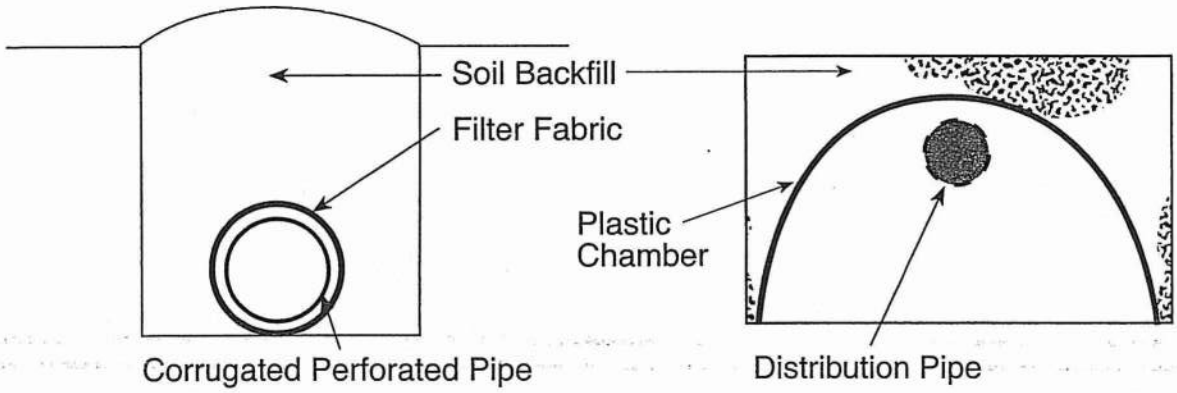
Because irrigation systems are designed to apply wastewater at very shallow depths, irrigation may be permitted on certain sites with high bedrock, high groundwater, or slowly permeable soils. Drip systems can be designed to accommodate sites with complex terrain due to the flexible tubing used. While subsurface drip systems distribute water evenly and create fewer problems with odors and ponding, emitters have been found to clog, effecting the uniformity of application. The subsurface positioning makes it difficult to monitor and correct clogging.



Gravelless and chamber systems

Gravelless and chamber systems use some material other than gravel or rock in the excavation to provide an infiltrate surface onto which septic tank effluent is distributed along the length of the trench. These systems provide some capacity to store effluent until it can be absorbed into the soil and also to inhibit sand and silt infiltration.

Advantages of gravelless and chamber systems include faster installation and increased volume of void space per unit length compared to conventional stone trenches. Soil compaction is reduced since the need to use heavy equipment to haul and place gravel is eliminated. In some instances, the area required for soil absorption is reduced for chamber/graveless systems when compared to the area needed for conventional soil absorption systems. Homeowners are advised to check local codes to see if such a reduction is allowed.

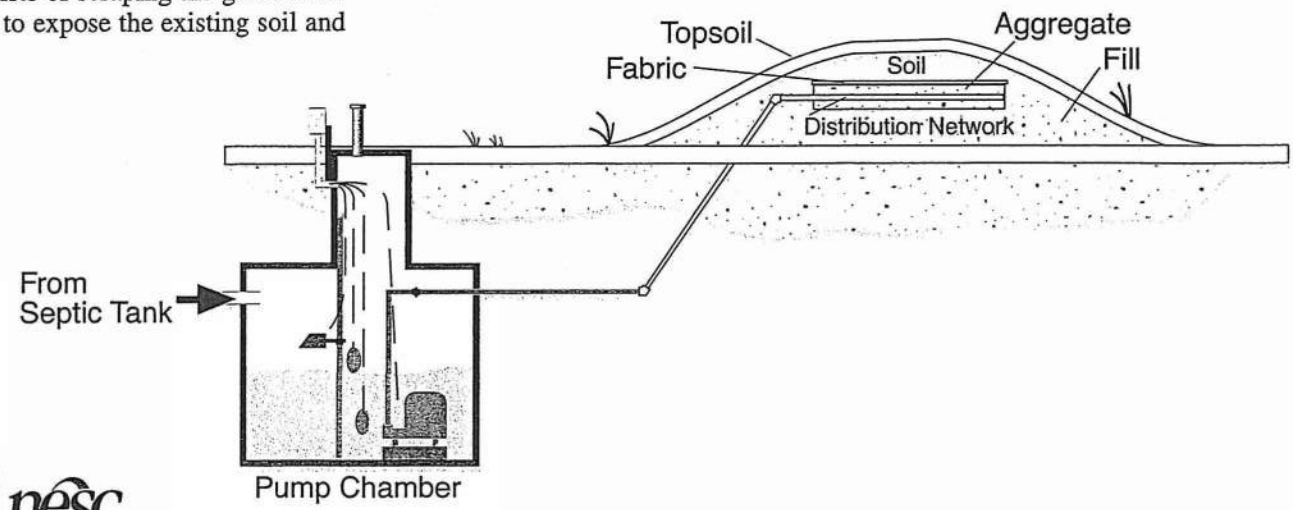


Mound system/at-grade

The mound is simply a raised drainfield. A mound is composed of sandfill on top of a gravel-filled bed and a network of small-diameter pipes known as the distribution system. Wastewater is pretreated in a septic tank, and then fed by gravity to a pump chamber where the effluent is dosed to the mound. In an at-grade system, the ground surface is the bottom of the trench. Construction consists of scraping the ground surface to expose the existing soil and eliminating vegetation prior to adding gravel to the ground surface.

The mound design overcomes site restrictions such as slowly permeable soil, shallow permeable soils over creviced or porous bedrock, and permeable soils with high water tables.

Mounds may be constructed on sites with slopes of up to 25 percent, but not in flood plains, drainage ways, or depressions unless flood protection is provided. Another siting consideration is adequate horizontal separation distances from water wells, surface waters, property boundaries, and building foundations. Although mound systems are typically much more expensive to install than conventional systems, when properly designed, constructed, and maintained, they are very satisfactory.

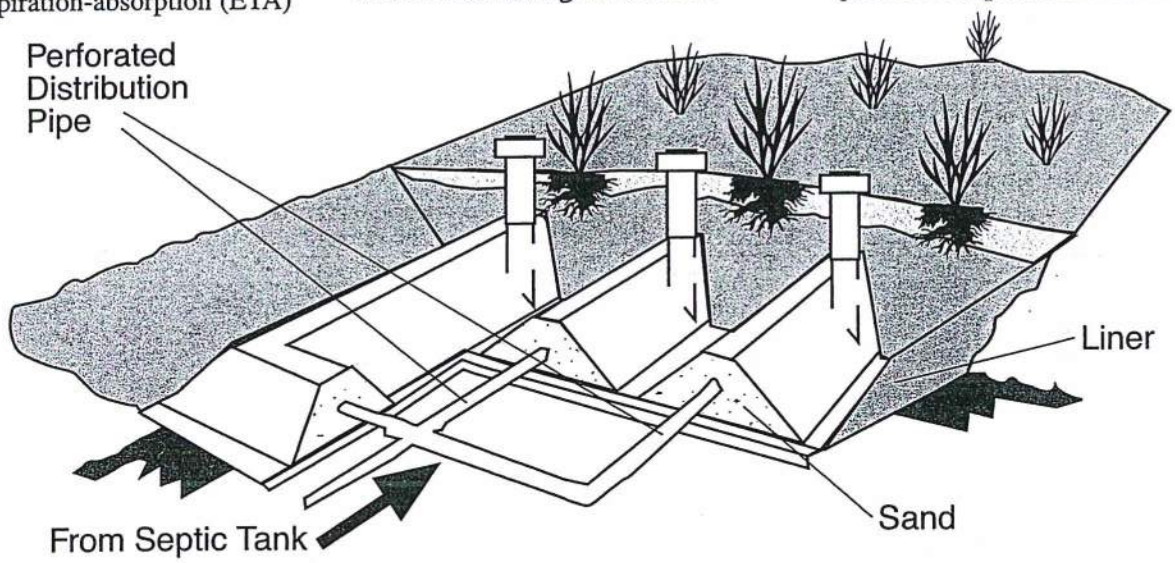


Evapotranspiration

Evapotranspiration systems (ET) employ the combined effects of evaporation from soil and transpiration from plants to dispose of wastewater effluent. The effluent flows from the pretreatment unit to a sand bed underlaid with an impermeable liner. Vegetation above the sand bed wicks up the moisture through their roots, eventually transpiring the excess through their leaves. Moisture that migrates to the soil surface evaporates into the atmosphere. The evapotranspiration-absorption (ETA) systems are similar but are designed for fairly impenetrable soils. ETA systems use unlined sand beds, allowing effluent to trickle slowly into the underlying ground.

ET systems can be used on sites having very porous soils and may be used to allow for a closer proximity to water wells (50 feet) as opposed to the one hundred-foot setback needed for soil absorption drainfields. ET systems are most effective in locations having low rainfall amounts, low humidity, high daily average temperatures, and high levels of solar radiation. Evapotranspiration must exceed rainfall by at least 24 inches or the system may become overloaded.

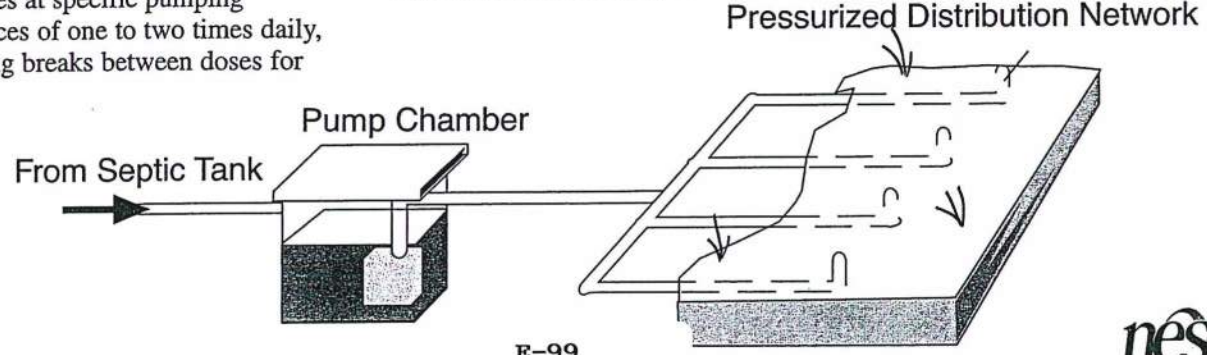
Due to the rather simple configuration, ETs require very little maintenance and are comparable in cost to other alternative onsite systems. ET systems are very useful in arid regions or on sites having very porous or impermeable soils.



Pressure/low pressure pipe system

Pressure and low-pressure pipe (LPP) systems are shallow, dosed soil absorption systems. LLP systems are composed of a septic tank or aerobic unit, a dosing chamber, and small-diameter distribution piping with small perforations. Partially clarified effluent is forced through the pipes at specific pumping sequences of one to two times daily, allowing breaks between doses for the soil to absorb the wastewater. Dosing frequencies vary between sites and soil conditions.

These pressure pipe systems are especially designed to overcome the site constraints of anaerobic conditions due to continuous saturation and/or a high water table. LPP systems can be located on sloping ground or on uneven terrain and can even be placed upslope of the home site, although in some cases, the suitability of these absorption designs can be limited by soil, slope, and space characteristics of a location.



Decisions, decisions, decisions. . .
the process for determining the most appropriate technology

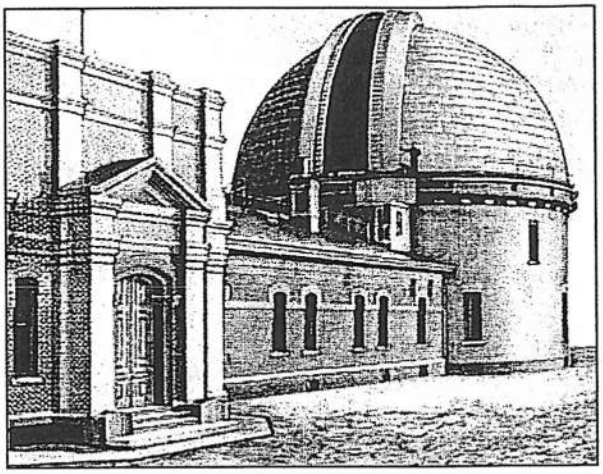
The Lick Observatory in California has been in use for more than 100 years and has provided more astronomical discoveries than any other in the world, but the antiquated wastewater treatment and dispersal systems in place are not up to the task of adequately treating the wastewater generated by over 40,000 visitors each year.

To address the worsening problem, the Kennedy/Jenks Consultants of San Francisco were contacted to recommend some innovative onsite replacement systems. Homeowners and local health officials may find it useful to follow the consultants' process as they determined the most appropriate onsite system for the observatory site.

Up near the stars

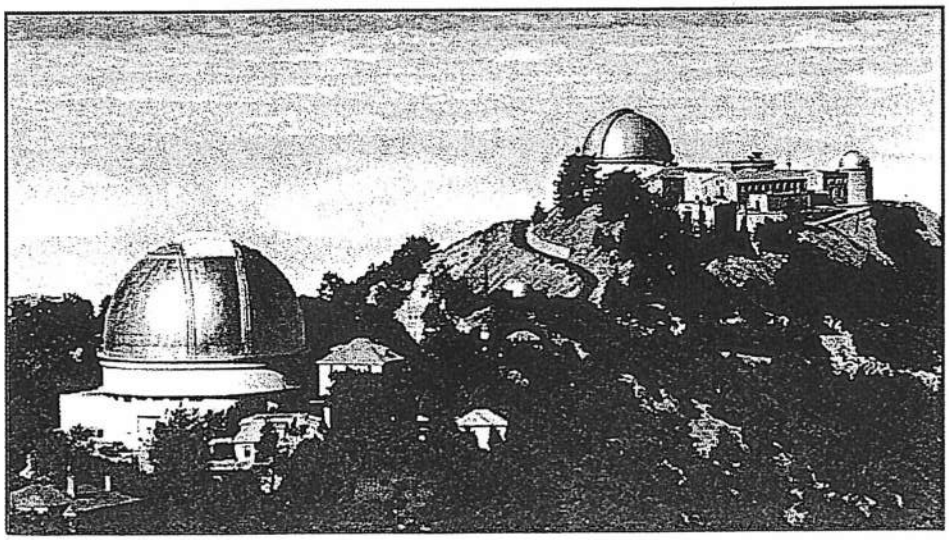
Located in Northern California, where soils are typically shallow, the observatory site was especially difficult for the more commonly employed drainfields, but discharge of 'any degree of wastewater effluent to continuous or ephemeral watercourses is prohibited' by state law, so land disposal was the only option.

The Lick Observatory structures, including the observatory itself and a picnic area, are located on the spine of Mount Hamilton; the sides of the mountain slope away steeply in both directions. The exposed rock is only one meter below grade. The underlying rock is decomposed, fractured sandstone and shale. Of special concern is the fact that the existing septic tanks and leach fields are in the watersheds of the springs that are the observatory's only water supply.



The observatory, founded in 1888, has always been a part of the University of California. After more than a century of operation, Lick Observatory remains among the most productive research observatories in the world.

Existing tanks were either too small or inaccessible (several had never been pumped or inspected); leach fields were too short to meet regulatory requirements and were of insufficient depth or located in fill soils. The slopes were very steep in most leach field locations, exceeding 20 percent.



This view of Lick Observatory illustrates the steep hillsides and shallow soils of Mount Hamilton.

Determining regulatory authority

To begin the process, it is always necessary to know who provides local regulatory responsibility at the site. And for most homeowners, it is usually the local health department but this site crossed several jurisdictional boundaries. In the State of California, all wastewater disposal is regulated by the State Water Quality Control Board through regional water quality control boards and in this case, it would be the San Francisco Bay Region Water Quality Control Board. Specialists with the Santa Clara Health department were also involved for approval.

To determine percolation rates and soil conditions according to the Santa Clara Sewage Ordinance, it was decided to seek sites for wastewater dispersal that would conform to the minimum slope requirement of 20 percent and be accessible. Several sites were found that had soil with acceptable percolation rates and provided enough area for subsurface dispersal of all the wastewater.

The recommendations

Three alternative systems were suggested.

Alternative 1 – Individual septic tank and leach fields

The first alternative plan was to continue the use of individual tanks, and not provide secondary treatment or disinfection. Instead, water conservation fixtures would be utilized to reduce leach fields requirements by 25 percent. A layer of sand in the trench below the perforated pipe would provide a filter and a dosing siphon leachfield flow would provide uniform but intermittent flow and resting cycles. Single field replacements were proposed with a replacement field area designated nearby.

Alternative 2 – Grouped wastewater treatment and disposal

This option would have individual septic tanks at each building that would either be pumped, or flow by gravity, to a recirculating sand filter. The wastewater would receive aerobic treatment in the sand filter followed by disinfection in a baffled tank system with a tablet chlorinator. A recirculating sand filter was selected over other possible systems because of its more compact size and less complexity. This system also has the lowest overall cost for construction, operation and maintenance.

Table 1

Comparison of cost and non-cost factors of septic system alternatives at Lick Observatory

		Alternatives 1	2	3
Item type	*Weighting factor*	*Individual*	*Grouped*	*Community*
Captial cost	25	20	15	12
O&M cost	25	25	10	5
Reliability	10	6	8	5
Flexibility	10	10	8	7
Expandability	10	8	7	9
Environmental	10	2	5	9
Aesthetic	10	10	5	8
Total	100	81	58	55
RANK		***1***	***2***	***3***

The percolation trench sizes were based on the tested percolation capacity and a sustained percolation rate of double the leach field area required by the county.

Alternative 3 – Community wastewater treatment and disposal

This alternative would collect all the wastewater from the existing buildings by submersible grinder pumps. Using a combination of pressure pipes and a gravity system, all of the wastewater would be conveyed to a community treatment and dispersal site. Existing septic tanks would be maintained for overflow in the event of power outage or for short-term discharges.

Making the right choice

The selection of the most appropriate replacement system must involve not only the capital costs plus operation and maintenance, but also other non-cost factors, such as reliability, flexibility, expandability, environmental and aesthetics.

Treatment reliability is defined as the dependability of the system to produce high-quality effluent on a continuing basis at the rated capacity. Flexibility is the ability to respond to changes in flow to accommodate flow pattern changes.

The expandability factor expresses how easily the system could be modified to handle an increase in capacity. Environmental factors include visual impact, noise, odor, and the potential for sludge production.

From a purely dollar standpoint, Alternative 1 rated as the most economical choice but the consultants didn't stop at that. They went on to assign values to the above non-cost factors for comparative purposes. Table 1 illustrates how the systems rated and were compared. Even with all these factors considered, Alternative 1, with the individual septic tanks and leach fields in combination with the water conservation fixtures, appeared to be the optimal choice for this situation.

This case study demonstrates some of the different steps required to choose which system is best for a given site.

Editor's Note: A copy of the original report on this project, *Innovative Replacements of Failed Septic Tank Leach Field Systems for Small Communities*, Robert A. Ryder, P.E., is available from NSFC. Request Item #L005630 at a cost of fifteen cents per page plus shipping.

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NSFC RESOURCES AVAILABLE

To order any of the following products, call the National Small Flows Clearinghouse (NSFC) at (800)624-8301or (304)293-4191, fax (304) 293-3161, e-mail nsfc_orders@nesc.wvu.edu, or write NSFC, West Virginia University, PO Box 6064, Morgantown, WV 26506-6064. Be sure to request each item by number and title. A shipping and handling charge will apply.

Onsite Wastewater Treatment for Small Communities and Rural Areas

The NSFC poster provides descriptions and illustrations of various onsite, conventional, and alternative wastewater treatment and disposal technologies. Formerly known as "Small Wastewater Systems: Alternative Systems for Small Communities and Rural Areas," the poster was revised to include several new technologies and to focus strictly on onsite technologies as opposed to both onsite and community-sized systems. The poster provides a large, illustration depicting typical uses of alternative wastewater systems in a rural community setting and showing how some onsite technologies can be clustered. Item #WWPSPE02. Cost is $1.25 plus shipping.

Wastewater Collection and Treatment Systems for Small Communities

This NSFC poster provides descriptions and illustrations of various onsite, conventional, and alternative wastewater treatment and disposal technologies. Although not meant to be a comprehensive guide to conventional and alternative small community and cluster systems, it serves to acquaint the public with several representative systems. Pretreatment options, including bar screens, communitors/grinders and grit chambers, and secondary treatment options such as lagoons and ponds, activated sludge, and oxidation ditches, are only a few of the technologies presented. Item #WWPSPE65. Cost is $1.25 plus shipping.

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Small Community Wastewater Issues Explained to the Public

Fall 2003
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NATIONAL SMALL FLOWS CLEARINGHOUSE

Septic tank enhancements

This issue of *Pipeline* will investigate some of the options available to enhance the efficiency of your septic tank or to make maintenance practices more convenient. Note: It is not the National Small Flows Clearinghouse's intention to endorse one product over another, but to inform readers about options on the market.

Historically, onsite septic systems were considered temporary measures, installed to fix an immediate problem until a more permanent solution could be arranged. Experience has shown us that if properly designed, installed, and maintained, onsite wastewater treatment systems are effective permanent solutions. But like any engineered device, an onsite system has a design life—a certain length of time after which performance begins to decline.

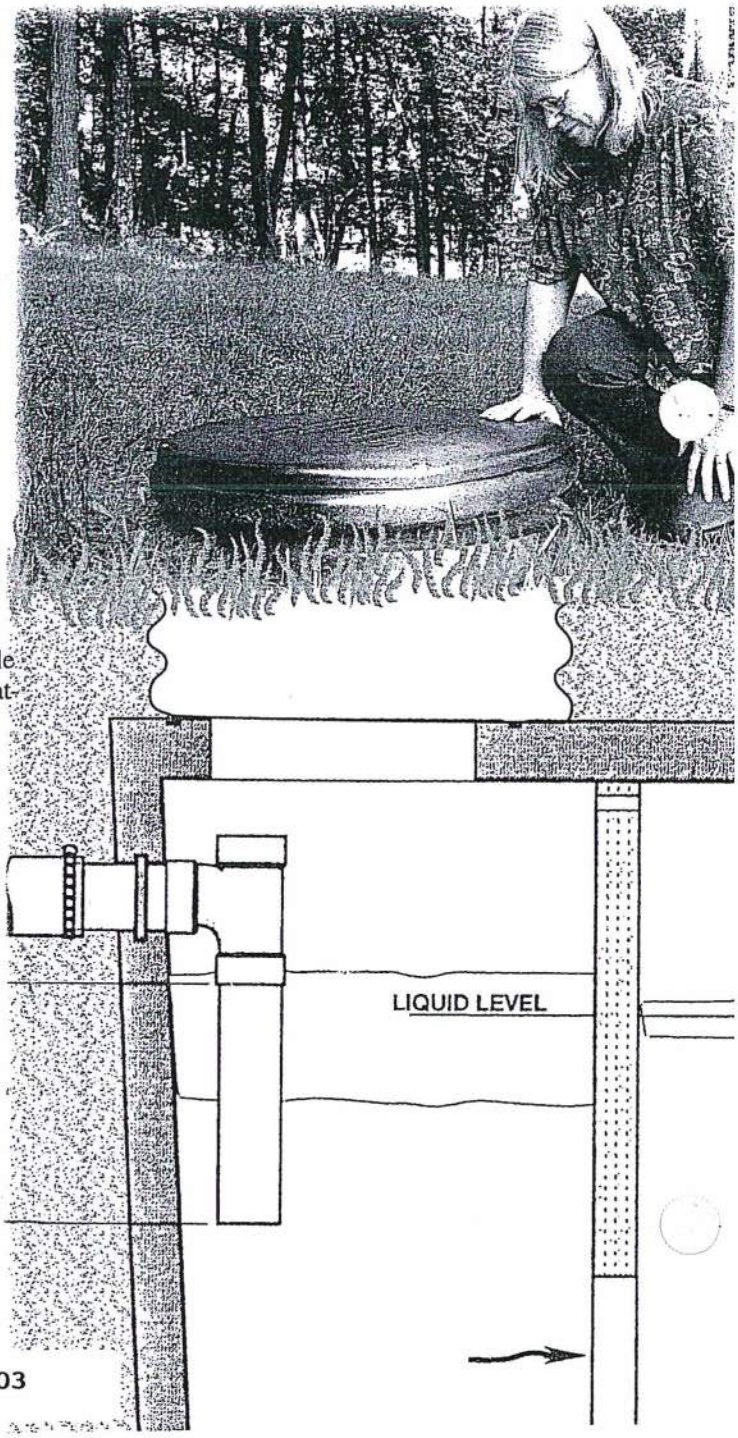
The critical factor of any onsite system is the soil absorption system. Soil is the least uniform component and the most difficult to monitor. The majority of the enhancements discussed here are directed at protecting the drainfield. By including some of the optional enhancements reviewed in this newsletter, your onsite treatment system can achieve even more efficiency and longevity.

As onsite wastewater treatment technology has developed, and more systems are in use, various enhancements have been designed to improve treatment and to simplify maintenance. Some options can be added on to existing systems, while others must be incorporated into the initial design and installation.

Your local or state regulations may require some of these accessory items, while others are optional. Some types and models of these enhancements must be accepted under your local code before being installed. Check with your local health department when considering any modification to your onsite wastewater system.

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Let's start with the tank

Septic tanks were originally designed to serve as simple settling basins — to separate scum and solids from the liquid. We now know that biological processes partially digest the sewage. In fact, a good percent of ultimate treatment can be accomplished in the septic tank. (A well-functioning tank will reduce biochemical oxygen demand by 40 percent and total suspended solids by 70 percent—the two parameters used most often to measure the effectiveness of wastewater treatment.)

A septic tank is a watertight container constructed of a durable material resistant to corrosion or decay (commonly concrete, polyethylene plastic, or fiberglass). Septic tanks are usually buried underground near the house (usually 10 to 15 feet from the foundation), about 18 to 24 inches below the surface.

Septic tanks can be constructed out of various materials, but they must be completely watertight. Concrete tanks are very economical, but they can be difficult to install on small or remote sites due to their heavy weight. For ease of transportation, concrete tanks sometimes are cast in two or more pieces, to be joined on the site. In this case, all joints should be made watertight with a special approved sealant such as bitumen or butyl rubber. The sealant must remain pliable across a wide range of temperatures. All fittings and connections must be flexible to ensure watertightness in case the tank moves due to settling.

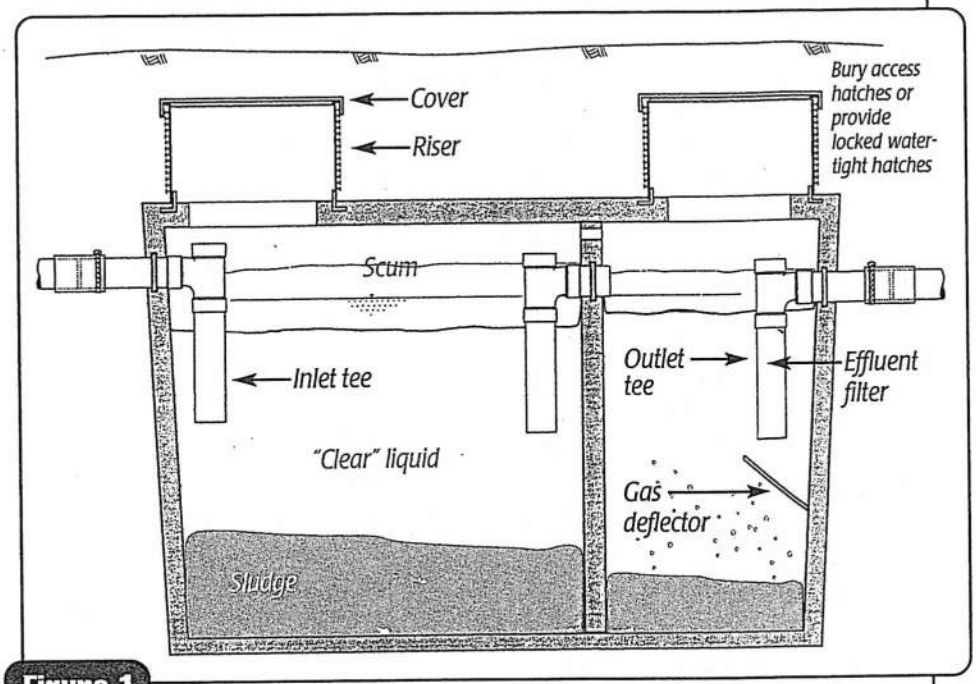


Figure 1 *Diagram of a typical dual compartment tank.*

Fiberglass tanks are lightweight, but can float out of the ground during periods of high groundwater unless securely anchored. Polyethylene tanks are also easy to transport and handle, but must be backfilled carefully to prevent crushing.

Today's septic tank is designed to do three major tasks—clarify, treat, and store. Clarification takes place when solids settle out of the liquid based upon size and specific gravity. The lighter fats, oils, and greases (FOG) float to the surface (often along with soap suds) forming the scum layer. The solids settle to the bottom of the tank forming a layer called sludge. The liquid between the scum and sludge is called clarified sewage or effluent. It slowly flows to the drainfield for further treatment when displaced by new sewage coming into the tank.

A septic tank should be able to store the sludge and scum that accumulate over a period of two to four years or between pumpings. This can mean that up to one-half of the tank volume is reserved for sludge and scum accumulation. The rate of solids accumulation varies greatly from one household to another; actual storage time can only be determined by routine septic tank inspections.

A well-designed septic tank provides:

- liquid volume sufficient for a 24 hour fluid retention time at maximum sludge depth and scum accumulation,
- sufficient sludge storage space,
- outlet devices to prevent sludge or scum from discharging to the drainfield, and
- venting provisions to direct gases safely away.

Variable features of a septic tank are: the size, shape, and number of chambers, and the number and style of baffles and gas venting provisions. Check with your local health department about the current regulations for these variations.

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Size

A septic tank for a residence should have a liquid capacity of between 500 to 2000 gallons. The tank must be adequately sized so wastewater remains in the tank long enough for bacterial activity to take place (approximately 24 hours). Tank volume is usually based upon the building size, number of bedrooms, or other similar parameter.

Up to 50 percent of the solids retained in the tank decompose; the remainder accumulates in the tank. Your home's tank must be capable of storing the sludge and scum accumulated over a two to four year period. As solids build up, settling time decreases and suspended solids may pass through to the drainfield and damage it.

The material pumped is known as septage. The frequency of pumping depends on the capacity of the septic tank, the volume of wastewater (determined by the size of the household), and the amount of accumulated solids in the tank. Garbage grinders (disposals) increase the amount of solids and, thus, increase the frequency of pumping.

Configuration

An improperly configured tank will allow the wastewater to short-circuit through the tank to the outlet. The shape of the tank should allow the wastewater to spend the maximum detention time (the amount of time the wastewater spends in the tank before being sent on to the drainfield). Elongated tanks (with length to width ratio of 3:1) tend to be the most effective in improving suspended solids removal. The depth of the tank should be at least three feet below the outlet to prevent disturbance of the sludge layer.

Septic tanks can have one or multiple chambers. Although some engineers are convinced that two-compartment tanks do a better job of settling solids than single-chambered models, the single-chambered model continues to be an efficient and popular choice. Two-chambered models consist of two compartments created by an internal wall with an opening for flow from one compartment to the next. The compartments of a dual compartment tank should be unequal in size for

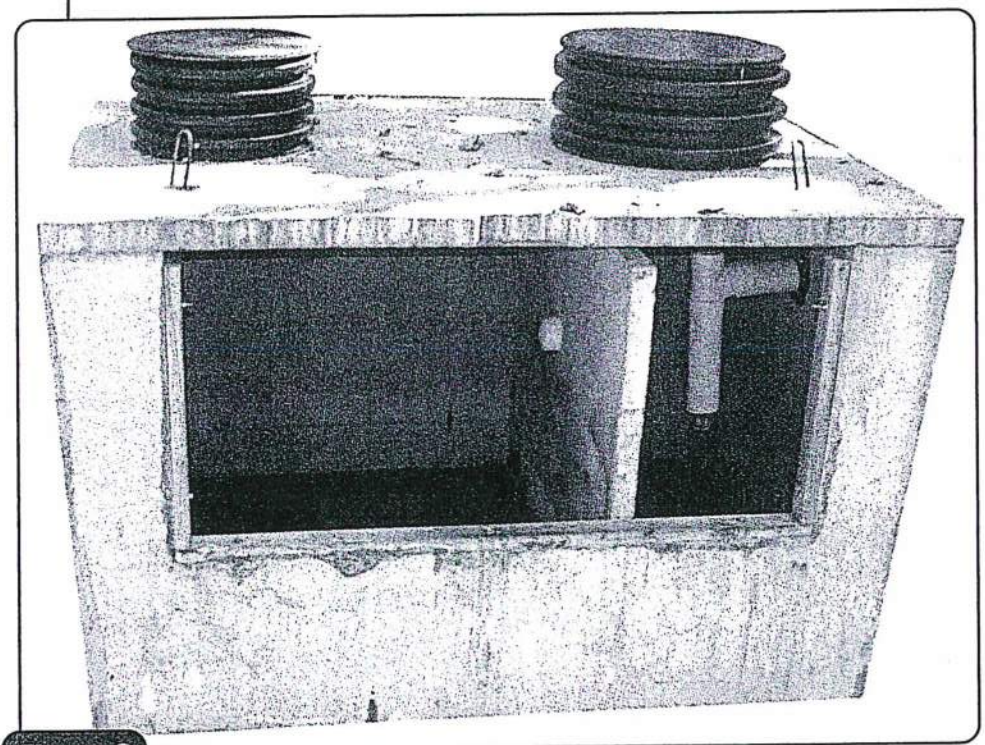


Figure 2 *Cutaway view of a dual compartment concrete tank.*

Installation considerations

The most important requirement of installation is to place the septic tank on a level grade and at a depth that provides adequate gravity flow from the home. The tank should be located where it can be easily accessed for pumping. Local codes must be consulted regarding minimum horizontal setback distances from buildings, property boundaries, wells, and water lines.

The tank should be placed on undisturbed soil so that settling does not occur that could loosen or break the lines. The underlying soils must be capable of bearing the weight of the tank and its contents. Soils with high organic content or containing large rocks are not suitable. If the excavation is dug too deep, it should be backfilled with sand to the proper elevation to provide a uniform bearing surface.

All joints must be sealed properly, including tank joints, inlets, outlets, manholes, and risers. Only high quality joint sealers should be used. After the seal has been given the specific curing time, all joints must be tested for leaks before backfilling begins.

After setting the tank and leveling and joining the lines, the tank must be carefully backfilled. The backfill material must be added in stages, and compacted after each addition. Only fine-textured soils should be used. In areas where freeze and thaw cycles are common it is very important that granular material be used, especially when using plastic and fiberglass tanks. Tanks made of different materials may have specific bedding and backfilling requirements. The manufacturer should be consulted for these specifications.

If you must locate your tank in a saturated area (or that has the potential for periodic saturation), the tank must be secured to prevent flotation. Tank manufacturers can recommend the appropriate anchoring methods.

best performance; the first chamber should be approximately two-thirds of the total volume. Studies show that the first chamber is in almost constant turmoil due to the ongoing addition of new wastewater, while the second chamber is relatively tranquil, allowing the re-suspended particles to settle and digestion to occur.

Multi-chambered tanks, which are now required by law in several states, need a more frequent pumpout schedule than the older single chamber tanks.

Baffles & tees

There must be an inlet and outlet device at either end of the tank. Baffles are placed between these ports to regulate the flow of the wastewater or the gases produced. The inlet and outlet ports, often referred to as sanitary tees, are usually T-shaped pipe configurations. See Figure 1 and 3.

The inlet tee forces incoming wastewater down into the tank, preventing it from flowing directly across the top of the standing wastewater to the outlet.

Inlet baffles are designed to slow the incoming rush of water to prevent disturbance to the scum layer. These are also known as splash baffles.

The outlet tee is designed to draw effluent only from the clarified zone between the sludge and scum layers, therefore keeping the scum layer from moving into the soil absorption system. The soil absorption system is the least uniform component, and is the component most difficult to monitor for operational problems; it is vitally important to protect it from damage.

Baffles are available in various sizes and styles, ranging from a simple bend in the inlet pipe to complex plastic, fiberglass, or concrete partitions attached to the ceiling or walls of the tank. Outlet baffles are used to retain the scum layer within the tank. There is often a special baffle, the gas deflector device or baffle, located below the outlet tee to deflect the gas bubbles (to which solid particles often adhere) from leaving the tank.

SAFETY



It should never be necessary to enter a septic tank. Any work to replace the baffles or repair the tank should be done from the outside. Decomposing wastes in the tank produce toxic gases which can overcome a human in a matter of minutes. When working on a tank be sure the area is well ventilated and that someone is standing nearby.

Effluent filters

Excessive discharge of solids to the drainfield can cause it to plug and lose efficiency in treatment and dispersal of the normal liquid flow. Septic tank effluent filters are basket-like screens that provide a relatively inexpensive method of preventing solids from discharging to the drainfield. They are installed at the outlet of the septic tank, sliding right into the top of the sanitary tee at the tank's outlet, collecting solids that may be discharged from the tank. See Figure 3. Effluent filters can collect suspended solids to less than one-sixteenth of an inch in size. Effluent filters are even capable of straining out FOG, the most damaging component of the wastewater.

If the septic tank is maintained properly, including frequent inspection for solids accumulation and removal, an effluent filter may not be necessary.

If you are considering using such a product, check with your local public health authority to find out what requirements apply to the installation and use of septic tank effluent filters.

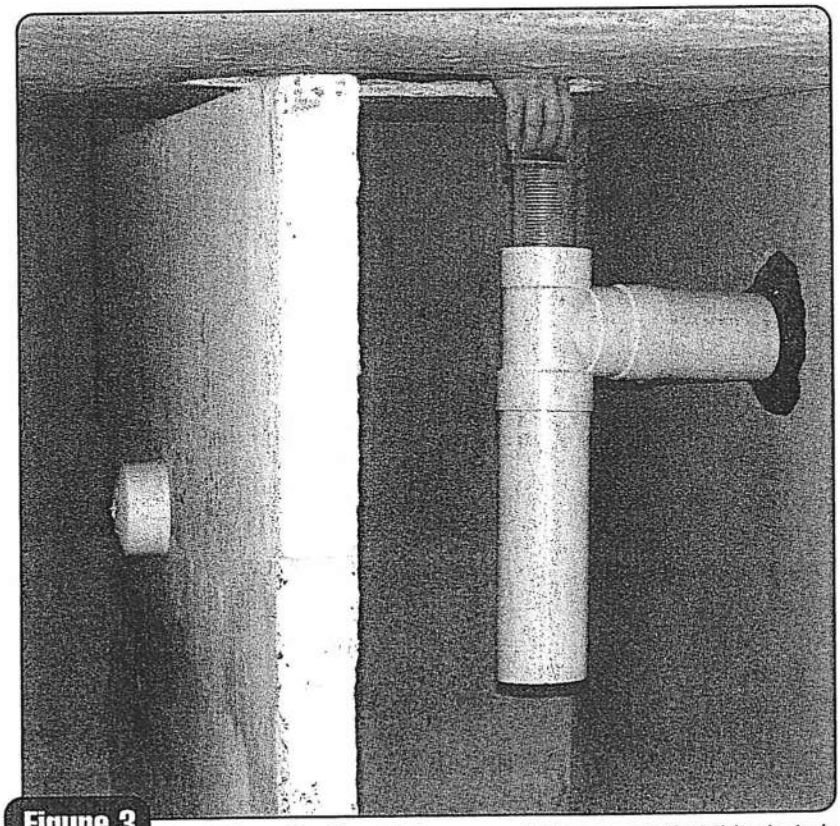


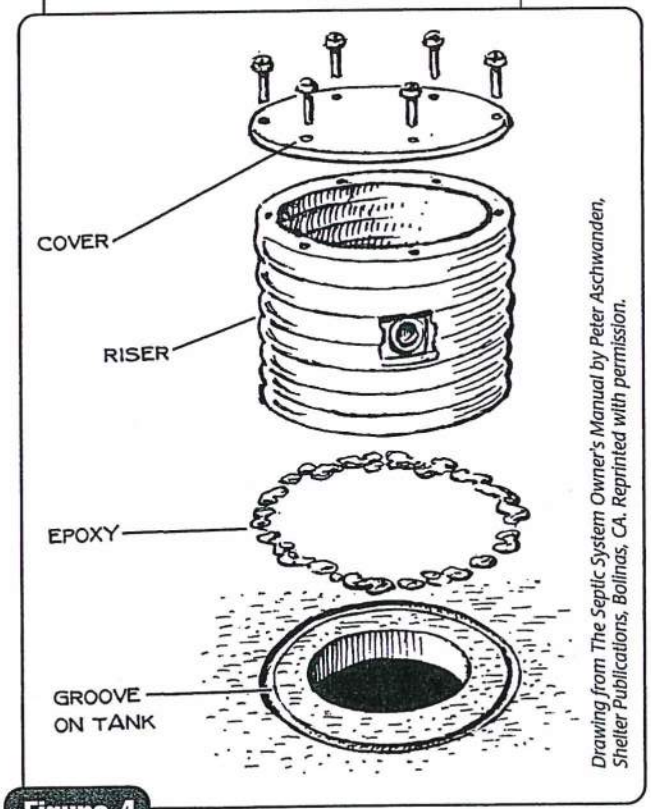
Figure 3 *Outlet tee with effluent filter exposed. Please note that this photo is of a demonstration tank, not actually in use. You should wear protective gloves when handling a filter in a working tank.*

Access ports

There are two types of access points into the tank itself: larger ones for maintenance and smaller ones for visual inspection. In some situations, especially with dual-compartment tanks, they are combined – each compartment has one large port, placed so inspection of baffles can occur and pumping can be done without damaging the baffles or inlet or outlet devices.

The large maintenance ports are usually called manholes and are large holes (24 or more inches wide) in each tank or compartment for pumping. Inspection ports are small openings (between four and six inches wide) used to inspect the scum and sludge levels, or the condition of baffles, etc. Be aware that pumping a tank through the baffle inspection port can damage the baffles. Also remember the dangers of entering the tank. See the Safety Tip on Page 4.

To facilitate accessing the various inspection ports and manholes, it is a common practice to add risers—vertical extensions from the actual opening in the tank to ground level. These ribbed plastic tubes allow easy access to the mechanics of the tank and simplifies lawn maintenance. Risers must be fitted with an airtight and watertight lid that prevents children or animals from entering. See Figure 4.



Drawing from The Septic System Owner's Manual by Peter Aschwanden, Shelter Publications, Bolinas, CA. Reprinted with permission.

Figure 4 *Detail for retrofitting a riser on an existing tank.*

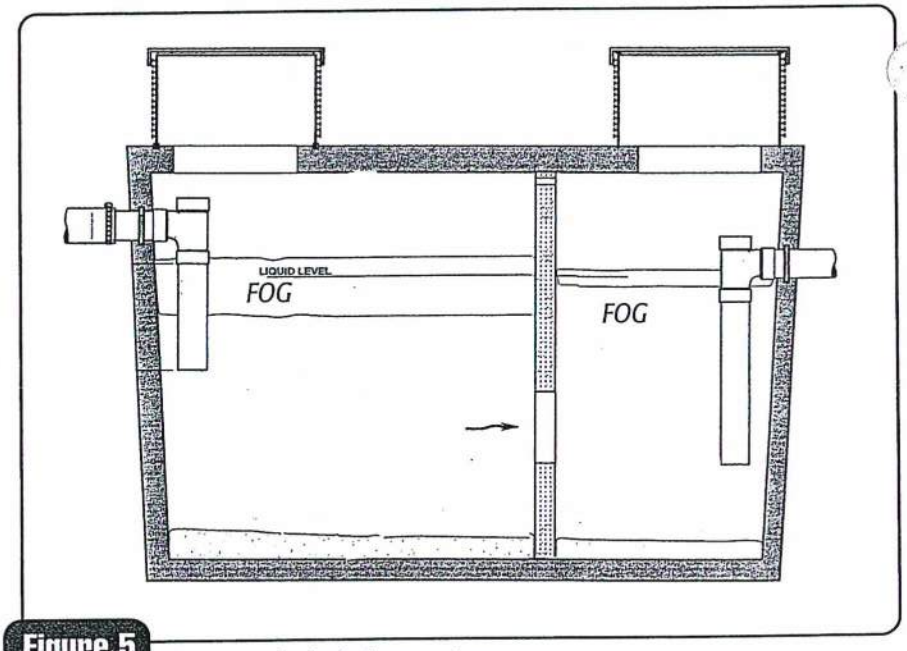


Figure 5 *Diagram of a typical grease trap.*

Gas vents

The natural digestion of the sludge at the bottom of the tank produce gases. These gases are hydrogen sulfide, methane and others—all of which are foul-smelling, possibly lethal, and explosive, and so must be vented out of the system. This venting is handled in several different ways.

Some inlet and outlet pipes are open at the top allowing the gas to collect at the top of the tank. From there the gases are piped back through the house's plumbing and released out the stack vent on the roof.

Vents inside the tank are placed above the scum layer between the inlet and outlet and through any compartment walls. Gas deflection devices or baffles are placed below the outlet tee to prevent rising gas bubbles from inadvertently carrying solids out to the drainfield.

Greasetraps

It is sometimes necessary to use several tanks in a series, the first a grease trap, designed to cool and capture all of the FOG. A grease trap prevents grease and other fatty substances from entering the septic tank and from being carried over to the drainfield, potentially causing clogging and system failures. Used mostly for effluent produced by commercial establishments, grease traps are essentially floatation chambers. They are either small units located directly at the kitchen drain, or large in-ground single or double chambered units. The outdoor type units will be discussed here.

The main application for grease traps is in treating kitchen wastewater for cafeterias, restaurants, hospitals, schools, and other institutions with large volumes of kitchen wastewater.

ing care of your septic system

- Always conserve water to reduce the amount of wastewater that must be treated and disposed of.
- Stagger your laundry wash loads throughout the week rather than doing it all on one day.
- Keep accurate records of all maintenance including pumping and repairs.
- Repair all leaking faucets and toilets.
- Discharge only biological wastes into the system: no panty liners, cigarette filters, q-tips, tampons, condoms, disposable diapers, dental floss, or other non-biodegradable products.
- NEVER flush chemicals that could contaminate surface and groundwater, such as paints, varnishes, thinners, waste oils, photographic solutions, or pesticides
- Divert all down spouts and all other surface water away from the tank and drainfields.
- Have your septic tank pumped on a regular schedule and check for leaks and cracks.
- Keep all septic tank covers accessible for tank inspections and pumping.
- Do not use a garbage disposal. Compost your garbage or put it in your trash instead. (A garbage disposal can be used if your septic system was designed for it; however, you should have your tank pumped more frequently.)
- Don't dig in your drainfield or build anything over the entire septic system including the tank.
- Don't plant anything over the drainfield except grass.
- Don't drive over the drainfield or compact it in any way as to prevent flow to the drainfields.

Taken from *"Septic System Maintenance,"* at *www.nesc.wvu.edu/nsfc/nsfc_septicnews.htm*

Grease traps operate by cooling the wastewater to separate out the FOG. The FOG floats to the surface of the trap, and is prevented from leaving by baffles and effluent discharge tees that extend below the depth of the oil and grease. See Figure 5. To make it more effective, a grease trap should be placed close to the kitchen where it can receive the still-hot wastewater. The separation process occurs while the liquid cools.

Maintenance practices are important as failure to properly clean the trap and remove the grease and solids can result in excessive grease buildup. This buildup could lead to the possible discharge of grease into the effluent, causing clogging of the drainfield.

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The following articles can be ordered from the National Small Flows Clearinghouse at (800) 624-8301, or by email at *nsfc_orders@mail.nesc.wvu.edu.* Cost is $.15 per page plus shipping and handling or they can be found online at *www.nesc.wvu.edu/nsfc/nsfc_archive.htm.*

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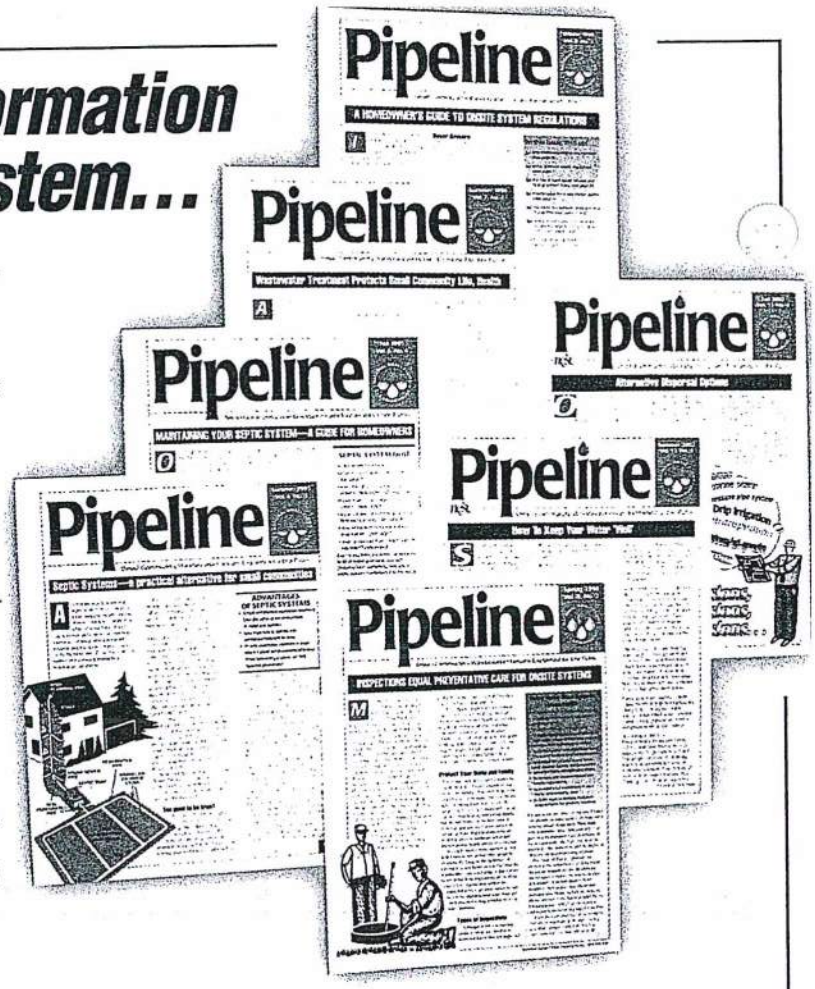
Making it more attractive

Decorative fake rocks are being manufactured that are specially designed to hide septic tank risers, manholes, vent pipes, and other potentially offensive parts of the wastewater treatment system that need to be at or above ground level.

The replicated boulders come in a variety of colors and are lightweight for easy moving. These 'rocks' help reduce motor noise, and have hidden air holes to keep constant air supply to vent pipes and motors.

There are also birdhouses and other lawn ornaments that are specifically manufactured to provide easily accessible, highly visible, yet esthetically pleasing solutions to the aboveground devices of a septic system.

For more helpful information about your septic system...



These issues of *Pipeline* are recommended for further reading. Hard copies may be ordered by calling the National Small Flows Clearinghouse at (800) 624-8301 or by email at *nsfc-orders@mail.nesc.wvu.edu*. A shipping and handling charge will apply. You can also find these newsletters online at *www.nesc.wvu.edu/nsfc/plarchiveframe.html*.

Septic Systems–A Practical Alternative for Small Communities
Summer 1995, SFPLNL02
This issue of *Pipeline* explains when septic systems are a good idea, how they work, and their advantages and disadvantages. Brief descriptions and sketches of various alternative designs and distribution systems are included.

Maintaining Your Septic System– A Guide for Homeowners
Fall 1995, SFPLNL03
This issue of *Pipeline* explains how to care for septic systems, when to pump, what to flush and not to flush, and what to expect during an inspection visit. Included also with this issue is a list of system do's and don'ts and information about failing systems, system additives, and the effect of cleaners and detergents.

Wastewater Treatment Protects Small Community Life, Health
Summer 1996, SFPLNL06
This issue of *Pipeline* explains the importance of wastewater treatment for protecting the health of small communities. Some of the potential health risks posed by inadequate treatment are also described.

A Homeowner's Guide to Onsite System Regulations
Winter 1998, SFPLNL12
This issue of *Pipeline* examines some common onsite wastewater system regulations as they affect property transfers, professional qualifications, operation and maintenance, and system changes and repairs. Their importance is discussed, as are the steps that others typically must take to have systems approved. The different roles and responsibilities of health officials are also discussed. This issue highlights a health inspector in rural Kentucky who aids in the installation of onsite wastewater systems.

Inspection Equals Preventative Care for Onsite Septic Systems
Spring 1998, SFPLNL13
This issue of *Pipeline* focuses on the advantages of having onsite wastewater systems regularly inspected. An overview of what occurs during an inspection visit is provided for homeowners, as well as information about when and how often systems should be inspected and how to locate a qualified inspector. The issue also includes a list of questions homeowners may be asked about their systems and a discussion of the homeowner's role in the process.

How to Keep Your Water "Well"
Summer, 2002, SFPLNL30
The Summer 2002 issue is titled "How To Keep Your Water 'Well" and presents the possible effects and special considerations that are mandatory to prevent the contamination of drinking water wells in areas where onsite treatment is employed. Included are tips from the EPA on protecting groundwater supplies and signs that suggest you should test your well.

Alternative Dispersal Options
Fall, 2002, SFPLNL31
The Fall 2002 issue is titled "Alternative Dispersal Options" and provides clear descriptions and diagrams of the various approved subsurface dispersal methods, including trenches, contour systems, drip irrigation, gravelless and chamber systems, mound systems, evapotranspiration systems, and pressure/low pressure pipe systems. A case study is presented which demonstrates the process for determining the most appropriate wastewater technology for a rocky, mountaintop observatory in California.

Reprint Info

Readers are encouraged to reprint *Pipeline* articles in local newspapers or include them in flyers, newsletters, or educational presentations. Please include the name and phone of the National Small Flows Clearinghouse (NSFC) on the reprinted information and send us a copy for our files. If you have any questions about reprinting articles or about any of the topics discussed in this newsletter, please contact the NSFC at (800) 624-8301.

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The National Environmental Services Center (NESC)—pronounced "nessie"—specializes in providing technical assistance and information about drinking water, wastewater, and environmental training to communities with fewer than 10,000 residents. You may be familiar with our individual programs, each well established as a national leader in its areas of expertise.

Located in Morgantown, West Virginia, NESC is based at one of the nation's major doctoral-granting research institutions, West Virginia University.

National Small Flows Clearinghouse (NSFC) is a national information and assistance program that helps identify appropriate wastewater technologies. NSFC offers more than 400 free or low-cost products, *Small Flows Quarterly* magazine, and *Pipeline*, a newsletter. NSFC maintains five databases with bibliographic, manufacturers and consultants, state regulations, health department, and facilities information. Visit their Web site at *www.nsfc.wvu.edu*.

National Drinking Water Clearinghouse (NDWC) services include a toll-free technical assistance hotline; *On Tap*, a quarterly magazine on current drinking water issues; more than 300 free products; a literature database, and RESULTS [Registry of Equipment Suppliers of Treatment Technologies for Small Systems] database. The Web address is *www.ndwc.wvu.edu*.

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National Onsite Demonstration Program, (NODP) encourages the use of alternative, decentralized wastewater treatment technologies in small and rural communities. NODP helps communities fund, install, monitor, and manage model wastewater treatment systems as cost-effective alternatives to centralized sewage systems. Visit their Web site at *www.nodp.wvu.edu*.

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Pipeline

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Small Community Wastewater Issues Explained to the Public

The Attached Growth Process – An old technology takes on new forms

In 1869, Sir Edward Frankland began his groundbreaking study of filtration performance on raw London sewage by packing laboratory columns with various combinations of coarse gravel and peaty soil. This experiment was the first scientific proof that intermittent sand filtration is an effective treatment for wastewater. The concept of flowing wastewater across some natural material for treatment is the basis of attached growth processes, also referred to as fixed film. Generally, these processes are low maintenance, have low energy requirements, and, overall, are 'low tech'– making them good wastewater treatment technology for small communities, as well as individual homes.

In contrast to activated sludge processes where the waste-consuming bacteria grow in suspension in water tanks, the active bacteria in attached growth processes cling to some surface, natural or manmade, to perform the cleaning. (The Spring 2003 issue of *Pipeline* describes the activated sludge process in detail. See the references section on page 7 for information.)

Attached growth technologies work on the principle that organic matter is removed from wastewater by microorganisms. These microorganisms are primarily aerobic, meaning they must have oxygen to live. They grow on the filter media (materials such as gravel, sand, peat, or specially woven fabric or plastic), essentially recycling the dissolved organic material into a film that develops on the media.

In all cases, attached growth filters act as secondary treatment devices following a septic tank or other primary treatment. Raw wastewater must be treated first to remove the larger solids and floating debris, because these solids can plug the filter.

There are two basic designs of attached growth or fixed film systems: those that hold the media in place, allowing the wastewater to flow over the bed (such as trickling filters), or those where the media is in motion relative to the wastewater (e.g., rotating biological disks). In most cases, drains under the media collect the effluent and either send it back through the filter or send it on for further treatment.

The main advantages of attached growth processes over the activated sludge process are lower energy requirements, simpler operation, no bulking problems, less maintenance, and better recovery from shock loads (Metcalf & Eddy, 2003). Attached growth processes in wastewater treatment are very effective for biochemical oxygen demand (BOD) removal, nitrification, and denitrification. Disadvantages are a larger land requirement, poor operation in cold weather, and potential odor problems.

Many small communities, housing developments, and individual homeowners are discovering that the use of filters or rotating biological contactors (RBCs), either alone or in some combination with other technologies, provide low-cost, low-maintenance wastewater treatment.

There are many variations and combinations of these processes, sometimes referred to as hybrids, that use the attached growth process in combination with other technologies. This issue of *Pipeline* will describe some of the more common types of attached growth filters: sand, peat, and textile filters; trickling filters and rotating biological contactors; and subsurface flow wetlands. We will also explain how these systems work and advantages and disadvantages of using them.

What's Inside...

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Rotating biological contactors ..... page 3
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Textile filters ..... page 6
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New Technologies?

We, at the National Small Flows Clearinghouse, are always interested in learning about new technologies. If you are aware of any new manufacturers or some great success stories where attached growth systems are being used, please let us know. Contact information can be found on page 2.

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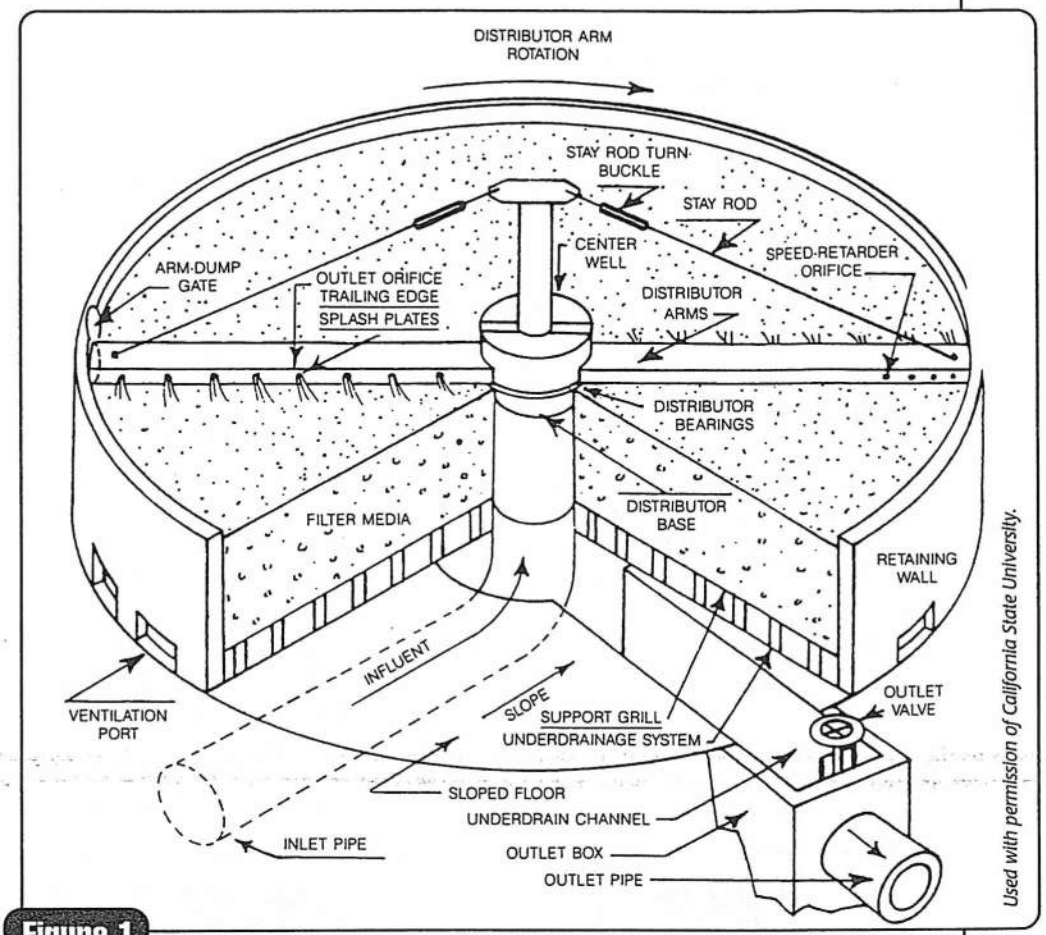
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Trickling filters

Trickling filters are by far the oldest attached growth process. This simple technology has been used for nearly 100 years to provide low-cost, low-maintenance, biological wastewater treatment.

Trickling filters offer simple, reliable treatment in areas where large tracts of land are not available. Because of their high design flexibility, trickling filters are able to handle a wide variability of wastewater strengths. But, these types of filters generate sludge, which must be treated and disposed of, and the treatment unit may need to be covered in cold climates for effective operation. Trickling filters also require regular attention from an operator.

The most common design is the non-submerged trickling filter. The wastewater is applied to the surface of the filter (a bed of rocks, gravel or plastic). The wastewater percolates down through the bed to a drain where it collects and discharges, or sent for further cleaning. See Figure 1. The composition, size, uniformity and depth of the media all affect performance.



Used with permission of California State University.

Figure 1 *Parts of a typical trickling filter.*

How trickling filters work

A jelly-like biological film forms on the gravel or plastic where the bacteria break down the organic matter. The film becomes very thick and eventually falls off of the supporting surface, and a new slime layer begins to grow in its place. This dropping off is called 'sloughing' (pronounced 'sluffing') and should be a continuous process if the system is managed properly. Without the sloughing action, the media will clog and develop anaerobic conditions. The collected liquid is passed to a sedimentation tank where the solids are separated from the treated wastewater. The bacteria clumps that drop off must be treated as suspended solids.

Sometimes called biological filters, trickling filters were developed from attempts at filtering municipal wastewater. The microbial growth clogged the filters; larger and larger filter media were used until the clogging was minimized. In the 1950s, plastic packing began replacing rock in the U.S. Plastic media allows high loading rates and taller filters that use less land area.

Trickling filter design

Beds of conventional trickling filters are made up of crushed rock, slag, or gravel about 2 to 3 inches in size. The bed is commonly 6 to 10 feet deep, held in place by a reinforced concrete basin. When the media is made up of plastic tubes, which are very light weight, the height can be much greater – these systems can be as tall as 30 feet. These systems are sometimes called tower trickling filters or biotowers. Most newer trickling filters use plastic packing as the working media.

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Conventional trickling filters are round in shape with centrally mounted rotating arms for distribution of the wastewater. Nozzles on the arms spray the wastewater evenly across the media. Natural drafts are created by temperature differences between the outside air and air inside the filter. Deep tower filters sometimes require an additional air supply. The temperature of the wastewater is more important to the success of the process than the air temperature.

Trickling filters show a high degree of reliability if operating conditions remain steady and the wastewater temperature does not fall below 55° F for prolonged periods. Sloughing tends to occur during seasonal temperature changes. Since the process is simple to operate, mechanical reliability is high.

The trickling filter process is effective for removing suspended materials but is less effective for removing soluble organics.

Rotating biological contactors (RBCs)

Rotating biological contactors (RBCS) were first used in Germany in the 1960s, and due to their proven effectiveness at treating wastewater, hundreds of them were built in the U.S. in the 1970s.

An RBC consists of a series of closely spaced, circular, plastic disks mounted on a shaft. The disks are partially submerged in wastewater and slowly rotate through it. The surface of the disks provides an attachment site for the aerobic bacteria. See Figure 2. Oxygen is provided as the disks move in and out of the water. Solids are kept in suspension by the mixing action of the rotating media. Excess slime on the disks sloughs off from time to time, just as in the trickling filter systems.

The disks are most commonly made of high-density polyethylene or styrofoam and are usually ridged, corrugated, or lattice-like to increase the available surface area. These systems must be designed carefully to avoid excessive biofilm growth and sloughing problems, which may lead to failure of mechanical parts in the treatment unit. RBCs can be arranged in a variety of ways depending on specific effluent characteristics and the secondary clarifier design and can be designed specifically for BOD removal or nitrification.

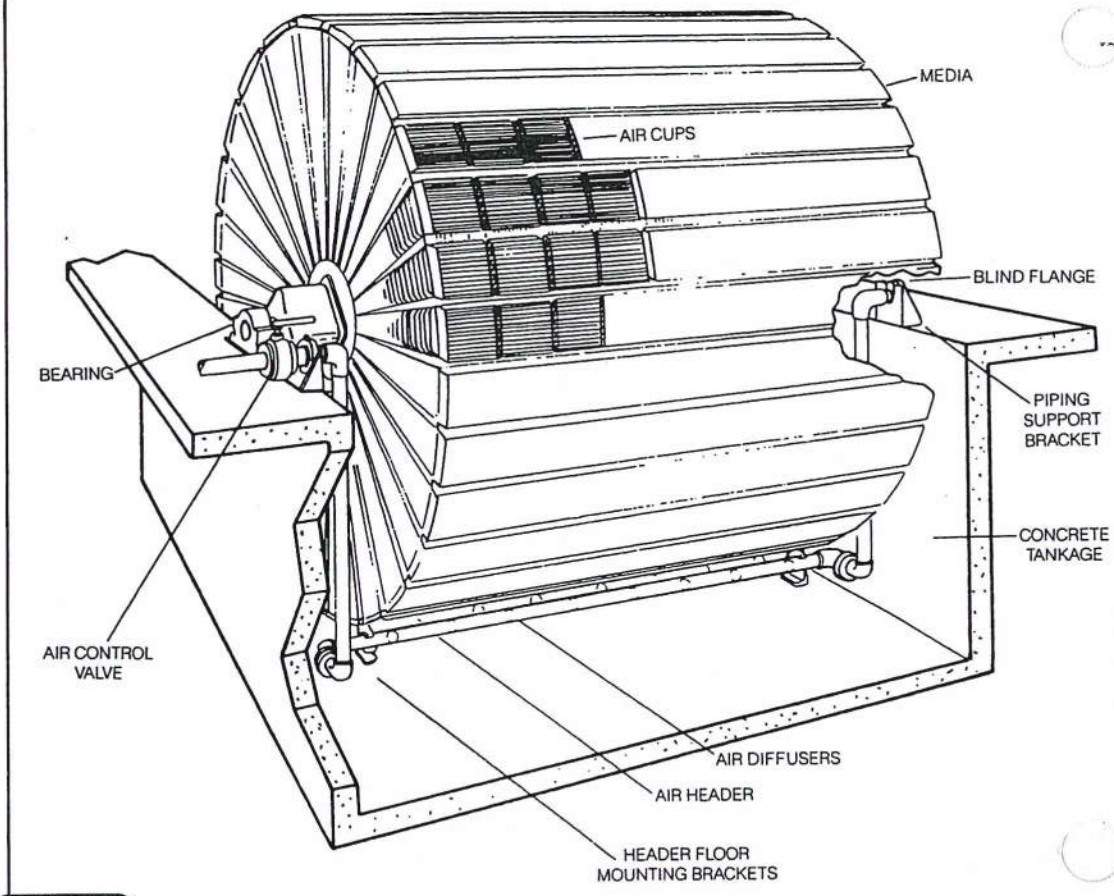
RBCs are often covered with a fiberglass housing to protect the disks from deterioration due to ultraviolet light, to protect the process from low temperatures, and to control the buildup of algae. Performance of this type of treatment design drops considerably at air temperatures below 55° F.

Sand and peat filters

Treatment filters using sand or peat as media make effective attached growth systems. They can be designed as either single-pass or recirculating filters, meaning that the wastewater is run across the media more than one time. Regardless of the media, the process is generally the same–wastewater from the septic tank is allowed to run through a bed of media and collected from underneath. Treatment occurs as the bacteria grows on the media.

Sand filters

Sand filters are constructed beds of sand or other suitable granular material usually 2 to 3 feet deep. The media is usually contained in a liner made of concrete, plastic, or other impermeable material.



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Figure 2 *Rotating biological contactor*

CASE STUDY

Peat filters overcome this lot's constraints

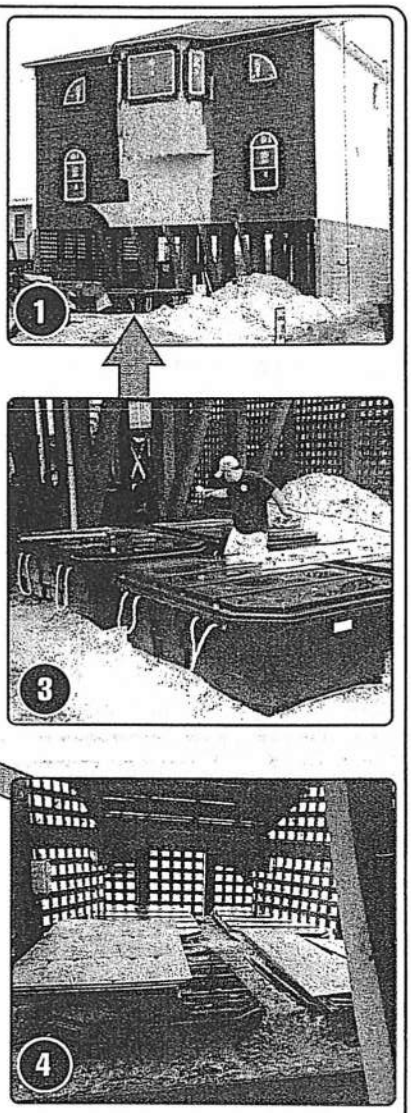
In 1996, when Hurricane Fran blew across coastal North Carolina, many beach-front homeowners were left with greatly diminished property due to the extreme erosion. Topsail Beach was one such community where residents were very unhappy to find their current wastewater treatment units either washed away or nonfunctioning, or in some cases, with very limited lot size remaining to build on, much less room enough to accommodate a conventional septic system and drainfield.

Bord na Mona, manufacturer of the Puralfo Peat Biofilters, was contacted by one property owner eager to develop his parcel regardless of the difficult lot constraints. (Additional restrictions included a 60 foot setback from the from line of stable vegetation on the ocean side and a 20 foot horizontal setback requirement from a neighboring septic field and obviously a high water table.)

To accommodate the intended four-bedroom house, one peat module was used per bedroom. These modules measured 4ft x 7ft x 30in deep and were shipped filled with the peat fiber and distribution lines installed. The modules were installed with the lids exposed above grade. The peat fiber used in the Puralfo systems requires very little maintenance and can be expected to filter effluent for up to 15 years without replacement.

The small footprint area of the peat treatment modules allowed for construction of the two separate gravel driveways on either side of the system. The septic tank and pump tank, (constructed of load bearing materials) were buried under one driveway.

On this cramped and problematic lot, the small space required for peat filters allowed the property owner to fully develop the site's potential.



Photos courtesy of Bord na Mona Environmental Products U.S. Inc.

Partially treated wastewater is applied to the filter surface intermittently, and receives treatment as it slowly trickles through the granules. Typically, the wastewater is collected in an underdrain and flows to further treatment and/or disposal. See Figure 3.

The media must be as clean and uniform in size as possible to allow the wastewater to flow through it properly. The wastewater must also flow freely through the media because the filter doesn't work properly if it is saturated.

Oxygen is critical to the biological and chemical treatment processes that take place inside the filter. The wastewater is applied intermittently, allowing the media to drain between doses, ensuring that oxygen is allowed to flow between the media particles. It is also important that the wastewater be applied evenly across the filter surface. This uniformity is accomplished either by flooding the surface completely with a thin layer of wastewater or by spraying or by

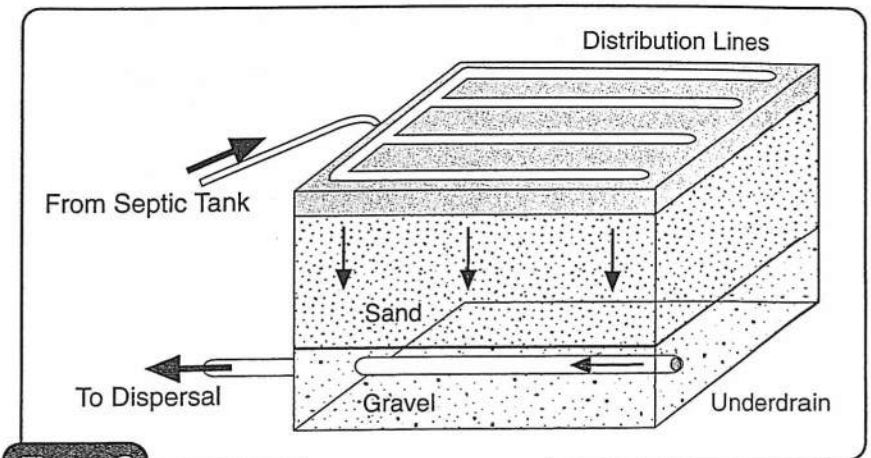


Figure 3 *Sand Filter* E-114

applying the wastewater through a network of distribution pipes within the bed itself.

Treatment occurs by physical, biological, and chemical processes in combination. Most treatment occurs in the first 6 to 12 inches of the filter surface.

Some of the organic matter sticks to the surfaces or gets caught in the crevices between the sand grains. Chemical bonding takes place as certain particles come in contact with and react with the media. Biological processes occur when the bacteria consume the particles in the wastewater in the thick layer called the biomat. This area near the surface of the filter is where the protozoa feed on the bacteria and help prevent the bacteria colony from becoming so dense that it clogs the filter. It is important that this balance between the various life forms is kept constant.

Sand filters are ideally suited for serving small populations, less than 1,000 people. Sand filters are generally low-cost and require minimal operator attention, although the top layer of sand may need to be removed or replaced if clogging occurs.

Sand filters do require a certain amount of land area that may restrict their use. Single-pass sand filters for single-family homes typically require between 300 and 400 square feet of surface area. Sand filters are built on-site using locally available sand that might be reasonably priced but is often of inferior quality. If good quality sand must be shipped in, the high cost of transporting it must be considered.

Due to the concern of overloading the sand and requiring difficult or expensive replacement, buried onsite sand filters are usually designed for low loading rates, which ensures homeowners of 10 to 20 years of continuous usage with minimal maintenance required.

(The Summer 1997 issue of *Pipeline* "Sand Filters Provide Quality, Low-Maintenance Treatment" presents a larger overview of sand filters as treatment technology. Details on how to obtain a copy of this newsletter can be found in the References section on page 7.)

Peat filters

Peat filters use a two-foot-thick layer of sphagnum peat moss for wastewater treatment. Unsterilized peat is home to a number of different microorganisms, including bacteria, fungi, and tiny plants, making peat a reactive and effective filter.

Similar to the previously discussed filters, peat filters are designed to accept wastewater from a septic tank where it has been screened to remove solids and grease. This effluent is then pumped to the peat filter.

A peat filter is made up of three parts: the peat bed, a distribution system for the wastewater, and a drain. The distribution system, usually pressurized, applies the water evenly over the surface of the peat. The effluent is collected at the bottom of the filter by the drain where it is sent to a soil treatment system. Some peat filters are designed without a drain and, in fact, are bottomless. The treated effluent goes directly into the soil below.

Due to the organic nature of the peat, the filter media must be replaced periodically. Normal life expectancy is between 10 and 15 years. Peat filters may be purchased as pre-assembled package plants or built on-site from purchased materials.

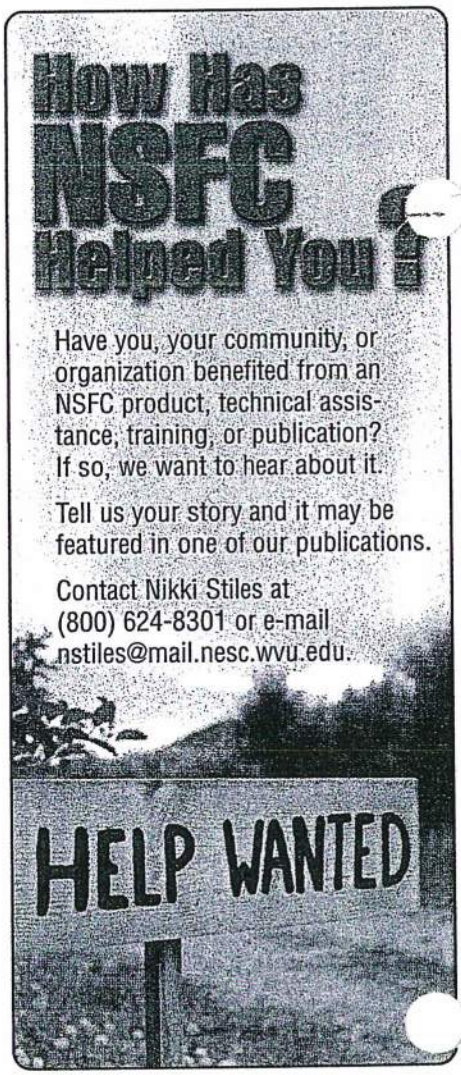
New filter technologies

In the quest for the perfect media, several new technologies have been developed. These innovative materials lend themselves to being sold as pre-packaged systems, providing quick installation and a high quality product.

Textile filters

The use of manmade textiles for wastewater treatment is a fairly recent development. The textile is a synthetic fiber and is durable and resistant to biodegradation. The engineered fabric is packed into a watertight fiberglass basin, providing a large surface area for biological breakdown, but taking up a much smaller space. The footprint area for a textile filter serving a four-bedroom, single-family home is only about 20 square feet.

The lightweight filter medium and small filter size make pre-manufactured treatment units practical, eliminating possible construction errors. These package systems are particularly suited for sites that are remote



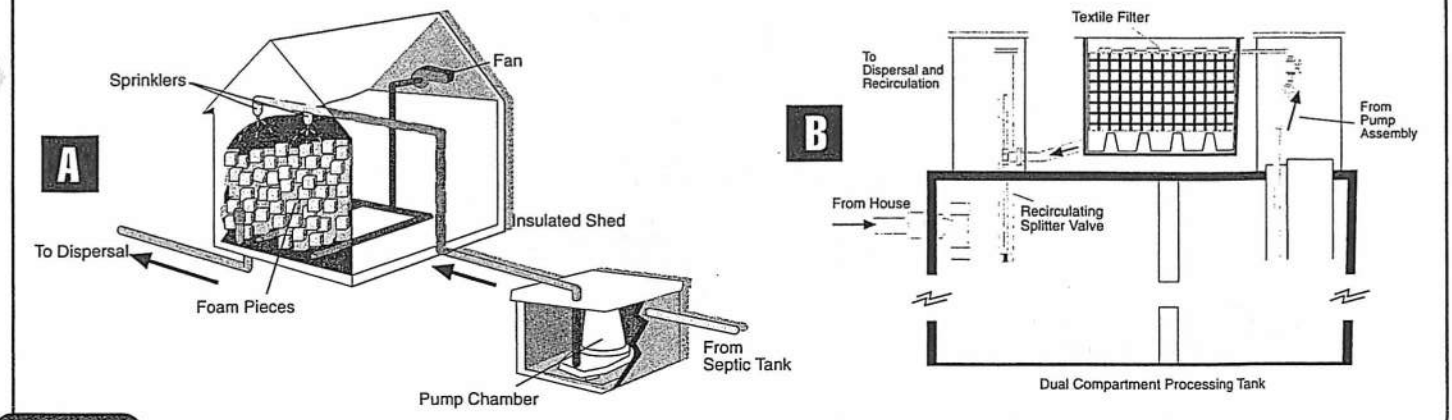


Figure 4 *Foam Filters*

or have limited yard area for wastewater treatment.

Textile systems are capable of high removal rates for BOD, total suspended solids (TSS), fecal coliforms, ammonia, and nitrate concentrations comparable to municipal treatment plants. Unfortunately most of these textile systems have been unsuccessful at attaining significant biological phosphorus removal. High levels of phosphorus increase the growth of nuisance plants in neighboring lakes and streams, so textile filters may not be the best treatment choice near sensitive bodies of water.

The town of Warren, Vermont, needed to replace their elementary school's failing septic system, but there wasn't enough adjoining property for a conventional drainfield. After some research, the city officials approached the engineers at Orenco Systems Incorporated, manufacturers of textile systems for help.

Fitting into less than half the area of a conventional system, the AdvanTex system with its pressurized, shallow, narrow drainfield was installed. The treatment units (water-tight fiberglass basins filled with an engineered textile material) sit less than ten feet away from the school's playground. A remote control system monitors performance and system functions and reports via modem to the city offices, freeing the school staff from worry about another septic system failure. The unit has been very effective, producing effluent, with BOD and total suspended solids reductions of up to 90 percent.

Foam filters

The physical properties of the plastic foam media allow for outstanding treatment with a single pass of the filtered wastewater. The media provides large open pores and high surface area for higher performance and long-term low maintenance. The absorbent foam chips or blocks provide consistent treatment with no plugging problems.

These foam media systems require a small amount of space for installation and can be scaled for different sized applications by adding additional modules. See Figure 4. The resulting effluent is often of high enough quality to be discharged into short shallow trenches without further treatment.

Subsurface Flow

Constructed wetlands consist of one or more rectangular treatment basins, called cells, filled with gravel, soil and/or plants that provide the filtering effect. Wetland systems are commonly designed with multiple cells operated in parallel to allow the system to be alternated and rested during maintenance. (The Summer 1998 issue of *Pipeline* "Constructed Wetlands: A Natural Treatment Alternative" presents a larger overview of wetlands as treatment technology. Details on how to obtain a copy of this newsletter can be found in the References section on page 7.)

The bottoms of subsurface flow cells may be slightly sloped (up to 0.5 percent) to encourage the flow of wastewater through the system, and a natural clay or synthetic liner may be necessary for certain sites with high groundwater or soil restrictions.

Subsurface flow wetlands are natural systems that don't require energy to perform treatment. When possible, the treatment cells are located near and down slope from the septic tank, avoiding the need for a pump. Most subsurface flow wetlands are designed so that wastewater travels through the length of the cell one time to receive treatment. Typical wastewater retention times range from two to six days.

Each cell is filled with rock or gravel placed on top of the soil or a lining on the cell bottom. The depth of the media is usually one to two feet. Water-loving plants are rooted in the gravel. In properly working systems, the wastewater flows just below the surface of the gravel and remains unexposed to the atmosphere. Although the media is saturated, the

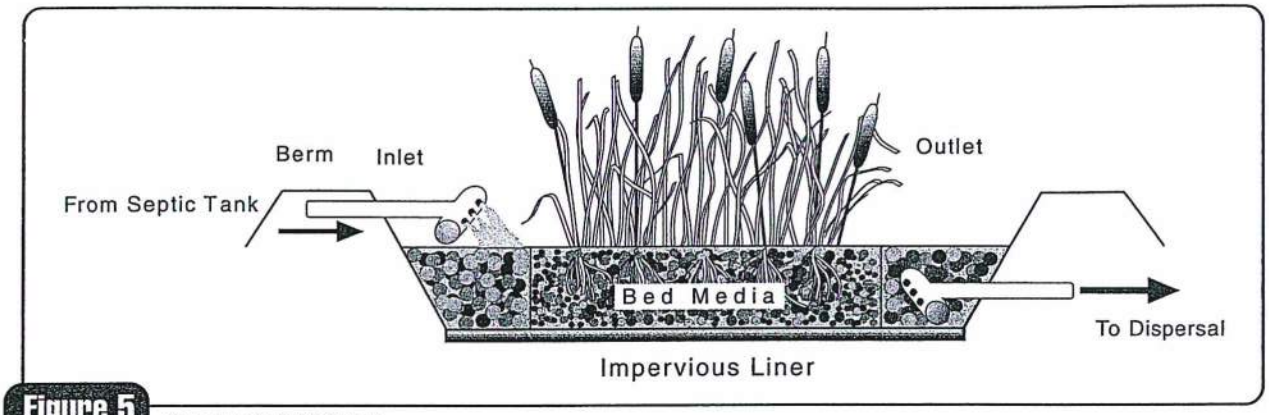


Figure 5 *Constructed Wetland*

wetland plants' roots provide oxygen to create conditions conducive to treatment. See Figure 5.

Cattails, bulrushes, and reeds are able to grow extensive roots and improve the treatment effectiveness by providing additional surfaces where bacteria can reside and where waste materials can be trapped. Plants also take up and store some of the metals and other pollutants in the wastewater.

Properly designed, operated, and maintained constructed wetlands can effectively reduce BOD, suspended solids, nitrogen, metals, and other pollutants. However, phosphorus removal is minimal. Depending on the level of treatment and local requirements, effluent from constructed wetlands may be disinfected, discharged directly into the environment, or directed to a soil absorption field for further treatment.

Reprint Info

Readers are encouraged to reprint *Pipeline* articles in local newspapers or include them in flyers, newsletters, or educational presentations. Please include the name and phone of the National Small Flows Clearinghouse (NSFC) on the reprinted information and send us a copy for our files. If you have any questions about reprinting articles or about any of the topics discussed in this newsletter, please contact the NSFC at (800) 624-8301.

References

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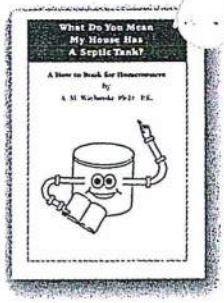
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Items with # codes are available from the NSFC at (800) 624-8301, email at nsfc_orders@nesc.wvu.edu. Past issues of *Pipeline* may be downloaded from the archives at www.nesc.wvu/nsfc/nsfc_pipeline.htm.

NSFC RESOURCES AVAILABLE

"What do you mean my house has a septic tank," (Item #WWBLPE82), is a booklet designed specifically with the homeowner in mind. This booklet unlocks many mysteries associated with onsite wastewater treatment systems. The booklet includes semi-technical descriptions of septic tanks, soil absorption fields, cesspools, seepage pits, and dry wells. Regular maintenance and routine pumping are detailed along with techniques on how to:



- locate your system,
- measure the sludge and scum in the septic tank, and
- determine when to pump your tank.

The last section is dedicated to "how to care for your septic tank" by discussing what not to put down the drain; the use of additives, garbage disposers; when repairs are needed; and whom to contact for servicing your system. This booklet will be useful to the general public, public health officials, and contractors/developers.

The cost of this booklet is $8.45. Shipping charges do apply.

For wastewater information, call the NSFC at (800) 624-8301 or (304) 293-4191



Sadly, we have lost our dear friend and colleague, Peter Casey. Peter passed away on the evening of Tuesday, October 28, after several weeks of hospitalization following emergency cardiac surgery.

As evidenced in both his professional and personal relationships, Peter lived every moment of life and loved people. That he was recognized and respected in his career as an engineer is not surprising. Peter was a dedicated practitioner of his craft, and a fine teacher and mentor. But, most importantly, he applied his engineering skills and knowledge to solving real human problems: those that involve water, the essence of life. This he did with great compassion and with understanding for the people involved and the complex struggles that they faced in trying to clean up their environment and meet their water needs.

Peters' professional affiliations were many, as were his colleagues and friends. During his 9 years with the National Small Flows Clearinghouse, an organization dedicated to helping small communities solve wastewater problems, Peter championed numerous initiatives to reach out to communities in need, and was an energetic and innovative thinker. Most importantly, he carried out his professional responsibilities and the business of life in a way that emphasized bringing people together for the common good.

As we mourn his passing, we also celebrate his life and his legacy, that of a kind, loving, decent human being. Peter, by example, turned our hearts toward kindness.

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The Use of Peat Filters in Domestic Wastewater Treatment

CONTRIBUTING WRITER

Clement Solomon

Editor's Note: This column is based on calls received over the National Small Flows Clearinghouse (NSFC) technical assistance hotline. If you have further questions concerning peat filters, call (800) 624-8301 or (304) 293-4191 and ask to speak with a technical assistant.

What are peat filters and how is this alternative technology used for domestic wastewater treatment?

Introduction

In rural and suburban areas where central sewer systems are not available, domestic wastewater is treated and disposed of onsite. The use of onsite systems has increased over the years, often due to the high costs associated with central sewers and the advent of innovative and alternative (I/A) systems that can be used where conventional septic systems are not feasible.

There are several I/A technologies available today using a wide variety of techniques to effectively treat and dispose of domestic wastewater onsite. Filters using different types of media are being developed to enhance the efficiency of the system by removing a large amount of pollutants before disposal. One such technology currently being evaluated as an alternative for onsite wastewater treatment is the peat filter.

Principle of Operation and System Description

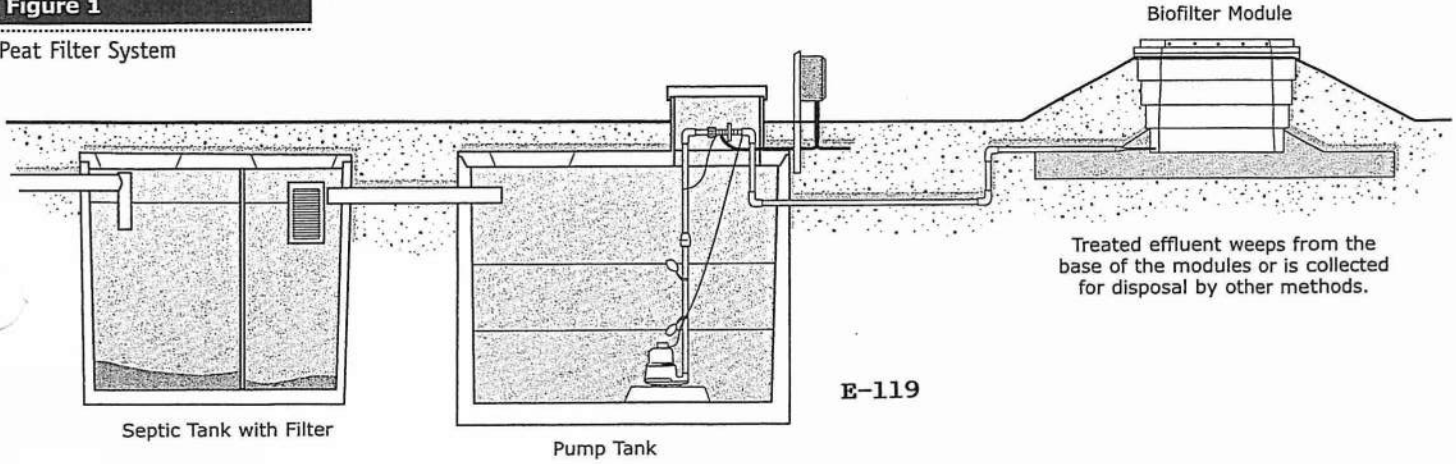
Peat is a fibrous mass of organic matter composed mainly of plant remains at various stages of decomposition that occurs in wet or supersaturated areas under anaerobic conditions. Peat is a complex material with a very high capacity to retain or bind water, as demonstrated by its widespread use in horticultural applications.

A peat filter is a biological system usually used to provide secondary level treatment of effluent from a septic tank or other primary treatment process. These filters can be constructed onsite or delivered as preconstructed modules. Treatment within the filter is achieved by a combination of physical (filtration and absorption), chemical (adsorption and ion exchange), and biological interactions (microbial assimilation) between the wastewater and the peat media.

A typical peat filter system would consist of a septic tank, a pump (dosing) tank, peat filter, and a disposal area as shown in figure 1. The septic tank is where settleable and floatable solids and scum are removed to provide primary treatment. Partially clarified effluent then flows by gravity to a pump tank where it is stored until it reaches the level of the upper float control, which activates the pump.

Figure 1

Peat Filter System



Effluent is pumped to a manifold and then evenly distributed over the peat filter. The effluent percolates through the peat media and is collected at the bottom of the filter. The treated effluent from the peat filter is disposed into a gravel bed directly under it or collected and disposed by gravity or pressure to a disposal field. The drainfield required to dispose of the treated effluent is considerably less than that required for a conventional septic system. This is due to the fact that there is considerable treatment in the peat filter before disposal.

Microbiology

Biological treatment and assimilation in a peat filter is achieved by a diverse microflora that are present on the surface of the media. Commonly found bacterial genera include *Pseudomonas, Micrococcus, Aeromonas, Flavobacteria,* and *Bacillus*. Bacterial populations are very large and similar numbers of fungal organisms have also been found. A wide range of higher forms of life, from protozoans, rotifers, and algae to nematodes, annelid worms, and insects have also been recorded in the media.

Advantages

- high effluent quality (BOD, TSS, fecal coliform reduction) produced when compared to conventional septic system,
- significant reduction in drainfield area requirement,
- less land area is required due to compact design,
- easy to install if its a pre-assembled unit,
- treatment capacity can be expanded through modular design,
- easily accessible for monitoring and does not require a lot of skill to maintain,
- no chemicals required, and
- low operating and maintenance costs.

Disadvantages

- limited to treating domestic strength wastewater—not suitable for industrial waste or graywater,
- treatment media has a limited useful life and has to be replaced with new media depending on the type of peat used (estimated 15 years), and
- cost of the system is higher than a conventional septic tank soil absorption system.

Case Study

In July 1997, the Department of Civil and Environmental Engineering, Old Dominion University, monitored 12 single-pass peat filter systems installed in four different soil types and operating under various climatic conditions. The monitoring was done in accordance with the guidelines recommended by the Virginia Department of Health.

Table 1

Treatment Performance of the Peat Filters Studied

Parameter	Septic Tank Effluent	Peat Filter Effluent	Percent Change
BOD (mg/L)	290	6	- 97.9
TSS (mg/L)	1190	16	- 98.7
NH_3-N(mg/L)	44	0.9	- 98.0
NO_3N(mg/L)	0.8	28	+ 97.0
Total Nitrogen (mg/L)	51	30	- 41.0
Fecal Coliform (Colonies/ml)	1.05 E6	2.0 E3	- 99.8

Source: Reasor, J. A., Erten-Urnal, M., et.al., "The Evaluation of the Performance of a Peat Biofilter for Onsite Wastewater Treatment in Virginia," Department of Civil and Environmental Engineering, Old Dominion University.

The objectives of this study were to determine quantitatively the reduction in biological oxygen demand (BOD_5), total suspended solids (TSS), ammonia nitrogen (NH_3-N), and fecal coliforms; investigate the performance of the system in a variety of soil types and climatic conditions; and demonstrate the effect of the system on groundwater quality.

There was significant reduction in the BOD_5, TSS, NH_3-N, and fecal coliform levels. A reduction of at least 95 percent was observed in all the parameters studied during a short period of monitoring. Table 1 shows the treatment performance (average values) of 12 peat filters sampled from July 1997 to January 1998.

Conclusions

On sites where conventional soil absorption systems are not feasible, peat filter systems and other media filters can be used as an alternative. A peat filter system, designed and installed properly could provide a high-quality effluent with minimal maintenance. It can be used to advantage on adverse sites where fecal coliform, nitrates and other pollutants are of major concern.

Alternative and innovative wastewater technologies are a viable option in addressing the needs and solving the wastewater problems of single-family residences and small communities since they can be used to effectively treat and dispose of domestic wastewater.

A number of states in the U.S have started issuing experimental permits for the use of alternative technologies to study the efficacy of these systems for onsite wastewater treatment or disposal. The systems are installed and monitored in different soil types, operating under varying climatic conditions.

Testing and evaluation of the new generation of systems is vital because it will provide alternatives to the conventional system. The wider use of alternative technologies will also reduce the cost per unit as more and more states approve their use for wastewater treatment and disposal. SF

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NODP to Develop National Database

A database of all demonstration projects in the U.S. is currently being developed as part of the National Onsite Demonstration Project—Phase 2. This database is designed to house a wide variety of information on as many domestic wastewater demonstration projects as can be located.

For more information concerning the database please contact Eric S. Menear at the following address:

National Demonstration Projects Database NODP II
National Small Flows Clearinghouse
West Virginia University
PO Box 6064
Morgantown, WV 26506-9900

Via Email: emenear@wvu.edu

USE OF PEAT FILTERS IN DOMESTIC WASTEWATER TREATMENT

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EPA TECHNOLOGY FACT SHEETS

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Onsite Wastewater Treatment Systems Technology Fact Sheet 4

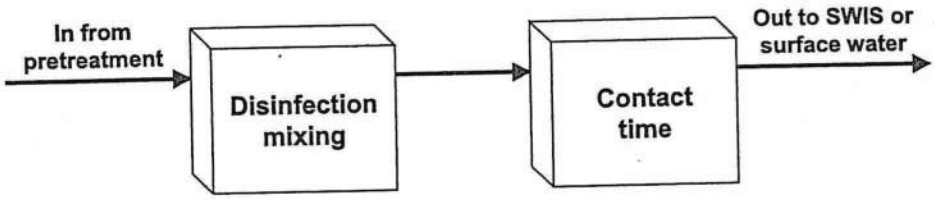
Effluent Disinfection Processes

Description

The process of disinfection destroys pathogenic and other microorganisms in wastewater. A number of important waterborne pathogens are found in the United States, including some bacteria species, protozoan cysts, and viruses. All pretreatment processes used in onsite wastewater management remove some pathogens, but data are scant on the magnitude of this destruction. The two methods described in this section, chlorination and ultraviolet irradiation, are the most commonly used (figure 1). Currently, the effectiveness of disinfection is measured by the use of indicator bacteria, usually fecal coliform. These organisms are excreted by all warm-blooded animals, are present in wastewater in high numbers, tend to survive in the natural environment as long as or longer than many pathogenic bacteria, and are easy to detect and quantify.

A number of methods can be used to disinfect wastewater. These include chemical agents, physical agents, and irradiation. For onsite applications, only a few of these methods have proven to be practical (i.e., simple, safe, reliable, and cost-effective). Although ozone and iodine can be and have been used for disinfection, they are less likely to be employed because of economic and engineering difficulties.

Figure 1. Generic disinfection diagram

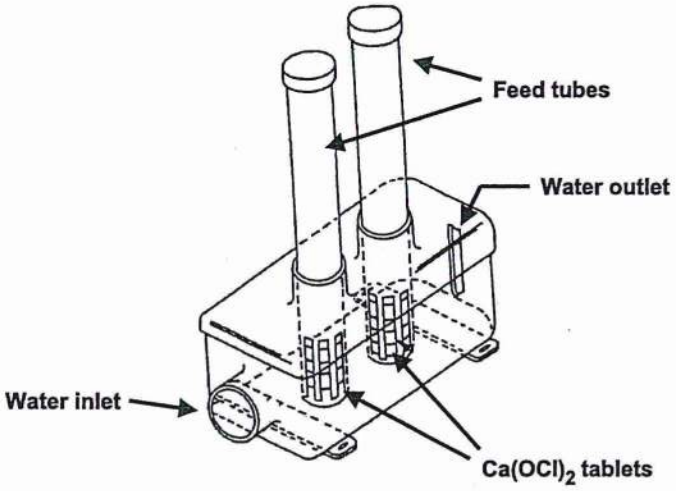


Chlorine

Chlorine is a powerful oxidizing agent and has been used as an effective disinfectant in water and wastewater treatment for a century. Chlorine may be added to water as a gas (Cl_2) or as a liquid or solid in the form of sodium or calcium hypochlorite, respectively. Because the gas can present a significant safety hazard and is highly corrosive, it is not recommended for onsite applications. Currently, the solid form (calcium hypochlorite) is most favored for onsite applications. When added to water, calcium hypochlorite forms hypochlorous acid (HOCl) and calcium hydroxide (hydrated lime, $Ca(OH)_2$). The resulting pH increase promotes the formation of the anion, OCl^-, which is a free form of chlorine. Because of its reactive nature, free chlorine will react with a number of reduced compounds in wastewater, including sulfide, ferrous iron, organic matter, and ammonia. These nonspecific side reactions result in the formation of combined chlorine (chloramines), chloro-organics, and chloride, the last two of which are not effective as disinfectants. Chloramines are weaker than free chlorine but are more stable. The difference between the chlorine residual in the wastewater after some

time interval (free and combined chlorine) and the initial dose of chlorine is referred to as chlorine demand. The 15-minute chlorine demand of septic tank effluent may range from 30 to 45 mg/L as Cl; for biological treatment effluents, such as systems in Technology Fact Sheets 1, 2, and 3, it may range from 10 to 25 mg/L; and for sand filtered effluent, it may be 1 to 5 mg/L (Technology Fact Sheets 10 and 11).

Figure 2. Example of a stack-feed chlorinator



Calcium hypochlorite is typically dosed to wastewater in an onsite treatment system using a simple tablet feeder device (figure 2). Wastewater passes through the feeder and then flows to a contact tank for the appropriate reaction. The product of the contact time and disinfectant residual concentration (Ct) is often used as a parameter for design of the system. The contact basin should be baffled to ensure that short-circuiting does not occur. Chlorine and combined chlorine residuals are highly toxic to living organisms in the receiving water. Because overdosing (ecological risk) and underdosing (human health risk) are quite common with the use of tablets, long swales/ditches are recommended prior to direct discharge to sensitive waters.

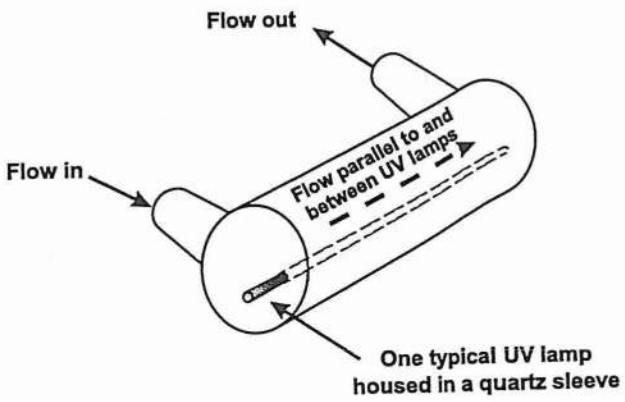
Use of simple liquid sodium hypochlorite (bleach) feeders is more reliable but requires more frequent site visits by operators. These systems employ aspirator or suction feeders that can be part of the pressurization of the wastewater, causing both the pump and the feeder to require inspection and calibration. These operational needs should be met by centralized management or contracted professional management.

Ultraviolet irradiation

The germicidal properties of ultraviolet (UV) irradiation have been recognized for many years. UV is germicidal in the wavelength range of 250 to 270 nm. The radiation penetrates the cell wall of the organism and is absorbed by cellular materials, which either prevents replication or causes the death of the cell. Because the only UV radiation effective in destroying the organism is that which reaches it, the water must be relatively free of turbidity. Because the distance over which UV light is effective is very limited, the most effective disinfection occurs when a thin film of the water to be treated is exposed to the radiation. The quantity of UV irradiation required for a given application is measured as the radiation intensity in microWatt-seconds per square centimeter ($mW\text{-}s/cm^2$). For each application, wastewater transmittance, organisms present, bulb and sleeve condition, and a variety of other factors will have an impact on the $mW\text{-}s/cm^2$ required to attain a specific effluent microorganism count per 100 mL. The most useful variable that can be readily controlled and monitored is Total Suspended Solids. TSS has a direct impact on UV disinfection, which is related to the level of pretreatment provided.

Many commercial UV disinfection systems (figure 3) are available in the marketplace. Each has its own approach to how the wastewater contacts UV irradiation, such as the type of bulb (medium or low pressure; medium, low, or high intensity), the type of contact chamber configuration (horizontal or vertical), or the sleeve material separating the bulb from the liquid (quartz or teflon). All can be effective, and the choice will usually be driven by economics.

Figure 3. Wastewater flow in a quartz UV unit



Typical applications

Disinfection is generally required in three onsite-system circumstances. The first is after any process that is to be surface discharged. The second is before a SWIS where there is inadequate soil (depth to ground water or structure too porous) to meet ground water quality standards. The third is prior to some other immediate reuse (onsite recycling) of effluent that stipulates some specific pathogen requirement (e.g., toilet flushing or vegetation watering).

Design assumptions

Chlorination units must ensure that sufficient chlorine release occurs (depending on pretreatment) from the tablet chlorinator. These units have a history of erratic dosage, so frequent attention is required. Performance is dependent on pretreatment, which the designer must consider. At the point of chlorine addition, mixing is highly desirable and a contact chamber is necessary to ensure maximum disinfection. Working with chlorinator suppliers, designers should try to ensure consistent dosage capability, maximize mixing usually by chamber or head loss, and provide some type of pipe of sufficient length to attain effective contact time before release. Tablets are usually suspended in open tubes that are housed in a plastic assembly designed to increase flow depth (and tablet exposure) in proportion to effluent flow. Without specific external mixing capability, the contact pipe (large-diameter Schedule 40 PVC) is the primary means of accomplishing disinfection. Contact time in these pipes (often with added baffles) is on the order of 4 to 10 hours, while dosage levels are in excess of those stated in table 1 for different pretreatment qualities and pH values. The commercial chlorination unit is generally located in a concrete vault with access hatch to the surface. The contact pipe usually runs from the vault toward the next step in the process or discharge location. Surface discharges to open swales or ditches will also allow for dechlorination prior to release to a sensitive receiving water.

Table 1. Chlorine disinfection dose (in mg/L) design guidelines for onsite applications

Calcium hypochlorite	Septic tank effluent	Biological treatment effluent	Sand filter effluent
pH 6	35–50	15–30	2–10
pH 7	40–55	20–35	10–20
pH 8	50–65	30–45	20–35

Note: Contact time = 1 hour at average flow and temperature 20 °C. Increase contact time to 2 hours at 10 °C and 8 hours at 5 °C for comparable efficiency. Dose = mg/L as Cl. Doses assume typical chlorine demand and are conservative estimates based on fecal coliform data.

The effectiveness of UV disinfection is dependent upon UV power (table 2), contact time, liquid film thickness, wastewater absorbance, wastewater turbidity, system configuration, and temperature. Empirical relationships are used to relate UV power (intensity at the organism boundary) and contact time. Table 2 gives a general indication of the dose requirements for selected pathogens. Since effective disinfection is dependent on wastewater quality as measured by turbidity, it is important that pretreatment provide a high degree of suspended and colloidal solids removal.

Table 2. Typical ultraviolet (UV) system design parameters

Design parameter	Typical design value
UV dosage	20–140 mW-s/cm^2
Contact time	6–40 seconds
UV intensity	3–12 mW-s/cm^2
Wastewater UV transmittance	50–70%
Wastewater velocity	2–15 inches per second

Commercially available UV units that permit internal contact times of 30 seconds at peak design flows for the onsite system can be located in insulated outdoor structures or in heated spaces of the structure served, both of which must protect the unit from dust, excessive heat, freezing, and vandals. Ideally, the unit should also provide the necessary UV intensity (e.g., 35,000 to 70,000 mW-s/cm^2) for achieving fecal coliform concentrations of about 200 CFU/100 mL. The actual dosage that reaches the microbes will be reduced by the transmittance of the wastewater (e.g., continuous-flow suspended-growth aerobic systems [CFSGAS] or fixed-film systems [FFS] transmittance of 60 to 65 percent). Practically, septic tank effluents cannot be effectively disinfected by UV, whereas biological treatment effluents can meet a standard of 200 cfu/100 mL with UV. High-quality reuse standards will require more effective pretreatment to be met by UV disinfection. No additional contact time is required. Continuous UV bulb operation is recommended for maximum bulb service life. Frequent on/off sequences in response to flow variability will shorten bulb life. Other typical design parameters are presented in table 2.

Performance

There are few field studies of tablet chlorinators, but those that exist for post-sand-filter applications show fecal coliform reductions of 2 to 3 logs/100 mL. Another field study of tablet chlorinators following biological treatment units exceeded a standard of 200 FC/100 mL
93 percent of the time. No chlorine residual was present in 68 percent of the samples. Newer units managed by the biological unit manufacturer fared only slightly better. Problems were related to TSS accumulation in the chlorinator, tablet caking, failure of the tablet to drop into the sleeve, and failure to maintain the tablet supply. Sodium hypochlorite liquid feed systems can provide consistent disinfection of sand filter effluents (and biological system effluents) if the systems are managed by a utility.

Data for UV disinfection for onsite systems are also inadequate to perform a proper analysis. However, typical units treating sand filter effluents have provided more than 3 logs of FC removal and more than 4 logs of poliovirus removal. Since this level of pretreatment results in a very low final FC concentration (<100 CFU/100 mL), removals depend more on the influent concentration than inherent removal capability. This is consistent with several large-scale water reuse studies that show that filtered effluent can reach essentially FC-free levels (<1 CFU/100 mL) with UV dosage of about 100 mW-s/cm^2, while higher (but attainable) effluent FC levels require less dosage to filtered effluent (about 48 mW-s/cm^2) than is required by aerobic unit effluent (about 60 mW-s/cm^2). This can be attributed to TSS, turbidity, and transmittance (table 3). Average quartz tube transmittance is about 75 to 80 percent.

Table 3. Typical (UV) transmittance values for water

Wastewater treatment level	Percent transmittance
Primary	45–67
Secondary	60–74
Tertiary	67–82

Source: USEPA, 1986.

Management needs

Chlorine addition by tablet feeders is likely to be the most practical method for chlorine addition for onsite applications. Tablet feeders are constructed of durable, corrosion-free plastics and are designed for in-line installation. Tablet chlorinators come as a unit similar to figure 2. If liquid bleach chlorinators are used, they would be similarly constructed. That unit is placed inside a vault that exits to the contact basin. The contact basin may be plastic, fiberglass, or a length of concrete pipe placed vertically and outfitted with a concrete base. Baffles should be provided to prevent short-circuiting of the flow. The contact basin should be covered to protect against the elements, but it should be readily accessible for maintenance and inspection.

The disinfection system should be designed to minimize operation and maintenance requirements, yet ensure reliable treatment. For chlorination systems, routine operation and maintenance would include servicing the tablet or solution feeder equipment, adding tablets or premixed solution, adjusting flow rates, cleaning the contact tank, and collecting and analyzing effluent samples for chlorine residuals. Caking of tablet feeders may occur and will require appropriate maintenance. Bleach feeders must be periodically refilled and checked for performance. Semiskilled technical support should be sufficient, and estimates of time are about 6 to 10 hours per year. There are no power requirements for gravity-fed systems. Chemical requirements are estimated to be about 5 to 15 pounds of available chlorine per year for a family of four. During the four or more inspections required per year, the contact basin may need cleaning if no filter is located ahead of the unit. Energy requirements for a gravity-fed system are nil. If positively fed by aspirator/suction with pumping, the disinfection unit and alarms for pump malfunctions will use energy and require inspection. Essentially unskilled (but trained) labor may be employed. Safety issues are minimal and include wearing of proper gloves and clothing during inspection and tablet/feeder work.

Commercially available package UV units are available for onsite applications. Most are self-contained and provide low-pressure mercury arc lamps encased by quartz glass tubes. The unit should be installed downstream of the final treatment process and protected from the elements. UV units must be located near a power source and should be readily accessible for maintenance and inspection. Appropriate controls for the unit must be corrosion-resistant and enclosed in accordance with electrical codes.

Routine operation and maintenance for UV systems involves semiskilled technician support. Tasks include cleaning and replacing the UV lamps and sleeves, checking and maintaining mechanical equipment and controls, and monitoring the UV intensity. Monitoring would require routine indicator organism analysis. Lamp replacement (usually annually) will depend upon the equipment selected, but lamp life may range from 7,500 to 13,000 hours. Based on limited operational experience, it is estimated that 10 to 12 hours per year would be required for routine operation and maintenance. Power requirements may be approximately 1 to 1.5 kWh/d. Quartz sleeves will require alcohol or other mildly acidic solution at each (usually four per year) inspection.

Whenever disinfection is required, careful attention to system operation and maintenance is necessary. Long-term management, through homeowner-service contracts or local management programs, is an important component of the operation and maintenance program. Homeowners do not possess the skills needed to perform proper servicing of these units, and homeowner neglect, ignorance, or interference may contribute to malfunctions.

Risk management issues

With proper management, the disinfection processes cited above are reliable and should pose little risk to the homeowner. As mentioned above, a potentially toxic chlorine residual may have an important environmental impact if it persists at high concentrations in surface waters. By-products of chlorine reactions with wastewater constituents may also be toxic to aquatic species. If dechlorination is required prior to surface discharge, reactors containing sulfur dioxide, sodium bisulfate, sodium metabisulfate, or activated carbon can be employed. If the disinfection processes described above are improperly managed, the processes may not deliver the level of pathogen destruction that is anticipated and may result in some risk to downstream users of the receiving waters. The systems described are compact and require modest attention. Chlorination does not inherently require energy input; UV irradiation and dosage pumps do consume some energy

(>1kWh/day). Both processes will require skilled technical support for the monitoring of indicator organisms in the process effluents.

Chlorination systems respond to flow variability if the tablets are feeding correctly. UV does not do so and is designed for the highest flow scenario, thus overdosing at lower flows since there is no danger in doing so. Toxic loads are unlikely to affect either system, but TSS can affect both. Inspections must include all pretreatment steps. UV is more sensitive to extreme temperatures than chlorination, and must be housed appropriate to the climate. In extremely cold climates, the UV system can be housed inside the home with minimal danger to the inhabitants. Power outages will terminate UV disinfection and pressurized pumps for both systems, while causing few problems for gravity-fed chlorination units. There should be no odor problems during these outages.

Costs

Installed costs of a complete tablet chlorination unit are about $400 to $500 for the commercial chlorinator unit and associated materials and $800 to $1,200 for installation and housing. Operation and maintenance would consist of tablets ($30 to $50 per year), labor ($75 to $100 per year), and miscellaneous repairs and replacements ($15 to $25 per year), in addition to any analytical support required.

Installed costs of UV units and associated facilities are $1,000 to $2,000. O/M costs include power ($35 to $40 per year), semiskilled labor ($50 to $100 per year), and lamp replacement ($70 to $80 per year), plus any analytical support.

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Onsite Wastewater Treatment Systems Technology Fact Sheet 5

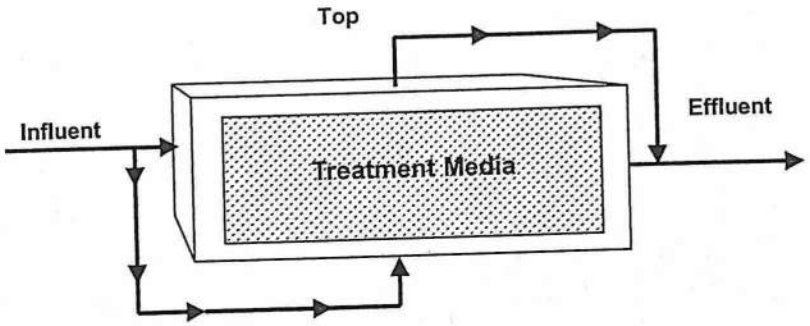
Vegetated Submerged Beds and Other High-Specific-Surface Anaerobic Reactors

Description

A high-specific-surface anaerobic reactor (figure 1) is any tank or cavity filled with solid media through which wastewater flows with a high hydraulic retention time (HRT). In onsite treatment the two primary types are vegetated submerged beds (VSBs) and anaerobic upflow filters (AUFs). The first is characterized by horizontal flow and prolific growth of macrophytes on the surface. The second comes in a variety of forms from upflow sludge blanket systems and fixed media anaerobic filters to partially fluidized beds of fine media. Both have long HRTs, produce anaerobic effluents, generally treat either high-strength or minimally pretreated wastewater, and usually require some form of posttreatment to meet surface discharge or water reuse requirements.

The primary removal mechanisms in all of these systems are physical, that is, floculation, sedimentation, and adsorption. Anaerobic biological reactions are extremely slow and do not have a significant impact on soluble BOD until HRTs become quite long. Some toxic organic compounds may be reduced through these mechanisms and chemical precipitation (e.g., sulfides) at shorter HRTs.

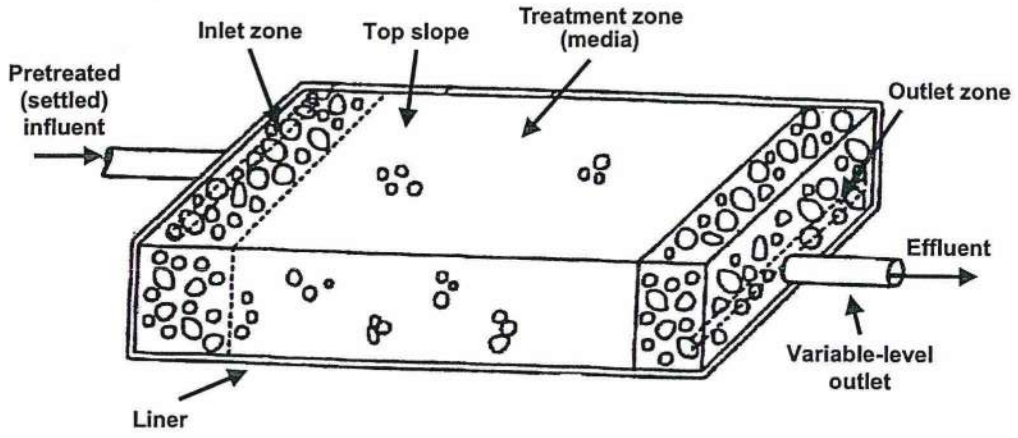
Figure 1. Generic high-specific surface anaerobic reactor

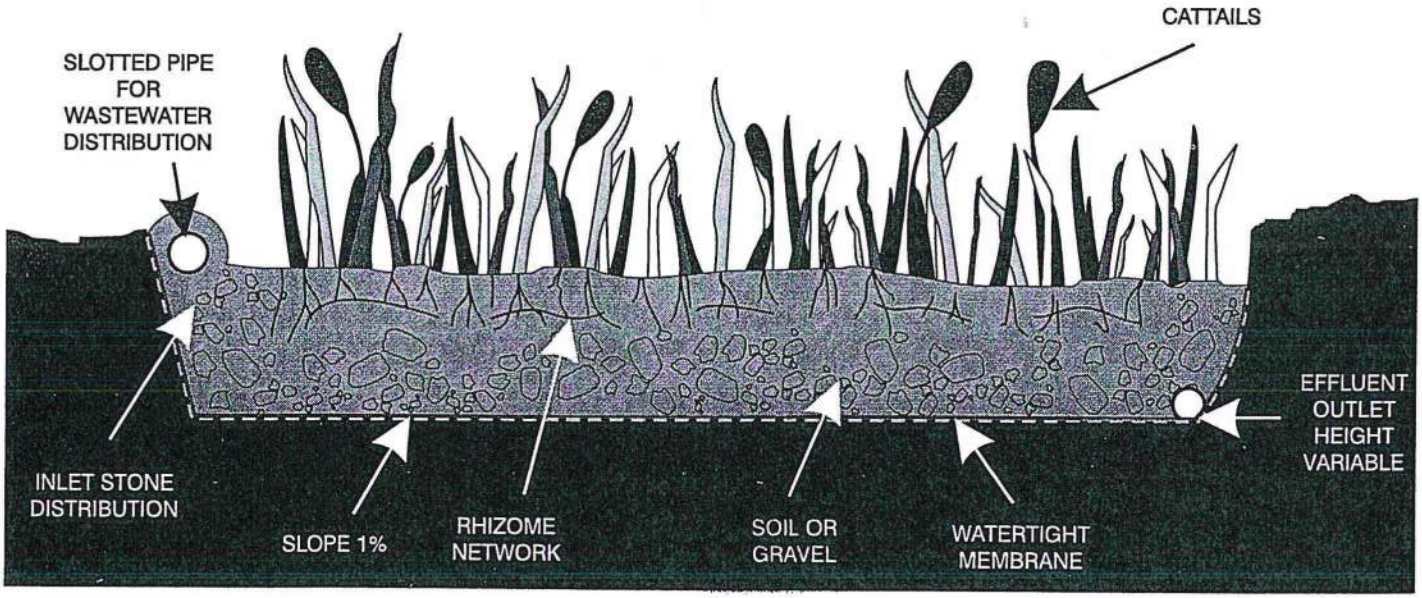


VSBs, as shown in figure 2, usually follow a septic tank and remove most of the suspended and larger colloidal particles, BOD, organic forms of nitrogen, and other particles. Although they are frequently identified as subsurface constructed wetlands, they do not fit the strict definition of a constructed wetland.

Three types of AUFs can be used as pretreatment devices for high-strength wastewater and some onsite pretreatment applications in the United States. They are in shown in figures 3, 4, and 5. Figure 3, with a rock medium, is the most typical U.S. application.

Figure 2. Elements of a vegetated submerged bed (VSB) system





Source: Toms Creek Project, VA.

Figure 3. Schematic of the upflow anaerobic filter process

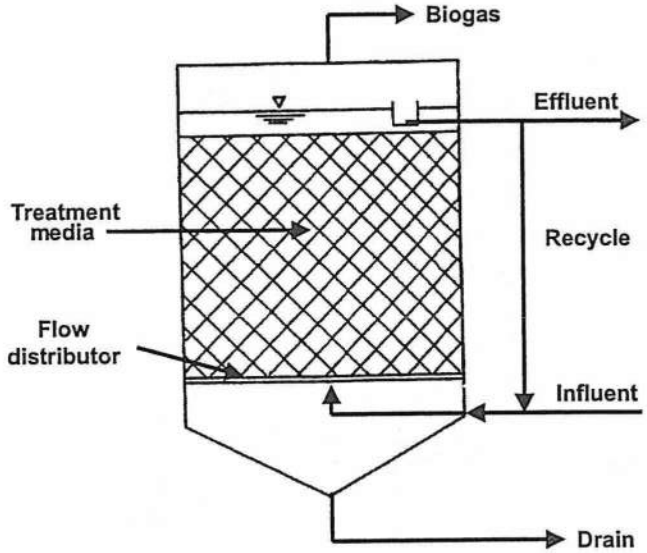


Figure 4. Schematic of the upflow anaerobic sludge blanket process

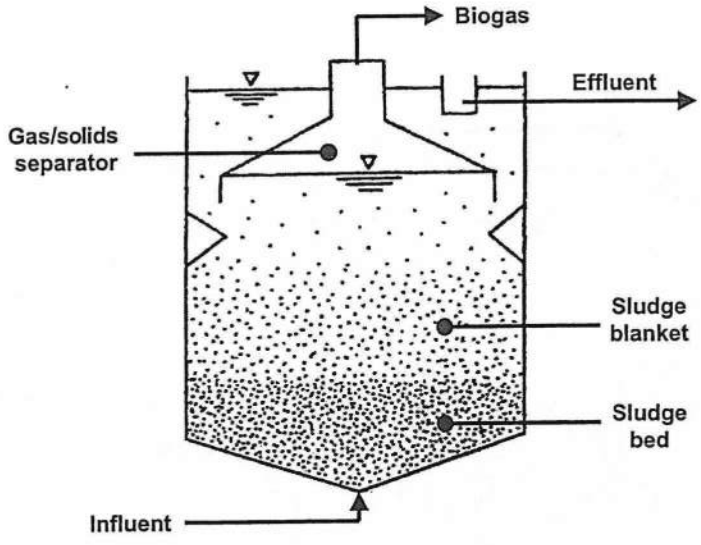
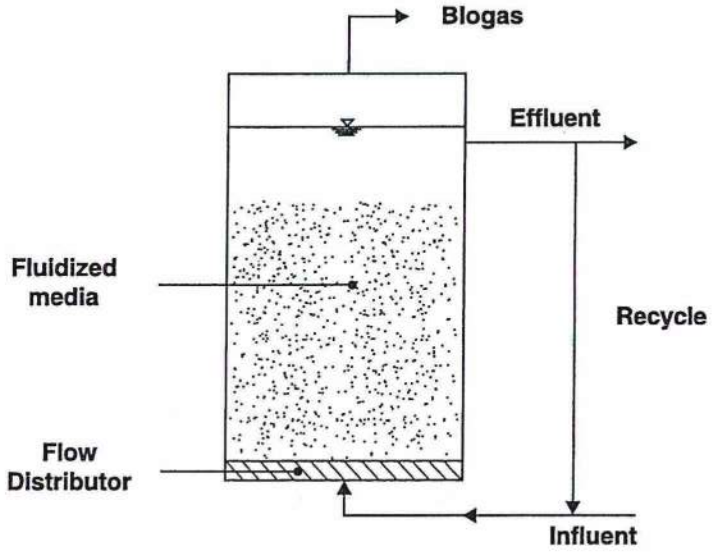


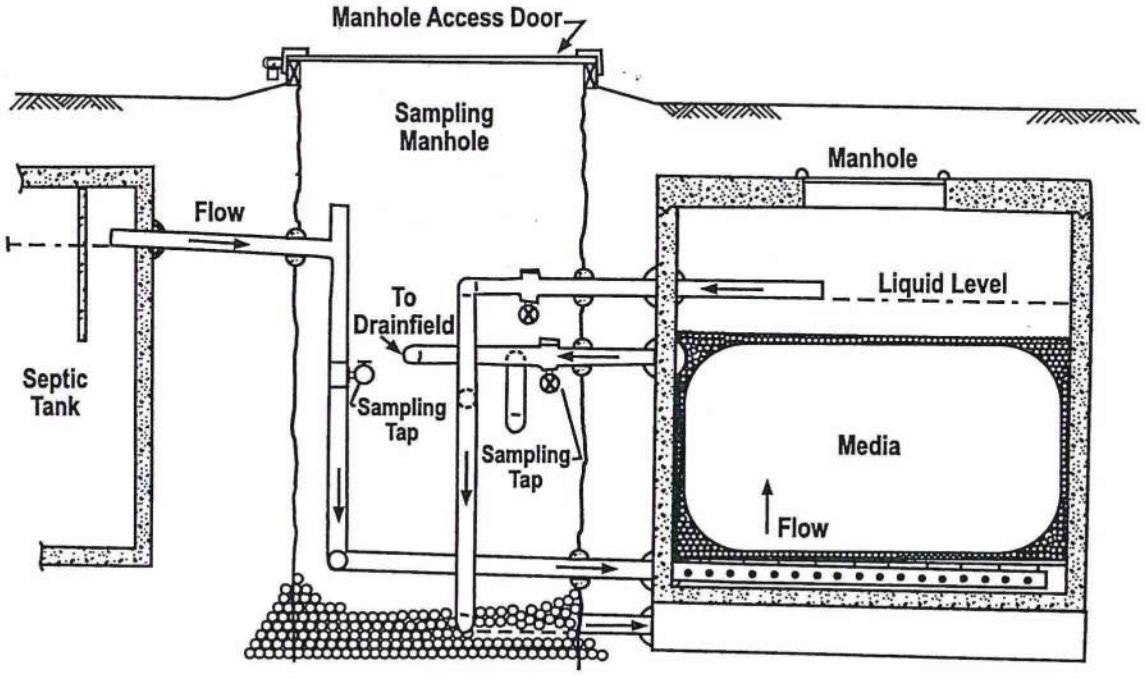
Figure 5. Schematic of the anaerobic fluidized bed process



Typical applications

AUFs are widely used in hot climates where domestic wastewaters are several times higher in strength than U.S. wastewaters. These systems can reduce high BOD and TSS to levels that can be readily treated by typical aerobic processes such as suspended and fixed growth aerobic units or recirculating/intermittent media filters. International literature contains numerous references to the three types of AUFs and their valuable contributions to water pollution abatement. Anaerobic rock upflow filters (figure 6) are also used to lower septic tank effluent BOD and TSS concentrations prior to discharge to the subsurface wastewater infiltration system (SWIS).

Figure 6. Anaerobic upflow filter



VSBs are extremely popular in the United States because of their aesthetic features and their ability to meet basic (secondary) effluent standards when treating septic tank effluent. Until recently they were purported to be capable of nitrification and nutrient removal at economically competitive HRTs. Since they are largely anaerobic, this would be biochemically impossible. However, they are fully capable of meeting secondary BOD and TSS standards. They are also sometimes used before a SWIS and can meet the same effluent TSS and BOD standards as aerobic units (Technology Fact Sheets 1, 2, and 3). VSBs can be considered as pretreatment units regarding SWIS design requirements. They do not, however, remove more than 2 logs of fecal coliform and would likely require disinfection for direct surface discharge. They also require some form of aeration to meet effluent standards for dissolved oxygen (DO). These VSBs will capture rainfall and snowmelt, effluent standards for requiring adjustment to designs of SWIS following these units.

Both VSBs and AUFs are being used in rural areas in combination with aerobic processes to remove significant amounts of nitrogen through denitrification. These processes are included in the nutrient removal fact sheets.

Design assumptions

VSB design guidance for small communities is provided in table 1. In the first few months of operation, excellent phosphorus removal will occur until the rock medium becomes saturated with phosphorus and breakthrough occurs. (Note: USEPA guidance on design of VSBs can be found in *Manual: Constructed Wetlands Treatment of Municipal Wastewater*; posted at **http://www.epa.gov/ordntrnt/ord/nrmrl/pubs/2001/wetlands/625r99010.pdf**)

Except for the anaerobic upflow rock filter, AUFs are rarely employed for U.S. onsite applications. Since the primary purpose of these systems is to improve the BOD and TSS of septic tank effluent, they are essentially physical processes. Therefore, they must be designed to maximize their flocculation and sedimentation functions. Limited field studies

Table 1. Summary of VSB design guidance

Pretreatment [a]	Objective
Surface area BOD TSS TKN TP	Based on desired effluent quality and areal loading rates as follows: 6 g/m²-d (53.5 lb/ac-d) to attain 30 mg/L effluent 1.6 g/m²-d (14.3 lb/ac-d) to attain 20 mg/L effluent 20 g/m²-d (178 lb/ac-d) to attain 30 mg/L effluent Use another treatment process in conjunction with VSB VSBs not recommended for phosphorus removal
Depth Media (typical) Water (typical)	 0.5–0.6 m (20–24 in) 0.4–0.5 m (16–20 in)
Length	Minimum of 15 m (49 ft.)
Width	As calculated
Bottom slope	0–1%
Top slope	Level or nearly level
Hydraulic conductivity First 30% of length Last 70% of length	 1% of clean K 10% of clean K
Media Inlet zone (1st 2 m [6.5 ft]) Treatment zone Outlet zone (last 1 m [3.3 ft]) Planting media (top 10 cm [4 in])	All media should be washed clean of fines and debris; more uniform rounded media will generally have more void spaces; media should be resistant to crushing or breakage. 40–80 mm (1.5–3.0 in) 20–30 mm (3/4–1 in) use clean K = 100,000, if actual K not known 40–80 mm (1.5–3.0 in) 5–20 mm (1/4–3/4 in)
Miscellaneous	Use adjustable outlet control device with capability to flood and drain system and sizing of VSB and SWIS (if used) must include a water balance analysis

[a] *Use after primary sedimentation (e.g., septic tank, Imhoff tank, primary clarifier); not recommended for use after ponds because of problems with algae.*

indicate that successful removal of particulate BOD and TSS could be obtained with an average HRT between 16 and 24 hours, rounded media size of 1 to 2 inches or greater, and a means of periodically draining excess accumulated solids from the bottom of the unit. At higher temperatures, some partial digestion of accumulated organic solids occurs. This liquefaction may by accompanied by gas production. The amount and makeup of that gas depend on pH, wastewater constituents (e.g., protein, lipids, carbohydrates), sulfate, alkalinity, and other constituents.

Performance

VSB systems can treat septic tank effluent to a BOD of 20 to 30 mg/L, depending on the organic loading rate chosen. The VSB effluent TSS is almost always less than 30 mg/L. Some removal of all constituents (e.g., heavy metals, organic nitrogen and organic phosphorus, pesticides, and other toxic organics) can also be expected. Over and above these removals, there will be some small percentage of dissolved organic removal owing to anaerobic biological activity.

Rock AUFs after septic tanks have not been widely studied, but they appear to remove TSS by as much as 55 percent from septic tank effluent, while removing a similar percent of the BOD. Actual removals will depend on the specific fractions of particulate, colloidal, and soluble matter in the septic tank effluent. Little soluble or fine particulate removal is likely. Both systems will remove pathogens, with VSBs capable of removing from 1 to 3 logs (design average = 2 logs), while AUF removal is estimated to be closer to 1 log because of shorter HRTs.

Management needs

All of these anaerobic systems are passive in nature and require minimal O/M activity. AUF units may be constructed aboveground, but they usually are below the ground surface to provide insulation and protect against severe climatic conditions. The solid medium can be a coarse gravel or one of many commercially available synthetic media that will not easily clog with biomass. Access to inlet and outlet systems should be provided for purposes of cleaning and servicing. An easily accessible means to drain the unit and an effective alarm system should be provided.

VSB units are generally aesthetically pleasing additions to the landscape if sufficient area is available for their application. It is estimated that fewer than 4 hours per year will be required for O/M tasks, which will involve inspecting the system and making any adjustments required. Therefore, until more information becomes available, a site visit schedule of three to four times a year is suggested.

Residuals generate in VSB systems at a slow rate. Although the system inlet where most solids accumulate can be excavated or piped for high-pressure removal, it is more likely that a replacement system would be built after the service life of the original system ends.

AUF units will require periodic flushing of accumulated solids and inspection of inlet and outlet systems. If solids are allowed to accumulate, the filter may clog or release high solids "events" to the SWIS. This will clog the infiltrative surface or the distribution system. Therefore, a site visit schedule of three to four times per year is suggested until more information becomes available. This would entail from 6 to 8 hours per year of labor. Disposal and transport of excess solids will require similar management to septage.

Risk management issues

VSB systems can usually handle the flow variations likely to occur from residential sources, as well as toxic shock loads and power outages. Reed and colleagues (1995) proposed some models to support the view that insulation provided by dead vegetation (litter) on the surface should aid these systems during typical winters in northern climates. The potential for odor is low for properly sized systems.

AUF systems should also accommodate typical flow variations, toxic shocks, and power outages. They should be insulated from cold weather. AUFs are inherently odor and corrosion generators, so corrosion-resistant materials should be employed. Odor (hydrogen sulfide) production may require the use of an odor-control system (e.g., soil filters) to deodorize off-gases.

Costs

VSB systems for onsite application will cost about $20 per square foot (USEPA, 1999). Almost half of that cost is for the media, while excavation, liner, plants, control structures, and piping make up the rest. Operation and maintenance costs would run less than $100 per year if these services are professionally provided.

AUF systems are likely to cost about $1,000 to $1,500 per house, primarily related to the cost of the tank and related containment features. O/M costs would run around $200 per year, including solids transport as required.

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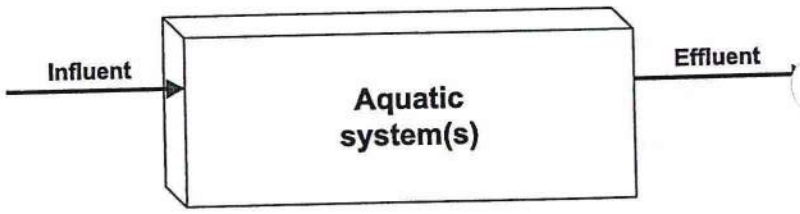
Onsite Wastewater Treatment Systems Technology Fact Sheet 7

Stabilization Ponds, FWS Constructed Wetlands, and Other Aquatic Systems

Description

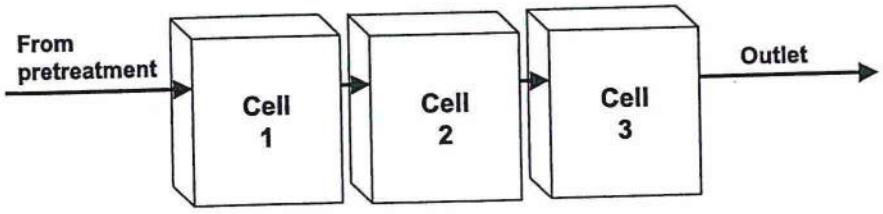
Aquatic systems are large basins filled with wastewater undergoing some combination of physical, chemical, and/or biological treatment processes that render the wastewater more acceptable for discharge to the environment (figure 1). They are not widely used because they tend to be large in area, require some form of fencing to minimize human health risk, often require supplemental treatment before discharge or reuse, and are approved in only a few states.

Figure 1. Generic aquatic lagoon system



Stabilization ponds (lagoons) have many forms, but the facultative lagoon is the most widely used. Aerated lagoons are often preferred because of their smaller size requirements. Anaerobic lagoons and maturation ponds are not used in the United States for onsite application by design. In some areas, lagoons must be lined according to codes, which further limits their application. Facultative lagoons are large in size, perform best when segmented into at least three cells, obtain necessary oxygen for treatment by surface reaeration from the atmosphere, combine sedimentation of particulates with biological degradation, and produce large quantities of algae, which limits the utility of their effluent without further treatment. A typical facultative lagoon is shown in figure 2.

Figure 2. Generic facultative lagoon

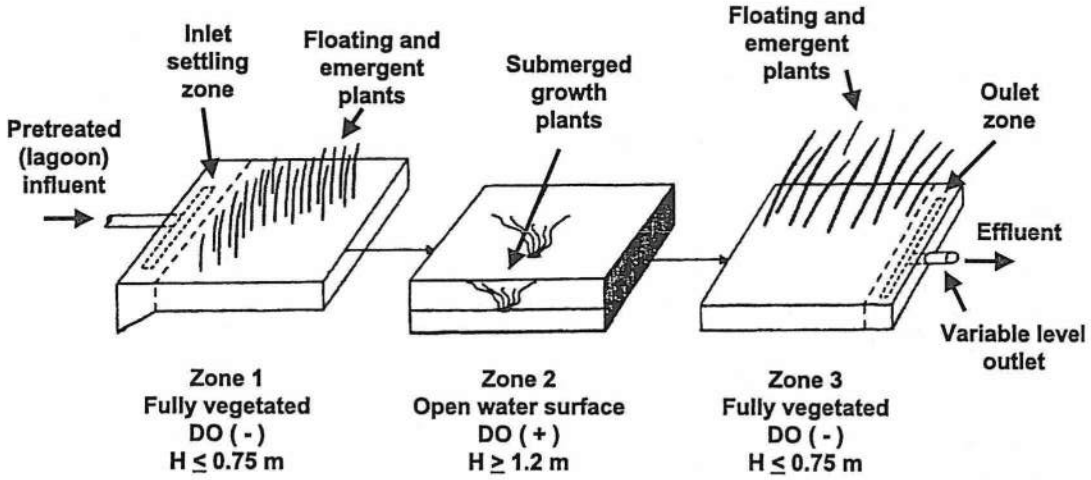


Aerated lagoons use mechanical equipment to enhance and intensify the biodegradation rate. They do not produce the intense algal load on downstream processes and have smaller areal requirements than facultative systems.

Free water surface (FWS) constructed wetlands have also been used, though rarely, for similar reasons. These systems perform best when divided into a minimum of three zones, the first and last being fully vegetated with macrophytes (cattails or bulrushes) and the middle having an open water surface, which performs like a facultative lagoon. In the first zone, the influent is suspended and colloidal solids are flocculated and settled under anaerobic or anoxic conditions. The second zone reaerates the anaerobic wastew

to provide oxygen for aerobic biodegradation and possible nitrification before the final-zone flocculation and sedimentation (and denitrification) steps. An FWS constructed wetland is shown in figure 3.

Figure 3. Elements of a free water surface (FWS) constructed wetland



Typical applications

Facultative lagoon systems, like evaporative (ET) systems, are not widely used for onsite wastewater treatment. They are large in size, are expensive to build, perform only a portion of the treatment necessary to permit surface discharge or reuse (table 1), and produce large concentrations of algae, which negates their use as direct pretreatment before soil infiltration. They have been used in a few states as an alternative system when a subsurface wastewater infiltration system (SWIS) is not feasible, usually to discharge without further treatment to surface waters, which is generally unacceptable under normal circumstances. In some states intermittent discharge lagoons are required. Storage volume is for all cold weather months (4 to 6 months), making the size of these systems too large for most applications.

Aerated lagoons require far less land and could theoretically be used in place of aerobic biological treatment, but they cannot be buried and insulated in northern climates like those units. They could be used in southern climates as pretreatment for SWISs and would otherwise have similar features to the fact sheets that describe those systems.

FWS constructed wetlands reliably produce an advanced secondary effluent and can be employed for significant nitrogen removal. They require large land areas, similar to facultative lagoons. Their effluent quality is excellent for SWIS application, but they require disinfection for surface discharge and many reuse options. They have a highly desirable appearance, which often makes them the preferred alternative for owners with sufficient land areas.

Table 1. Typical design guidance

Parameter	Facultative lagoon	Aerated lagoon	FWS constructed wetland
HRT (days)	30–180	3 (max)	6 (min)
Power (hp/10^6gal)	0	30	0
Depth (ft)	3–5	10	2–5
Minimum no. of cells	3	2	3
BOD loading (lb/acre-day)	20–60	200–600	40–53
TSS loading (lb/acre-day)	N/A	N/A	27–45

All of these aquatic systems should be placed after the septic tank and before the disinfection or SWIS steps in the treatment train.

Performance

Facultative lagoons are capable of 75 to 95 percent BOD removal, but TSS removal varies widely because of algal growth. During nonalgal periods, up to 90 percent TSS removal is possible, but during warm seasons TSS removal can be negligible. In summer months 80 percent of the ammonia-nitrogen is nitrified, total nitrogen removal can reach 60 percent, and total phosphorus removal can approach 50 percent. Very long detention times in hot climates can reduce fecal coliforms to levels that can often meet surface water discharge standards, but typical U.S. retention times reduce fecal coliforms by 2 to 3 logs/100 mL.

Aerated ponds have removal capabilities similar to facultative lagoons, except that TSS removal is more consistent with aerobic biological systems (20 to 60 mg/L). Nitrification of ammonia-nitrogen can be nearly complete in warm seasons, while cold weather will halt that process. Some minimal phosphorus and nitrogen removal (10 to 20 percent) can be anticipated. Fecal coliform removal of 1 to 2 logs/100 mL is likely.

FWS systems can produce effluent BOD and TSS of 20 to 30 mg/L and can reduce nitrogen significantly. TP reduction is generally minor and similar to that of lagoons. Fecal coliform removals of about 2 to 3 logs (99 to 99.9 percent) can be expected.

Management needs

Aquatic systems are normally excavated in natural soil and constructed with earthen dikes. They may or may not be lined, depending on soil type. Sufficient freeboard (up to 2 feet) must be provided to prevent topping during high winds. In some cases the lagoon may act as a percolation pond, allowing effluent to infiltrate into the underlying soil. When used, mechanical aeration devices must be installed and fixed in place. Aerators may be mounted on piers or floats. Appropriate controls and electrical connections must be provided. Inlets should be located as far away from outlets as possible, and both should be accessible for normal maintenance. Piping and pumps, as required, should be of corrosion-resistant materials, and pumps should be readily accessible. Fencing will normally be required to restrict access by the public.

The operation and maintenance of aquatic systems is typically minimal. Some attention must be paid to flow monitoring and adjustments, as required. Inlet and outlet structures, berms, and surface blockages should be inspected and maintained. The use of mechanical aeration will require operation and maintenance tasks but less than those for extended aeration systems. Sludge management is relatively simple, since sludge builds up very slowly over a period of 10 to 15 years. Pretreatment of lagoon influent by septic tanks will greatly reduce sludge accumulations in the lagoon. Requiring septic tanks for individual homes or facilities served by lagoon cluster systems is recommended. Monitoring of effluent quality for parameters of interest should be provided.

Only aerobic ponds require energy and semiskilled operators. Energy costs are in the range of $150 to $250 per year, and labor costs would be $200 to $250 per year. Sludge production would be similar to aerobic units. Facultative lagoons and FWS systems require nonskilled O/M personnel to visit the facility two to three times per year. Sludge removal will be required every 10 to 15 years at most. A fence around the facility usually satisfies safety needs.

Risk management issues

Aquatic systems, particularly facultative lagoons and FWS constructed wetlands, are large, passive systems that are minimally affected by flow variations, extreme cold, and power outages. The risk of drowning can be mitigated only with restricted access, such as that provided by fencing and signage. Aerated lagoons are negatively affected by toxic loads, extreme cold, and power outages. Both lagoon types can be overloaded, resulting in odors, and the aerated type may become odorous during power outages. Poorly maintained facultative lagoons and FWS systems can become sources of

vector problems such as mosquito infestations. FWS systems can be negatively affected by extended toxic discharges, but their aesthetic image is extremely positive.

Costs

Capital costs for a facultative lagoon for an individual home would be in the range of $2,500 to $7,500, whereas an aerated lagoon should cost somewhat more. An FWS system would cost $2,000 to $4,000.

Operation and maintenance costs for the facultative lagoon and FWS systems should be less than $100 per year, whereas O/M costs for the aerated lagoon (including power) would be $350 to $500 per year.

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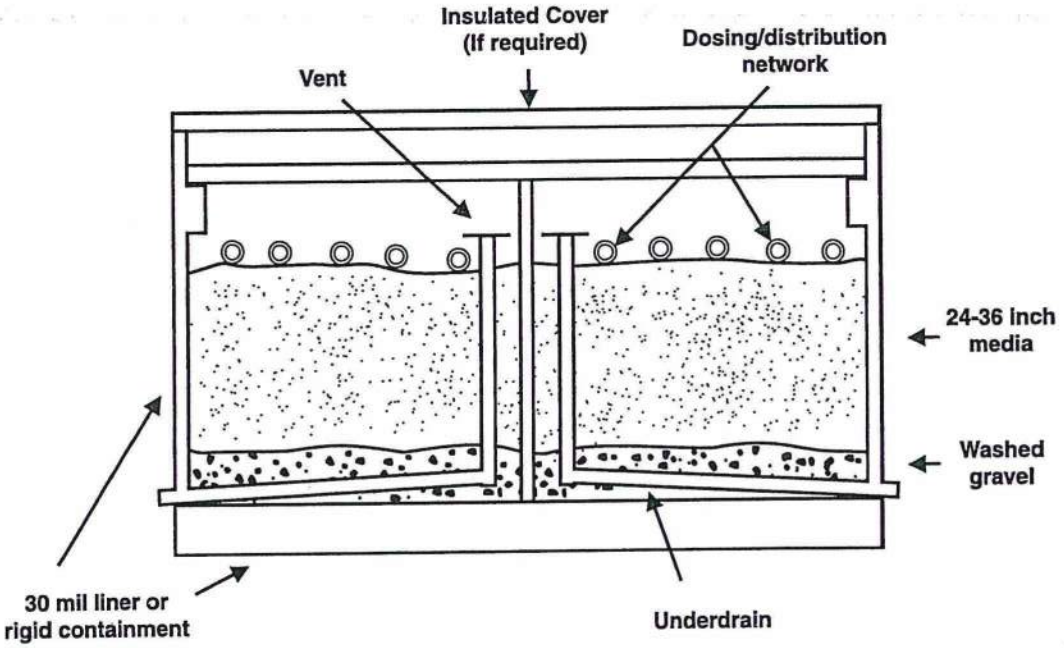
Onsite Wastewater Treatment Systems Technology Fact Sheet 10

Intermittent Sand/Media Filters

Description

The term *intermittent sand filter* (ISF) is used to describe a variety of packed-bed filters of sand or other granular materials available on the market. Sand filters provide advanced secondary treatment of settled wastewater or septic tank effluent. They consist of a lined (e.g., impervious PVC liner on sand bedding) excavation or structure filled with uniform washed sand that is placed over an underdrain system (see figure 1). The wastewater is dosed onto the surface of the sand through a distribution network and allowed to percolate through the sand to the underdrain system. The underdrain system collects the filter effluent for further processing or discharge.

Figure 1. Generic, open intermittent sand filter



Sand filters are aerobic, fixed-film bioreactors. Other treatment mechanisms that occur in sand filters include physical processes, such as straining and sedimentation, that remove suspended solids within the pores of the media. Also, chemical adsorption of pollutants onto media surfaces plays a finite role in the removal of some chemical constituents (e.g., phosphorus). Bioslimes from the growth of microorganisms develop as films on the sand particle surfaces. The microorganisms in the slimes absorb soluble and colloidal waste materials in the wastewater as it percolates over the sand surfaces. The adsorbed materials are incorporated into a new cell mass or degraded under aerobic conditions to carbon dioxide and water.

Most biochemical treatment occurs within approximately 6 inches of the filter surface. As the wastewater percolates through this layer, suspended solids and carbonaceous biochemical oxygen demand (BOD) are removed. Most suspended

solids are strained out at the filter surface. The BOD is nearly completely removed if the wastewater retention time in the sand media is sufficiently long for the microorganisms to absorb wastewater constituents. With depleting carbonaceous BOD in the percolating wastewater, nitrifying microorganisms are able to thrive deeper in the surface layer where nitrification will readily occur.

Chemical adsorption can occur throughout the media bed. Adsorption sites in the media are usually limited, however. The capacity of the media to retain ions depends on the target constituent, the pH, and the mineralogy of the media. Phosphorous is one element of concern in wastewater that can be removed in this manner, but the number of available adsorption sites is limited by the characteristics of the media.

The basic components of intermittent sand filters include a dosing tank, pump and controls (or siphon), distribution network, and the filter bed with an underdrain system (see figure 1). The wastewater is intermittently dosed from the dosing tank onto the filter through the distribution network. From there, it percolates through the sand media to the underdrain and is discharged. On-demand dosing is usually used, but timed dosing is becoming common.

There are a large number of variations in ISF designs. For example, there are different means of distribution, underdrain designs, housing schemes and, most notably, media choices. Many types of media are used in single-pass filters. Washed, graded sand is the most common. Other granular media used include gravel, crushed glass, and bottom ash from coal-fired power plants. Foam chips (polystyrene), peat, and coarse-fiber synthetic textile materials have also been used. These media are generally restricted to proprietary units. System manufacturers should be contacted for application and design using these materials.

There are also related single-pass designs, which are not covered in this fact sheet. These include lateral flow designs and upflow-wicking concepts, both of which use physical removal concepts closer to the concepts described in the fact sheet on anaerobic upflow filters and vegetated submerged beds. These processes are not discussed herein but may exhibit some pollutant removal mechanisms that are described here. Simple gravity-fed, buried sand filters are not discussed because their performance history is unsatisfactory.

Applications

Sand filters can be used for a broad range of applications, including single-family residences, large commercial establishments, and small communities. Sand filters are frequently used to pretreat septic tank effluent prior to subsurface infiltration onsite where the soil has insufficient unsaturated depth above ground water or bedrock to achieve adequate treatment. They are also used to meet water quality requirements (with the possible exception of fecal coliform removal) before direct discharge to a surface water. Sand filters are used primarily to treat domestic wastewater, but they have been used successfully in treatment trains to treat wastewaters high in organic materials such as those from restaurants and supermarkets. Single-pass ISF filters are most frequently used for smaller applications and sites where nitrogen removal is not required. However, they can be combined with anaerobic processes to reduce nitrogen significantly. Many studies have shown that ISF-treated onsite wastewaters can reduce clogging of the infiltrative surface by many times when compared with septic-tank effluents. However, be careful to evaluate the overall loading of pollutants and pathogens to the underlying aquifer and nearby surface waters before considering significant SWIS sizing reductions.

Design

ISF filter design starts with the selected media. The media characteristics determine the necessary filter area, dose volumes, and dosing frequency. Availability of media for a specific application should be determined before completing the detailed design. Typical specifications, mass loadings, and media depths are presented in table 1. The sand or gravel selected should be durable with rounded grains. Only washed material should be used. Fine particles passing the U.S. No. 200 sieve (less than 0.074 mm) should be limited to less than 3 percent by weight. Other granular media that have been used are bottom ash, expanded clay, expanded shale, and crushed glass. These media should remove BOD and TSS similar to sand and gravel for similar effective sizes, uniformity, and grain shape. Newer commercial media such as textile materials have had limited testing, but based on early testing should be expected to perform as well as the above types.

Traditionally, sand filters have been designed based on hydraulic loadings. However, since these filters are primarily aerobic biological treatment units, it is more appropriate that they be designed based on organic loadings. Unfortunately, insufficient data exist to establish well-defined organic loading rates. Experience presently suggests that BOD_5 loadings on sand media should not exceed about 5 lb/1,000 ft^3 per day (0.024 kg/m^2 per day) where the effective size is near 1.0 mm and the dosing rate is at least 12 times per day.

Higher hydraulic and organic loadings have been described in several studies, but the long-term viability of the systems loaded at those higher organic loads has not yet been fully verified. The values in the table are thus considered conservative and may be subject to increases as more quality-assured data become available.

Table 1. Specifications, mass loadings, and depth for single-pass intermittent sand filters

Design parameter	Typical design value
Material	Durable, washed sand/gravel with rounded grains
Specifications	
Effective size	
Sand	0.25–1.00 mm
Gravel	N/A
Uniformity coefficient	< 4
Percent fines (passing 200 sieve or < 0.074 mm)	≤ 3
Depth	2 to 3 ft
Mass loadings	
Hydraulic loading [a]	
Sand	1–2 gpd/ft^2
Gravel	N/A
Organic loading [b]	
Sand	5 lb BOD_5/1,000ft^2-d
Gravel	N/A
Underdrains	
Slope	0–0.1%
Size	3–4 in. dia.
Dosing	
Frequency	12–24 times per day
Dosing tank	
Volume	0.5–1.5 times design daily flow

[a] 1 gpd/ft^2 = 4 cm/day = 0.04 m^3/m^2 per day

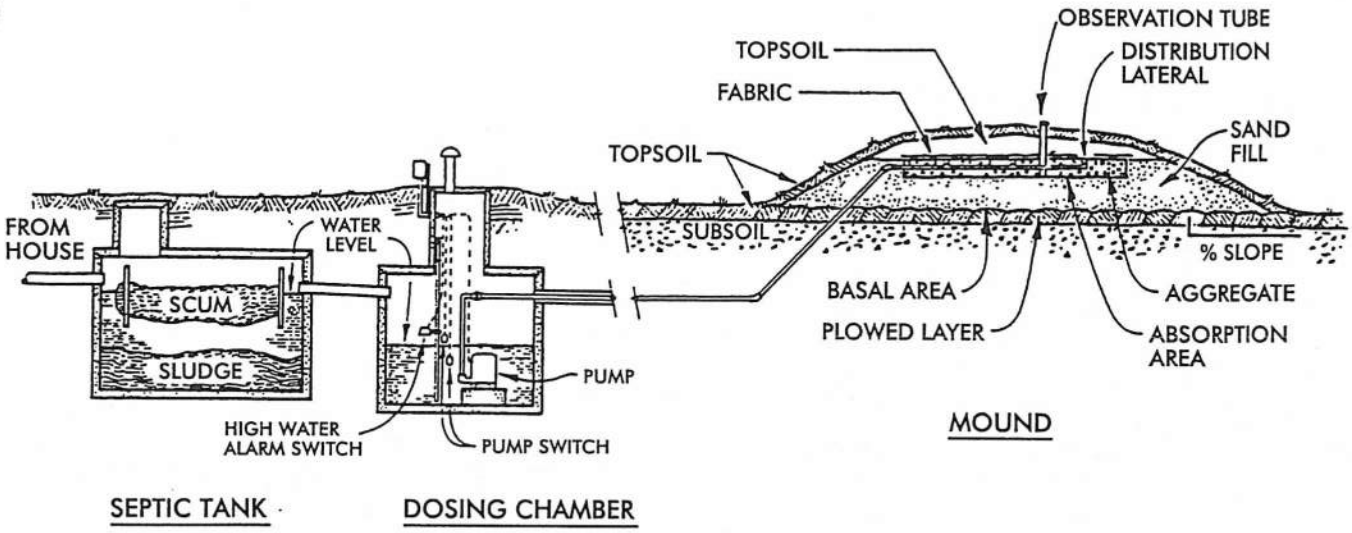
[b] 1 lb BOD/1000 ft^2 per day = 0.00455 kg/m^2 per day

Dosing volume and frequency have been shown to be the critical design variables. Small dose volumes are preferred because the flow through the porous media will occur under unsaturated conditions with higher moisture tensions. Better wastewater media contact and longer residence times occur under these conditions. Smaller dose volumes are achieved by increasing the number of doses per day. It has been suggested that each dose should be ≤0.5 cm (based on media surface perpendicular to infiltration direction) to fully nitrify the effluent in an ISF. This would limit maximum daily hydraulic loading to 12 cm/d, or 3 gpd/ft^2, if the maximum frequency of daily dosing is accepted as 24 (or hourly) as supported by the literature. Media characteristics can limit the number of doses possible. Reaeration of the media must occur between doses. As the effective size of the media decreases, the time for drainage and reaeration of the media increases.

Distribution network characteristics will also limit the number of doses possible. The primary characteristics are the volume, pressure, orifice sizes, and spacing. To achieve uniform distribution over the filter surface, minimum dose volumes are necessary and can vary with the distribution method selected. Therefore, if the dose volume dictated by the distribution network design is too high, the network should be redesigned. Since the dose volume is a critical operating parameter, the method of distribution and design of the distribution system should be considered carefully.

Distribution methods used include rigid pipe pressure networks with orifices or spray nozzles, drip distribution, and surface flooding, which is no longer recommended for small ISFs (see chapter 4). Rigid pipe pressure networks are the most commonly used method. Both orifices and spray nozzles are used. The use of spray nozzles is usually limited to recirculating filters because nozzle fouling from suspended solids is less likely than with undiluted septic tank effluent. Since the minimum dose volume required to achieve uniform distribution is five times the rigid pipe volume, the filter can be divided into multiple cells that are loaded individually so the distribution networks can be smaller to reduce the dose volume needed for uniform distribution. Optimum designs minimize the dose each time the system is dosed. Drip distribution is being used increasingly because the minimum dose volumes are much less than the volumes of rigid pipe networks.

Figure 2. ISF constructed in a mound with direct subsurface infiltration



Source: Converse and Tyler, 1998.

The underdrain system is placed on the floor of the tank or lined excavation. Ends of the underdrains should be brought to the surface of the filter and fitted with cleanouts that can be used to clean the biofilms underdrain, if necessary. The underdrain outlet is cut in the basin wall such that the drain invert is at the floor elevation and the filter can be completely drained. The underdrain outlet invert elevation must be sufficiently above the recirculation tank inlet to accommodate a minimum of 0.1 percent slope on the return line and any elevation losses through the flow splitting device. The underdrain (usually 1.25- to 2.0-inch PVC, class 200 [minimum]) is covered with washed, durable gravel to provide a porous medium through which the filtrate can flow to the underdrain system. The gravel should be sized to prevent the filter medium from mixing into the gravel, or a layer of 1/4- to 3/8-inch-diameter washed pea gravel should be placed over the washed underdrain gravel before the filter medium is added.

The filter basin can be a lined excavation or fabricated tank. For single-home systems, prefabricated concrete tanks are commonly used. Many single-home filters and most large filters are constructed within lined excavations. Typical liner materials are polyvinyl chloride and polypropylene. A liner thickness of 30 mil can withstand reasonable construction activities yet be relatively easy to work with. A sand layer should be placed below the liner to protect it from being punctured if the floor and walls of the excavation are stony. The walls of the excavation should be brought above the final grade to prevent entry of surface water.

Filters can be covered or buried. It is often necessary to provide a cover for the filter surface because the surface of a fine medium (e.g., sand) exposed to sunlight can be fouled with algae. Also, there may be concerns about odors, cold weather impacts, precipitation, leaf and debris accumulation, and snowmelt. In addition, the cover must provide ample fresh air venting. Reaeration of the filter medium primarily occurs from the filter surface. The lower 20 percent of the medium's depth maintains a high moisture content. At the bottom, the medium is near or at saturation, which is a barrier to air flow and venting from the underdrain system. The gravel surrounding the distribution piping must be vented to the surface to provide a fresh air flow. ISF filters open to the surface are built with roofs or removable covers or are merely shaded. Roofs provide cold weather protection and shed precipitation, debris, and snowmelt that would otherwise enter the system.

Performance

Treatment field performance of single-pass intermittent sand filters is presented in table 2. Typical effluent concentrations for these single-family wastewater treatment systems are less than 5 mg/L and less than 10 mg/L for BOD and TSS, respectively. Effluent is nearly completely nitrified but some variability can be expected in nitrogen removal capability. Controlled studies generally find typical nitrogen removals of 18 to 33 percent with an ISF. Fecal coliform removal ranges

from 2 to 4 logs (99 to 99.99 percent). ISF fecal coliform removal is a function of hydraulic loading, with reduced removals as the loading rate increases above 1 gpm/ft² (Emerick et al., 1997). Effluent suspended solids from sand filters are typically low. The media retains the solids. Most organic solids are digested by the media over time.

Table 2. Single-pass intermittent sand filter performance

Reference	BOD(mg/L) Influ.	BOD(mg/L) Efflu. (% Removal)	BOD(mg/L) Influ.	BOD(mg/L) Efflu. (% Removal)	BOD(mg/L) Influ.	BOD(mg/L) Efflu. (% Removal)	BOD(mg/L) Influ.	BOD(mg/L) Efflu. (% Removal)	BOD(mg/L) Influ.	BOD(mg/L) Efflu. (% Removal)
Cagle and Johnson, 1994 [a] (California)	160	2 (98.75%)	73	16 (78.08%)	61.8	5.9 (90.45%)	61.8	37.4 (39.48%)	1.14E+05	1.11E+02 (99.90%)
Effert et al., 1985[b] (Ohio)	127	4 (96.85%)	53	17 (67.92%)	-	- -	41.5	37.5 (9.64%)	2.19E+05	1.60E+03 (99.27%)
Ronayne et al., 1982[c] (Oregon)	217	3 (98.62%)	146	10 (93.15%)	57.1	1.7 (97.02%)	57.5	30.3 (47.30%)	2.60E+05	4.07E+02 (99.84%)
Sievers, 1998[d] (California)	297	3 (98.99%)	44	3 (93.18%)	37	0.5 (98.65%)	37.1	27.5 (25.88%)	4.56E+05	7.30E+01 (99.98%)

[a] Sand media: es = 0.25-0.65 mm; uc = 3-4. Design hydraulic loadings = 1.2 gpd/ft² based on 150 gpd/bedroom. Actual flows not measured.
[b] Sand media: es = 0.4 mm; uc = 2.5. Average loadings = 0.4 gpd/ft² / 0.42 lb BOD/1,000 ft². Doses per day = 3.3.
[c] Sand media: es = 0.14-0.30 mm; uc = 1.5-4.0. Average loadings = 0.33 gpd/ft² / 0.6-1.27 lb BOD/1000 ft² per day.
[d] Sand media: not reported; uc = 3-4. Design hydraulic loadings = 1. gpd/ft². Daily flows not reported.

Management needs

Construction of ISF units usually involves excavation, forming/framing, liner placement with supporting sand layers, and plumbing. ISF units should never be placed in surface depressions without thoroughly sealing against prolonged inundation and drainage configurations that prevent stormwater entry. In all cases, units must be watertight with sealed entries and exits for piping. Filter fabric should not be used at any location through which the filtrate would flow. Media delivered to the site should be tested against design-sizing specifications. Excess (3 percent or greater) fines are one of the greatest concerns of the construction inspector.

The operation and maintenance requirements of packed bed filters are few and simple. As with all treatment systems, flow monitoring should be conducted to identify excessive flows and check dose volumes and dosing rates. If the flows are excessive, the source of the flows should be identified and corrective measures taken. Reduced dose volumes or dosing rates suggest that the distribution network is plugged or the pump is not performing properly. The distribution network should be flushed annually (or more often, as necessary) using the manual flushing device. Also, the dosing pump should be recalibrated at least annually.

The filter surface should not pond if the filter is designed properly and the wastewater characteristics do not change significantly. If standby cells are not available for regular resting and the surface is not covered with pea gravel, the surface can be raked to break up any material clogging the filter surface. Reducing the dose volume and increasing the dosing frequency may help to increase the reaeration potential and reduce clogging of the media. If the ponding problem persists, however, removal of the top layer or complete replacement of the media may be necessary. Before replacing the media, monitor wastewater flows and concentrations to determine if they are the cause of the problem. Problem sources should be identified and addressed before repairs are effected. Premature clogging is often traceable to excess TSS and BOD loading or to fines in the media. Where the problem develops naturally over time and standby cells are available, resting may be used to supplement the raking and/or surface skimming steps.

Free-access ISFs should be checked regularly (at least every 3 to 4 months), to prevent surface problems. Periodic raking and resting is recommended to maintain percolation and prevent ponding. Scraping off the top layer (e.g., 1 inch) of sand helps to prevent clogging. Intervals between scraping vary from a minimum of 3 months up to greater than 1 year. Removed surface layers need not be replaced until the total filter depth falls below 18 inches. If new filter material is not

readily available, it may be cost-effective to clean and reuse the old filter material. Resting is considered the best rehabilitation approach due to possible clogging contributions from raking/scraping.

ISFs have low energy requirements compared with other systems offering comparable effluent quality. Free-access ISFs using pumped dosing would require approximately 0.3 to 0.4 kWh/day.

Risk management issues

ISF filters are simple in design and relatively passive to operate because the fixed-film process is very stable and few mechanical components are used. High flow variations after equalization in a septic tank are not a problem because the residual peaks and valleys are absorbed in the pressurization tank or in the last compartment of the preceding septic tank. Although ISFs have biological properties, the impact of toxic loading shocks are not well documented.

Free-access ISFs are often installed with removable covers to regulate temperatures in cold climates and to reduce odors. Space of 12 to 24 inches (30 to 61 cm) should be allotted between the sand surface and the installed cover (EPA, 1980). Odors from free-access filters treating septic tank effluent may warrant installation away from dwellings, especially if spray nozzles are used in distribution.

Power outages will impact ISF systems if these systems are uniformly dosed with pumps. During the power outage, all wastewater generated will accumulate in that dosing facility and septic tank, increasing the potential for odors.

Costs

Filter media is the most expensive component in ISF construction. Typically, filter media can be installed for $10 to $15 per square foot, depending primarily on the type of media and the contractor's experience with ISF construction. Operation/maintenance costs include electricity for pumping/dosing, and 3 to 6 hours of semiskilled management visits per year cost about $150 to $200. The electricity is about $10 to $20 of that total.

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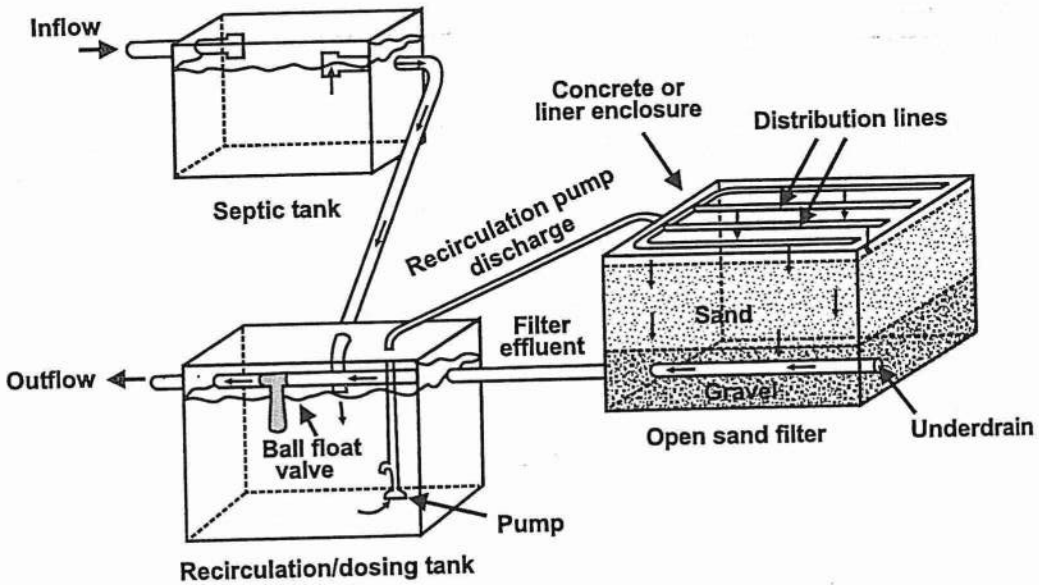
Onsite Wastewater Treatment Systems Technology Fact Sheet 11

Recirculating Sand/Media Filters

Description

Recirculating filters using sand, gravel, or other media provide advanced secondary treatment of settled wastewater or septic tank effluent. They consist of a lined (e.g., impervious PVC liner on sand bedding) excavation or structure filled with uniform washed sand that is placed over an underdrain system (see figure 1). The wastewater is dosed onto the surface of the sand through a distribution network and allowed to percolate through the sand to the underdrain system. The underdrain system collects and recycles the filter effluent to the recirculation tank for further processing or discharge.

Figure 1. Typical recirculating sand filter system



Recirculating sand filters (RSFs) are aerobic, fixed-film bioreactors. Other treatment mechanisms that occur in sand filters include physical processes, such as straining and sedimentation, that remove suspended solids within the pores of the media. Also, chemical sorption of pollutants onto media surfaces plays a finite role in the removal of some chemical (e.g., phosphorus) constituents. Bioslimes from the growth of microorganisms develop as films on the sand particle surfaces. The microorganisms in the slimes absorb soluble and colloidal waste materials in the wastewater as it percolates over the sand surfaces. The absorbed materials are incorporated into a new cell mass or degraded under aerobic conditions to carbon dioxide and water.

Most biochemical treatment occurs within approximately 6 inches of the filter surface. As the wastewater percolates through this layer, suspended solids and carbonaceous biochemical oxygen demand (BOD) are removed. Most suspended solids are strained out at the filter surface. The BOD is nearly completely removed if the wastewater retention time in the sand media is sufficiently long for the microorganisms to absorb waste constituents. With depleting carbonaceous BOD in

the percolating wastewater, nitrifying microorganisms are able to thrive deeper in the surface layer, where nitrification will readily occur.

Chemical adsorption can occur throughout the media bed. Adsorption sites in the media are usually limited, however. The capacity of the media to retain ions depends on the target constituent, the pH, and the mineralogy of the media. Phosphorus is one element of concern that can be removed from wastewater in this manner, but the number of available adsorption sites is limited by the characteristics of the media.

The basic components of recirculating filters include a recirculation/dosing tank, pump and controls, distribution network, filter bed with an underdrain system, and a return line. The return line or the underdrain must split the flow to recycle a portion of the filtrate to the recirculation/dosing tank. A small volume of wastewater and filtrate is dosed to the filter surface on a timed cycle 1 to 3 times per hour. Recirculation ratios are typically between 3:1 and 5:1. In the recirculation tank, the returned aerobic filtrate mixes with the anaerobic septic tank effluent before being reapplied to the filter.

Recirculating filters must use a coarser media than single-pass filters because recirculation requires higher hydraulic loadings. Both coarse sand and fine gravel are used as filter media. Because of the high hydraulic conductivities of the coarse media, filtrate recirculation is used to provide the wastewater residence times in the media necessary to meet the treatment requirements. Based on forward flow, daily hydraulic loadings are typically about 3 gpd/ft^2 (2 to 5 gpd/ft^2) when the filter media is coarse sand. Therefore, the corresponding combined daily filter hydraulic loading, including the recirculated flow, may be 6 to 25 gpd/ft^2. Where gravel is used as the media, the daily hydraulic loadings are increased to as much as 10 to 15 gpd/ft^2 with a combined daily loading of 30 to 75 gpd/ft^2. BOD and TSS removals are generally the same as those achieved by single-pass filters. Nearly complete ammonia removal by nitrification is also achieved. In addition, the mixing of the return filtrate anaerobic septic tank effluent removes approximately 50 percent of the total nitrogen. However, because of the greater hydraulic loadings and coarser media, fecal coliform removal is somewhat less than in single-pass filters.

Recirculating filters offer advantages over single-pass filters. Greater control of performance is possible because recirculation ratios can be changed to optimize treatment. The filter can be smaller because of the higher hydraulic loading. Recirculation also reduces odors because the influent wastewater (septic tank effluent) is diluted with return filtrate that is low in BOD and high in dissolved oxygen.

Many types of media are used in packed-bed filters. Washed, graded sand was the most common, but pea gravel has generally replaced it in recent times. Other granular media used include crushed glass, garnet, anthracite, plastic, expanded clay, expanded shale, open-cell foam, extruded polystyrene, and bottom ash from coal-fired power plants. Coarse-fiber synthetic textile materials are also used. These materials are generally restricted to proprietary units. Contact the system manufacturers for application and design using these materials.

Other modifications to the basic RSF design include the type of distribution system, the location and design of the recirculation tank, the means of flow splitting the filtrate between discharge and return flows, and enhancements to improve nitrogen removal. The last is addressed in Technology Fact Sheet 9 on nitrogen removal.

Applications

Recirculating sand filters can be used for a broad range of applications, including single-family residences, large commercial establishments, and small communities. They are frequently used to pretreat wastewater prior to subsurface infiltration on sites where soil has insufficient unsaturated depth above ground water or bedrock to achieve adequate treatment. They are also used to meet water quality requirements before direct discharge to a surface water. RSFs are primarily used to treat domestic wastewater, but they have also been used successfully in treatment trains to treat wastewaters high in organic materials such as those from restaurants and supermarkets. Single-pass filters are most frequently used for smaller applications and at sites where nitrogen removal is not required. Recirculating filters are used for both large and small flows and are frequently used where nitrogen removal is necessary. RSFs frequently replace aerobic package plants in many parts of the country because of their high reliability and lower O/M requirements.

Design

Packed-bed filter design starts with the selected media. The media characteristics determine the necessary filter area, dose volumes, and dosing frequency. Availability of media for a specific application should be determined before completing the detailed design. Typical specifications, mass loadings, and depths for sand and gravel media are presented in chapter 4. The sand or gravel selected should be durable with rounded grains. Only washed material should be used. Fine particles passing the U.S. No. 200 sieve (<0.074 mm) should be limited to less than 3 percent by weight. Other granular media are bottom ash, expanded clay, expanded shale, and crushed glass. These media should perform similarly to sand and gravel for similar effective sizes, uniformity, and grain shape. Newer commercial media such as textile materials have had limited testing, but should be expected to perform as well as the above types.

Traditionally, media filters have been designed based on hydraulic loadings. However, since they are primarily aerobic biological treatment units, it is more appropriate that they be designed based on organic loadings. Unfortunately, insufficient data exist to establish well-defined organic loading rates. Experience suggests that BOD_5 loadings on sand media should not exceed about 5 lb/1000 ft² per day (0.024 kg/m² per day) where the effective size is approximately 1.0 mm and the dosing rate is at least 12 times per day. Higher loadings have been measured in short-term studies, but designers are cautioned about exceeding this loading rate until quality-assured data confirm these higher levels. The BOD_5 loading should decrease with decreasing effective size of the sand. Because of the larger pore size and greater permeability, gravel filters can be loaded more heavily. BOD_5 loadings of 20 lb/1000 ft² per day (0.10 kg/m² per day) have been consistently successful, but again higher loadings have been measured. Some often-quoted design specifications for RSFs are given in table 1.

Table 1. Typical design specifications for individual home recirculating sand filters

Design parameter	Typical design value
Median	Durable, washed sand/gravel with rounded grains
Specifications	
Effective size	
Sand	1.0 – 5.0 mm
Gravel	3.0 – 20.0 mm
Uniformity coefficient	< 2.5
Percent fines (passing 200 sieve or < 0.074 mm)	≤ 3
Depth	24 in. (18 to 36 in.)
Mass loadings	
Hydraulic loading [1]	
Sand	3 -5 gpd/ft²
Gravel	10 –15 gpd/ft²
Organic loading [2]	
Sand	≤ 5 lb BOD_5/1000ft²-d
Gravel	≤ 15 lb BOD_5/1000ft²-d
Underdrains	
Type	Slotted or perforated pipe
Slope	0 – 0.1%
Transition bedding	0.6 – 1.0 cm washed pea gravel
Size	0.6 – 4.0 cm washed gravel or crushed stone
Dosing	
Frequency	48 times/day (every 30 min.) or more
Per Dose	1 to 2 gal./orifice
Recirculation tank	
Volume	1.5 times design daily flow
Recirculation rate	3 to 5 times daily flow

[a] 1 gpd/ft² = 4 cm/day = 0.04 m³ / m² per day (forward flow only).
[b] 1 lb BOD/1,000 ft² per day = 0.00455 kg/m² per day.

The RSF dose volume depends on the recirculation ratio, dosing frequency, and distribution network:

Dose Volume = Design Flow (gpd) x (Recirculation Ratio + 1) ÷ Number of Doses/Day

Small dose volumes are preferred because the flow through the porous media will occur under unsaturated conditions with higher moisture tensions. Better wastewater media contact and longer residence times occur under these conditions. Smaller dose volumes are achieved by increasing the number of doses per day.

The recirculation ratio increases the hydraulic loading without increasing the organic loading. For example, a 4:1 recirculation ratio results in a hydraulic loading of five times the design flow (1 part forward flow to 4 parts recycled flow). The increased hydraulic loading reduces the residence time in the filter so that recirculation is necessary to achieve the desired treatment. Typical recirculation ratios range from 3:1 to 5:1. As the permeability of the media increases, the recirculation ratio may need to increase to achieve the same level of treatment.

Media characteristics can limit the number of doses possible. Media reaeration must occur between doses. As the effective size of the media decreases, the time for drainage and reaeration of the media increases. For single pass filters, typical dosing frequencies are once per hour (24 times/day) or less. Recirculating sand filters dose 2 to 3 times per hour (48 to 72 times/day).

Distribution network requirements will also limit the number of doses possible. To achieve uniform distribution over the filter surface, minimum dose volumes are necessary and can vary with the distribution method selected. Therefore, if the dose volume dictated by the distribution network design is too high, the network should be redesigned. Since the dose volume is a critical operating parameter, the method of distribution and the distribution system design should be considered carefully.

Distribution methods used include rigid pipe pressure networks with orifices or spray nozzles, and drip emitters. Rigid pipe pressure networks are the most commonly used method. Orifices with orifice shields, facing upward, minimize hole blockage by stones. Since the minimum dose volume required to achieve uniform distribution is five times the pipe volume, large multihome filters are usually divided into multiple cells. Drip emitter distribution is being used increasingly because the minimum dose volumes are much less than the rigid pipe network volumes.

Recirculation tanks are a component of most recirculation filter systems. These tanks consist of a tank, recirculation pump and controls, and a return filter water flow splitting device. The flow splitting device may or may not be an integral part of the recirculation tank. Recirculation tanks store return filtrate, mix the filtrate with the septic tank effluent, and store peak influent flows. The tanks are designed to either remain full or be pumped down during periods of low wastewater flows. Since doses to the recirculating filter are of a constant volume and occur at timed intervals, the water level in the tank will rise and fall in response to septic tank effluent flow, return filtrate flow, and filter dosing.

In tanks designed to remain full, all filtrate is returned to the recirculation tank to refill the tank after each dosing event. When the tank reaches its normal full level, the remaining return filtrate is discharged out of the system as effluent. This design is best suited where treatment performance must be maintained continuously. For single-family home systems, the recirculation tank is typically sized to be equal to 1.5 times the design peak daily flow.

When the filtrate flow is continuously split between the return (to the recirculation tank) and the discharge, the liquid volume in the recirculation tank will vary depending on wastewater flows. During low flow periods the tank can be pumped down to the point that the low-water pump off switch is activated. This method leaves less return filtrate available to mix with the influent flow. While simple, this method of flow splitting can impair treatment performance because minimum recirculation ratios cannot be maintained. This is less of a disadvantage, however, for large, more continuous flows typical in small communities or large cluster systems.

The recirculation pump and controls are designed to dose a constant volume of mixed filtrate and septic tank effluent flow onto the filter on a timed cycle. The pump must be sized to provide the necessary dosing rate at the operating discharge head required by the distribution system. Pump operation is controlled by timers that can be set for pump time on and pump time off. A redundant pump-off float switch is installed in the recirculation tank below the minimum dose volume level. A high water alarm is also installed to provide notice of high water caused by pump failure, loss of pump calibration, or excessive influent flows.

Recirculation tank sizing

In many types of commercial systems, daily flow variations can be extreme. In such systems, the recycle ratios necessary to achieve the desired treatment may not be maintained unless the recirculation tank is sized properly. During prolonged periods of high influent flows, the recirculation ratio can be reduced to the point that treatment performance is not maintained unless the recirculation tank is sized to provide a sufficient reservoir of recycled filtrate to mix with the influent during the high-flow periods.

To size the tank appropriately for the application, assess the water balance for the recirculation tank using the following procedure:

1. Select the dosing frequency based on the wastewater strength and selected media characteristics.

2. Calculate the dose volume based on the average daily flow:

   $$V_{dose} = [(\text{recycle ratio} + 1) \times Q_{ave.\ daily}] \div (\text{doses/day})$$

   $$Q_{dose} = V_{dose} \div (\text{dose period})$$

   Where V and Q are the flow volume and flow rate, respectively.

3. Adjust the dose volume if the calculated volume is less than the required minimum dose volume for the distribution network.

4. Estimate the volumes and duration of influent peak flows that are expected to occur from the establishment.

5. Calculate the necessary recirculation tank "working" volume by performing a water balance around the recirculation tank for the peak flow period with the greatest average flow rate during that peak period.

   $$\text{Inputs} = Q_{inf.} \times T + Q_{recycle} \times T = Q_{inf} \times T + (Q_{dose} - Q_{eff}) \times T = V_{inf.} + V_{recycle}$$

   $$\text{Outputs} = V_{dose} \times (T \div \text{dose cycle time})$$

   Where T is the peak flow period duration.

   If the inputs are greater than the outputs, then $Q_{eff} = Q_{dose}$ and the peaks are stored in the available freeboard space of the recirculation tank. If the inputs are less than the outputs, then $Q_{eff.} = Q_{inf.}$

   To provide the necessary recycle ratio, sufficient filtrate must be available to mix with the influent septic tank effluent. The filtrate is provided by the return filtrate flow and the filtrate already in the recirculation tank.

   $$\text{Recycle ratio} \times Q_{inf.} \times T \leq Q_{recycle} \times T + \text{minimum tank working volume}$$

   $$\text{Where minimum tank working volume} = \text{Recycle ratio} \times (Q_{inf.} - Q_{recycle}) \times T$$

6. Calculate the necessary freeboard volume for storage of peak flows when the influent volume is greater than the dosing volume during the peak flow period.

   $$\text{Freeboard volume} = Q_{inf.} \times T + Q_{recycle} \times T - Q_{dose} \times T$$

   $$= Q_{inf.} \times T(Q_{dose} - Q_{eff.}) - Q_{dose} \times T$$

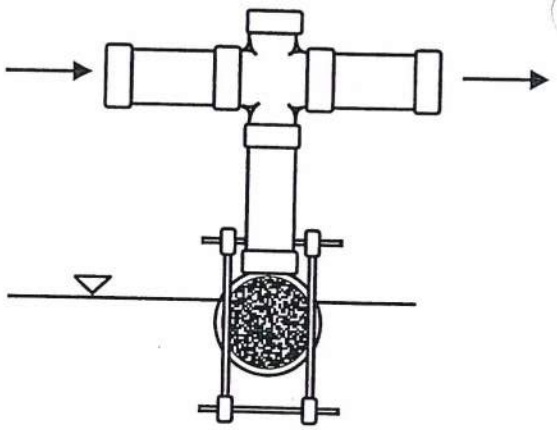
7. Calculate the minimum total recirculation volume.

   $$\text{Total tank volume} = \text{minimum tank working volume} + \text{freeboard volume}$$

(Adapted from Ayres Associates, 1998.)

Several flow splitting devices may be used. The most common are ball float valves and proportional splitters. The ball float valve is used where the recirculation tank is designed to remain full. The valve is connected to the return filtrate line inside the recirculation tank (see figure 2). The return line runs through the tank. The ball float valve is open when the water level is below the normally full level. When the tank fills from either the return filtrate or the influent flow, the ball float rises to close the valve, and the remaining filtrate is discharged from the system. The proportional splitters continuously divide the flow between return filtrate and the filtrate effluent (see figure 3). Another type of splitter consists of a sump in which two pipes are stubbed into the bottom with their ends capped. In the crowns of each capped line, a series of equal-sized, pluggable holes are drilled. The return filtrate floods the sump, and the flow is split in proportion to the relative number of holes left open in each perforated capped pipe.

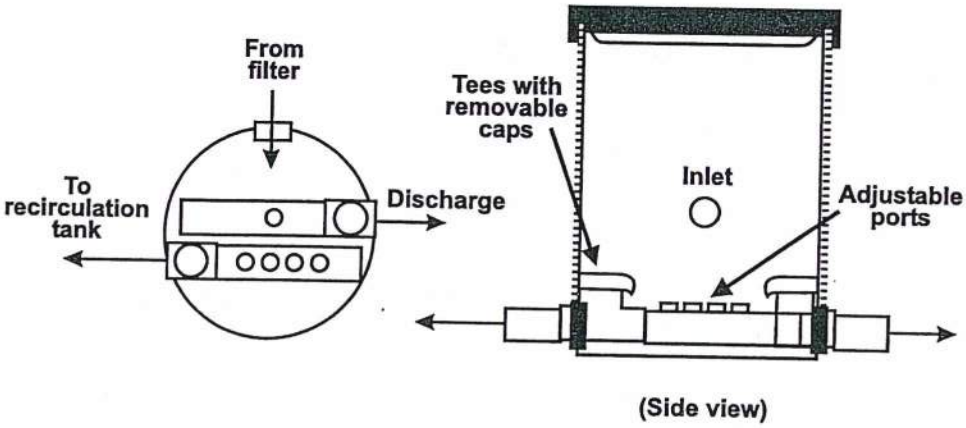
Figure 2. Flow splitter operated by a float ball valve



Another type of splitter divides flow inside the filter. The filter floor is raised so that it slopes in opposite directions. The raised point is located so that the ratio of the floor areas on either side is in proportion to the desired recirculation ratio. Each side has its own underdrain. One side drains back to the recirculation tank, the other side drains to discharge. This method has the disadvantage that adjustments to the recirculation ratio cannot easily be made.

Most RSFs are constructed aboveground and with an open filter surface; however, in cold climates, they can be placed in the ground to prevent freezing. Placing a cover over an RSF is recommended to reduce odors and to provide insulation in cold climates, although no freezing was observed in an open RSF in Canada using coarse gravel media. Covers must provide ample fresh air venting, because reaeration of the filter media occurs primarily from the filter surface.

Figure 3. Splitter basin

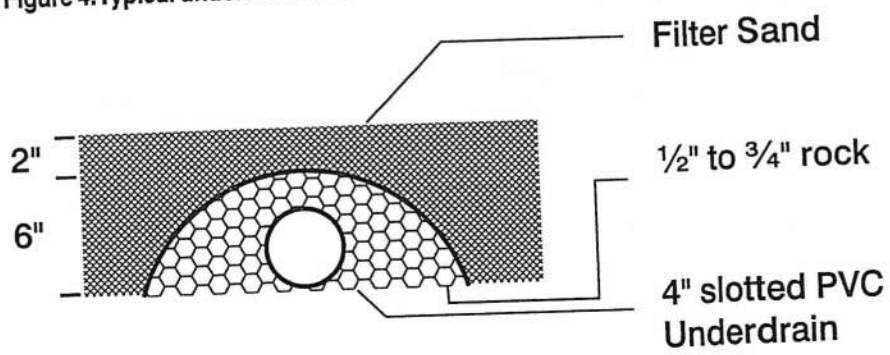


The filter basin can be a lined excavation or fabricated tank. For single-home systems, prefabricated concrete tanks are commonly used. Many single-home filters and most large filters are constructed within lined excavations. Typical liner materials are polyvinyl chloride and polypropylene. A liner thickness of 30 mil can withstand reasonable construction activities yet be relatively easy to work with. A sand layer should be placed below the liner to protect it from puncturing if the floor and walls of the excavation are stony. The excavation walls should be brought above the final grade to prevent entry of surface water. It is often necessary to cover the filter surface to reduce the effects of algae fouling, odors, cold weather impacts, precipitation, and snow melt. The cover must provide ample fresh air venting, however. Reaeration of the filter media primarily occurs from the filter surface.

The underdrain system is placed on the floor of the tank or lined excavation (figure 4). Ends of the underdrains should be brought to the surface of the filter and fitted with cleanouts that can be used to clean the underdrains of biofilms if necessary. The underdrain outlet is cut in the basin wall such that the drain invert is at the floor elevation and the filter can be completely drained. The underdrain outlet invert elevation must be sufficiently above the recirculation tank inlet to accommodate a minimum of 0.1 percent slope on the return line and any elevation losses through the flow splitting device. The underdrain is covered with washed, durable gravel to provide a porous medium through which the filtrate can flow to

the underdrain system. The gravel should be sized to prevent the filter media from mixing into the gravel, or a layer of 1/4- to 3/8-inch-diameter gravel should be placed over the underdrain gravel before the filter media is added.

Figure 4. Typical underdrain detail.



Performance

RSF systems are extremely effective and reliable in removing BOD, TSS, and contaminants that associate with the particulate fraction of the incoming septic tank effluent. Some typical performance data are provided in table 2.

Normally, BOD and TSS effluent concentrations are less than 10 mg/L when RSF systems are treating residential wastewater. Nitrification tends to be complete, except in severely cold conditions. Natural denitrification in the recirculating tank results in 40 to 60 percent removal of total nitrogen (TN). Fecal coliform removal is normally 2 to 3 logs (99 to 99.9 percent). Phosphorus removal drops off from high percentages to about 20 to 30 percent after the exchange capacity of the media becomes exhausted. Some media and media mixes have very high iron and/or aluminum content that extends the initial period of high phosphorus removal. (See Enhanced Nutrient Removal—Phosphorus, Technology Fact Sheet 8.)

Table 2. Recirculating filter performance

Reference	BOD (mg/L) Influ. Efflu. (% Removal)	TSS (mg/L) Influ. Efflu. (% Removal)	TKN (mg-N/L) Influ. Efflu. (% Removal)	TN (mg-N/L) Influ. Efflu. (% Removal)	Fecal Coliform (#/100mL) Influ. Efflu. (% Removal)
Louden et al., 1985 [a] (Michigan)	150 6 *(96.00%)*	42 6 *(85.71%)*	55 2.3 *(95.82%)*	55 26 *(52.73%)*	3.40E+03 1.40E+01 *(99.59%)*
Piluk and Peters, 1994 [b] (Maryland)	235 5 *(97.87%)*	75 8 *(89.33%)*	Not reported	57 20 *(64.91%)*	1.80E+06 9.20E+03 *(99.49%)*
Ronayne, et al., 1982 [c] (Oregon)	217 3 *(98.62%)*	146 4 *(97.26%)*	57.1 1.1 *(98.07%)*	57.5 31.5 *(45.22%)*	2.60E+05 8.50E+03 *(96.73%)*
Roy and Dube, 1994 [d] (Quebec)	101 6 *(94.06%)*	77 3 *(96.10%)*	37.7 7.9 *(79.05%)*	37.7 20.1 *(46.68%)*	4.80E+05 1.30E+04 *(97.29%)*
Ayres Assoc., 1998 [e] (Wisconsin)	601 10 *(98.34%)*	46 9 *(98.35%)*	65.9 3 *(95.45%)*	65.9 16 *(75.72%)*	> 2500 6.20E+01 *(> 98%)*
Owen and Bobb, 1994 [f] (Wisconsin)	80 8 *(90.00%)*	36 6 *(83.33%)*	- - *(> 95%)*	Not reported	Not reported

[a] Single-family home filters. Sand media: es = 0.3 mm; uc = 4.0. Average loadings = 0.9 gpd/ft² (forward flow) / 1.13 lb BOD/1,000 ft² –day. Recirculation ratio = 3:1. Dosed 4-6 times per hour. Open surface.

[b] Single-family home filters. Sand media: es = 1 mm; uc = <2.5. Design hydraulic loadings = 3.54 gpd//ft² (forward flow). Actual flow not measured. Recirculation ratio = 3:1. Doses per day = 24.

[c] Single-family home filters. Sand media: es = 1.2 mm; uc = 2.0. Maximum hydraulic loading (forward flow)= 3.1 gpd/ft². Recirculation ratio = 3:1-4:1. Doses per day = 48.

[d] Single-family home filters. Gravel media: es = 4.0 mm; uc = <2/5. Design hydraulic loading (forward flow)= 23.4 gpd/ft². Recirculation ratio = 5:1. Doses per day = 48. Open surface, winter operation.

[e] Restaurant (grease and oil inf./eff. = 119/<1 mg/L, respectively). Gravel media: pea gravel (3/8 in. dia.) Design hydraulic loading (forward flow) = 15 gpd/ft². Recirculation ratio = 3:1- 5:1. Doses per day = 72. Open surface, seasonal operation.

[f] Small community treating average 15,000 gpd of septic tank effluent. Sand media: es = 1.5 mm; uc = 4.5. Design hydraulic loading (forward flow) = 2.74 gpd/ft². Recirculation ratio = 1:1-4:1. Open surface, winter operation.

Management needs

As with all treatment systems, the RSF should be constructed carefully according to design specifications using corrosion-resistant materials. Every truckload of media delivered to the site should be tested for compliance with the specifications. All tanks and lined basins, including the entry and exit plumbing locations, must be watertight.

Inspection and operation/maintenance (O/M) needs are primarily related to inspection and calibration of the recirculation pump and controls. For sand media units, frequent removal of vegetation and scraping of the surface are required. Regular maintenance tasks include periodic checks on the pressure head at the end of the distribution system, draining of the accumulated solids from lines, and occasional brushing of the lines (at least once per year), with bottle brushes attached to a plumber's snake.

The recirculation tank should be checked for sludge accumulation on each visit and pumped as necessary (usually one to three times per year).

Risk management issues

RSFs are extremely reliable treatment devices and are quite resistant to flow variations. Toxic shocks are detrimental to RSF treatment performance because of the resistance of biofilms to upset and the extended period of contact between biofilms and wastewater.

Gravel RSFs (or RGFs) are likely viable throughout the United States when proper precautions (e.g., covering, insulation) are taken. These systems perform best in warmer climates, but they increase opportunities for odor problems. In general, gravel RSF systems are far less prone to odor production than ISFs. Increased recycle ratios should help minimize such problems. However, power outages will stop the process from treating the wastewater, and prolonged outages would be likely to generate some odors.

Costs

Construction costs for recirculating sand filters are driven by treatment media costs, the recirculating tank and pump/control system costs, and containment costs. Total costs are therefore site specific, but tend to vary from $8,000 to $11,000. Low-cost alternative media can reduce this figure significantly.

Power costs for pumping at 3 to 4 kWh/day are in the range of $90 to $120 per year, and management costs for monthly visits/inspections by semiskilled personnel typically cost $150 to $200 annually.

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Onsite Wastewater Treatment Systems Technology Fact Sheet 12

Land Treatment Systems

Description

Land (surface) treatment systems (figures 1 and 2) are permitted in some states, but are not widely used because of their large land area requirements exacerbated by code-required setbacks. For example, a spray irrigation system requires about four times the area of an individual home lagoon. When these systems are used, large buffer areas and fencing may be required to ensure minimal human exposure. Also, given the nature of these systems, all requirements include disinfection and significant pretreatment before application. In wet and cold areas, an additional basin for storage or a larger dosing

Figure 1. Conceptual schematic of spray irrigation system

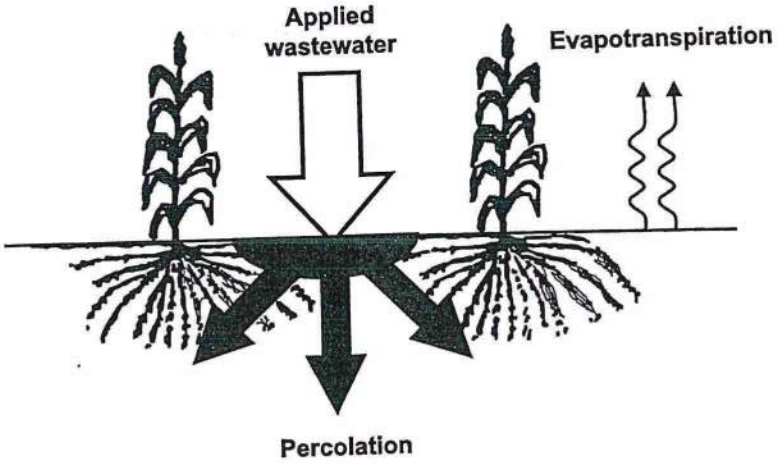


Figure 2. Conceptual schematic of rapid infiltration system

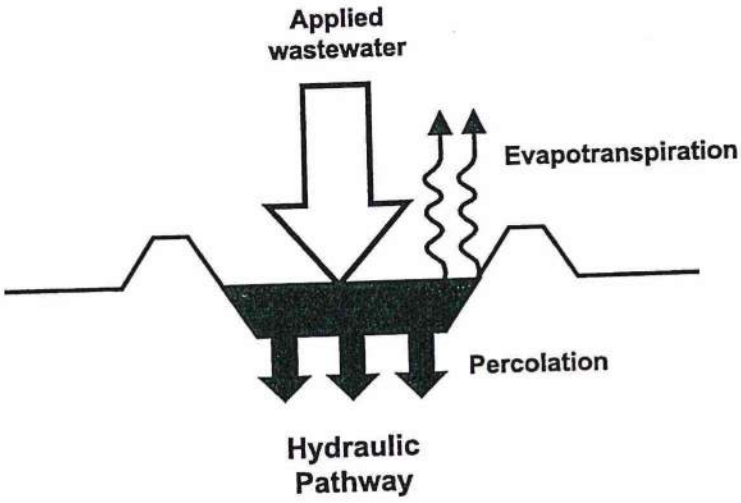
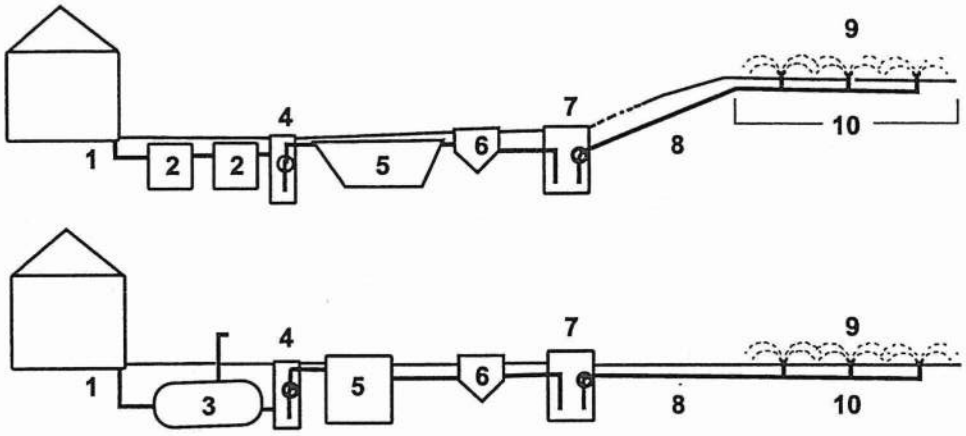


Figure 3. Typical residential spray irrigation systems



1. House sewer; 2. Septic tank (two required); 3. Aerobic unit; 4. Dosing tank; 5. Sand filter; 6. Cl_2 disinfection (or UV); 7. Tank and pump (plus storage); 8. Piping system; 9. Sprinklers; 10. Application site

Source: Adapted from McIntyre et al., 1994.

tank is necessary to eliminate possible runoff from the application area. The most used variation of these systems is the spray irrigation system (figure 3).

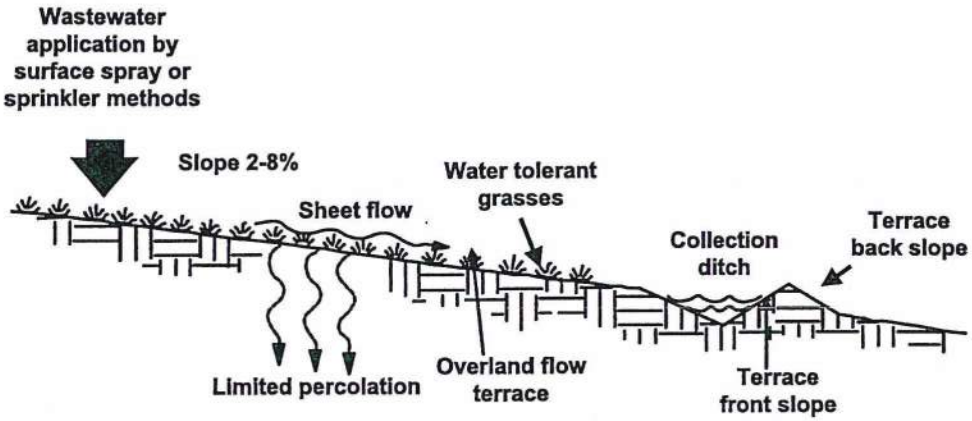
Spray irrigation systems distribute wastewater evenly on a vegetated plot for final treatment and discharge. Spray irrigation can be useful in areas where conventional onsite wastewater systems are unsuitable due to low soil permeability, shallow water depth table or impermeable layer, or complex site topography. Spray irrigation is not often used for residential onsite systems because of its large areal demands, the need to discontinue spraying during extended periods of cold weather, and the high potential for human contact with the wastewater during spraying. Spray irrigation systems are among the most land-intensive disposal systems. Drifting aerosols from spray heads can be a nuisance and must be monitored for impact on nearby land use and potential human contact. Buffer zones for residential systems must often be as large as, or even larger than, the spray field itself to minimize problems.

In a spray irrigation system, pretreatment of the wastewater is normally provided by a septic tank (primary clarifier) and aerobic unit, as well as a sand (media) filter and disinfection unit. Some states do not require the aerobic unit if the filter is used. The pretreated wastewater in spray irrigation systems is applied at low rates to grassy or wooded areas. Vegetation and soil microorganisms metabolize most nutrients and organic compounds in the wastewater during percolation through the first several inches of soil. The cleaned water is then absorbed by deep-rooted vegetation, or it passes through the soil to the ground water.

Rapid infiltration (RI) is a soil-based treatment method in which pretreated (clarified) wastewater is applied intermittently to a shallow earthen basin with exposed soil surfaces. It is only used where permeable soils, which generally can accept a conventional OWTS, are available. Because loading rates are high, most wastewater infiltrates the subsoil with minimal losses to evaporation. Treatment occurs within the soil before the wastewater reaches the ground water. The RI alternative is rarely used for onsite wastewater management. It is more widely used as a small-community wastewater treatment system in the United States and around the world.

The third and last type of land surface treatment is the overland flow (OF) process. In this system, pretreated wastewater is spread along a contour at the top of a gently sloping site that has minimum permeability. The wastewater then flows down the slope and is treated by microorganisms attached to vegetation as it travels by sheet flow over very impermeable soils until it is collected at the bottom of the slope for discharge. This system (figure 4) requires land areas similar to the spray

Figure 4. Overland flow system schematic



irrigation system. However, surface water discharge requirements (e.g., disinfection) from the OF system must still be met. Overland flow, like rapid infiltration, is rarely used for onsite wastewater management.

Typical applications

Spray irrigation (SI) is normally considered at site locations that do not permit a conventional SWIS because of relative impermeability and shallow depths caused by restrictive conditions (e.g., ground water or impermeable bedrock or fragipan). SI is normally the final step in the treatment sequence as the effluent is reintroduced to the environment. Most states require advanced treatment and disinfection prior to SI treatment.

Design assumptions

After pretreatment, which at a minimum should be a typical ISF effluent followed by disinfection, the treated wastewater is conveyed to a holding tank with a pump and controls that deliver it to the sprinkler system. The sprinklers spread the wastewater over a predetermined area at specific times. In wet climates or frozen soil conditions, an additional holding (storage) basin or larger dosing tank is required to prevent irrigation during periods when the wastewater would not be accepted by the soil for treatment and intended environmental incorporation. Regulations for buffer requirements from Texas, Virginia, and Pennsylvania are incorporated into table 1. Typically, the features listed below and their peripheral buffer zones are fenced to prevent exposure.

Application rates vary. Texas determines design rates based on evaporation, Virginia bases rates on soil texture, and Pennsylvania uses a combination of soil depth and slope. From a performance code approach, the application rate should be based on protecting the receiving surface/ground waters. It should be based on wastewater characteristics, critical constituent required concentrations (at a monitoring location where a specific quality standard must be met), and the characteristics of the site (i.e., features that will mitigate wastewater contaminants in order to meet the constituent concentration at the point of use).

In practical terms, all three states require the same pretreatment sequence, which yields SI influent of approximately 5, 5, 25, and 4 mg/L of CBOD, TSS, TN, and TP, respectively, in addition to a fecal coliform (FC) level of about 10 cfu/100 mL (if the disinfection step is working properly). Passage through 1 foot of unsaturated soil should for a few years remove most CBOD, TSS, TP, and FC; therefore, nitrogen will be the

Table 1. Buffer requirements to various features

Feature	Buffer distance (ft)
Property lines	10 - 100
Roads, driveways	25
Dwellings	0 - 100
Streams and lakes	25 - 100
Wells and water supplies	100
Recreation areas	100

Source: North Carolina DEHNR, 1996.

constituent of most concern. During the growing season, removal should be feasible by crop uptake and, to a lesser degree, ammonia volatilization.

Therefore, the hydraulic and nitrogen loading rates for a specific site are the primary design parameter. Also, these systems are rarely considered for permeable soils. The design approach described below is for this set of circumstances.

Spray irrigation systems are designed to treat wastewater and evenly distribute the effluent on a vegetated lot for final treatment. The application rate is determined by two major factors: hydraulic loading and nutrient loading (usually nitrogen is the limiting factor). The application rate is designed to meet the capacity of the soil to accept the effluent hydraulically and subsequently allow it to drain through the soil. The application rate can be varied according to the permeability of the soil. In Pennsylvania and Virginia, this method results in application rates of 0.6 to 2.5 cm/week. Lower rates can greatly improve nitrogen removal. The treated wastewater is spread over the required application area through a sprinkler or drip irrigation system.

Sprinklers are generally low-angle (7 to 13 degrees), large-drop-size nozzles designed to minimize aerosols. Application areas must be vegetated (with crops not intended for human consumption) and have slopes that preclude runoff to streams. The type of vegetation determines the nitrogen loading capacity of the site, but the hydraulic capacity depends on climate and soil characteristics. Additional nitrogen losses may occur through denitrification (only about 25 percent due to the low BOD:N ratio) and ammonia volatilization (about 10 percent if soil pH is high; less to none if it is acidic).

Spray irrigation of wastewater effluent must be timed to coincide with plant uptake and nutrient use. Temperature factors in some areas of the country may preclude the use of spray irrigation during certain times of the year. The wastewater may need to be stored in holding tanks during the coldest period of the year, because plant growth is limited and the nitrogen in effluent discharged during this time will be mineralized and unavailable for plant uptake.

Some SI systems irrigate only one or two days per week so that the soil can drain and aerate between applications. Others spray twice during the night or in the early morning to minimize inconvenience to the homeowner and to minimize the potential for human contact.

The width of the required buffer zone depends on the slope of the site, the average wind direction and velocity, the type of vegetation, and the types of nearby land uses. For wastewater produced by a single-family home, the minimum recommended SI plot area, including buffer zones, is commonly about 2 acres (0.81 hectares) in Pennsylvania and Virginia.

Performance

Studies that sample both the soil below the spray field and its runoff show that spray irrigation systems work as well as other methods of managing wastewater. Spray irrigation systems are designed for no degradation; therefore, hydraulic and nutrient loading rates are based on the type of vegetation used and the hydraulic properties of the soils. If the vegetation cannot assimilate the amount of nitrogen applied, for example, then nitrogen removal to reduce the nitrogen content of the effluent prior to spray irrigation may be required. The overall efficiency of a spray irrigation system in removing pollutants will be a function of the pollutant removal efficiencies of the entire treatment process and plant uptake.

There have been few documented cases of health problems due to the spray irrigation, but use of proper buffer zones is crucial. One benefit of spray irrigation is savings on potable water because the wastewater is used for irrigation.

Management needs

Construction factors include site preparation and installation of runoff controls, irrigation piping, return systems, and storage facilities. Since sustained wastewater infiltration is an important component of successful system operation, it is critical that construction activity be limited on the application site. Where stormwater runoff can be significant, measures must be taken to prevent excessive erosion, including terracing of steep slopes, contour plowing, no-till farming, establishment of grass border strips, and installation of sediment control basins. Earthworking operations should be conducted in

such a way as to minimize soil compaction. Soil moisture should generally be low during these operations. High-flotation tires are recommended for all construction vehicles.

The soil profile must also be managed to maintain infiltration rates by avoiding soil compaction and maintaining soil chemical balance. Compaction and surface sealing (caused by harvesting equipment and development of fine layers from multiple wastewater applications) can reduce soil infiltration and increase runoff.

Local regulatory agencies may require ground water monitoring to evaluate system performance. Soil fertility and chemical balance should be evaluated periodically to determine if soil amendments are necessary. Trace elements may also be analyzed to monitor possibly toxic accumulations.

Residuals produced by slow-rate land application systems are limited to harvested crops and crop residues that are not for human consumption. Agricultural crop applications require the most intensive management, while forest application requires the least management. Management tasks may include soil tillage, planting and harvesting of crops, nutrient control, pH adjustment, and sodium and salinity control. No special equipment, other than the appropriate agricultural equipment, is required. Typical pump, controls, and basin requirements prevail for the dosing system.

Virginia's O/M requirements for onsite spray irrigation systems (not including pretreatment unit processes) include the following:

- *Monthly.* Walk over spray area and examine for
  - Ponding of effluent
  - Bad odors
  - Damage to spray heads
  - Surfacing liquids
  - Vegetation problems
  - Surface soil collapse
- *Quarterly.* Conducted by a qualified, semi-skilled operator
  - Proper spray sequence
  - Proper pump function
  - Proper liquid levels
- *Biannually*
  - Erosion
  - Storage unit capacity
- *Annually.* Effluent sampling by a certified laboratory
  - Test water supplied to spray irrigation area for pH, total Kjeldahl nitrogen, fecal coliform bacteria, chlorine, TSS, and BOD
  - Reports of analyses are to be submitted by the laboratory to the local/district health department within 10 days of the completion of the analyses.

A management contract with an approved operator or operations firm is also required.

Risk management issues

No crops grown on the SI application area should be consumed by humans. Buffer zones should minimize aerosol exposure. Spray irrigation systems with sufficient storage capacity are essentially unaffected by major flow variations. A water balance should be conducted to determine the need under the climate conditions, soils, and application rates and patterns of each rate. Similarly, toxic shock loadings should be largely dissipated in the preceding pretreatment steps, but phytotoxic compounds may still be a concern at the application site. Spray irrigation cannot function during saturated or frozen conditions, and the pretreated influent must be stored until proper vegetative uptake (usually nitrogen) conditions return. Power outages will affect the upstream pretreatment processes rather than the SI system, even though the system must have power to function.

However, by the time the wastewater effluent is discharged by the sprinklers, the water should be sufficiently treated so as not to pose health risks. There have been no documented cases of health problems due to the spray irrigation of properly treated wastewater. However, drifting aerosols from the spray heads should be monitored for impact on nearby land uses. A benefit of spray irrigation is the use of effluent, instead of potable tap water, to water the landscape.

Costs

Construction costs of SI systems are very high if the generally required pretreatment is included, especially if both an aerobic unit and a sand filter treating septic tank effluent are included. Such a system could easily cost $20,000 or more.

O/M costs for the SI system alone primarily include labor (15 to 20 hours per year), power (for pumps and other pretreatment needs) and materials (e.g., chlorine, if chosen). O/M costs are estimated at more than $500 per year, given the entire treatment train suggested by figure 3. If the aerobic treatment unit is not required ahead of the sand filter, and a UV disinfection unit is used, this cost may reduce to $300 to $400 annually.

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Onsite Wastewater Treatment Systems Technology Fact Sheet 13

Renovation/Restoration of Subsurface Wastewater Infiltration Systems (SWIS)

Although an analysis to diagnose problems in OWTSs is provided in chapter 5, this Fact Sheet is included to provide a special reference to identify alternatives likely to be recommended to renovate and restore SWIS and observed results.

Functions of the subsurface wastewater infiltration system (SWIS)

The subsurface wastewater infiltration system (SWIS) receives the effluent pretreated in the septic tank and purifies it through biological, physical, and chemical reactions as it passes through the unsaturated soil to the ground water. An important component of the infiltration system is the biomat, a layer of organic and inorganic material and bacteria that forms at the interface between the trench and the surrounding soil. The biomat enhances treatment efficiency because it usually slows down the movement of the effluent, provides the flora and fauna necessary to biologically decompose wastes, and enhances the physical and chemical removal of very small particles of matter in the wastewater. Permeable soil textures and structures are required to support these processes.

SWISs are occasionally unable to accept the total daily wastewater load they receive, leading to ponding and eventual hydraulic failure. This is typically caused by the accumulation of biomass and suspended solids in or near the biomat, which reduces the soil's porosity and hydraulic conductivity. If the system fails hydraulically, the first step is usually to pump the septic tank and clean and replace the effluent screen (also known as a filter).

Restoring the hydraulic function of the infiltration system involves eliminating or reducing the flow restrictions. Various methods and products have been developed for restoring the infiltration capacity of SWISs. These include resting, additives, hydrogen peroxide, and soil fracturing.

A variety of additives are also marketed to improve the performance of septic tanks or eliminate the need for pumping. These septic tank additives are discussed in Special Issue Fact Sheet 1.

SWIS restoration alternatives

Periodic resting

Periodic resting is a passive method for restoring the hydraulic capacity of the SWIS. Infiltration surfaces are "rested" by removing them from service for an extended period of time, typically 6 to 12 months. To remove a portion of the SWIS from service requires that the SWIS be constructed with multiple cells that have a total hydraulic capacity of 100 to 200 percent of the design flow, or enough suitable reserve SWIS area. Resting may also be used in seasonal facilities that discharge no wastewater for extended periods of the year. The portion of the SWIS taken offline receives no wastewater during the resting period, which allows the infiltration surface to drain and dry out. The resulting aerobic biochemical oxidation of the biomat mass can restore the porosity of the biomat, helping to unclog the system.

Several studies have shown resting to be an effective method to rejuvenate the hydraulic capacity of soil infiltration surfaces (Sharpe et al., 1984). Extended periods of resting at regular intervals is effective in preventing excessive soil clogging and restoring clogged infiltration surfaces. Seventy to eighty percent of the original infiltration capacity of the soil can be recovered by resting. The rate of restoration is proportional to grain size; that is, sand restores more quickly than silt and clay.

Some studies have explored the potential for adding earthworms when a malfunctioning SWIS is pumped. Generally, this approach has not been successful. If the system is basically sound in design, loaded within design limits, and located in well-drained soils, some improvement in hydraulic function may occur when worms are used, especially if some water conservation measures are implemented. However, no quantitative data exist to support the concept that worms aid SWIS restoration.

Additives

In addition to the additives described in Special Issue Fact Sheet 1, there are commercially available compounds that are apparently benign to the treatment processes in the septic tank and have potential benefit to the SWIS by exchanging with potentially harmful ions (e.g., sodium), that could destroy existing fine soil structure. Such additives could be useful in places having high-sodium drinking water or in areas with hard water supplies where ion exchange softeners are used and the regenerant is not discharged to the SWIS, leaving those soils with an excess of sodium ions. In general, however, the benefits of SWIS additives are not well documented. Chemical additives that contain strong acids or bases or toxic chemicals are generally discouraged or banned because of the possible adverse effects these chemical can have on system components, the soil structure, or ground water quality. Biological additives, on the other hand, may have some small benefits, but there is little published documentation to support this view. Microbial and enzyme preparations appear to enhance liquefaction of biodegradable solids in septic tanks. However, the effects of their use on the soil infiltration surface have not been documented. Studies have shown that biological additives are not directly harmful to traditional onsite systems, but significant beneficial impacts have not been documented with domestic wastewaters (Clark, 1999).

Hydrogen peroxide

Hydrogen peroxide (H_2O_2) is a chemical treatment that was once promoted for its ability to treat a clogged SWIS. H_2O_2, a strong oxidant, was pumped directly into the absorption trench to restore the hydraulic capacity of the infiltration zone by oxidizing the biomat and breaking down the crust surrounding it. While early research on the use of hydrogen peroxide to unclog SWIS in sandy, unstructured soils appeared positive, subsequent testing did not. Controlled field studies found decreasing infiltration rates for clogged systems treated with H_2O_2. These reports suggest that hydrogen peroxide mobilizes fine soil particles during initial treatment in some soils. As the chemical reactions subside, however, these fine particles are deposited on top of the infiltrative surface, which can result in further clogging. Hydrogen peroxide can produce temporary benefits at a substantial cost, and is not recommended for regular long-term use in unclogging failed drainfields.

Hydrogen peroxide is a strong oxidant that has been shown to be very effective in eliminating biomats in SWIS, but it can also reduce soil porosity and hydraulic conductivity. The process has been shown to oxidize or "boil" the soil, which creates a layer of fine particles that are released when the soil peds are destroyed on the infiltrative surface. This dramatically reduces the hydraulic capacity of SWIS.

Pneumatic soil fracturing

Pneumatic soil fracturing is a mechanical treatment used to increase soil porosity by fracturing and lifting the soil surrounding the infiltration surface. A steel probe, inserted below the infiltration surface, is used to inject high-pressure air into the soil. The air fractures and lifts the ground. As the soil expands, polystyrene beads are discharged into the soil fractures, thereby holding them open to increase the porosity of the soil after the particles settle. However, any hydraulic improvements are accompanied by a potential for contamination of underlying aquifers. Insufficient data are available to recommend use of this concept in any area where sensitive ground water supplies lie in close proximity to the infiltrative surface.

Introduced in the early 1990s, pneumatic soil fracturing is a relatively new treatment method. Thus, available performance data on the method are limited and incomplete. Appropriate applications and expected performance are unknown.

Application

These renovation methods can be applied for either preventive maintenance or rehabilitation after a hydraulic failure has occurred. Resting and the application of additives are primarily preventive maintenance methods. Standby infiltration cells to allow resting can be constructed with the original system or additional land can be held for replacement if failure of the original infiltration system fails. It should be noted that the ability to alternate cells regularly during normal operation is more effective as a preventive maintenance technique than a method to relieve a failed system. The use of additives and hydrogen peroxide is generally not recommended.

Users must be aware that when any of these methods are used to correct hydraulic failures, only the symptoms of failure is treated. The causes of the failure will usually persist. Therefore, the causes of failure should be identified and appropriate corrective action taken to prevent recurrences. Excessive daily flows, inadequate or improperly maintained pretreatment processes (e.g., failure to pump septic tank), and changes in wastewater characteristics because of new ownership or changes in use are common causes of hydraulic failure. If these failures are not eliminated or accommodated through appropriate system modifications, the effectiveness of the treatments will be short-lived.

Responsibilities of the homeowner

The key responsibilities of the homeowner in ensuring the best operation of an existing or new septic tank/SWIS system include the following:

- *Using household cleansers in moderation.* Excessive use of household cleansers, disinfectants, and other common products can kill bacteria residing in the septic tank and the soil adsorption field. Used in moderate amounts and according to label directions, however, cleaners and disinfectants can be flushed into the wastewater system with no significant impacts. The wastewater stream dilutes the product, and organic material adsorbs it. Slug loading (excessive, instantaneous loadings) of household cleaners can be lethal to septic system bacteria, but normal follow-up usage usually reestablishes the tank's bacterial population within a few hours.
- *Avoiding disposal of toxic and hazardous materials in the wastewater stream.* Many common household products have toxic properties and should never be poured down the drain. The list includes drugs and antibiotics, solvents, paints, varnishes, photography chemicals, weed killers, and insecticides. All of these products have the potential to wipe out septic system bacteria and percolate into ground water supplies.
- *Curbing the use of drain cleaners and openers.* Products aimed at unclogging indoor wastewater pipes contain strong acids or alkalis as the active ingredient. Used according to the label directions, they can be effective in removing clogs of organic matter in indoor drainpipes. Most product labels warn, however, that the product is caustic or corrosive to pipes and can be hazardous to the user if applied improperly. A controlled study concluded that as little as 1.3 ounces of a name brand drain cleaner could destroy the bacteria population in a 1,000-gallon septic tank. This amount is within the general range of normal usage for some people. Bacteria populations in the tank will recover in a few days if the system inputs return to normal levels.
- *Disposing of solids appropriately.* Items such as cigarette butts, condoms, sanitary napkins, paper towels, and kitty litter should never be flushed or washed down the toilet or sink. Septic tanks are not designed as a disposal receptacle for these wastes. They can clog drainpipes and cause excessive and rapid sludge buildup in the tank.
- *Keeping fats, oils, and grease out of kitchen drains.* Fats, oils, and grease are natural by-products of cooking meats and other foods. Grease washed down the drain can stick, accumulate, and in some cases block wastewater drain pipes and the inlet and outlet structures in septic tanks. Food wastes should be scraped from plates and utensils and discarded as solid waste.

- *Avoiding the use of a garbage disposal unless the treatment system is designed for one.* Homes with garbage disposals generally have 20 to 28 percent higher biochemical oxygen demand (BOD) and 25 to 40 percent higher suspended solid loadings to septic tanks than homes without disposals. These significant contributions of organic matter require special consideration when sizing and installing a septic tank or soil absorption system.
- *Conserving water.* To function at peak efficiency, the septic tank needs to provide a quiescent environment and adequate detention time (i.e., more than 24 hours) for the solids and floatable matter to separate from the wastewater. Limiting water flows and timely repair of leaking fixtures help maintain these conditions and prevent overloading of the soil adsorption field.

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EPA SPECIAL ISSUES FACT SHEETS

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Onsite Wastewater Treatment Systems Special Issues Fact Sheet 1

Septic Tank Additives

Description

Because of the presence of significant numbers and types of bacteria, enzymes, yeasts, and other fungi and microorganisms in typical residential and commercial wastewaters, the use of septic system additives containing these or any other ingredients is not recommended. The benefits of consumer products sold as septic system cleaners, degraders, decomposers, deodorizers, organic digesters, or enhancers are not significant or have not been demonstrated conclusively, depending on the product. Some of these products can actually interfere with treatment processes, affect biological decomposition of wastes, contribute to system clogging, and contaminate ground water. The septic tank/soil absorption field system is the most commonly used onsite wastewater treatment system in the United States. It is relatively low in cost, has no moving parts, and requires little maintenance.

Septic tanks have a number of important functions, including:

- *Remove oils, grease and settleable solids.* The septic tank is designed to provide quiescent conditions over a sufficient time period to allow settleable solids to sink to the bottom of the tank and floatable solids, oils, and grease to rise to the surface. The result is a middle layer of partially clarified effluent that exits the tank to the soil absorption field.
- *Store settleable and floatable material.* Tanks are generously sized according to projected wastewater flow and composition to accumulate sludge and scum at the bottom and top of the tank, respectively. Tanks require pumping at infrequent intervals (e.g., 1 to 7 years), depending on sludge and scum accumulation rates.
- *Digest/decompose organic matter.* In an anaerobic environment, facultative and anaerobic bacteria can reduce retained organic molecules to soluble compounds and gases, including H_2, CO_2, NH_3, H_2S, and CH_4. This digestion can significantly reduce sludge volume in warm climates.

Types of additives and effects on treatment processes

There are three general types of commonly marketed septic system additives:

- *Inorganic compounds*, usually strong acids or alkalis, are promoted for their ability to open clogged drains. Product ingredients (e.g., sulfuric acid, lye) are similar to those used in popular commercial drain cleaners. These products can adversely affect biological decomposition processes in the treatment system and cause structural damage to pipes, septic tanks, and other treatment system components. Hydrogen peroxide, once promoted as an infiltration field reconditioner, has been found to actually degrade soil structure and compromise long-term viability of soil treatment potential. Its use to unclog failed infiltration fields is no longer recommended.
- *Organic solvents,* often chlorinated hydrocarbons (e.g., methylene chloride, trichloroethylene) commonly used as degreasers and marketed for their ability to break down oils and grease. Organic solvents represent significant risks to ground water and wastewater treatment processes. These products can destroy resident populations of decomposer and other helpful microorganisms in the treatment system. Use of products containing organic solvents in onsite treatment systems is banned in many states. Introduction of organic solvents into onsite systems located in states that ban the use of these products may trigger liability issues if ground water becomes contaminated.

- *Biological additives*, like bacteria and extracellular enzymes mixed with surfactants or nutrient solutions, which mirror but do not appear to significantly enhance normal biological decomposition processes in the septic tank. Some biological additives have been found to degrade or dissipate septic tank scum and sludge. However, whether this relatively minor benefit is derived without compromising long-term viability of the soil infiltration system has not been demonstrated conclusively. Some studies suggest that material degraded by additives in the tank contributes to increased loadings of BOD, TSS, and other contaminants in the otherwise clarified septic tank effluent.

Other products containing formaldehyde, paraformaldehyde, quaternary ammonia, and zinc sulfate are advertised to control septic odors by killing bacteria. This objective, however, runs counter to the purpose and function of septic tanks (promoting anaerobic bacterial growth). If odor is a problem, the source should be investigated because sewage may be surfacing, a line might have ruptured, or another system problem might be present.

Another variety of consumer products is marketed for their ability to remove phosphorus from wastewater. These products are targeted at watershed residents who are experiencing eutrophication problems in nearby lakes and streams. Phosphorus is an essential nutrient for aquatic plant growth and limiting its input to inland surface waters can help curtail nuisance algae blooms. Aluminum (as alum, sodium aluminate, aluminum chloride, and activated alumna), ferric iron (as ferric chloride and ferric sulfate), ferrous iron (as ferrous sulfate and ferrous chloride), and calcium (as lime) have been proven to be effective in stripping phosphorus from effluent and settling it to the bottom of the tank. An important side effect of this form of treatment, however, can be the destruction of the microbial population in the septic tank due to loss of buffering capacity and a subsequent drop in pH. Treatment processes can be severely compromised under this scenario.

Finally, baking soda and other flocculants are marketed as products that lower the concentration of suspended solids in septic tank effluent. Theoretically, flocculation and settling of suspended solids would result in cleaner effluent discharges to the subsurface wastewater infiltration system. However, research has not conclusively demonstrated significant success in this regard.

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Onsite Wastewater Treatment Systems Special Issues Fact Sheet 2

High-Organic-Strength Wastewaters (Including Garbage Grinders)

Description

Because many onsite treatment alternatives are sensitive to organic loading rate, high-strength wastewaters may require additional treatment steps to ultimately meet environmental discharge or reuse goals. Among the individual home options that increase the organic strength of the wastewater (see chapter 3) are water conservation and use of garbage grinders (disposals). Commercial wastewater may also be high in organic concentration and, thus, organic loading. The database on such wastewaters is extremely limited for use in design of OWTSs.

The major concern caused by high organic loadings in the pretreated wastewater is higher organic loadings (e.g., BOD) to the infiltrative surface of the SWIS, which could result in clogging. A certain degree of clogging at the interface of infiltration trenches and the surrounding soil is expected and helps the soil absorption field function properly. The clogging layer, or biomat, which forms at this interface, is composed of organic material, trapped colloidal matter, bacteria, and microorganisms and their by-products. The biomat may slow the infiltrative capacity of the SWIS, but it increases effluent treatment time under unsaturated aerobic conditions (in the vadose zone below the trenches).

Physical clogging occurs when solid material such as grit, organic material, and grease is carried in the effluent beyond the septic tank to the soil adsorption field and deposited on the biomat. Biological clogging generally occurs with excessive organic loading to the biomat, which results in excess microbial growth that restricts the passage of effluent into the soil. Slimes, sugars, ferrous sulfide, and the precipitation of metals such as iron and manganese are additional clogging by-products. Chemical clogging can occur in clayey soils when high concentrations of sodium ions exchange with calcium and magnesium ions in the clay. The soil loses its structure and becomes tighter and more impervious.

Garbage disposals

Garbage disposals, which have become a standard appliance in many residential kitchens in the United States, contribute excessive organic loadings to the infiltrative field and other system components. Usually installed under the kitchen sink, disposals are basically motorized grinders designed to shred food scraps, vegetable peelings and cuttings, bones, and other food wastes to allow them to flow through drain pipes and into the wastewater treatment system. Disposing of food waste in this manner eliminates the nuisance of an odor of food wastes decaying in a trashcan by moving this waste to the wastewater stream. Many states accommodate these appliances by prescribing additional septic tank volume, service requirements, or other stipulations (e.g., septic tank effluent filter, multiple tanks, larger infiltration field) that address higher BOD and TSS loadings.

Table 1 contains reported information that illustrates that in-sink garbage disposal units increase septic tank loadings of BOD by 20 to 65 percent, suspended solids by 40 to 90 percent, and fats, oils, and grease by 70 to 150 percent. For any septic system, the installation of a disposal causes a more rapid buildup of the scum and sludge layers in the septic tank and an increased risk of clogging in the soil adsorption field due to higher concentrations of suspended solids in the effluent. Also, it means that septic tank volumes should be increased or tanks should be pumped more frequently.

Table 1. Increase in pollutant loading caused by addition of garbage disposal

Parameter	Increase in pollutant loading (%)
Suspended solids	40–90
Biochemical oxygen demand	20–65
Total nitrogen	3–10
Total phosphorus	2–3
Fats, oils, and grease	70–150

Sources: Hazeltine, 1951; Rawn, 1951; Univ. of Wisconsin, 1978; USEPA, 1992.

Eliminating the use of garbage disposals will significantly reduce the amount of grease, suspended solids, and BOD in wastewater (see table 1). Elimination of garbage disposal use reduces the rate of sludge and scum accumulation in the septic tank, thus reducing the frequency of required pumping. All of these can improve wastewater system performance.

For system owners who choose to use garbage grinders, manufacturers recommend grinding wastes with a moderate flow of cold water. No research data representing claims of enhanced performance of garbage grinders equipped with septic system additive injectors are available. Additives are not required nor recommended for onsite system operation, and some might actually interfere with treatment, damage the drainfield, or contaminate ground water below the drainfield. (See Special Issues Fact Sheet 1.)

The most common unsewered commercial sources that exhibit high organic strength are restaurants, although a variety of commercial sources produce such wastewaters. These include other facilities with food service capability and dairy product/processing plants. The preprocessing required to remove the source of excessive organic strength is a function of (1) the fractionation of the organic content (settleable, supra-colloidal, colloidal, or soluble); (2) the site characteristics; and (3) the final steps in OWTS processing and the environmental introduction method.

Typical Applications

Additional pretreatment is typically required before discharge to a SWIS or surface water. There are some proprietary aerobic units that are designed to accept high organic loads, and greatly increase the potential for odors and, where concrete structures are employed, corrosion. Therefore, odor protection becomes a major issue for the designer in these situations. These units are usually a combination of suspended growth/fixed growth or enhanced Continuous-Flow, Suspended Growth Aerobic Systems (CFSGAS; see Technology Fact Sheet 1). Alternatively, anaerobic upflow filters (UAFs) and other anaerobic proprietary and nonproprietary systems can also "thin" excess organics to permit normal loading to these final processing steps.

The Safe Drinking Water Act (SDWA) underground injection systems (UIC) Title V Rule, which is discussed in chapter 1, is designed to eliminate some of these problem wastewater sources of potential ground water contamination (e.g., auto repair facilities) from further consideration for SWIS disposal.

Design

For domestic systems the additional organic and oil/grease concentrations resulting from use of a garbage grinder usually does not in itself cause the wastewater to require additional processing as described above, but the designer should at least calculate any potential design changes that might be required by the increased strength. For example, for a sandy soil, the

bottom area hydraulic loading rate could be crosschecked against the limiting organic loading rate limits cited in table 4-2. Most state codes require a septic tank size increase to account for the additional volume of sludge and scum accumulating in a septic tank but offer no advice as to any increasing field size.

For restaurants, facilities with food preparation, and other producers of high-organic wastewaters, the designer must evaluate alternative pretreatment schemes that can reduce the excess organics (and sometimes other constituents) to levels that allow subsequent processes to function normally and achieve surface water effluent discharge or reuse standards, if applicable.

An analysis of organic waste sources and waste characteristics (particulate/soluble fractions) is required to determine the best pretreatment approach. On the latter issue, if the majority was coming from a highly concentrated, low-volume source in the facility, a holding tank/hauling solution may be most cost-effective choice. The fraction that contains the majority of the excess contaminants might be readily removable by a specific process (e.g., soluble and biodegradable (aerobic unit) versus supracolloidal and removable by flocculation/sedimentation (vegetated submerged bed or anaerobic upflow filter).

Performance

The performance of these pretreatment devices is discussed in other fact sheets. Influent concentrations which still exceed normal loading rates can be accommodated by increasing the size or other key basis of computing loading rate or by investigating and implementating pollution prevention measures to reduce the source concentration of the constituent of concern (e.g., BOD).

The reliability of anaerobic processes is highly temperature-dependent, thus requiring heating in northern climates. However short-term anaerobic upflow filters and vegetated submerged beds are less sensitive because of their primary reliance on physical processes. Aerobic treatment processes are also temperature-sensitive, but less so than anaerobic processes.

There is little documented, quality-assured information on the performance of small alternative systems that treat high-organic strength wastewater. However, well-managed aerobic units, upflow filters, and vegetated submerged beds are known to perform reliably.

Management needs

Management needs are the same as those noted in the unit process fact sheets.

Risk management issues

Depending on the sequence of processes chosen, the impacts of flow variation, toxic shocks, extreme temperatures, and power outages may cause significant variations from expected treatment performance. However, high-strength wastewaters greatly increase the potential for odors and, where concrete structures are employed, corrosion. Therefore, protection from odor becomes a major issue for the designer in these situations.

Costs

Costs of treatment trains for high-organic-strength wastewaters can be estimated from the costs of the unit process components.

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Onsite Wastewater Treatment Systems Special Issues Fact Sheet 3

Water Softeners

Description

Home water softeners, which periodically generate a backwash that is high in sodium, magnesium, and calcium concentrations, can affect wastewater treatment processes and the composition and structure of the infiltration field biomat and the underlying soil. However, attempts to predict whether impacts will occur and to estimate their severity are difficult and often inconclusive.

Water softeners remove "hardness" (dissolved calcium and magnesium) through ion exchange processes. Incoming hard water passes through a tank of containing high-capacity ion exchange resin beads supersaturated with sodium. The calcium and magnesium ions in the water attach to the resin beads, replacing the sodium, which is released into the water. The softened water is then distributed for use throughout the house.

Over time, the ion exchange resin beads become saturated with calcium and magnesium ions. When this occurs, the tank must be recharged by flushing with a salt brine solution. Sodium ions reclaim their position on the resin beads, and the calcium and magnesium ions are released into the backwash water. The backwash water then exits the tank and is discharged to the wastewater treatment system. The number of times the tank is recharged and the amount of wastewater generated depends on a number of factors, including the hardness of the water, the amount of water used, the size of the water softener, and the capacity of the resins to remove calcium and magnesium.

The wastewater generated during the recharge phase of the water softening process mixes with other household wastewaters, enters the septic tank, and eventually moves to the soil adsorption field. Studies conducted by soil scientists at the University of Wisconsin and the National Sanitation Foundation conclude that the wastewater effluent generated from properly operating and maintained water softeners will not harm onsite systems that are designed, operated, and maintained appropriately. Specifically, the studies conclude the following:

- High concentrations of calcium and manganese in the softener backwash water have no deleterious effect on the biological functions occurring in the septic tank and may, in some cases, be helpful.
- The additional volume of wastewater generated (typically about 50 gallons per recharge cycle) is added slowly to the wastewater stream and does not cause any hydraulic overload problems.
- Soil structure in the soil absorption field is positively affected by the calcium and mangnesium ions in water softener effluent (Corey et al., 1977).

Regarding the last conclusion, some people have the misconception that the salt brine that enters the ion exchange tank also exits the tank as wastewater. In fact, the influent with its high concentration of sodium ions is very different than the effluent, which has a high concentration of calcium and magnesium ions. Consequently, the potential for chemical clogging of clayey soil by sodium ions is reduced. The calcium and magnesium input may even help improve soil percolation.

Risk management issues

The human health impacts of ingesting softened water are increasingly discussed in addition to the traditional benefits of reduced use of surfactants and plumbing repair requirements. The choice of the homeowner to soften or not to soften will

factor into all arguments. Also, the preceding descriptions are predicated on whole-house-supply softening. Today point-of-use devices designed for use with specific features in the house make the traditional advantages and disadvantages less clear.

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FILTER PERFORMANCE COMPARISON

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Filter Type	Hydraulic Loading Rate $g/ft^2/d$	Parameter (% reduction)			
		$BOD_5/CBOD_5$ [1]	TSS	NH_3-N	Fecal Coliform
Gravity SF [2]	5	82	83	63	98
Upflow SF [2]	5	83	81	62	98
Intermittent SF [2]	3	71	81	61	96
Partial Recirculating SF [2]	5	77	81	53	94
CO-OP RFS III [3]	5	98	98	96	99
Peat Filter (Ecoflo) [3]	2.5	98	91	80	99.9
Peat Filter (Puraflo) [3]	5.57	96	95	90	99.9
ABS system [3]	5.2	98	98	98	99

[1] $BOD_5/CBOD_5$ values are normally within 1%
[2] Tested on sites with LZ>20"
[3] May be used on sites with LZ >10" to SHWT, >16" to rock

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ON-LOT DISPOSAL

Understanding Septic Systems

Sewage Planning Requirements Under Act 537
for Exceptions to the Requirement to revise the Official Plan

Sewage Management Programs

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DEP FACT SHEETS

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DEP Fact Sheet
Commonwealth of Pennsylvania • Department of Environmental Protection Act 537 #1

UNDERSTANDING SEPTIC SYSTEMS

What is a septic system?

Septic systems (also called "onlot" disposal systems or OLDS) are sewage systems located on the property of the homeowner. They treat and dispose of domestic sewage through natural processes. Liquid waste from a treatment tank percolates through the soil, where it is neutralized and broken down further. Septic system operation and maintenance is the responsibility of the homeowner. In contrast, a centralized sewage system collects and treats sewage from many homes and/or businesses and disposes it off site. Centralized systems often use complex mechanical and chemical treatment methods.

Who uses septic systems?

For many Pennsylvanians, centralized sewage disposal is not an option. In fact, one-quarter of Pennsylvania residents currently depend on septic systems to treat their sewage. In some cases, this is because many rural areas have no central sewage facility. In other cases, a central facility may have reached capacity due to development, requiring new homes to use septic systems on an interim basis.

How do I obtain a septic system permit?

Anyone who intends to install a septic system with a flow of less than 10,000 gallons per day must use the following generalized process:

1. The lot owner or an agent for the owner applies for a permit through the local agency* Sewage Enforcement Officer (SEO);
2. The SEO for the local agency conducts soil profile examination and percolation tests to determine site suitability;
3. The lot owner or agent completes the permit application by including a septic system design based upon the results of the site suitability testing;
4. The SEO approves or denies the permit within seven days of receipt of a completed application; and
5. If approved, the SEO issues a permit. Installation of a system may begin. If denied, the SEO notifies the applicant and provides opportunity for an appeal hearing.
6. The SEO may oversee any step of installation and must inspect the completed system before coverage and use.

What is an SEO and what are his/her duties?

Certified SEO's working for local governing bodies handle the septic system permitting process. This includes the review of soil profiles (deep probes) and percolation tests and the issuance of permits.

What is DEP's role in the permitting process?

DEP can review, monitor and assist a local agency's administration of the permitting process.

What is a deep probe test?

The first test on the site is a deep probe test. In this test, a backhoe pit is dug as deep as eight feet. The SEO enters this pit to examine the make up of the soil (soil profile). From this, the SEO will determine the suitability of the soil for a septic system. If the soil is determined suitable for a type of system (standard or alternate), then a percolation test will be performed. If the soil is determined unsuitable, no permit will be issued.

What is a percolation test?

A percolation ("perc") test measures the rate at which water moves through soil. The test is to determine if the soil will allow water to drain quickly enough to support a properly working septic system. The following process is used to perform a percolation test:

1. A minimum of six holes are dug in the area of the proposed absorption field;
2. The soil is soaked before the actual test to reproduce wet season operation;
3. The day of the test, a final soaking is completed for one hour; and
4. The actual test then begins with a series of measurements of water level drop done at 10 or 30 minute intervals. This test may take as long as four hours or as little as 40 minutes, depending upon the type of soil. (Very sandy soils usually take less time to test than soils with a lot of clay.)

It is very important to realize that although the effluent from a septic or aerobic tank is partially treated, it still contains substances that can affect the groundwater, such as viruses, pathogens and nitrates. The soil is a critical component of an efficiently running system. Regular maintenance of the system also is necessary to ensure long-term operation.

* The local agency may be the municipality, a multi-municipal organization, county or joint county Department of Health.

There are several variations to the standard septic system depending on soil, site and operational conditions. They are:

1. Standard trench
2. Seepage bed system
3. Subsurface sand filter
4. Elevated sand mound
5. Individual residential spray irrigation system (IRSIS)

For more information on these variations, please contact your local SEO (obtain address/phone number from your municipality's government office).

How does a septic system function?

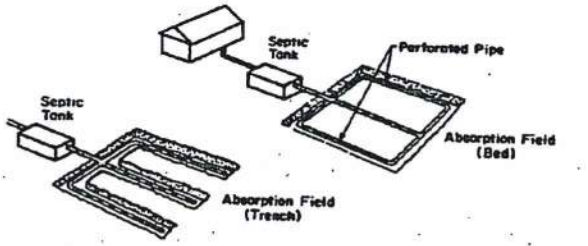


Figure A: Gravity Distribution Systems

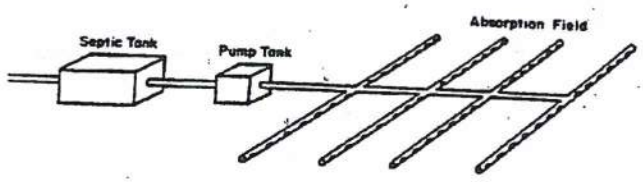


Figure B: Pressure Distribution Systems

1. Sewage, both human waste and water used for bathing and washing, flows to the **septic tank**. Here, primary treatment of the sewage takes place. The heaviest matter falls to the bottom of the tank forming **sludge**. Lighter matter (**scum**) floats on top of the liquid (**effluent**). Sludge and scum must be pumped out regularly.
2. Septic tank effluent then flows to a **distribution box** or a **solid header** in gravity flow systems (see Figure A) or to a **pump tank** in pressurized systems (see Figure B).
3. In both types of systems, the septic tank effluent is then directed to an **absorption area** constructed of pipe placed within a layer of gravel, and percolates through the soil for additional treatment. The soil neutralizes many of the contents of the wastewater and converts other contents to different forms.

How often must my septic tank be pumped?

Up to 50 percent of the solids retained in the tank decompose; the remainder accumulate in the tank. A septic tank should be pumped out at least every three to five years, or according to your local sewage management program which may require more frequent pumping.

Under current Pennsylvania law, a 900-gallon septic tank must be used for a home with three bedrooms or fewer. If six people reside in a three-bedroom house, the tank should be pumped every 1.3 years. If the same system serves a family of two, the tank would be pumped every 5.2 years. Systems installed before 1971 may have septic tanks smaller than 900 gallons. These tanks may need to be pumped more than once a year.

What if my lot conditions do not meet the requirements for a standard septic system?

If your particular lot conditions do not allow the installation of a standard septic system, some alternates may be available. Your local SEO can help find the best system for you depending on your specific site, soil and operational conditions.

How do state and local actions protect Pennsylvania's public health and water quality?

The Pennsylvania Sewage Facilities Act (Act 537) was enacted in 1966 to set uniform standards for the construction or repair of any sewage disposal facility. The two main goals of Act 537 are to correct existing disposal system problems and to prevent future problems. To reach this goal, Act 537 requires the planning of all sewage facilities and the permitting of onlot sewage disposal systems.

Provisions of Act 537 administered by DEP include:

1. Training and certifying SEOs;
2. Providing technical assistance;
3. Reviewing official sewage plans and revisions;
4. Awarding planning grants to local agencies; and
5. Reimbursing local agencies for permitting expenses.

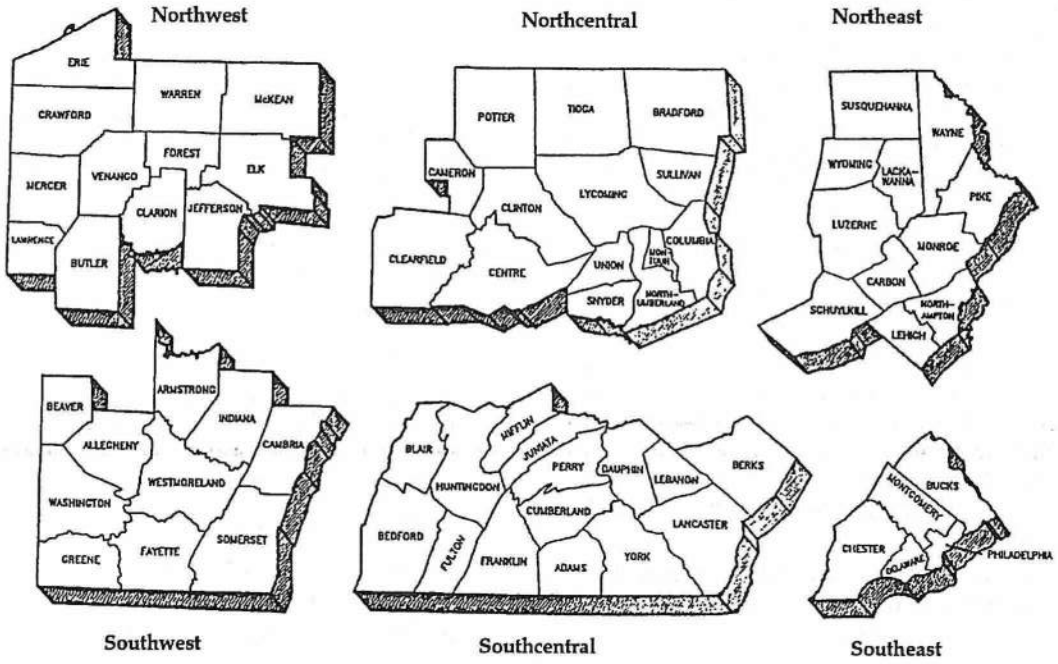
Where can I obtain more information on septic-related questions?

For more information on onlot sewage disposal systems, contact your local SEO or the DEP regional office serving your county.

For more information, visit DEP's website at www.dep.state.pa.us, Keyword: "DEP Wastewater."

For more information,
call the DEP regional office in your area or contact:

Department of Environmental Protection
Bureau of Water Supply and Wastewater Management
Division of Wastewater Management
P.O. Box 8774
Harrisburg, PA 17105-8774
(717) 787-8184



DEP REGIONAL OFFICES

Southeast Region
2 E. Main St.
Norristown, PA 19401
Main Telephone: 484-250-5900
24-Hour Emergency: 484-250-5900

Counties: *Bucks, Chester, Delaware, Montgomery and Philadelphia*

Southwest Region
400 Waterfront Drive
Pittsburgh, PA 15222-4745
Main Telephone: 412-442-4000
24-Hour Emergency: 412-442-4000

Counties: *Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland*

Southcentral Region
909 Elmerton Ave.
Harrisburg, PA 17110
Main Telephone: 717-705-4700
24-Hour Emergency: 1-877-333-1940

Counties: *Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry and York*

Northwest Region
230 Chestnut St.
Meadville, PA 16335-3481
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24-Hour Emergency: 1-800-373-3398

Counties: *Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren*

Northeast Region
2 Public Square
Wilkes-Barre, PA 18711-0790
Main Telephone: 570-826-2511
24-Hour Emergency: 570-826-2511

Counties: *Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne and Wyoming*

Northcentral Region
208 W. Third St., Suite 101
Williamsport, PA 17701
Main Telephone: 570-327-3636
24-Hour Emergency: 570-327-3636

Counties: *Bradford, Cameron, Clearfield, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union*

DEP Fact Sheet

Commonwealth of Pennsylvania • Department of Environmental Protection **Act 537 #2**

Sewage Planning Requirements Under Act 537 for Exceptions to the Requirement to Revise the Official Plan ("Exceptions")

Act 537, the Pennsylvania Sewage Facilities Act, requires each municipality in the Commonwealth to have an Official Sewage Facilities Plan that addresses the existing and future sewage disposal needs of the municipality. In most cases, DEP requires completion of formal sewage facilities planning for new land development to update or revise the municipal official plan before a subdivision is created thus ensuring an adequate means of sewage disposal. However, there are certain categories of subdivisions that do not require formal adoption of the plan by the municipality as a revision to the official plan. This fact sheet answers questions that are often asked regarding sewage planning for "exceptions" as described in Title 25, Pennsylvania Code, Chapter 71 §71.55. This section of DEP's Regulations, as well as others, is available on line at www.pacode.com.

What is an exception or minor subdivision?

To qualify as an "exception," the subdivision must fit the following criteria:

- Planning must be required for the subdivision under Act 537 (to determine if planning is required for your project, request information on subdivisions exempt from planning from your DEP regional office or refer to the DEP fact sheet on the subject that is available on the DEP website (www.dep.state.pa.us, Keyword: "DEP wastewater");
- The entire subdivision (proposed lots, previous lots and residual land) must consist of no more than 10 lots created since May 15, 1972;
- The lots must be proposed as sites for construction of detached single family homes;
- The proposed homes must be intended to be served by individual onlot sewage disposal systems;
- "Exceptions" are not prohibited by local public health or environmental conditions; and

If all of these conditions are met, the proposed subdivision should qualify as an "exception."

How is an "exception" planned?

DEP has produced a series of forms, called "planning module components," that are used to gather information about a project. When an exception is proposed, the developer should request a "Component 1" form from the municipality where the proposed subdivision is located, from the DEP regional office serving that municipality, or from the DEP website at www.dep.state.pa.us (Keyword: "wastewater").

Who should complete the Component 1 planning module form?

An individual, such as a consulting engineer or surveyor, who is familiar with the municipality's official plan and with DEP's regulations and procedures, should complete Component 1. The municipality's certified Sewage Enforcement Officer (SEO) also should be consulted to confirm site and soil testing information.

What information must be provided in the Component 1?

The Component 1 form contains instructions that describe the planning process and the information required in detail. The developer is required to provide information about the proposed subdivision, including:

- the location of the subdivision;
- the number of lots proposed;
- the planned layout of the subdivision, in the form of a surveyor's drawing or "plot plan";
- the planned source of drinking water (wells or a public supplier); and
- the site conditions, such as soil testing results and ground slope measurements.

When the Component 1 form is complete and all of the associated information required has been attached, the complete plan is called a "planning module for land development" or simply a "planning module."

When the Component 1 planning module is complete, what's the next step?

The municipality where the proposed subdivision is located reviews the completed planning module.

What is the municipality's role in review of "exceptions?"

Each municipality has the primary responsibility to review and if appropriate approve "exceptions." DEP provides oversight and assistance to local governments to help them effectively carry out their duties.

How long does it take to get municipal approval?

If the planning module is complete, the municipality has 60 days to review and act on the plan unless both the developer and municipality agree to a time extension in

writing. The municipality must either approve or disapprove the plan within the 60 days, or the agreed-to time extension. If the municipality approves the planning module, it then sends the planning module to DEP for final review. If the municipality fails to act within the allotted time, the planning module is "deemed approved" and can be sent to DEP for final review. If the planning module is not complete, the municipality will request the missing information before taking action.

How long does it take to get DEP approval for an exception?

DEP has 30 days to act on a complete Component 1 planning module. If DEP does not act within the 30 day period, the "exception" planning module is deemed to be applicable.

Is there a fee for DEP review of an exception?

Yes. Act 537 requires DEP to charge a per-lot fee for review of planning modules. The amount is set by law and varies with the type of project. The fee for exceptions planned using a Component 1 is $35 per lot. The developer may calculate the appropriate fee and submit it to DEP with the planning modules or DEP will calculate the review fee and advise the developer by mail of the amount owed. DEP does not include residual tracts in this fee calculation.

What happens if DEP or the municipality finds that my proposed subdivision is not an exception ?

If the municipality or DEP discover that the proposed subdivision does not meet one or more of the conditions required to qualify as an exception, the applicant will be informed and provided with the appropriate DEP forms. While some of these forms may require more information than the Component 1, much of the information, such as soil test results and plot plan, can be reused.

When can I apply for onlot system permits for my lots?

The developer may apply for individual onlot sewage disposal system permits after receiving final DEP action on the Component 1 Planning Module.

For more information, please visit the PA PowerPort at www.state.pa.us, Keyword: "DEP Wastewater."

DEP REGIONAL OFFICES

Southeast Region
Suite 6010, Lee Park
555 North Lane
Conshohocken, PA 19428
Water Supply: 610-832-6060
Wastewater: 610-832-6131

Counties: *Bucks, Chester, Delaware, Montgomery and Philadelphia*

Northwest Region
230 Chestnut St.
Meadville, PA 16335-3481
Water Supply: 814-332-6899
Wastewater: 814-332-6942

Counties: *Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren*

Southwest Region
400 Waterfront Drive
Pittsburgh, PA 15222-4745
Water Supply: 412-442-4217
Wastewater: 412-442-4035

Counties: *Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland*

Northeast Region
2 Public Square
Wilkes-Barre, PA 18711-0790
Water Supply: 570-826-2511
Wastewater: 570-826-2511

Counties: *Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne and Wyoming*

Southcentral Region
909 Elmerton Ave.
Harrisburg, PA 17110
Water Supply: 717-705-4708
Wastewater: 717-705-4707

Counties: *Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry and York*

Northcentral Region
208 W. Third St., Suite 101
Williamsport, PA 17701
Water Supply: 570-327-3636
Wastewater: 570-327-3670

Counties: *Bradford, Cameron, Clearfield, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union*

Commonwealth of Pennsylvania
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Department of Environmental Protection
Kathleen A. McGinty, Secretary
3800-FS-DEP1564 Rev. 8/2003

DEP Fact Sheet
Commonwealth of Pennsylvania • Department of Environmental Protection Act 537 #3

SEWAGE MANAGEMENT PROGRAMS

Ensuring Long-Term Use of Onlot Systems Through Proper Operation and Maintenance

The Pennsylvania Sewage Facilities Act (Act 537) requires all municipalities to develop and maintain an up-to-date sewage facilities official plan to protect public health from diseases, prevent future sewage treatment problems and protect the quality of the state's surface water and groundwater. As part of an official plan update, the municipality should consider developing a sewage management program. Such a program to ensure the operation and maintenance of onlot sewage systems should be established before malfunctions are widespread in an area. Malfunctioning onlot treatment systems can endanger public health, degrade the environment and reduce property and community value by discharging onto public areas, private property or contaminating receiving waters including drinking water supplies.

Properly designed and installed onlot treatment systems function better and longer with regular maintenance. Sewage management programs ensure that onlot sewage treatment systems are properly operated and maintained. If operation and maintenance activities are neglected, systems can either fail completely or may function well below their capabilities. This can quickly negate the efforts of a municipality in assuring public health protection through requirements for proper design and installation of these systems.

Municipal sewage management programs can be as simple or as comprehensive as needed and may be based on each municipality's particular needs and resources. This fact sheet explains the importance of municipal sewage management programs and how they are developed by municipalities to meet their needs for individual and community onlot sewage systems.

Why should my municipality manage onlot systems?

Most municipalities have areas that can never be physically or cost-effectively served by public sewer facilities. Areas may contain suitable soils but have scattered malfunctioning onlot treatment systems that can cause public health and other hazards. Malfunctioning individual onlot systems will also often be found in areas that have poor soils and/or small lot sizes. It may become impossible to repair or replace these systems on an individual lot-by-lot basis. If your municipality is faced with this latter situation, you can assess your options for using community onlot systems to meet your long-term needs. In any case, repairing onlot systems as they malfunction typically will not solve the problem permanently until regular management and maintenance of onlot systems is established to help keep the problems that lead to malfunctions from recurring.

What options are available for establishing a Sewage Management Program?

Municipalities have established numerous approaches to sewage management in Pennsylvania. While existing management programs range from simple pumping or maintenance permit programs to more complex municipal inspection programs, you should base your sewage management program on the specific needs and resources in your municipality.

In developing a sewage management program for your municipality, you may choose from a variety of possible management service options and administrative alternatives. Management options for onlot systems may include such services as:

- Public and homeowner education;
- Regular pumping of tanks;
- Operation and maintenance activities tailored to specific onlot systems or treatment components;
- Testing and monitoring procedures to assess the quality of effluent treatment; and/or
- Periodic inspections to determine system integrity and operational performance and more.

Administrative alternatives for delivering or ensuring your program's management services can range from:

- Maintenance contracts established between a homeowner and the manufacturer or a third-party maintenance provider;
- Operating permits issued by the municipality based on the system's compliance with particular quality or operating standards;
- Direct provision of management services by the municipality or an established service utility; or
- Direct ownership and management of onlot systems by the municipality or an established utility.

There are many examples and variations of these management service options and administrative alternatives in use in municipalities across Pennsylvania. Your local DEP representative can help you learn more about existing sewage management programs.

How can my municipality begin managing onlot systems?

The first step in the process is for your municipality to assess available administrative, technical, financial and management options by preparing an update revision to its Act 537 official plan. The update revision should provide for identification of all onlot systems and a determination of their operational status. Such factors as the suitability of soils, underlying geology and any peculiar environmental conditions that could impact the continued long-term use of onlot systems are also examined.

Using this information, the various options to ensure performance of routine operation and maintenance for new and existing onlot systems are identified and compared.

Ultimately, the specific options and alternatives for a sewage management program that best fits with your municipality's resources and needs are selected for implementation. In connection with the management program, the plan should also evaluate required needs for septage handling (septage haulers, septage disposal options, etc.) and develop appropriate administrative and legal procedures.

Finally, to allow implementation, your official plan must establish an ordinance that legally authorizes the municipality's program to manage onlot systems.

What other steps are there to developing a Sewage Management Program?

There are several additional steps that should occur together with sewage facilities planning in considering and developing the service options, administrative alternatives, legal procedures, ordinances and other pieces that will make up your municipality's sewage management program. These steps primarily involve gaining understanding and consensus from the residents in your municipality who will be impacted by the proposed management program.

It is important that opportunities be afforded for homeowners and the public to learn what onlot systems are, how they work and why management and maintenance of these systems is so important. Public education meetings, civic events or programs provided at local schools can be excellent ways to get the word out.

The citizens in your municipality will better accept the management program if they have a voice in its planning and development. Surveys or questionnaires, public forums for exchanging questions and opinions, as well as citizen representation on advisory or planning groups can all be very helpful.

Residents need to be informed about the details of the proposed program, how it will affect them and what actions they need to take. Mailings, newsletters, articles or announcements in the local media, websites and public information sessions are just some of the ways Pennsylvania municipalities have educated and involved their citizens.

Are there minimum requirements for Sewage Management Programs?

There are minimum requirements only if a sewage management program is required by regulation. Maintenance standards are listed in Title 25 of the Pennsylvania Code, Chapter 71 §71.73 to make sure that management programs carry out at least the minimum activities necessary to maintain onlot systems (this DEP regulation, as well as others, can be found on-line at www.pacode.com).

Minimum standards include:

- Removal of septage from the treatment tanks once every three years or following a tank inspection that reveals the need for septage removal (when the tank is determined to be more than 1/3 full);

- Maintenance of surface contouring around the system to divert stormwater and to protect the system from damage;
- Water conservation requirements;
- Provisions for septage pumping and disposal; and
- Requirements for holding tank maintenance.

Can municipalities work together through Sewage Management Programs?

Yes. Municipalities in many parts of the state have banded together to form "joint local agencies." These agencies then implement sewage management programs consistently throughout the service areas of their member municipalities.

Can sewage management be administered through existing municipal structures?

Yes. Some municipal governments are already involved in the permitting of onlot sewage systems through programs administered by agencies such as joint sewage committees, county health departments, etc. These existing onlot permitting programs involve testing proposed sites, reviewing designs and addressing adequate system construction through final inspections of installed onlot systems. Unfortunately, in many cases, system installation marks the boundary of the permitting program.

Sewage management programs, administered by joint local agencies, or even municipal sewer authorities, can extend municipal oversight for these permitted systems to include regular operation, maintenance, testing and/or inspection. Such actions assure that the special care and attention taken to properly design and install onlot systems is not negated by the lack of system management and oversight.

Is management of onlot treatment systems cost-effective?

Yes. Maintaining properly installed sewage systems can extend the life of these systems and may save the homeowner the cost of repairing or replacing an abused, malfunctioning onlot system. Sewage management programs can also help prevent future problems from occurring with systems that have been repaired following malfunction.

Municipalities confronting areas with numerous malfunctioning systems often opt to extend sewer lines for great distances. This action may solve the problem, but can be very costly to the municipality and the affected property owners. Sewer lines can inadvertently promote unwanted development. Municipalities might also attempt to deal with areas of malfunctioning individual onlot systems by connecting the affected homes to a single community onlot system. This may also solve the immediate problem; however, there is still the potential for future malfunctioning of the resulting community systems unless the municipality has a management program that commits it to oversee proper operation and maintenance of these larger systems.

Is financial and technical assistance available for my municipality to develop or update its sewage facilities official plan?

Yes. Municipalities can apply to DEP for a planning grant to reimburse up to 50 percent of the cost of preparing a sewage facilities official plan.

Additionally, to assist municipalities in the development of their sewage management programs, DEP has several model ordinances that reflect the requirements typical of the different programs. The "pump" model ordinance reflects the simplest approach to a sewage management program, while the ordinance for a municipal inspection program is the most complex approach. You should keep your municipality's management program as simple and effective as possible to meet your special needs.

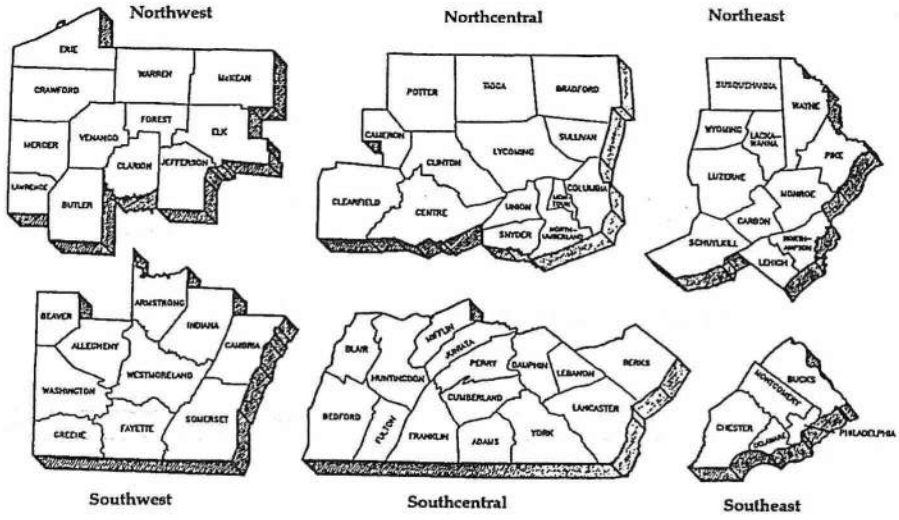
Is there financial assistance available to my municipality to establish and administer a Sewage Management Program?

Yes. Sewage management program costs of staffing and administration are eligible costs of the sewage enforcement reimbursement program. Your management program is expected to charge reasonable fees to cover the costs of the activities you conduct. If revenue does not adequately cover all these costs, your municipality may recover monies from the state to eliminate this deficit amount, up to 50 percent of the total cost of the enforcement program. Local agencies qualifying for 85 percent sewage permitting enforcement reimbursement also qualify for the same method of calculating reimbursement for their sewage management program's activities.

For more information, visit DEP's website at www.dep.state.pa.us, Keyword: "DEP wastewater."

For more information,
call the DEP regional office in your area or contact:

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Division of Wastewater Management
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DRINKING WATER WELLS

Frequently Asked Questions About Private Water Wells in PA

Understanding Your Drinking Water Well

Disinfection of Home Wells and Springs

Guidelines for Installing Private Water Wells in Bedrock

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Fact Sheet

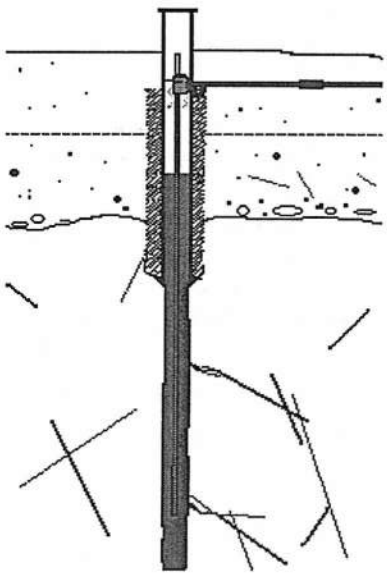
Commonwealth of Pennsylvania • Department of Environmental Protection

FREQUENTLY ASKED QUESTIONS ABOUT PRIVATE WATER WELLS IN PENNSYLVANIA

Do I have to have a permit to install a new well?

The Commonwealth of Pennsylvania does not regulate the construction of or water quality in private wells. However, a few municipalities in Pennsylvania require permits. You should contact your local municipality.

I'm buying a house with a well. Should I test the water? What should I have the laboratory test for?



Testing the water is the only way to know for sure that the water is safe to drink. Pennsylvania does not require testing of private wells, although some county or other local governments may. In addition, financial institutions may require certain water analyses for properties to be sold.

DEP recommends you test your well yearly. At a minimum, have your water tested for coliform bacteria. Nitrates and lead are other common contaminants. Lead can be present from older plumbing systems. These are some of the most common potentially harmful contaminants in private wells. Iron and hydrogen sulfide are common contaminants that cause mainly aesthetic problems; most water can be successfully treated. See DEP's publication, *Citizens Guide on Home Drinking Water Treatment Devices* on DEP's website at www.dep.state.pa.us, Keyword: "DEP Drinking Water." Keep in mind, however, that neither DEP nor the U.S. Environmental Protection Agency (EPA) certifies or endorses treatment devices. So you should beware of sellers who say their units are DEP or EPA-certified.

Will the Commonwealth pay for any water quality tests?

Because private water wells are not regulated, DEP does not typically sample private wells unless there is some nearby potential or suspected contamination problem from a regulated facility. It is the responsibility of the well owner to ensure a safe drinking water supply. In general, you should work with a private laboratory to have your water tested.

I had my well water tested and the results are positive for coliform bacteria. Is this harmful?

For bacteria, the results for a safe water well should be zero. Drinking water with any coliforms is potentially harmful. This is because *E.coli* is a significant member of the total coliform group of bacteria. The presence of coliform organisms raises a red flag that there could be disease-causing coliforms such as *E.coli*. Also, false positives or sampling errors can occur when water is sampled and analyzed for bacteria. For this reason, we suggest re-sampling.

What do I do if my well has coliform bacteria in it?

Harmful bacteria will be killed by boiling the water. A rapid boil for a minute makes the water safe for drinking. If you're a handy person, you may want to consider your own treatment of the well. A procedure is described under the DEP fact sheet, "Disinfection of Home Wells and Springs" available on DEP's website. However, this procedure should not be considered a permanent solution for a water source that is continuously exposed to bacteria because of poor well construction or contaminated groundwater. It's a good idea to sample the well again in a month or two after any treatment. If you do find bacteria again, treatment systems for this problem can be installed. Treatment methods like ultraviolet light and chlorination systems will kill the bacteria and any viruses.

What do my water test results mean?

Although there are no standard levels for private wells in Pennsylvania, you can compare your results with maximum and secondary contaminant levels for public drinking water supplies. These values are available on DEP's website.

Should I worry about methane gas in my well?

In some areas of Pennsylvania (especially areas of coal mining and gas well activity), stray methane gas in the subsurface may be a concern that should be taken seriously. Under certain conditions, methane can migrate to private water supply wells and ultimately into a house or structure. Unmitigated, methane can build to

explosive concentrations. A proper well vent allows methane to vent to the atmosphere, rather than build up to explosive levels. Since these problems can occur in wells where methane was previously not a concern, it should be routine that all wells are properly vented as a precaution. For proper well venting, you may want to contact an environmental consultant or local well driller.

The risk of an explosion from stray methane varies from location to location based on site-specific conditions. For example, in 1997, a methane explosion destroyed a home in Greene County. Methane gas had migrated through an improperly vented water well into the house.

Does it make a difference what kind of well cap you have?

Most well caps in Pennsylvania are loose-fitting caps that sit on top of the casing. A good well cap will protect the well from sources of contamination at the well top. Well caps should be weather tight and vermin-proof, and provide venting while being tightly secured to the well casing. A tight cap prevents insects from entering the well and falling into the water. A screened vent allows air into the well and keeps the well pressure equalized. These caps will typically cost less than $50, depending on the type and who installs it.

We have a lot of earwigs around our well cap. Should we be concerned?

Even if the well is grouted around the casing in a properly constructed well, insects like earwigs may seek sources of moisture and provide a source of coliform bacteria to the well. Earwigs can enter the top of the cap (which is typically a loose fitting steel cap) and be a source of bacteria to the well water. Because they are scavengers, earwigs can carry coliform bacteria into the well. We recommend a well cap that seals the well but has a screened vent. A makeshift solution is to cover the well top with nylon stockings secured with duct tape.

What else can I do to make my well water safer?

Proper well construction will help to keep your water supply safe. Other ways include common sense care around the well. See our guidelines for installing wells in bedrock on DEP's website. Also, sample your well once a year for coliform bacteria. Consider sampling your water if the physical qualities (taste, odor, color, turbidity, etc.) change suddenly. Proper siting of the well can also help.

Where should I site my well?

Wells should be sited at least 100 feet away from sources of contamination such as septic system leach fields, roads, fuel tanks and barnyards. Ideally, the well will be uphill from these pollution sources. Combining these isolation distance guidelines with sound construction practices will go a long way toward protecting the groundwater quality and the user's health.

Should I hire a water witcher to site my well?

There is no scientific evidence that "water witching" – using a forked stick or metal rods to locate "underground streams of water" – works. First, water is typically found in the small fractures, bedding planes and pore spaces in sediments and rocks. Underground streams are rare and occur only in limestone areas (or in old deep-mined areas of coal).

Our new well produces less than a gallon a minute. Is there anything we can do?

Most wells in Pennsylvania produce more than one gallon a minute; however, nearly all rock types can have areas where there are few fractures and consequently low yields.

A deeper well can store water that allows the homeowner to cope with a low-yielding well. Other methods of storing water can be used.

Also, a procedure called hydrofracturing has been successfully applied in "tight" formations like metamorphic and igneous rocks. Using a packer to seal off zones of a well, a driller uses high-pressure pumps to inject water and open new fractures. These fractures can "heal," so sand is sometimes added to keep the fractures open.

Hydrofracturing is cheaper than drilling a second well, but it can be an involved procedure. You should talk to your drilling firm and ask about its experience with hydrofracturing if your well yield isn't adequate. However, there is no state requirement for a minimum quantity of water from a private well.

What do I do if my well goes dry?

First, before your well goes dry, develop good water conservation habits. Water conservation tips are available on DEP's website. If your well does go dry, contact a water well driller. Perhaps your pump could be lowered, or the well deepened. Sometimes though, a new well will have to be drilled.

We just drilled a new well and the water smells like rotten eggs. What is going on?

The smell is most likely hydrogen sulfide gas - a fairly common, mostly natural contaminant that occurs in groundwater. It is often associated with certain rock formations like black shales that can have a high sulfur content. It does not usually pose a health threat, but it can be a terrible nuisance. It also can be corrosive to metals. Higher concentrations can cause a laxative affect and produce a bitter taste.

Hydrogen sulfide in a well can appear and disappear, but will probably need to be dealt with when its odor is present. Proper treatments can typically control the problem. We would recommend getting your well tested for hydrogen sulfide.

The treatment method typically depends on the concentration of hydrogen sulfide. Concentrations up to 6 milligrams per liter (mg/L) can be removed by an oxidizing filter. A new method for treating hydrogen sulfide uses catalytic carbon. Chlorination shock treatment of a well can sometimes be effective if bacteria is causing the production of the hydrogen sulfide gas. For public water supplies, the safe drinking water standard for sulfate is 250 mg/L. This concentration is a secondary maximum contaminant level (for contaminants that affect the taste, color or odor of water).

My water has a very low pH. Is this dangerous?

A pH value is a measure of the hydrogen ion concentration of a substance – lower values indicate increasing acidity, whereas higher values indicate increasing alkalinity. A low pH is typically not something that needs to be corrected. In Pennsylvania, most groundwater has a pH between 5 and 9. However, the pH of precipitation is typically between 4.0 and 4.7. Soft drinks can have a much lower pH (3). Stomach acids have a very low pH value (2). A low pH has no particular health risk in itself.

EPA has listed pH to be a secondary contaminant, with an acceptable range of 6.5 to 8.5. Secondary contaminants are mainly aesthetic in nature and not health-related. However, the corrosiveness of water generally increases with a decreasing pH. Corrosive water can leach lead from old lead pipes, lead-soldered joints or brass or bronze plumbing fixtures. The presence of lead is a problem that should be corrected. If you have an older house, you may want to test your water for lead. You may be able to purchase a pH neutralizer from a water treatment company to adjust the pH. If you have plastic, non-corrosive pipes, then no action is needed.

Are roadside springs good sources of water?

Most springs, including roadside springs, are not tested unless they are part of a public water system. Without any information, the user of water from springs should consider their potential problems. Shallow springs often have bacteria and other contaminants present.

We found an old abandoned well on our property. Is this a problem?

There are tens of thousands of abandoned wells across Pennsylvania. Abandoned wells should be properly sealed. Besides the obvious physical hazard, old wells can spread contaminants to different areas of the aquifers. The property owner could be held liable for contamination that an old well causes or spreads.

How do I seal an old well?

Contact a licensed water well contractor. In most cases, this is a job for a driller who can remove old equipment from the well and seal the borehole from the bottom up. See the guidelines for well abandonment on DEP's website.

I know there used to be a well on my property. How can I find it?

Look for any evidence of an old well: windmills, small buildings or vaults. Plumbing fixtures, pipes and pits can also mark a well's location. Old property plans and deeds may show the location of a well.

What laws protect groundwater quality in Pennsylvania?

Although Pennsylvania does not have specific groundwater protection statutes, the Clean Streams Law provides a framework for managing and protecting the groundwater quality in the waters of the Commonwealth. The Act states that "... the waters of the Commonwealth shall be construed to include any and all rivers, streams, creeks, rivulets, impoundments, ditches, and other bodies or channels of conveyance of surface and **underground** (emphasis added) water, or parts thereof, whether natural or artificial, within or on the boundaries of the Commonwealth." The Clean Streams Law protects the waters of the Commonwealth from pollution. Many other laws protect the groundwater through the regulation of specific activities that can pollute ground water.

Where can I have my water tested?

Contact a DEP regional office for a list of commercial certified drinking water laboratories in Pennsylvania, or look up "Water Testing" or "Laboratories" in the yellow pages of the telephone listings.

For more information, visit DEP's website at www.dep.state.pa.us, Keyword: "DEP Drinking Water."

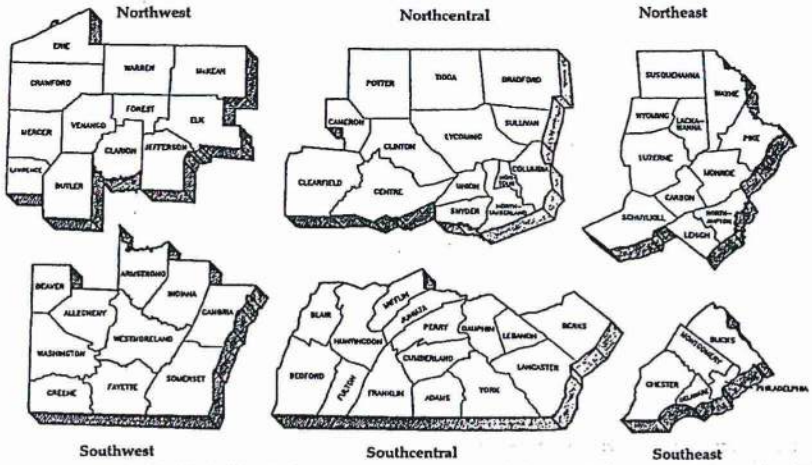
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Fact Sheet

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Understanding Your Drinking Water Well

Water Well Basics

A drinking water well uses groundwater as its source of water. Groundwater exists in the spaces, cracks and fractures in the underground soil and rock formations known as an aquifer. An aquifer is the part of the soil and rock that is saturated with water and can yield water to a well. How much water is available depends on the type of soil and rock below Earth's surface. For instance, some rock formations such as limestone can give large quantities of groundwater, while others like shale and diabase (a hard igneous rock) can yield only small amounts of water.

The groundwater table (or water table) is the top of the water-saturated zone. The water table level is usually maintained by rain water that seeps into the ground. As it soaks into the ground, the water flows toward a discharge point – typically a nearby spring or stream. An average of 65 percent of all stream and river water in Pennsylvania comes from groundwater. This is known as "base flow."

When precipitation decreases and/or water is unable to soak into the ground – from a drought, from paving or when the ground surface freezes in wintertime – then the water table begins to drop. Over time, stream flows begin to decline as groundwater levels are lowered. The water table normally rebounds as winter ends and spring rains soak into the ground. If those rains don't come, the water table and stream levels drop. An increased demand on groundwater in an area, the decrease of precipitation due to a drought and/or a decrease in water recharge areas from paving, can all lower groundwater levels in a region.

How does a well "go dry?"

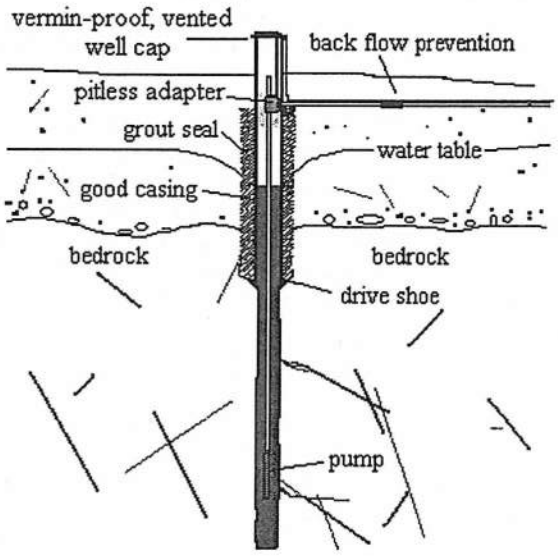
A well works by inserting a pump inside a drilled hole to bring water up and into a house through a pipe. If there is no groundwater available to enter the pump, it sucks air instead of water. When the tap is turned on, nothing comes out. In most cases, this is caused by the underground water table dropping below the level of the well pump.

How much water can my well provide?

When the well is drilled, the water well driller estimates the yield of a well. Wells that are estimated to yield 10 to 20 gallons a minute typically can easily meet all the requirements of a household, although lower yielding wells are generally adequate for most domestic purposes. Wells with lower yields may depend more on the storage capacity of the well. This is why wells with low yields are often drilled deeper to meet the needs of a home. The deep borehole serves as a "storage tank."

The water level in a low-yielding well will drop faster than in a well that taps a geologic formation that has a lot of water. For this reason, it's helpful to know what your well's yield is. If you have a low-yielding well (less than 5-10 gallons a minute), you should be very careful of how much demand you place on the well.

The average life of a well is estimated at more than 20 years. However, over time, the yield of a well typically declines for various reasons. At some point, the well may need to be cleaned out or treated to restore its former condition.



Drinking Water Well

What can I do to prevent my well from running dry?

Most importantly, practice water conservation. You can find water conservation tips on DEP's website at www.dep.state.pa.us (Keyword: "DEP drought"). Try to limit the demand on your well by spreading out your daily water-use activities such as bathing, watering the garden and dish and clothes washing as much as possible during the day and the week. If necessary, take laundry to a local Laundromat to conserve your well water supply.

Invest in water-efficient fixtures for faucets and showerheads, turn off water softeners and replace older toilets with newer, low flow models to save on water use. Take the time to repair any dripping faucets and leaking toilets. These seemingly small measures can save thousands of gallons per year in an average household and help to prevent your well from going dry.

How can I know that my well is running out of water?

This can be difficult to determine. Tap water that is muddy or murky in appearance or other changes in water quality can indicate that the well water level is getting low. Air that gets in the line may cause your spigots to cough and sputter as air comes through the line instead of water. Sometimes there will not be a sign until the submersible well pump is pumping air.

However, one certain way to determine if your well is running out of water is to measure the actual water level. This can be very difficult with a deep well, and you may want to call a water well driller. It's helpful to know how deep your well is, what depth the pump has been set, and what the water level is in the well. Knowing the yield of the well can also help you assess the stability of your water supply.

How can I find out information about my well?

When a well is drilled, the driller is required to provide information about the well to the state and to the well owner. If you do not have this information, in some cases the Commonwealth may have a record of the well. Contact the Bureau of Topographic and Geologic Survey at 717-702-2074. If you know the company that drilled your well, you may be able to contact it for a record.

I turned my water faucet on but nothing is coming out. What can I do?

If you're unfamiliar with your well, and you don't know the location where your water comes into your house, you should probably contact a water well driller, or someone who can find the cause of the loss of water. It could be that the electricity is off or a fuse has blown, since pumps and pressure tanks need electricity to work. The pump, pressure tank or the wiring to the pump can also fail. It also could be that the water level in the well has dropped below the pump.

Can a new well drilled in my neighborhood cause my well to go dry?

Possibly. Well owners have a right to a reasonable use of the groundwater beneath their land; however, as neighborhoods and communities expand, private water wells sometimes compete for the groundwater. If you suspect that a neighbor's private well is affecting yours, DEP can provide little help because water wells are essentially unregulated in Pennsylvania. Private water well conflicts highlight the need for good water planning when land developments are designed.

On a larger scale, if you suspect that your water well is being impacted by a large groundwater withdrawal and you live in central or eastern Pennsylvania, your river basin commission may be able to assist you. Both the Susquehanna and Delaware River Basin Commissions regulate large withdrawals of groundwater in wells used for many agricultural, municipal, industrial and other purposes. In order to withdraw large amounts of groundwater, entities must demonstrate that there is no significant impact on other water resources such as private wells.

Can I hire a tanker truck to pour water down my well?

This should not be done because you will get only as much water as you pour down the borehole. More importantly, you can damage the well's borehole and pump and/or introduce poor quality water from the container or tanker that will contaminate your well.

I have run out of water – do I have to drill a new well?

After making sure that the well is out of water, you can explore several options before drilling a new well. First, can the well's pump be lowered? If you don't have a record of the well's construction details, a water well driller can determine the depth of the well and the pump. If there's room, the pump can be lowered deeper into the borehole. It's also possible that the well could be deepened without drilling a new well. However, for some situations, it may be as expensive to deepen a well as it is to drill a new well. For example, the well casing may have to be pulled out to allow the driller to drill a deeper hole. A driller may not be able to do this for a variety of reasons.

A procedure called hydrofracturing has been successfully used in "tight" rock formations like metamorphic and igneous rocks. Using this method, a driller uses high-pressure pumps to open new fractures in sealed off parts of the borehole. This may be cheaper than drilling a second well, but it can be an involved procedure. You should talk to your drilling firm and ask about its experience with hydrofracturing if your well yield isn't adequate. This technique will not work if the water table has dropped below the pump.

Finally, it may be that a new, deeper well is the only solution. See the DEP guidelines on constructing a new bedrock well at www.dep.state.pa.us (Keyword: "DEP private wells"). After a new well is installed, the abandoned well should be sealed to protect the aquifer and eliminate any physical hazard. Recommendations for sealing a well are available at the website on private wells.

How can I find a good well driller?

First, drillers must be licensed in Pennsylvania but that doesn't guarantee good service or practices. DEP recommends using a reputable driller and checking the references that they provide. Also, the National Ground Water Association certifies water well drillers. You can access the list of member drillers in your area at www.wellowner.org or by calling 800-551-7379. See tips on "Finding a Contractor" at http://www.wellowner.org/hto-whatis.htm. Check the yellow pages of your telephone book under "Water Wells" or "Drillers."

What can I do to make my well water safer?

Proper well construction will help to keep your water supply safe. Other ways include common sense care around the well. See our guidelines for installing wells in bedrock at www.dep.state.pa.us (Keyword: "DEP Private Wells"). Also, sample your well once a year for coliform bacteria. Consider sampling your water if the physical qualities (taste, odor, color, turbidity, etc.) suddenly change. Proper siting of the well can also help.

How can I learn more about groundwater and water resources?

- See the DEP web page on private wells at www.dep.state.pa.us (Keyword: "DEP private wells" and "water resources")
- See the Pennsylvania Geologic Survey's The Geology of Pennsylvania's Groundwater at http://www.dcnr.state.pa.us/topogeo/groundwater/groundwater.htm
- Check out EPA's publication EPA *The Water Sourcebooks* at http://www.epa.gov/safewater/kids/wsb/index.html
- Download the Water Resources Education Network publication *Groundwater - A Primer for Pennsylvanians* at http://pa.lwv.org/wren/pubs/primer.html
- Visit the Department of Conservation and Natural Resources' website at www.dcnr.state.pa.us/topogeo/
- Visit the Susquehanna River Basin Commission's website at www.srbc.net or call 717-238-0423
- Visit the Delaware River Basin Commission's website at www.drbc.net or call 609-883-9500
- Visit the Pennsylvania Groundwater Association's website at www.pgwa.org

Water Conservation Tips for Everyone

The average person each day uses about 62 gallons of water, with the majority of water used for clothes washing, toilet flushing and showering, followed by faucet use and leaky fixtures.

Replace an old toilet with a new 1.6 gallon-per-flush model. This measure can save a typical household from 7,900 to 21,700 gallons of water per year;

Save over 1,000 gallons per year by placing a plastic jug of water or commercial "dam" in older toilet tanks to cut down on the amount of water needed for each flush;

Repair dripping faucets and leaking toilets (flapper valves are usually the cause). Repairs can save more than 10 gallons of water per person per day. A faucet dripping at one drop per second wastes 2,700 gallons per year;

Wash clothes and dishes only when you have a full load. When replacing an older machine, consider high efficiency models, which use an average of 30 percent less water and 40-50 percent less energy, saving about 9 gallons per washing machine cycle and 7.5 gallons per dishwasher cycle;

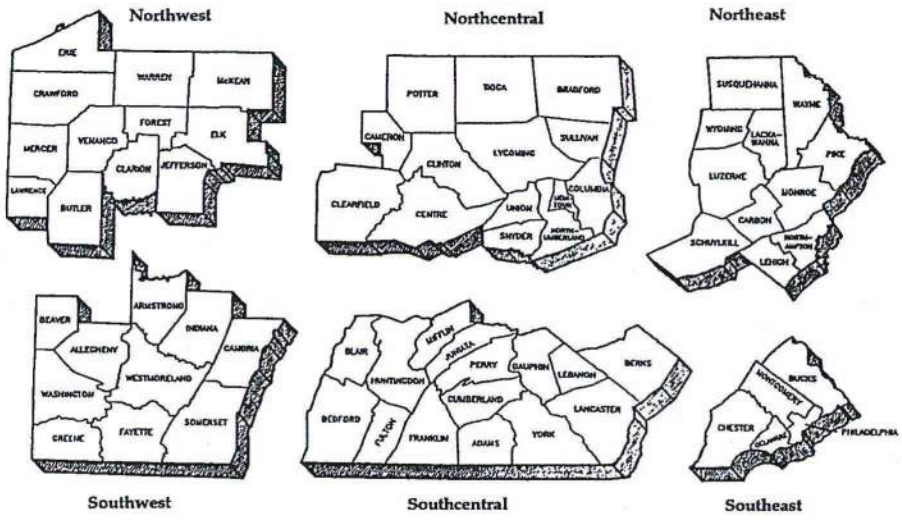
Install low-flow, water-efficient showerheads and faucets and save 1 to 7.5 gallons per minute. Taking a quick shower can save an average of 20 gallons of water; and

Turn off the water when brushing teeth or shaving to save more than 5 gallons per day.

For more information, call the DEP regional office in your area or contact:

Department of Environmental Protection
Bureau of Watershed Management
P.O. Box 8555
Harrisburg, PA 17105-8555
(717) 787-5259

Department of Environmental Protection
Bureau of Water Supply and Wastewater Management
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For more information, please visit DEP's website at www.dep.state.pa.us, Keyword: "DEP Private Wells."

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Kathleen A. McGinty, Secretary
3800-FS-DEP2780 Rev. 4/2004

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DISINFECTION OF HOME WELLS AND SPRINGS

Editor's Note: The disinfection procedure described below is only a temporary measure for use by homeowners to treat for bacteriological contamination (not including the organisms that cause giardiasis or cryptosporidiosis) and may *not* be used by public water suppliers. It should not be considered to be a permanent correction for a home groundwater source that is continuously exposed to microbiological contamination due to improper location and/or construction.

Disinfection of a home groundwater source should be performed under any of the following conditions:

a. After completing construction of a new well or spring supply;

b. When repair or reconstruction of a well or spring, pumps or attached piping is completed;

c. If the well or spring has been temporarily flooded or subjected to another temporary source of bacteriological contamination; and

d. Receipt of a laboratory report indicating an unsatisfactory bacteriological analysis of the well or spring supply.

MATERIALS NEEDED

You will need a two-gallon or larger bucket; a length of garden hose long enough to reach as far as possible into the home water source; a funnel that fits into the end of the garden hose and a suitable quantity of a liquid or granular chlorinating compound.

Chlorinating compounds are sold at grocery, hardware, plumbing and swimming pool supply stores under various trade names. You should look for one of the following:

1. Liquid Forms

   - Unscented laundry bleach containing 5 to 6 percent sodium hypochlorite.
   - Sodium hypochlorite solution containing 5 to 14 percent sodium hypochlorite.

   NOTE: Do not use a laundry bleach containing scent additives. These additives should not be consumed. Since liquid laundry bleach weakens with time, obtain a fresh supply rather than using old laundry bleach you may have at home.

2. Granular Forms

   - Swimming pool granules containing 65 to 70 percent calcium hypochlorite.
   - Calcium hypochlorite granules (65 to 70 percent)

   NOTE: Do not use stabilized chlorine products that are meant for swimming pools or non-chlorinated "pool shock" products. These products are not intended for disinfecting wells or springs. There are fast dissolving pellets containing chlorine which are specifically made for disinfecting wells. This should not be confused with the larger stabilized chlorine pellets (one to three inches in diameter) that should not be used. Please check the product label.



Chlorinating products must be handled in accordance with the manufacturer's directions. Failure to follow instructions could cause bodily injury. Wearing eye and body protection during the procedure is strongly recommended. Do not drink well water containing high levels of chlorine. The water should be tested for bacteria after the disinfection procedure has been completed. Until tested and found potable, bring the water to a rolling boil for at least one minute before consuming or using for food preparation.

PROCEDURE

First, remove any cover over the well casing or spring vault to allow access to the water source.

Then add the appropriate amount of chlorinating compound (see below) to three or four buckets of water (6 to 10 gallons total) and mix thoroughly.

a. For liquid chlorinating products with 5 to 6 percent available chlorinating chemical, use about 1½ quarts of the chlorinating product.

b. For liquid chlorinating products with more available chlorinating chemical, reduce the amount used. For example, for products with 10 percent, use about ¾ quart or for products with 14 percent, use about ½ quart of the chlorinating chemical.

c. For granular chlorinating chemicals with 65 to 70 percent available chlorinating chemical, use about 4 ounces (10 tablespoons) of the chlorinating product.

The process of mixing the appropriate amount of chlorinating product with 6 to 10 gallons of water is important for the following reasons:

a. It helps to mix the disinfectant evenly through the water in the well and force the disinfectant into the surrounding water-bearing rocks.

b. It prevents the concentrated chlorinating chemical from corroding the metal pump and other metal parts of the well.

3. These amounts of chlorinating products will disinfect about 150 gallons of water to 100 - 150 parts per million (ppm). That corresponds to 100 feet of water in a 6-inch diameter well; a spring vault with inside dimensions of 5 feet long by 5 feet wide and a water depth of 1 foot; or a dug well with an inside diameter of 5 feet and a water depth of 1 foot. If your well or spring holds more or less water, the amount of chlorinating product should be increased or decreased proportionately.

4. Place one end of the garden hose into the well or spring (remove the pump, if necessary) so that the hose is as far into the well or spring as possible.

5. Place the funnel into the other end of the hose and, with help, pour the contents of each bucketful of diluted chlorinating product through the hose while alternately raising and lowering the hose to disperse the disinfectant throughout the water supply.

6. When the appropriate amount of disinfectant has been added to the water supply, do the following:

   a. If the water source has no pump, close the cover over it.

   b. If the water source has a pump or is piped to a house or other outlets, draw the chlorinated water through all the fixtures and outlets until the smell of chlorine is noticed so that all of the piping and fixtures are disinfected. After the odor is noticed, turn off the water at the fixture or valve outlet.

   c. In some cases involving wells, running the water from fixtures may not produce a chlorine odor quickly. In those cases, it may be necessary to run the water from an outside faucet through a garden hose and back into the well to further mix the chlorinating chemical into the well water.

7. The chlorinating solution should remain in the entire water supply system for at least four hours and preferably overnight. The water should be pumped out after that period until no odor of chlorine remains at the fixtures and outlets. Please avoid discharging water containing detectable amounts of chlorine into storm drains, waterways, ponds, creeks, etc. Fish and aquatic animals are very sensitive to very low levels of chlorine and can be killed.

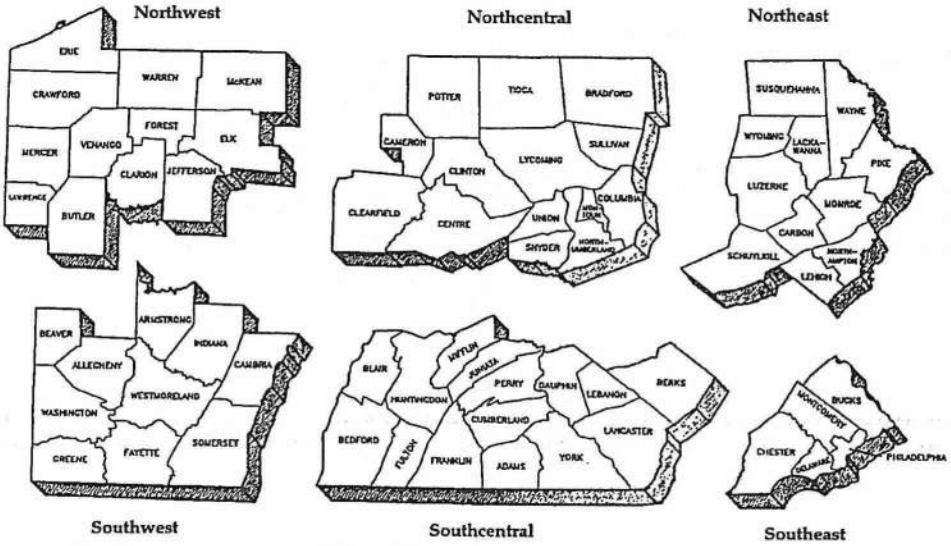
8. Once the water source is chlorine-free, wait an additional 2-5 days and then resample for bacteria. If total coliform organisms are present, the water should not be consumed unless it is brought to a rolling boil for at least one minute. If total coliform organisms are not found, the water is considered bacteriologically potable. However, the well or spring should be sampled for bacteria at least annually.

9. If the well or spring continues to be contaminated after disinfection and sampling or is found to be contaminated as the result of a future sample, the construction or location of the water supply should be re-evaluated.

For more information, visit DEP's website at www.dep.state.pa.us, Keyword: "DEP Drinking Water."

For more information,
call the DEP regional office in your area or contact:

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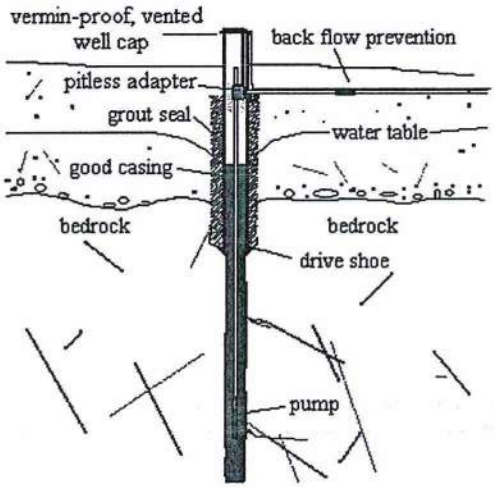
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3800-FS-DEP0131 Rev. 3/2004

DEP Fact Sheet
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Guidelines for Installing Private Water Wells in Bedrock



Components of a properly constructed well

Introduction

This fact sheet contains guidelines for homeowners and contractors on the construction and maintenance of private wells. The guidelines cover construction of "open rock" wells in fractured rock aquifers.

Open rock wells are the most common type of private water well in Pennsylvania. The typical well has a steel casing set in bedrock with a borehole that taps groundwater in the fractures of the rock.

Additional construction precautions beyond those listed in this fact sheet may be warranted for some wells. A water well constructed without any precautions may be adequate; however, the use of these guidelines will provide better protection of the well owner's water supply. Proper well siting and construction are probably the most effective steps a homeowner can take to protect a private well.

Background

Private water supplies are unregulated in Pennsylvania. Consequently, homeowners who have their own private water supplies in Pennsylvania are not protected by any regulations or standards.

When a new well is drilled, no state requirements for construction materials, yield or quality apply. State law does require drillers to have a valid rig permit and a Water Well Drillers License. They must also give the state and homeowner a copy of the Water Well Completion report. This report describes where, when and how the well was constructed.

A few local and county governments have adopted standards for private water supplies (i.e. Chester and Montgomery counties). Mortgages associated with federal housing may require certain water analyses for the well. Other lending institutions also may have sampling requirements. But for the most part, private well owners must take responsibility for their own water quality and for maintaining their well.

Reasons for Concern

Almost half of Pennsylvanians get their water supply from groundwater. Although some areas have inadequate amounts of groundwater, sufficient water supplies for a single family home occur just about everywhere in Pennsylvania.

The old saying "you never miss the water 'til the well runs dry" is true. Except in severe drought, dry wells don't happen often in Pennsylvania. What could be said more often is that "you never miss the well until you have contaminated water."

In the past, groundwater was thought to be protected from contamination by the soil layer. We now know that is not necessarily true. Water can pass through the soil with limited filtering of contaminants in many areas (for example, in areas with shallow bedrock, limestone with sinkholes or high water tables). In addition, poor well

construction is increasingly the prime suspect in the presence of bacterial contamination.

Coliform bacteria are a noted contaminant of concern by the U.S. Geological Survey (USGS). In a 1996 study of the Lower Susquehanna River Basin, the USGS found that "nearly 70 percent of the [146] wells sampled had total coliform present and thus were not suitable for drinking without treatment." The USGS concluded that poor well construction can allow contaminated surface or shallow groundwater to directly enter the well. Complicating this threat is the fact that microbial contamination can be sporadic and often does not affect taste, appearance, or odor of the water.

A properly constructed well minimizes the threat of contamination entering the well, and keeps people healthy who otherwise might get sick from their own well water.

What Can You Do?

As a first defense, wells should be sited at least 100 feet away from sources of contamination such as septic system leach fields, roads, fuel tank and barnyards. Ideally, the well will be uphill from these pollution sources. Combining these isolation distance guidelines with sound construction practices will go a long way toward protecting the groundwater quality and the user's health.

The homeowner can require the driller to construct a well that protects the water supply. This is slightly more expensive than a traditional well with no such features. However, the increased cost of constructing a "sanitary well" may be offset by savings associated with better health of users and protection of the water source, or by preventing the need for costly treatment equipment in the future.

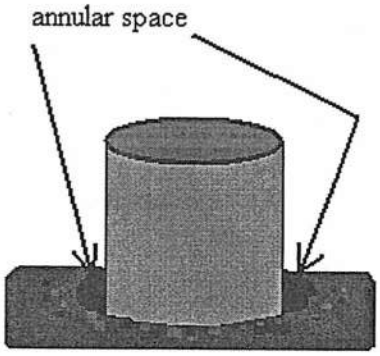
Recommended Construction for Open Rock Wells

Casing – Drillers typically install a steel casing to keep the loose rock and soil from collapsing into the well. Properly installed casing also should keep shallow groundwater and surface water from entering the well. This water is likely to be contaminated and often enters the well by flowing down the outside of the casing. The casing should be new and meet ASTM (American Society of Testing and Materials) standards. Casing should be at least 20 feet in length *and* extend at least five feet into sound bedrock. Finally, the casing should extend at least 12 inches above land surface, more if the area is subject to water accumulations that might enter the well.

Drive shoe – In most cases, a drive shoe should be used to protect the casing from cracking and splitting during installation into bedrock.

Pitless Adapter – This device diverts water laterally below the frost line from the well to a storage tank. It allows the well casing to extend above the ground surface. The pitless adapter should be manufactured by a reputable company and installed so that it is watertight.

Casing Grout – When a casing is installed down a hole, an annular space is created between the wall of the boring and the casing (see figure). If not properly sealed, the annular space becomes an avenue for pollution to move into the water supply. To remove this threat, the annular space should be filled with a watertight sealant, such as a cement-based grout, or a grout and clay mixture. The grout prevents contaminated surface water from seeping down along the casing directly into the groundwater. To ensure a watertight seal, the annular space should be filled from bottom to top. This is typically done by placing a pipe in the annular space and pumping the sealant as the pipe is withdrawn. The annular space should be grouted from the casing bottom to at least the base of the pitless adapter. For long casing lengths, the driller should grout at least 30 feet of casing to the pitless adapter.



It is recommended that the driller construct the well in two steps. The first step is the drilling of the hole into firm bedrock, and installing and grouting the casing. The second step would be to drill the hole to the desired depth (after allowing the grout to cure).

There may be instances where grouting could be effectively done after completing all the drilling. In either case, care should be given to make certain the casing seals off shallow water, and that grout is not placed into the open rock portion of the well.

Development, Yield and Disinfection

The driller should develop the well by cleaning out the fine material. The driller typically estimates the well's yield at this time. A two- to four-person household typically requires 125-250 gallons of water per day.

After the development, the driller should disinfect the well to kill any organisms that may be introduced during the construction. The driller must provide a copy of the well construction record to the owner, who should keep it as a permanent record. Information on the well depth, water level (with no pumping), well yield and the depth of the pump should be included. The well should be topped with a vermin-proof, vented cap that can be locked.

Testing the Water Quality

The water may *look fine,* but could have undesirable substances. Sanitary well construction is no guarantee of safe water quality. If the aquifer is contaminated, then the construction of the well won't help. For this reason, the water should be tested yearly for total coliform bacteria and nitrates. In addition, the well owner may want to test for additional substances.

Common undesirable substances in groundwater include coliform bacteria, nitrates, hydrogen sulfide and excess iron, manganese, lead and turbidity. Volatile organic compounds and petroleum products are released to the groundwater from such sources as spills and underground storage tanks. It is recommended that a DEP certified laboratory for drinking water be used for the analysis. A list of certified laboratories can be obtained from a DEP regional office or website. An annual check on the water and the well is a good idea.

After the Well is Drilled

The well owner can take precautions to prevent problems by establishing their own "wellhead protection areas." This involves keeping potential contaminants away from the well.

- Keep livestock or the family pet away from the well.
- Do not dispose of waste into basement or garage floor drains.
- Take used oil to a recycling center – Never dump it on the ground. Yes, the oil may have initially come out of the ground, but it wasn't from a drinking water well.
- Mix pesticides or paints over a sidewalk or concrete pad, away from the well; apply fertilizers and pesticides with caution.
- Be careful where you dispose of waste or where you wash equipment.
- Don't allow back-siphonage from a container or tank into a well; install a backflow preventer or keep hoses out of mixing containers or tanks.
- Properly dispose of household chemicals and refuse. Sinkholes are probably the worst place to put trash. Usually, a sinkhole is a direct connector to groundwater.
- Properly seal old abandoned wells.
- And remember, water drawn from a well most likely originated nearby as rainfall or snowmelt. Good land use practices can pay off with good water quality.

References and Sources of Information

Additional information is available electronically on DEP's website at www.dep.state.pa.us, Keyword: "DEP Private Wells" or by calling the Bureau of Water Supply and Wastewater Management at 717-783-3795.

Other References:

Bickford, T.M., Lindsey, B.D., and Beaver, M.R., 1996, *Bacteriological Quality of Ground Water Used for Household Supply, Lower Susquehanna River Basin, Pennsylvania and Maryland,* USGS Water Resources Investigations Report 96-4212. USGS (website: http://pa.water.usgs.gov/)

Fleeger, G.M., 1998, *The Geology of Pennsylvania's Groundwater*, Department of Conservation and Natural Resources, PA Topographic and Geologic Survey (website: http://www.dcnr.state.pa.us/topogeo/index.htm)

National Well Owners Association, 601 Dempsey Rd., Westerville, OH 43081; Telephone: 800-551-7379; (website: http://www.wellowner.org)

Waller, R.M., *Ground Water and the Rural Homeowner*, U.S. Geological Survey

For more information, visit DEP's website at www.dep.state.pa.us, Keyword: "DEP Drinking Water."

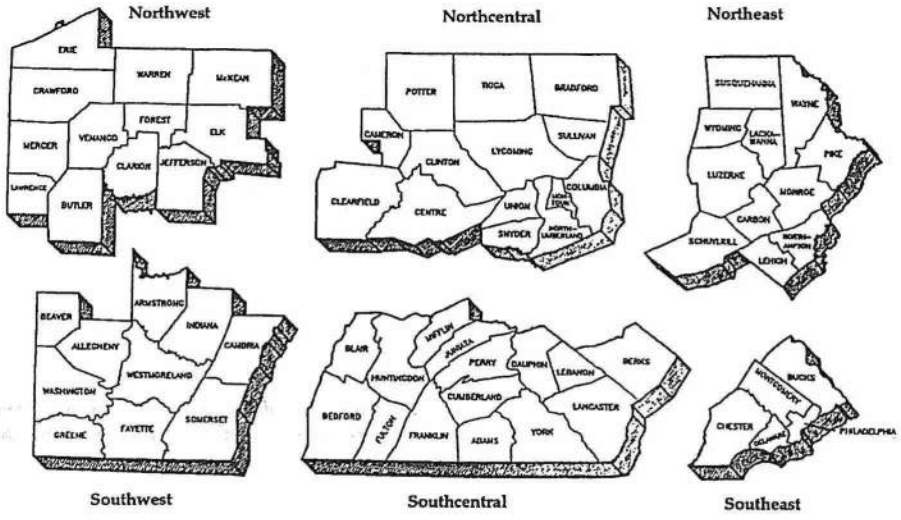
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24-Hour Emergency: 1-800-373-3398

Counties: *Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren*

Northeast Region
2 Public Square
Wilkes-Barre, PA 18711-0790
Main Telephone: 570-826-2511
24-Hour Emergency: 570-826-2511

Counties: *Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne and Wyoming*

Northcentral Region
208 W. Third St., Suite 101
Williamsport, PA 17701
Main Telephone: 570-327-3636
24-Hour Emergency: 570-327-3636

Counties: *Bradford, Cameron, Clearfield, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union*

Commonwealth of Pennsylvania
Edward G. Rendell, Governor

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Department of Environmental Protection
Kathleen A. McGinty, Secretary
3800-FS-DEP2450 Rev. 3/2004

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APPENDIX F

NEW BRITAIN TOWNSHIP SEWAGE SYSTEM MAINTENANCE AGREEMENTS

"Sewage System Maintenance Agreement for Individual Spray Irrigation Systems (IRSIS)
Alternate Systems with UV Disinfection (ALT UV Systems)
and Small flow Sewage Treatment Facilities (SFTF)"

"Sewage Maintenance Agreement for Drip Irrigation Systems"

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NEW BRITAIN TOWNSHIP
SEWAGE SYSTEM MAINTENANCE AGREEMENT
FOR INDIVIDUAL RESIDENTIAL SPRAY IRRIGATION SYTEMS (IRSIS)
ALTERNATE SYSTEMS WITH UV DISINFECTION (ALT UV SYSTEM)
AND SMALL FLOW SEWAGE TREATMENT FACILITIES (SFTF)

THIS AGREEMENT is made this **[enter date]** day of **[enter month]**, A.D., 20**[enter year]** by and between ***NEW BRITAIN TOWNSHIP***, a Township of the Second Class, with offices located at 207 Park Avenue, Chalfont, PA 18914 (hereinafter referred to as ***"Township"***) and **[enter Owner's name]** of **[enter Owner's address]** (hereinafter referred to as ***"Owner")*** and

WHEREAS, Owner warrants that it is the Owner in fee simple of a parcel of land situated in New Britain Township, Bucks County, Pennsylvania, which tract is currently unimproved, and the Owner desires to improve said property by the construction of a single-family residence, which is more particularly identified as Bucks County Tax Map Parcel No.**[enter tax map parcel #]**. The deeds of transfer are recorded at the Office of the Bucks County Recorder of Deeds in Land Record Book **[enter book #]** page **[enter page number]** and

WHEREAS, Owner is required, pursuant to the Sewage Facilities Act, 35 P.S. 750, et. Seq., (hereinafter referred to as ***"Act"***), to establish an agreement with the township to monitor compliance of the system with the Act and applicable Pennsylvania Department of Environmental Protection (***DEP***) regulations for the installation and maintenance of **[enter Residential Spray Irrigation System, Alternate System with UV Disinfection, or Small Flow Sewage Treatment Facility]**.

NOW, THEREFORE, for and in consideration of the covenants contained herein, Owner hereby covenants and agrees as follows:

1. No improvements, hereinafter referred to in connection with this Project, shall commence until **[enter Residential Spray Irrigation System, Alternate System with UV Disinfection or Small Flow Sewage Treatment Facility]** (hereinafter referred to as **[enter IRSIS, ALT UV System or SFTF]**) has been approved by the DEP and/or a permit has been issued by the Bucks County Department of Health.

2. The **[enter IRSIS, ALT UV System or SFTF]** shall be in compliance at all times with the Act and any interim or permanent rules and regulations established by DEP, the Bucks County Department of Health and the Township.

3. Once the **[enter IRSIS, ALT UV System or SFTF]** has been designed and installed by the Owner upon the property in accordance with the requirements of the Pennsylvania Department of Environmental Protection, as amended from time to time, the Owner shall retain the services of a trained service provider who shall semi-annually inspect the system and annually test the discharge of the system for fecal coliforms, 5-Day Carbonaceous Biochemical Oxygen Demand (**$CBOD_5$**), suspended solids, chlorine residual, and any other parameters as required by the Pennsylvania Department of Environmental Protection, Bucks County Department of Health and/or the Township. All sampling and testing of the discharge effluent shall be conducted by a United States Environmental Protection Agency approved laboratory. All test results and inspection reports as described above shall be submitted along with an Annual Maintenance Report form by a Trained Service Provider to the DEP, Bucks County Department of Health,

and the Township and shall be filed with the Township. The Trained Service Provider shall be an authorized manufacturer's representative, a Pennsylvania Registered Professional Engineer or other individual or company specifically approved by the Township.

4. During the first year of operation of the **[enter IRSIS, ALT UV System or SFTF]**, there shall be made an inspection, at least quarterly, by a Trained Service Provider retained by the Owner. The inspection shall include the testing and sampling of the discharge effluent, in accordance with the procedure described above, to confirm that said discharge meets or exceeds the required levels of treatment required by DEP.

5. A service contract with the Trained Service Provider shall be executed so that periodic inspections and "as needed" services are provided. A copy of the service contract shall be submitted to the Township and filed by the Township.

6. In the event that the reports prepared by the Trained Service Provider or inspections by DEP, Bucks County Department of Health or the Township indicate that repairs and/or replacement of any component part or all of the system is necessary in order to bring the system into compliance with DEP regulations, the Owner shall complete such repair and/or replacement and shall certify that the repairs and/or replacements have been made in accordance with DEP specifications within thirty (30) days of the date of the inspection report.

7. Owner contemporaneously with the execution of the Agreement shall deposit the sum of Two thousand Five Hundred Dollars ($2,500.00) (hereinafter referred to as ***"Escrow***

Fund") with the Township which shall be held by the Township to be used to monitor compliance of the system with applicable statutes and/or regulations. Should the Escrow Fund fall below the sum of Two Thousand Five Hundred Dollars ($2,500.00), Owner shall deposit sums necessary to bring the Escrow Fund to Two Thousand Five Dollars ($2,500.00) upon notice by the Township. Township shall hold the foregoing-described Escrow Fund until such time that the subject property served by the **[enter IRSIS, ALT UV System or SFTF]**, is connected to a public sewage treatment facility or other approved treatment facility.

8. Owner shall contract with a sewage hauler, licensed by the Township in accordance with the Township's Sewage Facilities Maintenance Ordinance to pump out the septic tank, aerobic tank and/or dosing tank for the **[enter IRSIS, ALT UV System or SFTF]**, once a year or whenever inspection of the septic tank, aerobic tank and/or dosing tank reveals the presence of septage and other solids is in excess of one-third (1/3) of the depth of the tank, which ever occurs first. Owner and sewage hauler shall provide documentation to the Township in accordance with the Township's Sewage Facilities Maintenance Ordinance.

9. The Township shall have the further right and privilege to sue the current property Owner for reimbursement of any Township expenses in excess of the above-described Escrow Fund or to lien the property for any such excess. Owner hereby grants to the Township the right to enter the property for the purpose of inspecting or testing the facility as is reasonably necessary to monitor the system.

10. It is expressly understood and agreed that nothing contained herein shall be construed to waive or affect or alter any requirements of the Zoning, Building, Land Development or Subdivision Ordinances or other Ordinances of the Township and nothing contained herein empowers any Township officer or employee to waive any requirements of such Ordinances.

11. During any period of time when the system is inoperable and/or incapable of treating the discharge effluent in compliance with DEP standards, Owner shall arrange for the disposition of all effluent by a certified and licensed sewage disposal facility. Owner shall provide the Township with a signed agreement with the licensed hauler providing for such removal. Owner shall continue hauling such effluent until such time as the system has been properly repaired and/or replaced as certified by DEP or the Bucks County Department of Health. In the event that the system is inoperable or incapable of treating this discharge effluent for a period in excess of sixty (60) days, the property Owner shall be required to vacate said property until the system has been replaced or repaired and any and all occupancy permits issued by the Township for said property shall be deemed to be revoked.

12. It is expressly agreed that this Agreement shall be recorded in the Office of the Recorder of Deeds of Bucks County and all terms and conditions of the Agreement shall be binding upon Owner, Owner's heirs, administrators, successors and assigns, and any party acquiring title to said site covered by the Agreement shall assume all of the duties and obligations set forth in this Agreement.

13. Owner, Owner's heirs, administrators, successors and assigns shall at all times hold the Township harmless from any claims, suits, legal expenses or judgments which any adjoining property owners may bring against the Township or against the Township officials and employees and against the Owner or any of its successor property owners for any conditions occurring on the adjacent property as a result of the development of Owner's tract with the **[enter IRSIS, ALT UV System or SFTF]**. Owner further agrees that Owner, Owner's heirs, administrators, successors and assigns will reimburse the Township for any expenses which the Township has incurred including legal fees, engineering fees, expert witness fees and any judgments rendered against the Township as a result of claims filed or brought against the Township, its officers or employees, by anyone as a result of conditions arising because of the development of the **[enter IRSIS, ALT UV System or SFTF]**.

14. Owner shall reimburse the Township for the cost of the preparation of this Agreement, the cost of recording this Agreement and any costs and expenses of any consultants incurred in the review, filing and processing of Owner's proposal for the **[enter IRSIS, ALT UV System or SFTF]**.

IN WITNESS WHEREOF, the parties hereto, intending to be legally bound, have hereunto set their hands and seals the day and year first above written.

WITNESS:

_____ _____

[enter Witnesses's name] **[enter Owner's name]**

NEW BRITAIN TOWNSHIP
SEWAGE SYSTEM MAINTENANCE AGREEMENT
(Signatures Continued)

NEW BRITAIN TOWNSHIP
BOARD OF SUPERVISORS

_____
Dr. Robert J. Piccone, Chairman

_____
John A. Bodden, Sr., Vice-Chairman

_____
Robert V. Cotton, Member

_____
William B. Jones, Member

_____
Helen B. Haun, Member

ATTEST:

_____
John Cornelius, Manager

ACKNOWLEDGEMENTS

By Individual

STATE OF PENNSYLVANIA:

: SS.

COUNTY OF BUCKS

On this **[enter day]** day of **[enter month]**., A.D., 20**[enter year]**, before me, a Notary Public in and for the County of Bucks, Commonwealth of Pennsylvania, the undersigned officer, personally appeared **[enter Owner's name(s)]**, known to me, (or satisfactorily proven) to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged, that he/she executed the same for the purpose therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____ (SEAL)
Notary Public

ACKNOWLEDGEMENTS

By Township

COMMONWEALTH OF PENNSYLVANIA:
: SS.
COUNTY OF BUCKS

On this **[enter day]** day of **[enter month]**., A.D., 20**[enter year]**, before me, a Notary Public in and for the County of Bucks, Commonwealth of Pennsylvania, the undersigned officer, personally appeared **[enter Township Supervisor's name(s)]**, who acknowledged that they are the Supervisors of New Britain Township, and as such, being authorized to do so, executed the foregoing instrument on its behalf for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____ (SEAL)
Notary Public

NEW BRITAIN TOWNSHIP
SEWAGE SYSTEM MAINTENANCE AGREEMENT
FOR DRIP IRRIGATION SYTEMS

THIS AGREEMENT is made this **[enter date]** day of **[enter month]**, A.D., 20**[enter year]** by and between ***NEW BRITAIN TOWNSHIP***, a Township of the Second Class, with offices located at 207 Park Avenue, Chalfont, PA 18914 (hereinafter referred to as ***"Township"***) and **[enter Owner's name]** of **[enter Owner's address]** (hereinafter referred to as ***"Owner")*** and

WHEREAS, Owner warrants that it is the Owner in fee simple of a parcel of land situated in New Britain Township, Bucks County, Pennsylvania, which tract is currently unimproved, and the Owner desires to improve said property by the construction of a single-family residence, which is more particularly identified as Bucks County Tax Map Parcel No.**[enter tax map parcel #]**. The deeds of transfer are recorded at the Office of the Bucks County Recorder of Deeds in Land Record Book **[enter book #]** page **[enter page number]** and

WHEREAS, Owner is required, pursuant to the Sewage Facilities Act, 35 P.S. 750, et. Seq., (hereinafter referred to as ***"Act"***), to establish an agreement with the township to monitor compliance of the system with the Act and applicable Pennsylvania Department of Environmental Protection (***DEP***) regulations for the installation and maintenance of a **Drip Irrigation System**.

NOW, THEREFORE, for and in consideration of the covenants contained herein, Owner hereby covenants and agrees as follows:

1. No improvements, hereinafter referred to in connection with this Project, shall commence until the **Drip Irrigation System** has been approved by the Township, DEP and/or a permit has been issued by the Bucks County Department of Health.

2. The **Drip Irrigation System** shall be in compliance at all times with the Act and any interim or permanent rules and regulations established by the Township, DEP, the Bucks County Department of Health, and the Township.

3. Once the **Drip Irrigation System** has been designed and installed by the Owner upon the property in accordance with the requirements of the Pennsylvania Department of Environmental Protection, as amended from time to time, the Owner shall meet with a Trained Service Provider, the Registered Professional Engineer who designed the system, and Township Representative within one month of system start-up and/or occupancy of the dwelling to explain the operation and maintenance of the system and provide an operation and maintenance manual which shall include locations of all parts of the system and an explanation of the automatic alarm system. The Trained Service Provider shall be an authorized manufacturer's representative, a Pennsylvania Registered Professional Engineer, or other individual or company specifically approved by the Township, who is contacted by the Owner to maintain the Drip Irrigation System.

4. At no time shall the Owner be allowed to disturb the drip zones (i.e. excavation for trees, fencing, etc.). Drip zone areas shall be restricted from any type of construction or development.

5. The Owner shall provide a statement requiring that both the manufacturer's representative and the Owner's Trained Service Provider be contacted if the alarm system is activated. A copy of the statement shall be submitted to the Township and filed by the Township. The Owner shall also submit to the Township a copy of the manufacturer's 2-year warranty as required by the PADEP.

6. After system start-up, the Owner shall retain the services of a Trained Service Provider who shall inspect the system at least quarterly in the first year of operation and annually thereafter, or more frequently as recommended or required by DEP, the manufacturer's representative, or the Township. An inspection report shall be submitted by the Trained Service Provider to the DEP, Bucks County Department of Health, the Township within 7 days after each system inspection, and shall be filed with the Township.

7. A service contract with the Trained Service Provider shall be executed so that periodic inspections and "as needed" services are provided. A copy of the service contract shall be submitted to the Township and filed by the Township.

8. In the event that the reports prepared by the Trained Service Provider or inspections by DEP, Bucks County Department of Health or the Township indicate that repairs and/or replacement of any component part or all of the system is necessary in order to bring the system into compliance with DEP regulations, the Owner shall complete such repair and/or replacement and shall certify that the repairs and/or replacements have been made in accordance with DEP specifications within thirty (30) days of the date of the inspection report.

9. Owner contemporaneously with the execution of the Agreement shall deposit the sum of Two thousand Five Hundred Dollars ($2,500.00) (hereinafter referred to as ***"Escrow Fund"***) with the Township which shall be held by the Township to be used to monitor compliance of the system with applicable statutes and/or regulations. Should the Escrow Fund fall below the sum of Two Thousand Five Hundred Dollars ($2,500.00), Owner shall deposit sums necessary to bring the Escrow Fund to Two Thousand Five Dollars ($2,500.00) upon notice by the Township. Township shall hold the foregoing-described Escrow Fund until such time that the subject property served by the **Drip Irrigation System**, is connected to a public sewage treatment facility or other approved treatment facility.

10. Owner shall contract with a sewage hauler, licensed by the Township in accordance with the Township's Sewage Facilities Maintenance Ordinance, to pump out septic tank(s) or aerobic tank for the **Drip Irrigation System**, once a year or whenever inspection of the septic tank(s) or aerobic tanks reveals the presence of septage and other solids is in excess of one-third (1/3) of the depth of the tank, which ever occurs first. Owner and Sewage Hauler shall provide documentation to the Township in accordance with the Township's Sewage Facilities Maintenance Ordinance.

11. The Township shall have the further right and privilege to sue the current property Owner for reimbursement of any Township expenses in excess of the above-described Escrow Fund or to lien the property for any such excess. Owner hereby grants to the Township the right to enter the property for the purpose of inspecting or testing the facility as is reasonably necessary to monitor the system.

12. It is expressly understood and agreed that nothing contained herein shall be construed to waive or affect or alter any requirements of the Zoning, Building, Land Development or Subdivision Ordinances or other Ordinances of the Township and nothing contained herein empowers any Township officer or employee to waive any requirements of such Ordinances.

13. During any period of time when the system is inoperable and/or incapable of treating the discharge effluent in compliance with DEP standards, Owner shall arrange for the disposition of all effluent by a certified and licensed sewage disposal facility. Owner shall provide the Township with a signed agreement with the licensed hauler providing for such removal. Owner shall continue hauling such effluent until such time as the system has been properly repaired and/or replaced as certified by DEP or the Bucks County Department of Health. In the event that the system is inoperable or incapable of treating this discharge effluent for a period in excess of sixty (60) days, the property Owner shall be required to vacate said property until the system has been replaced or repaired and any and all occupancy permits issued by the Township for said property shall be deemed to be revoked.

14. It is expressly agreed that this Agreement shall be recorded in the Office of the Recorder of Deeds of Bucks County and all terms and conditions of the Agreement shall be binding upon Owner, Owner's heirs, administrators, successors and assigns, and any party acquiring title to said site covered by the Agreement shall assume all of the duties and obligations set forth in this Agreement.

15. Owner, Owner's heirs, administrators, successors and assigns shall at all times hold the Township harmless from any claims, suits, legal expenses or judgments which any adjoining property owners may bring against the Township or against the Township officials and employees and against the Owner or any of its successor property owners for any conditions occurring on the adjacent property as a result of the development of Owner's tract with the **Drip Irrigation System**. Owner further agrees that Owner, Owner's heirs, administrators, successors and assigns will reimburse the Township for any expenses which the Township has incurred including legal fees, engineering fees, expert witness fees and any judgments rendered against the Township as a result of claims filed or brought against the Township, its officers or employees, by anyone as a result of conditions arising because of the development of the **Drip Irrigation System**.

16. Owner shall reimburse the Township for the cost of the preparation of this Agreement, the cost of recording this Agreement and any costs and expenses of any consultants incurred in the review, filing and processing of Owner's proposal for the **Drip Irrigation System**.

IN WITNESS WHEREOF, the parties hereto, intending to be legally bound, have hereunto set their hands and seals the day and year first above written.

WITNESS:

_____ _____

[enter Witnesses's name] **[enter Owner's name]**

NEW BRITAIN TOWNSHIP
SEWAGE SYSTEM MAINTENANCE AGREEMENT
(Signatures Continued)

NEW BRITAIN TOWNSHIP
BOARD OF SUPERVISORS

_____
Dr. Robert J. Piccone, Chairman

_____
John A. Bodden, Sr., Vice-Chairman

_____
Robert V. Cotton, Member

_____
William B. Jones, Member

_____
Helen B. Haun, Member

ATTEST:

_____
John Cornelius, Manager

ACKNOWLEDGEMENTS

By Individual
STATE OF PENNSYLVANIA:

: SS.

COUNTY OF BUCKS

On this **[enter day]** day of **[enter month]**., A.D., 20**[enter year]**, before me, a Notary Public in and for the County of Bucks, Commonwealth of Pennsylvania, the undersigned officer, personally appeared **[enter Owner's name(s)]**, known to me, (or satisfactorily proven) to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged, that he/she executed the same for the purpose therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____ (SEAL)
Notary Public

ACKNOWLEDGEMENTS

By Township
COMMONWEALTH OF PENNSYLVANIA:
: SS.
COUNTY OF BUCKS

On this **[enter day]** day of **[enter month]**., A.D., 20**[enter year]**, before me, a Notary Public in and for the County of Bucks, Commonwealth of Pennsylvania, the undersigned officer, personally appeared **[enter Township Supervisor's name(s)]**, who acknowledged that they are the Supervisors of New Britain Township, and as such, being authorized to do so, executed the foregoing instrument on its behalf for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____ (SEAL)
Notary Public

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APPENDIX G

NEW BRITAIN TOWNSHIP ORDINANCE NO. ____,

ESTABLISHING A SEWAGE FACILITIES MAINTENANCE PROGRAM

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DRAFT - October, 2004
NEW BRITAIN TOWNSHIP

ORDINANCE NO. ____ 2004

AN ORDINANCE OF NEW BRITAIN TOWNSHIP OF BUCKS COUNTY, PENNSYLVANIA, ESTABLISHING A SEWAGE FACILITIES MAINTENANCE PROGRAM PURSUANT TO AND IN IMPLEMENTATION OF ITS OFFICIAL SEWAGE FACILITIES PLAN.

WHEREAS, New Britain Township, Bucks County, Pennsylvania (hereinafter "Township") has previously enacted a Sewage Facilities Plan for the Township pursuant to the Pennsylvania Sewage Facilities Act, commonly known as Act 537, 35 P.S. §750.1 *et seq.* ("Act 537");

WHEREAS, Pennsylvania second class townships, in accordance with the Second Class Township Code, 53 P.S. §66522, are authorized to enact ordinances regulating individual and community sewage treatment facilities pursuant to Act 537;

WHEREAS, the Township, as a second class township, amended its subdivision and land development ordinance by Ordinance No. 2002-05-02 of 2002 to incorporate relevant portions of the Township's Act 537 Sewage Facilities Plan;

WHEREAS, the Board of Supervisors of the Township deems it in the best interest of the Township to establish a Sewage Facilities Maintenance Program pursuant to its Act 537 Sewage Facilities Plan to assure proper operation and maintenance of certain sewage facilities located within the Township;

WHEREAS, said program is intended to promote, protect and facilitate the public health, safety and general welfare of the residents of the Township.

NOW THEREFORE, BE IT ORDAINED AND ENACTED, by the Board of Supervisors of New Britain Township, Bucks County, Pennsylvania as follows:

Section 1 - Purpose

The purpose of this ordinance is to establish a Sewage Facilities Maintenance Program under the authority of New Britain Township to regulate, inspect, and assure maintenance and proper operation of all existing and future sewage facilities permitted within the Township except those served by either the Chalfont-New Britain Township Joint Sewerage Authority (CNBTJSA) or Bucks County Water and Sewer Authority (BCW&SA), and to authorize charges for rendering such services pursuant to the statutory authority of the New Britain Township Board of Supervisors.

Section 2 - Definitions

A. "Authorized Agent" - A licensed Sewage Enforcement Officer (SEO), Professional Engineer or sanitarian, plumbing inspector, soils scientist, or any other qualified or licensed person who is delegated to function within the specified limits as the agent of New Britain Township to carry out the provisions of this ordinance.

B. "Alternate or Experimental Sewage System" - An individual or community sewage system which disposes of sewage utilizing systems and technologies acceptable to the Pennsylvania Department of Environmental Protection (DEP), as identified in DEP Publication No. 362-0300-007, entitled, Alternate Systems Guidance, revised February, 2004, or latest revision thereof, and DEP Publication No. 362-0300-008, entitled, Experimental Systems Guidance, revised July 29, 2003, or latest revised thereof.

C. "Cesspool" - A lined and covered excavation in the ground which receives the discharge of domestic sewage or other organic wastes from a drainage system, so designed as to retain the organic matter and solids, but permitting the liquids to seep through the bottom and sides. (This type of treatment system is no longer approved by the DEP for new installations.)

D. "Community Sewage System" - a sewage facility, whether publicly or privately owned, for the collection of sewage from two or more equivalent dwelling units (800 gpd) and the treatment or disposal, or both, of the sewage on one or more of the lots or at another site.

E. "Community On-Lot Sewage System" - a community sewage system which uses a system of piping, tanks or other facilities for collecting, treating and disposing of sewage into a subsurface soil absorption area or retaining tank.

F. "Domestic Type Sewage" - the liquid or solid removed from a septic tank, cesspool, portable toilet, community on-lot sewage system, alternate or experimental sewage system or small flow treatment facility (SFTF) which is generated from a single family dwelling, community sewage system, apartment, or rooming house and is a sewage type having domestic wastewater characteristics consistent with the DEP Alternate Systems Guidance for each aforementioned on-lot sewage disposal system.

G. "Individual On-Lot Sewage System" - an individual sewage system which uses a system of piping, tanks or other facilities for collecting, treating and disposing of sewage flow, not to exceed one (1) Equivalent Dwelling Unit (400 gallons per day), into a subsurface absorption area or a retaining tank.

H. "Individual Sewage System" - a sewage facility, whether publicly or privately owned, located on a single lot and serving one equivalent dwelling unit and collecting, treating and disposing of sewage in whole or in part into the soil or into waters of this Commonwealth or by means of conveyance of retaining tank wastes to another site for final disposal.

I. "Individual Residential Spray Irrigation System" (IRSIS) - An Individual Sewage System which serves a single dwelling and which treats and disposes of sewage using a system of piping, treatment tanks and soil renovation through spray irrigation.

J. "Owner" - Any natural person, corporation, partnership or other entity holding legal or equitable title to real property within the Township.

K. "Septage" - Liquid and solid material pumped from a septic tank, cesspool, or similar domestic sewage treatment system, or a holding tank, when the system is cleaned or maintained.

L. "Sewage Enforcement Officer (SEO)" - A person certified by the Pennsylvania Department of Environmental Protection in accordance with Pennsylvania Code, Title 25, Chapter 71, Administration of Sewage Facilities Planning Program, §71.1 to, among other duties, review permit applications, perform percolation tests, make site and soil evaluations, and issue sewage permits for on-lot disposal systems.

M. "Sewage Facilities" - a system of sewage collection, conveyance, treatment and disposal which will prevent the discharge of untreated or inadequately treated sewage or other waste into waters of this Commonwealth or otherwise provide for the safe and sanitary treatment and disposal of sewage or other waste.

N. "Sewage Waste Hauler" - A person, corporation or other entity that is licensed by the DEP and the Bucks County Department of Health and approved by New Britain Township to remove and transport sewage waste in DEP approved vehicles to DEP approved disposal facilities.

O. "Small Flow Treatment Facility" (SFTF) - An Individual or Community Sewage System designed to adequately treat sewage flows not greater than 2,000 gallons per day (gpd) for final disposal using a stream discharge or other method approved by the Pennsylvania Department of Environmental Protection.

P. "Township" - New Britain Township, Bucks County, Pennsylvania.

Q. "Treatment Tank" - A water-tight tank designed to retain sewage long enough for satisfactory bacterial decomposition of the solids to take place. The term includes the following:

1. "Septic Tank" - A treatment tank that provides for anaerobic decomposition of sewage prior to its discharge to an absorption area or other treatment unit.

2. "Aerobic Tank" - A mechanically aerated treatment tank that provides aerobic biochemical stabilization of sewage prior to its discharge to an absorption area or other treatment unit.

R. "Waters of this Commonwealth" - Rivers, streams, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, ponds, springs and other bodies or channels of conveyance of surface and underground water, or of their parts, whether natural or artificial, within or on the boundaries of this Commonwealth.

All other definitions of words and terms used in this ordinance shall have the same meaning as set forth in Pennsylvania Code, Title 25, Chapter 73 entitled Standards for On-Lot Sewage Treatment Facilities.

Section 3 - Responsibility for Compliance.

The responsibility for compliance with this ordinance, including the responsibility to arrange and pay for a Township Approved Sewage Waste Hauler to pump septic tanks, and/or cesspools, and pay for inspection of sewage facilities by an Authorized Agent, and to perform maintenance or repairs to sewage facilities, shall be with the Owner of any property serviced by sewage facilities within the Township, excluding those Owners of properties serviced by either the CNBTJSA or BCW&SA.

Owners of property serviced by any or all of the following types of sewage disposal systems shall also be regulated under this ordinance, unless site specific maintenance agreements with New Britain Township are in effect, in which case the site specific agreement shall supercede this ordinance:

Alternate or Experimental Sewage Systems
Small Flow Treatment Facilities
Individual Residential Spray Irrigation Systems
Community On-Lot Sewage Systems
Community Spray Irrigation Systems

Section 4 - Pumping and Inspection of Tanks and Cesspools.

1. All Owner(s) of property served by septic tanks, cesspools and pump tanks that serve one residential dwelling shall obtain the services of a Township Approved Sewage Waste Hauler to pump said tanks and cesspools within one (1) year of receipt of notification from New Britain Township and every three (3) years thereafter. The Owner may obtain the List of Township Approved Sewage Waste Haulers by contacting the New Britain Township Secretary. The List of Township Approved Sewage Waste Haulers will also be included with letter notifying the Owner of required service.

The Owner shall allow the Authorized Agent to be present and to perform an inspection of sewage facilities during the time the Township Approved Sewage Waste Hauler is removing septage and sewage waste from tanks and facilities at the property. The Hauler must therefore provide sufficient notification to the Authorized Agent by contacting the New Britain Township Secretary 72 hours or more prior to the scheduled service. All Owners of property served by septic tanks, cesspools and pump tanks which serve community on lot sewage systems, community spray irrigation systems, community small flow treatment facilities, or any other sewage facilities serving commercial, industrial or institutional establishments shall obtain the services of a Township Approved Sewage Waste Hauler to pump said tanks, treatment systems and facilities at least once each year. The Owner may obtain the List of Township Approved Sewage Waste Haulers by contacting the New Britain Township Secretary. In the case of community systems as mentioned above, where multiple Owners have a joint interest and responsibility for maintenance, they shall authorize and designate in writing to the Township, a single person, homeowner's association officer or corporate officer to represent them in carrying out their responsibilities under this Section and in taking any actions on their behalf as required under this Ordinance. The Owner or Owner's representative, whichever applies, shall allow the Authorized Agent to be present and to perform an inspection of sewage facilities during the time the Township Approved Sewage Waste Hauler is removing septage and sewage waste from tanks and facilities at the property. The Owner or Owner's representative must therefore provide sufficient

notification to the Authorized Agent of the date and time scheduled for pumping by contacting the New Britain Township Secretary, 72 hours or more prior to the scheduled service.

The Owner of the residential disposal system or the Owner(s) or designated representative of commercial or community treatment and disposal systems must be present at the time the system is pumped in order to sign the Proof of Compliance Receipt described in Section 5 and to answer any questions from either the hauler or the Authorized Agent regarding his or her knowledge of the existing system as well as to allow access to the interior of structures, upon consent of the Owner, for the purpose of establishing the location of building sewers and treatment tanks.

If the Owner will not be present during pumping he must arrange with the Authorized Agent to sign the receipt.

The requirement to pump within one (1) year of the effective date of this ordinance may be waived for Owners owning property with septic tanks, cesspools and/or pump tanks serving one residential dwelling who provide the Township with a receipt demonstrating that their septic tanks, cesspools and pump tanks have been pumped within three (3) years prior to the effective date of this ordinance provided that the frequency of future pumping is not less frequent than one time every three (3) years.

2. A Sewage Waste Hauler shall be considered Township Approved if the hauler is on the List of Township Approved Sewage Waste Haulers.

3. Sewage Waste Haulers wishing to be listed as Township Approved must submit an application with the Township, renewable yearly, supplying company information and in which the hauler agrees to provide the information required by this Ordinance and to cooperate fully with the Authorized Agent. The Sewage Waste Hauler shall be removed from the Township Approved List of Township Approved Sewage Waste Haulers if his or her Bucks County Department of Health license to pump and transport liquid waste is revoked or suspended, or if the Waste Hauler fails to cooperate with the Township Authorized agent in providing Proof of Compliance Receipts or in the implementation of this Ordinance.

4. The Township will notify the Sewage Waste Haulers on the Bucks County list of haulers that they are required to register with the township upon enactment of this Ordinance.

Section 5 - Proof of Compliance

Every time a septic tank, cesspool or other subsurface waste disposal system tank is pumped out, the Township Approved Sewage Waste Hauler shall provide to the Authorized Agent and property Owner a signed receipt containing the following information:

Provided by Owner:

1. Name and address (with property tax parcel number provided by the Township in notification letter) of system Owner.
2. Address (with property tax parcel number) of tank location if different than that of Owner.

Provided by Hauler:

1. Description and diagram of location of all tanks, distribution boxes, pump tanks and disposal fields, including location of any markers, risers, and access hatches. Where buildings or other permanent structures are located within 100 feet of these features, reference measurements must be provided from two corners of the building or structure to the tank, distribution box and disposal field.
2. Size of any septic tank(s), cesspool(s) and pump tank(s)
3. Age of the system and condition of the tanks, tank baffles, and other system appurtenances.
4. Last date of pump out
5. List of any maintenance performed and any maintenance or repairs recommended.
6. Any indication of system malfunction
7. Amount of septage or other solid or semi-solid material removed
8. Cost of pumping service
9. Name, address and signature of licensed sewage waste hauler performing the work, and license number permitting hauler to collect and haul septage in Pennsylvania.
10. New Britain Township Waste Haulers authorization number.

Where any of the above information is not available or is unknown by the sewage waste hauler, a statement indicating this shall be provided.

The receipt that is provided to the Authorized Agent shall also be signed by the Owner or designated Owner's representative and shall certify that to the best of his or her knowledge the septage does not contain any of the substances listed below in Section 6. The receipt shall be submitted to the Authorized Agent at the time of completion of pumping as proof of compliance with the requirements of this ordinance. If the Authorized Agent is not present at the site to receive the receipt, the Owner or designated Owner's representative shall mail or deliver the receipt personally to the New Britain Township Secretary within 7 days of completion of the pumping. The Owner shall retain a copy of the receipt.

Section 6 - Permitted and Prohibited Discharge

Only domestic type sewage shall be discharged into a sewage system, unless otherwise specifically permitted in writing by the Township.

A. The following waste shall not be discharged into any Individual On-Lot Sewage System, Individual Residential Spray Irrigation System, Small Flow Treatment Facility serving an individual residence or any Alternate or Experimental Sewage System serving an individual residence:

1. Fats, greases, and garbage grindings from non-residential uses, automobile oil, or other petroleum products.

2. Toxic or hazardous substances

B. The following waste shall not be discharged into any Community On-Lot Sewage System, Community Spray Irrigation System, Community Small Flow Treatment Facility or to any other sewage facilities serving Commercial, Industrial or Institutional establishments, unless specifically permitted in writing by the Township:

1. Oils and grease of animal or vegetable origin, as measured by EPA test method 1664, in concentrations greater than 100 mg/l (this is typical domestic wastewater concentration).

2. Oils and greases in the form of Total Petroleum Hydrocarbons, as measured by EPA test method 1664, in concentrations greater than the Method Detection Limit (MDL) as specified for that test method in 40 CFR Park 136.

3. Volatile Organic and Semi Volatile Organic chemicals, including PCB's and Pesticides, in amounts in excess of Method Detection Limits (MDLs) as specified in 40 CFR Part 136.

4. Toxic or hazardous substances

The Operators of community systems are required to notify Homeowners of the above listed restrictions.

Section 7 - Right of Entry

Pursuant to Act 537, 35 P.S. §750.8.(b)(5), employees and authorized agents of the Township shall, upon presentation of proper identification be permitted to enter onto all properties (not including the interior of residential buildings without the consent of the Owner(s) or a validly executed search warrant) for the purpose of inspection, observation, sampling, dye trace testing, maintenance or rehabilitation of sewage facilities in accordance with the provisions of this ordinance.

This right of entry shall include the right to excavate any part of the property to inspect, maintain, or alter any component of any sewage facilities or to sample soils, water, wastewater or septage. Upon completion of such excavation, the Township or its authorized agent shall return the land to its former condition as soon as possible provided no further maintenance repair or other work is required.

Section 8 - Inspection, Maintenance and Repairs

A. The property Owner shall make sewage facilities accessible for inspection by the Township or its Authorized Agent upon the effective date of this ordinance. Inspections may be performed to determine whether or not sewage facilities are operating properly whenever the Owner or Owner's designated representative contracts with a Township Approved Sewage Waste Hauler to pump the contents of sewage facilities, whenever the Township or its Authorized Agent reasonably suspects that any sewage facilities are malfunctioning, are being maintained improperly, or are causing a nuisance, water pollution or health hazard, or if the Owner has failed to comply with Sections 4 or 5 of this ordinance. These inspections may occur at any time and may include the pumping and removal of sewage from tanks and related sewage facilities using a Township Approved Sewage Waste Hauler, uncovering and inspection of septic tanks, cesspools, aerobic tanks, disposal fields, distribution boxes and any other component of the subject sewage facilities and system. Inspections may include dye trace testing, sampling of soils in and around the disposal field, sampling of wastewater out of the septic tank, aerobic tank or cesspool, sampling of wastewater out of portions of the disposal system downstream of the septic tank, aerobic tank or cesspool, sampling of surface water on or adjacent to the property, and sampling of ground water from active or inactive wells used for a potable water supply or from monitoring wells in and around disposal fields.

B. The Township may increase the frequency of inspections described above in Section 8.A: 1) if the sewage facilities are presently malfunctioning, 2) if a regular inspection reveals a malfunctioning system, 3) if the sewage facilities have malfunctioned in the past, 4) if frequent tank pump out is required, 5) if seasonal use will significantly increase use of the sewage facilities, 6) if the number of people using the sewage facilities increases, and 7) for other good cause shown. The sewage facilities are malfunctioning when they cause or threaten to cause pollution to the ground or surface waters, contamination of private or public drinking water supplies, nuisance problems, or a hazard to public health. Indications of malfunctioning sewage facilities are evidenced by, but are not limited to, foul odors, lush grass growing over the system, backup of wastewater in the attached buildings, soggy ground over the system and surfacing sewage effluent flowing over the ground.

C. A copy of any Township inspection report shall be furnished to the Owner and among other information, shall contain the following:

1. Date of inspection.
2. Name and address of system Owner.
3. Description and diagram of the location (including tax parcel number of the subject property).
4. Size of tanks and disposal fields.
5. Users.
6. Indication of system malfunction observed.
7. Results of any and all soils, water and dye trace tests.
8. Any remedial action required.

D. When a system is found by the Township to require maintenance or repair, based on recommendations of an inspection by the Township Authorized Agent , then the Owner shall proceed with said recommended maintenance or repair after obtaining necessary permits from the Bucks County Department of Health Sewage Enforcement Officer in compliance with Pennsylvania Code Title 25, Chapter 73. The Owner shall submit all permit applications and shall obtain a permit for said

maintenance or repair within 30 days of notification from the Township to do so. The Owner shall complete the required maintenance or repair as prescribed by the Township and approved by the Health Department within thirty (30) days of permit issuance or if no permit is required, within 30 days of written notification by the Township. If the Owner fails to complete the required repairs or maintenance, then the Township or its authorized agent may, but shall not be obligated to, obtain the necessary permits and undertake the required maintenance or repair and assess the Owner for any costs incurred. The Owner may submit a written request to the Township for an additional 30 days to complete the necessary maintenance or repair if weather conditions or any other unusual event prohibits completion.

In no case shall the above established administrative procedures excuse the property Owner from immediate and continuing responsibility to protect surface and/or ground water from pollution associated with sewage disposal system malfunctions, nor shall any part of this ordinance be used to justify noncompliance with all other existing or future County, State and Federal environmental regulations.

Section 9 - Charges and Liens

Charges for services rendered by the Township or its Authorized Agent under this ordinance will be established from time to time by Resolution of the Township Board of Supervisors. Charges for the service(s) performed by the Township or it's Authorized Agent shall be paid by the Owner within thirty (30) days of billing by the Township. Unpaid charges shall constitute a lien against the property and may be collected by the Township by its use of any and all legal remedies, including those at law and in equity.

Section 10 - Personnel

The Township may employ, directly or by contract, professional engineers, soil scientists, private laboratories, sewage enforcement officers, technicians, sewage waste haulers, inspectors, or other personnel as needed to enforce and perform services related to this ordinance.

Section 11- Penalties

Any Owner who violates any section of this ordinance shall, upon conviction thereof by summary proceeding, be subject to a fine not to exceed one thousand ($1,000.00) dollars. Each day a violation continues, and each section of this ordinance violated, shall constitute a separate offense.

Section 12 - Severability

The provisions of this ordinance shall be severable, and if any provisions hereof shall be held to be unconstitutional, invalid or illegal by any court of component jurisdiction, such decision shall not affect the validity of any of the remaining provisions of this ordinance. It is hereby declared as legislative intent that this ordinance would have been enacted had such unconstitutional, invalid or illegal provisions not been included herein.

Section 13 - Effective Date

This Ordinance shall be effective five (5) days after enactment.

ENACTED AND ORDAINED into an Ordinance this _____ day of _____, 20____ by the Supervisors of New Britain Township, Bucks County, Pennsylvania.

ATTEST:

BOARD OF SUPERVISORS
NEW BRITAIN TOWNSHIP

_____
Secretary

_____
Chairperson

_____
Vice Chairperson

_____
Member

APPENDIX H

BUCKS COUNTY DEPARTMENT OF HEALTH

LICENSED SEWAGE SLUDGE HAULERS

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TABLE___
BUCKS COUNTY DEPARTMENT OF HEALTH
LICENSED SEWAGE SLUDGE HAULERS

HAULER NAME	ADDRESS	PHONE
A Royal Flush, Inc.	101 Wayside Court Delran, NJ 08075	(877) 769-2535
ACE Disposal	1133 Valley Hill Road Malvern, PA 19355	(610) 644-3685
Allstate Septic Systems	5167 Berry Hollow Road Bangor, PA 19355	(610) 498-4547
B & C Septic Service	305 Three Mile Run Road Sellersville, PA 18960	(215) 257-8544
Bob Drayton, Inc.	151 Big Hill Road Southampton, NJ 08088	(609) 859-3629
Borough of Ambler	122 East Butler Avenue Ambler, PA 19002	(215) 646-1000
Brad S. Nicholas	25 Brandon Way Kintnersville, PA 18930	(610) 847-2555
Bucks County Water & Sewer	1275 Almshouse Road Warrington, PA 18976	(215) 343-2538
Chalfont-New Britain Township	1645 Upper State Road Doylestown, PA 18901	(215) 345-1225
Charles M. Perna, Inc.	60 Schoolhouse Road Souderton, PA 18964	(215) 799-2200
Childs Instant Homes, Inc, D/B/A L	861 East Butler Avenue Doylestown, PA 18901	(215) 345-1271
Clarence Pursell	1247 Bridgeton Hill Road Upper Black Eddy, PA 18972	(610) 982-5019
Dan Tedesco	312 North West End Blvd Quakertown, PA 18951	(215) 536-0922
Daniel Kiriposki	130 East Station Avenue Coopersburg, PA 18036	(610) 282-3780

TABLE___
BUCKS COUNTY DEPARTMENT OF HEALTH
LICENSED SEWAGE SLUDGE HAULERS

HAULER NAME	ADDRESS	PHONE
Earth America DBA	223 Fellowship Road Eagle, PA 19480	(888) 984-1000
Emma Robertson	169 Smithtown Road Pipersville, PA 18947	(215) 297-0299
Ferrero & Young, Inc.	P.O. Box 962 Blue Bell, PA 19422	(610) 630-9181
Franc Environmental	P.O. Box 5098 New Britain, PA 18901	(215) 997-0920
Gary's Septic Service	Box 333, 7045 Easton Road Pipersville, PA 18947	(215) 766-1913
George C. Allen & Son, Inc.	4375 County Line Road Colmar, PA 18915	(215) 997-3299
George Curtin	2430 Edgely Avenue Levittown, PA 19057	(215) 946-4832
Green Top Park, Inc.	107 Green Top Road Sellersville, PA 18960	(215) 257-3104
J.H. Freed, Inc.	115 Allentown Road Elroy, PA 18964	(215) 723-2426
Jesse Baro, Inc.	4 Quarry Road Douglassville, PA 19518	(610) 323-8783
John D. Slifer	1443 Farmington Avenue Pottstown, PA 19464	(610) 323-0206
Johnny On The Spot	Box 753 Columbus OH, 43216	(215) 724-2660
J.H. Freed, Inc.	115 Allentown Road Elroy, PA 18964	(215) 723-2426
Kiriposki & Sons, Inc.	5447 Blue Church Road Coopersburg, PA 18036	(610) 434-1817

TABLE___
BUCKS COUNTY DEPARTMENT OF HEALTH
LICENSED SEWAGE SLUDGE HAULERS

HAULER NAME	ADDRESS	PHONE
Lewis Weiser, Jr.	23 Trevose Road Trevose, PA 19053	(215) 357-0963
Luken Septic Tank Service	102 James Street Quakertown, PA 18951	(215) 536-9089
Mercer County Improvement Authority	640 South Broad Street P.O. Box 8068 Trenton, NJ 08650	(609) 695-1200
Michael J. Horvath	1320 Black Rock Road Phoenixville, PA 19460	(610) 933-2068
Modern Disposal Service	1393 Zimmerman Lane Langhorne, PA 19047	(215) 946-4400
National Construction Rentals	15319 Chatsworth Street Mission Hills, CA 91345	(800) 352-5675
Patricia D. McCurdy	1554 Quarry Road Coopersburg, PA 18036	(610) 346-6143
Penn Park	Box 226 Pineville, PA 18946	(215) 598-3538
Port A Bowl Restrooms	P.O. Box 571 Plumsteadville, PA 18949	(215) 766-8164
Potty Queen	3115 Sanatoga Road Pottstown, PA 19464	(610) 705-5555
Preston Heckler	648 Upper State Road North Wales, PA 19454	(215) 855-2946
Richard R. Schmick, Inc.	2201 Southwest 33rd Street Allentown, PA 18103	(610) 797-0630
Robert L. Kline	3067 Limekiln Road Birdsboro, PA 19508	(610) 582-1642

TABLE___
BUCKS COUNTY DEPARTMENT OF HEALTH
LICENSED SEWAGE SLUDGE HAULERS

HAULER NAME	ADDRESS	PHONE
Ron Ziegler Disposal, Inc.	95 Ervin Road P.O. Box 263 Pipersville, PA 18947	(215) 343-2080
Russel Reid Waste Hauling & Disposal	200 Smith Street P.O. Box 130 Keasby, NJ 08832	(732) 225-2238
Scott Landis	2710 Grant Street Reading, PA 19606	(610) 374-3067
Synagro of Texas	7014 Baltimore Street Baltimore, MD 21224	(410) 452-8000
U.S. Sewer & Drain	P.O. Box 1072 Langhorne, PA 19047	(215) 826-9155
Warrington Plumbing	2324 Street Road Warrington, PA 18976	
Waste Management of New Jersey	208 Patterson Avenue Trenton, NJ 08610	(732) 441-3527
Waste Management of Delaware Valley	1224 Hayes Boulevard Bristol, PA 19007	(215) 798-8600
Waste Management of Pennsylvania	400 Progress Drive Telford, PA 18969	(215) 453-2450
Waste Management of Pennsylvania, Hauling	600A Tyburn Road Morrisville, PA 19067	(215) 428-1278
Waste Management of Primos	408 South Oak Avenue Primos, PA 19018	(610) 622-8342
Wayne Nicholas	11 Brandon Way Kintnersville, PA 18930	(610) 847-2039

TABLE___
BUCKS COUNTY DEPARTMENT OF HEALTH
LICENSED SEWAGE SLUDGE HAULERS

HAULER NAME	ADDRESS	PHONE
WM P. Crossland, Sr.	5610 Haring Road Doylestown, PA 18901	(215) 348-2123
Woelkers LLC DBA	673 Keller Creamery Road Telford, PA 18969	(215) 723-2122

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APPENDIX I

NEW BRITAIN TOWNSHIP SEWAGE HAULER APPROVAL APPLICATION

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NEW BRITAIN TOWNSHIP

SEWAGE HAULER APPROVAL APPLICATION

REQUIRED OF ALL SEWAGE HAULERS WISHING TO BE LISTED AS A TOWNSHIP APPOVED SEWAGE HAULER IN ACCORDANCE WITH NEW BRITAIN TOWNSHIP ORDINANCE NO. _____

1. Company Name:

   _____

   Company Address: _____

   _____

2. Owner Name: _____

   Owner Address: _____

   _____

   Telephone No.: ( ) _____ Fax No.: ( ) _____

   Email Address: _____

3. Name, title and telephone number of signing official:

   Person: _____

   Title: _____ Telephone No.: ( ) _____

4. Alternate person to contact concerning information provided herein:

   Person: _____

   Title: _____ Telephone No.: ( ) _____

   Proof of liability insurance: _____

5. List Sewage Hauling Vehicles

   Vehicle 1

   Capacity (gal): _____ Truck License Plate No.: _____

   Bucks County Health Dept. License No.: _____

Vehicle 2

Capacity (gal): _____ Truck License Plate No.: _____

Bucks County Health Dept. License No.: _____

Vehicle 3

Capacity (gal): _____ Truck License Plate No.: _____

Bucks County Health Dept. License No.: _____

Vehicle 4

Capacity (gal): _____ Truck License Plate No.: _____

Bucks County Health Dept. License No.: _____

Provide attachment with above information for additional vehicles as necessary
Attachment Provided? _____(Yes or No)

I certify that the above information is accurate and agree to fully cooperate with New Britain Township in providing Proof of Compliance Receipts to the Township Authorized Agent and the Property Owner in accordance with New Britain Township Ordinance No. _____.

Signature of Corporate Officer completing this form:
(Please print Name and Official Position above signature)

_____ _____
Signature Date

SECTION II – TOWNSHIP APPROVAL CERTIFICATION

THIS CERTIFIES THAT THE ABOVE REFERENCED SEWAGE HAULER IS APPROVED BY NEW BRITAIN TOWNSHIP TO ACT AS A TOWNSHIP APPROVED SEWAGE HAULER IN ACCORDANCE WITH THE NEW BRITAIN TOWNSHIP SEWAGE FACILITIES MAINTENANCE PROGRAM AS DEFINED UNDER NEW BRITAIN TOWNSHIP ORDINANCE NO. _____.

New Britain Township Authorized Agent: _____
(Print Name) (Sign)

_____
Date

(Date of Signature Must be within One Year of Present Date to be considered current)

APPENDIX J

NEW BRITAIN TOWNSHIP SEWAGE WASTE HAULER PROOF OF COMPLIANCE

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NEW BRITAIN TOWNSHIP
SEWAGE WASTE HAULER PROOF OF COMPLIANCE
PART I - BACKGROUND INFORMATION
(Submit to Township within 7 days of completion of pumping)

To be completed by Owner:

Property Address:_____

Property Tax Parcel No._____

Property Owner Name:_____

Property Owner Address:_____

_____

Responsible Person or Official Representing the Owner:_____

(President, Secretary, Treasurer, or Vice President, if a Corporation; a General Partner or Proprietor if a partnership or sole proprietorship respectively)

Property Owner Contact Telephone Number:_____

If residential use, indicate one of the following:

Individual Single family (Yes or No):_____

Community Residential (Yes or No):_____If yes, indicate No. of Dwelling Units:_____

If Commercial, Institutional or Industrial Use, the Owner must complete "Attachment A".

To be completed by Sewage Waste Hauler:

Sewage Waste Hauler Name & License No.:_____

Sewage Waste Hauler Address:_____

_____

Sewage Waste Hauler Telephone Number: _____

New Britain Township Authorization No.: _____

NEW BRITAIN TOWNSHIP
SEWAGE WASTE HAULER PROOF OF COMPLIANCE
PART II - RECEIPT FOR PUMPING

Property Owner Name:_____

Property Address:_____

_____

Date of Pumping: _____ No. of Years since previous Pumping: _____

Tank No. 1:

Indicate Type of Tank (Septic Tank, Pump Tank, Cesspool, Aerobic Tank,Other): _____

Capacity (gallons):_____Material (i.e., concrete, metal, etc.):_____Age:_____

Condition of Inlet and Outlet Baffles:_____Depth to manhole lid if buried:_____

Depth in feet from surface to: Top of tank:_____Bottom of tank:_____

Amount of Sludge Removed (gallons):_____Cost of Service $_____

List maintenance performed other than pumping:_____

_____

Repair or maintenance recommendations:_____

_____

Are their any indications of sewage system malfunction (if yes, describe)?_____

_____

Signature of Sewage Waste Hauler:_____
(Print Name) (Sign)

I certify that to the best of my knowledge, the material removed from this tank does not contain any of the substances identified in Section 6 of the New Britain Township Sewage Facilities Maintenance Program.

Signature of Property Owner:_____
(Print Name) (Sign)

Above, sketch the location of tanks, disposal fields or points of surface discharge in relation to buildings, or attach a sketch or plan to this form(include reference measurements)

NEW BRITAIN TOWNSHIP
SEWAGE WASTE HAULER PROOF OF COMPLIANCE
PART II - RECEIPT FOR PUMPING - ADDITIONAL TANKS

Property Owner Name:_____

Property Address:_____

_____

Date of Pumping: _____ No. of Years since previous Pumping: _____

Tank No. 1:

Indicate Type of Tank (Septic Tank, Pump Tank, Cesspool, Aerobic Tank,Other): _____

Capacity (gallons):_____Material (i.e., concrete, metal, etc.):_____Age:_____

Condition of Inlet and Outlet Baffles:_____Depth to manhole lid if buried:_____

Depth in feet from surface to: Top of tank:_____Bottom of tank:_____

Amount of Sludge Removed (gallons):_____Cost of Service $_____

List maintenance performed other than pumping:_____

_____

Repair or maintenance recommendations:_____

_____

Are their any indications of sewage system malfunction (if yes, describe)?_____

_____

Signature of Sewage Waste Hauler:_____
(Print Name) (Sign)

I certify that to the best of my knowledge, the material removed from this tank does not contain any of the substances identified in Section 6 of the New Britain Township Sewage Facilities Maintenance Program.

Signature of Property Owner:_____
(Print Name) (Sign)

Above, sketch the location of tanks, disposal fields or points of surface discharge in relation to buildings, or attach a sketch or plan to this form(include reference measurements)

(PHOTOCOPY THIS FORM AS NEEDED FOR ADDITIONAL TANKS)

ATTACHMENT A
Commercial / Industrial / Institutional
Building Use Information

Owner Must Complete for Each Building:

Building No. 1
Establishment No. 1

Establishment Name:_____

Address:_____

Business Address:_____

Name of Business Owner (if other than the Property Owner):_____

Business Owner Contact Telephone Number:_____

Type Business Activity (Office, manufacturing, etc.)_____

Water Use in gallons per day _____

Indicate if above water use is metered or estimated:_____

Building Space Occupied (Square Feet):_____

Building No. 1
Establishment No. 2

Establishment Name:_____

Address:_____

Business Address:_____

Name of Business Owner (if other than the Property Owner):_____

Business Owner Contact Telephone Number:_____

Type Business Activity (Office, manufacturing, etc.)_____

Water Use in gallons per day _____

Indicate if above water use is metered or estimated:_____

Building Space Occupied (Square Feet):_____

ATTACHMENT A (Continued)
Commercial / Industrial / Institutional
Building Use Information
(PHOTOCOPY AS NEEDED)

Owner Must Complete for Each Building:

Building No. 1
Establishment No. 1

Establishment Name:_____

Address:_____

Business Address:_____

Name of Business Owner (if other than the Property Owner):_____

Business Owner Contact Telephone Number:_____

Type Business Activity (Office, manufacturing, etc.)_____

Water Use in gallons per day _____

Indicate if above water use is metered or estimated:_____

Building Space Occupied (Square Feet):_____

Building No. 1
Establishment No. 2

Establishment Name:_____

Address:_____

Business Address:_____

Name of Business Owner (if other than the Property Owner):_____

Business Owner Contact Telephone Number:_____

Type Business Activity (Office, manufacturing, etc.)_____

Water Use in gallons per day _____

Indicate if above water use is metered or estimated:_____

Building Space Occupied (Square Feet):_____

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APPENDIX K

NEW BRITAIN TOWNSHIP SEWAGE MAINTENANCE CERTIFICATE

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NEW BRITAIN TOWNSHIP

SEWAGE MAINTENANCE CERTIFICATE

REQUIRED PRIOR TO PROPERTY SALE OR TRANSFER OF OWNERSHIP

THIS ORIGINAL FORM MUST BE PROVIDED TO THE NEW OWNER TOGETHER WITH A COPY OF NEW BRITAIN TOWNSHIP ORDINANCE NO. _____

SECTION I - PROPERTY, OWNER AND SEWAGE HAULER INFORMATION
(To be completed by the Applicant)

Property Address:_____

Property Tax Parcel No._____

Property Owner Name:_____

Property Owner Address:_____

_____

Responsible Person or Official Representing the Owner:_____

(President, Secretary, Treasurer, or Vice President, if a Corporation; a General Partner or Proprietor if a partnership or sole proprietorship respectively)

Property Owner Contact Telephone No.:_____

Sewage Waste Hauler Name & License No.:_____

Sewage Waste Hauler Address:_____

_____

Sewage Waste Hauler Telephone No: _____

Attach most recent Proof of Compliance Receipt

SECTION II – TOWNSHIP CERTIFICATION

THIS CERTIFIES THAT THE ABOVE REFERENCED FACILITY HAS BEEN MAINTAINED IN ACCORDANCE WITH THE NEW BRITAIN TOWNSHIP SEWAGE FACILITIES MAINTENANCE PROGRAM AS DEFINED UNDER NEW BRITAIN TOWNSHIP ORDINANCE NO. _____.

New Britain Township Authorized Agent:_____
(Print Name) (Sign)

_____
Date

(Date of Signature Must be within One Year of Present Date to be considered current)

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APPENDIX L

NEW BRITAIN TOWNSHIP ORDINANCE 2001-01-01

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ORDINANCE NO. 2001-01-01

AN ORDINANCE OF THE TOWNSHIP OF NEW BRITAIN, BUCKS COUNTY, PENNSYLVANIA PROVIDING FOR THE IMPLEMENTATION OF THE PENNSYLVANIA SEWAGE FACILITIES ACT; ESTABLISHING STANDARDS FOR ON-LOT SEWAGE SYSTEMS; AND REQUIRING MAINTENANCE AGREEMENTS AND FINANCIAL SECURITY; AND PRESCRIBING PENALTIES FOR VIOLATION.

The New Britain Township Board of Supervisors hereby ordains:

Article I. **Definitions.**

ACT - The Pennsylvania Sewage Facilities Act (35 P.S. 750.1-750.20).

COMMUNITY SEWAGE SYSTEMS - Any system, whether publicly or privately owned, for the collection of sewage from two (2) or more lots, or the disposal of the sewage on one (1) or more lots or at any other site. This term includes community on-lot sewage systems including sand mounds.

CONVENTIONAL SEWAGE SYSTEM - A system employing the use of demonstrated on-lot sewage treatment and disposal technology in a manner specifically recognized by the regulations promulgated under the Act. This term includes individual lot sewage systems including individual sand mounds.

DEPARTMENT - Department of Environmental Protection of the Commonwealth of Pennsylvania.

HOLDING TANK - A water tight receptacle which receives and retains sewage and is designed and constructed to facilitate the ultimate disposal of the sewage at another site. Holding tanks include, but are not limited to the following:

Chemical Toilet -	Toilet using chemicals that discharge into a holding tank.
Retention Tank -	Holding tank to which sewage is conveyed by a water carrying system.
Privy -	Holding tank designed to receive sewage where water under pressure is not available.

INDIVIDUAL RESIDENTIAL SPRAY IRRIGATION SYSTEM (IRSIS) - An individual sewage system permitted under Section 7 of the Sewage Facilities Act, which serves a single

dwelling and which treats and disposes of sewage using a system of piping, treatment tanks and soil renovation through spray irrigation.

INDIVIDUAL SEWAGE SYSTEM - A system of piping, tanks or other facilities serving a single lot and collecting and disposing of sewage in whole or in part into the soil or into any waters of this Commonwealth.

LOT - A part of a subdivision or a parcel of land used as a building site or intended to be used for building purposes, whether immediate or future.

PERSON - Any individual, association, public or private corporation for profit or not for profit, partnership, firm, trust, estate, department, board, bureau or agency of the Commonwealth, political subdivision, authority, or any other legal entity whatsoever which is recognized by law as the subject of rights and duties. Whenever used in any clause prescribing and imposing the penalty or imposing a fine or imprisonment, the term person shall include the members of an association, partnership or firm and the officers of any local agency or municipal, public or private corporation for profit or not for profit.

PUBLIC SEWAGE SYSTEM - Sewer system and the treatment facility owned, operated or maintained by a municipality or municipal authority approved by the Department under a permit issued pursuant to the Clean Streams Law, 35 P.S. 691.1, et seq., as hereafter amended, supplemented, modified or re-enacted by the General Assembly of Pennsylvania.

SEWAGE - Any substance that contains any of the waste products or extriment or other discharge from the bodies of human beings or animals and any noxious or deleterious substances being harmful or inimical to the public health, or to animal or aquatic life, or to the use of water for domestic supply or for recreation or which constitutes pollution under the Act of June 22, 1937, (PL 1987, 394), known as the "Clean Streams Law," as amended.

SMALL FLOW TREATMENT FACILITY - An Individual or community sewage system designed to adequately treat sewage flows not greater than two thousand (2,000) gallons per day for final disposal using a stream discharge or discharge to the surface of the ground.

TOWNSHIP - The Township of New Britain, Bucks County, Pennsylvania.

Article II. Sewage Facilities Act Implemented.

This Ordinance shall be construed as implementing for the Township of New Britain the provisions of the Pennsylvania Sewage Facilities Act, PL 1535, 537, January 24, 1966, 35 P.S. 750.1, et seq., as hereafter amended, supplemented, modified or re-enacted by the General Assembly of Pennsylvania.

Article III. **Connections with Individual Sewage Systems.**

Where public sewer services are not available to a property owner, the building sewer shall be connected to an individual sewage system complying with the provisions of this Ordinance and the Act.

Article IV. **Conformity to all Regulations.**

The type, capacities, location and layout of a community sewage system or an individual sewage system and building sewer shall comply with all rules, regulations and ordinances of New Britain Township, the Bucks County Department of Health, the Pennsylvania Department of Environmental Protection and all applicable statutes of the Commonwealth of Pennsylvania.

Article V. **Holding Tanks.**

A. Holding tank regulations: If the Bucks County Department of Health or the Pennsylvania Department of Environmental Protection determines that the use of a holding tank is necessary to abate a nuisance or public health hazard, or for use by an institutional, recreational or commercial establishment with a sewage flow of four hundred (400) gallons per day or less; or for temporary installation when an Act 537 provision provides for a replacement of the temporary holding tank by adequate sewage services in accordance with the schedule approved by the Pennsylvania Department of Environmental Protection, such holding tanks shall be subject to the following additional regulations:

1. The collection and transportation of all sewage from any use utilizing a holding tank shall be performed under the direction and control of the Bucks County Department of Health. The disposal site thereof shall be made only at such site or sites as may be approved by the Pennsylvania Department of Environmental Protection.

2. All holding tanks shall be permitted by the Bucks County Department of Health and/or the Pennsylvania Department of Environmental Protection. Copies of all Bucks County Department of Health and/or Pennsylvania Department of Environmental Protection permits and plans shall be filed with the Township by the permit holder.

3. All property owners or permit holders shall be approved by the Township through an agreement to hold the Township harmless in the event of a claim against the Township arising from the operation of the holding tank and shall furthermore pay a non-refundable fee to the Township for costs of administration of its sewage maintenance program and for future compliance monitoring and/or enforcement

of this Ordinance.

B. The owner of a property that utilizes a holding tank shall:

1. Maintain the holding tank in conformance with this or any ordinance of the Township and the rules and regulations of the Bucks County Department of Health and the Pennsylvania Department of Environmental Protection;

2. Permit only persons authorized by the Bucks County Department of Health and/or Pennsylvania Department of Environmental Protection to collect, transport and dispose of the contents therein;

3. Be responsible for the periodic cleaning or emptying of the holding tank as well as the costs thereof;

C. Public sewer connections: From time to time in the future, as public sewage services become available for a property utilizing a holding tank, each and every owner of such property shall be required to make the necessary connection to the abutting or adjoining sewer lines. The holding tank must be disconnected and disposed of in accordance with applicable Pennsylvania Department of Environmental Protection and Bucks County Department of Health rules and regulations.

Article VI. **Individual Residential Spray Irrigation Systems.**

A. The owner of a property that utilizes an individual spray irrigation system shall:

1. Construct and maintain the system in conformance with this and any ordinance of the Township, the Act and the rules and regulations of the Bucks County Department of Health and the Pennsylvania Department of Environmental Protection and all applicable statutes of the Commonwealth of Pennsylvania.

2. Execute an agreement with the Township to hold the Township harmless in the event of a claim against the Township arising from the operation and maintenance of the system and furthermore pay a non-refundable fee to the Township for its cost of administration, future compliance monitoring and enforcement of this Ordinance.

B. Public sewer connections: From time to time in the future, as public sewage services become available for a property utilizing an IRSIS, each and every owner of such property shall be required to make the necessary connection to the abutting or adjoining sewer lines. The IRSIS must be disconnected and disposed of in accordance with applicable Pennsylvania Department of Environmental Protection and Bucks County Department of Health rules and regulations.

Article VII. **Small Flow Treatment Facilities.**

A. The owner of a property that utilizes an individual small flow treatment system shall:

1. Construct and maintain the system in conformance with this and any ordinance of the Township, the Act and the rules and regulations of the Bucks County Department of Health and the Pennsylvania Department of Environmental Protection and all applicable statutes of the Commonwealth of Pennsylvania.

2. Execute an agreement with the Township to hold the Township harmless in the event of a claim against the Township arising from the operation and maintenance of the system and furthermore pay a non-refundable fee to the Township for its cost of administration, future compliance monitoring and enforcement of this Ordinance.

B. Public sewer connections: From time to time in the future, as public sewage services become available for a property utilizing a small flow treatment facility, each and every owner of such property shall be required to make the necessary connection to the abutting or adjoining sewer lines. The small flow treatment facility must be disconnected and disposed of in accordance with applicable Pennsylvania Department of Environmental Protection and Bucks County Department of Health rules and regulations.

Article VIII. **Conventional Sewage Systems.**

Permit approval from the Bucks County Board of Health and the Department shall be required for the installation of an individual conventional sewage system and building sewer prior to the construction of any buildings for which such system or systems will be installed, and prior to the alteration, replacement, repair or extension of any such existing sewage system.

Article IX. **Sewage Maintenance Agreements; Fees.**

A. All owners of property or persons who propose utilizing a holding tank, individual spray irrigation system, small flow treatment facility, or community sewage system shall execute a Sewage Facilities Maintenance Agreement with the Township. The agreement shall provide for a non-refundable fee to the Township for administration and future compliance monitoring, and shall furthermore provide for sufficient financial security to guarantee the proper operation and maintenance of the proposed facility in accordance with the Act, which may include cash, a letter of credit or other Township approved financial security.

B. All owners of property or persons proposing a holding tank, IRSIS, small flow treatment facility, or community sewage system shall pay a non-refundable fee to be set by separate

resolution of the Board of Supervisors and shall furthermore pay for all Township costs related to the required Sewage Maintenance Agreement.

Article X. **Additional Rules and Regulations Authorized.**

The Board of Supervisors is hereby authorized to make and promulgate any additional rules and regulations for the review, regulation, approval, administration and enforcement of sewage systems within New Britain Township not in conflict with this Ordinance, and violations of the same shall be subject to the same penalties as provided in this Ordinance.

Article XI. **Penalty.**

A. In the event that any person or property owner fails to construct, operate or maintain an individual or community sewage system in accordance with this Ordinance, the Act or the rules and regulations of the Bucks County Department of Health or the Pennsylvania Department of Environmental Protection, the Township may revoke any certificate of occupancy issued for the use or uses being served by the individual or community sewage system.

B. Any person or property owner who shall violate any provision of this Ordinance shall, upon conviction thereof, be sentenced to pay a fine of not more than One Thousand Dollars ($1,000.00) and in default of payment, to imprisonment for a term not to exceed thirty (30) days. Every day that a violation of this Ordinance continues shall constitute a separate offense.

C. In addition to or in lieu of enforcement by action before a District Justice, the Township may enforce this Ordinance in equity or it may find the person or property owner in violation of this Ordinance and in default of any financial security provisions provided for in the Township's Sewage Maintenance Agreement.

Article XII. **Repealer.**

All ordinance or parts of ordinances which are inconsistent herewith are hereby repealed. Ordinance No. 97-06-02 is specifically repealed.

Article XIII. **Severability.**

If any sentence, clause, section or part of this Ordinance is for any reason found to be unconstitutional, illegal or invalid, such unconstitutionality, illegality or invalidity shall not affect or impair any of the remaining provisions, sentences, clauses, sections or part of this Ordinance. It is hereby declared as the intent of the Board of Supervisors of New Britain Township, that this Ordinance would have been adopted had such unconstitutional, illegal or invalid sentence, clause, section or part thereof not been included therein.

Article XIV. **Effective Date.**

This Ordinance shall became effective five (5) days after its adoption.

ENACTED AND ORDAINED into an Ordinance this 22nd day of January, A.D., 2001, by the Board of Supervisors of the Township of New Britain in lawful session duly assembled.

NEW BRITAIN TOWNSHIP
BOARD OF SUPERVISORS

Dr. Robert L. Benner, Chairman

Robert V. Cotton, Vice-Chairman

Robert J. Piccone, Member

John A. Bodden, Sr., Member

Helen B. Haun, Member

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APPENDIX M

PROOF OF PUBLICATION

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NOTICE

NEW BRITAIN TOWNSHIP SEWAGE FACILITIES PLAN FOR ON-LOT SEWAGE DISPOSAL SYSTEM AREA

In accordance with PA Code Title 25, Chapter 71, New Britain Township proposes to adopt an Act 537 Sewage Facilities Plan for the ***On-Lot Disposal System Area*** of New Britain Township. This Act 537 Sewage Facilities Plan is a stand alone document which addresses the present and future on-lot sewage disposal needs of New Britain Township, Bucks County, Pennsylvania. The ***On-Lot Disposal System Area*** within New Britain Township consists of the On-Lot Sewage Service Area specifically identified in this document, as well as other isolated areas within the Township that are not ***now or in the future to be*** served by public sewers. This Act 537 Sewage Facilities Plan shall be implemented in conjunction with the current Act 537 Plan titled, "Neshaminy Basin Sub-Region II 201 Facilities Plan" prepared by Gilbert Associates, Inc., last amended in 1987 and the "Act 537 Sewage Facilities Plan Update for Chalfont-New Britain Township Joint Sewage Authority Service Area", last amended in March of 2005.

This Act 537 Plan addresses the following issues:

A. Preferential List of On-Lot Sewage Disposal Systems

This Act 537 Plan establishes a Preferential List of Sewage Disposal Systems for Land Development utilizing on-lot sewage disposal.

B. Township Involvement

This Act 537 Plan provides a framework and procedure for Township involvement in the site evaluation and planning process. The procedure allows for the proper siting, evaluation, design, installation and maintenance of on-lot sewage disposal systems.

C. Sewage Management Program

This Act 537 Plan establishes a proposed Sewage Maintenance Program that includes the following:

1. Enacting a Sewage Maintenance Ordinance.
2. Establishing a Sewage Hauler Approval Process.
3. Establishing a Waste Hauler Proof of Compliance Program.
4. Establishing an Educational Program.
5. Establishing a procedure for monitoring and implementation of existing On-Lot Sewage System Maintenance Agreements.
6. Appointing a Township Authorized Agent to monitor the Program.

A copy of the "Act 537 Plan for ***On-Lot Sewage Disposal System Area***, New Britain Township, Bucks County, Pennsylvania" is available for review at the New Britain Township Building, 207 Park Avenue, Chalfont, Pennsylvania 18914, from 8:00 a.m. to 4:00 p.m., Monday through Friday. Written comments will be accepted by New Britain Township for a (thirty) 30 day period following publication of this notice. All comments should be directed to the attention of the New Britain Township Board of Supervisors.

John Cornelius, Township Manager
New Britain Township

Resolution No. 2006-18
New Britain Township
Bucks County, Pennsylvania

RESOLUTION FOR REVISION TO OFFICIAL SEWAGE FACILITIES PLAN

RESOLUTION OF THE BOARD OF SUPERVISORS OF NEW BRITAIN TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA (hereinafter "the Municipality").

WHEREAS, Section 5 of the Act of January 24, 1966, P.L. 1535, No. 537, known as the "Pennsylvania Sewage Facilities Act" as amended, and the Rules and Regulations of the Department of Environmental Protection (Department) adopted thereunder, Chapter 71 of Title 25 of the Pennsylvania Code, requires the Municipality to adopt an Official Sewage Facilities Plan (Facilities Plan), providing for sewage services adequate to prevent contamination of waters and/or environmental health hazards with sewage wastes, and to revise said Plan, whenever it is necessary to meet the sewage disposal needs of the Municipality; and

WHEREAS, New Britain Township has prepared a report titled, "Act 537 Sewage Facilities Plan for ***On-Lot Sewage Disposal System Area***, New Britain Township, Bucks County, Pennsylvania", which addresses the present and future on-lot sewage disposal needs of New Britain Township; and

WHEREAS, New Britain Township finds that the Act 537 Sewage Facilities Plan described above conforms to zoning, subdivision, other municipal ordinances and plans and to a comprehensive program of pollution control and water quality management.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of New Britain Township hereby adopts and submits to the Department of Environmental Protection for its approval as a revision to the "Official Facilities Plan" of the Municipality, the above referenced Act 537 Sewage Facilities Plan. The Municipality hereby assures the Department of the complete and timely implementation of the said Plan, as required by law. (Section 5, Pennsylvania Sewage Facilities Act as amended).

This Act 537 Plan is a stand alone document which addresses only the ***On-Lot Sewage Disposal System Area***, within New Britain Township, and shall be implemented in conjunction with the current Official Act 537 Plan titled, "Neshaminy Basin Sub-Region II 201 Facilities Plan" prepared by Gilbert Associates, Inc., last amended in 1987 and the "Act 537 Sewage Facilities Plan Update for Chalfont-New Britain Township Joint Sewage Authority Service Area", last amended in March of 2005. The ***On-Lot Sewage Disposal System Area*** consists of the On-Lot Sewage Service Area specifically identified in this document, as well as other isolated areas within the Township that are not ***now or in the future to be*** served by public sewers.

This Act 537 Plan addresses the following issues:

A. Preferential List of On-Lot Sewage Disposal Systems

This Act 537 Plan establishes a Preferential List of Sewage Disposal Systems for Land Development utilizing on-lot sewage disposal.

B. Township Involvement

This Act 537 Plan also provides a framework and procedure for Township involvement in the site evaluation and planning process. The procedure allows for the proper siting, evaluation, design, installation and maintenance of on-lot sewage disposal systems.

C. Sewage Management Program

This Act 537 Plan establishes a proposed Sewage Maintenance Program that includes the following:

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5. Establishing a procedure for monitoring and implementation of existing On-Lot Sewage System Maintenance Agreements.
6. Appointing a Township Authorized Agent to monitor the Program.

The following list and corresponding dates outline the steps to be performed in implementing the Selected Plan:

- New Britain review of Draft Act 537 Plan Update (July/Aug., 2006).
- Planning Agency and Health Department review of Draft Act 537 Plan Update (July/Aug., 2006).
- Public Notification of Draft Act 537 Plan Update (Sept., 2006).
- New Britain finalizes and adopts Act 537 Plan Update (Nov., 2006).
- Act 537 Plan Update submitted to DEP for review (Nov., 2006).
- DEP approval of Act 537 Plan Update (Jan., 2007).
- Apply to DEP for 50% Planning Grant (Jan., 2007).

RESOLVED, this 13th day of November, 2006, at a public meeting of the Board of Supervisors.

NEW BRITAIN TOWNSHIP BOARD OF SUPERVISORS

Helen B. Haun - Chair

William B. Jones, Vice Chair

John A. Bodden, Sr. - Member

Robert V. Cotton - Member

A. James Scanzillo – Member

Attest: John Cornelius, Secretary/Manager

On-Lot Sewage Facilities Plan for On-Lot Sewage Service Area Act 537 Plan

Timeline

June 20, 2006	Sent to Bucks County Department of Health and Bucks County Planning Commission (60 day review period)
August 2, 2006	Received response from Bucks County Planning Commission
August 17, 2006	Received response from Bucks County Department of Health
September 18, 2006	Public advertisement for 30-day public comment period
October 18, 2006	End 30-day public comment period
October 23, 2006	Adoption of Resolution at Public Meeting Confirm Lane Bodley's attendance at meeting
October 24, 2006	Lane Bodley, Carroll Engineering Corporation – forward complete Act 537 Plan to PaDEP

- Need to discuss Act 537 reimbursement process with CEC.
- Need to discuss implementation of Act 537 Plan with Craig Kennard and Township staff.
- Forward a copy of PaDEP approved plan to Bucks County Department of Health, Bucks County Planning Commission, CNBTJSA, Gilmore & Associates.

Resolution No. 2006-18
New Britain Township
Bucks County, Pennsylvania

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Attest: John Cornelius, Secretary/Manager

Resolution No. 2006-18
New Britain Township
Bucks County, Pennsylvania

RESOLUTION FOR REVISION TO OFFICIAL SEWAGE FACILITIES PLAN

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RESOLVED, this 13th day of November, 2006, at a public meeting of the Board of Supervisors.

NEW BRITAIN TOWNSHIP BOARD OF SUPERVISORS

Helen B. Haun - Chair

William B. Jones, Vice Chair

John A. Bodden, Sr. - Member

Robert V. Cotton - Member

A. James Scanzillo – Member

Attest: John Cornelius, Secretary/Manager

Carroll Engineering Corporation

NEW BRITAIN TOWNSHIP
6-22-06
DATE RECEIVED

June 20, 2006

Certified Mail

Amletto A. Pucci, Jr. Ph.D., PE.
Chief, Division of Environmental Engineering
Bucks County Department of Health
Health Building
Neshaminy Manor Center
Doylestown, PA 18901

Dear Mr. Pucci:

Subject: New Britain Township Act 537 Sewage Facilities Plan for the On-Lot Sewage Service Area - Request for Comment

On behalf of New Britain Township, we are submitting one draft copy of "Act 537 Sewage Facilities Plan for On-Lot Sewage Service Area, New Britain Township, Bucks County, Pennsylvania", for your review and comment. This document is submitted in fulfillment of requirements established under Pennsylvania Code Title 25, Chapter 71.31.

Please provide your comments to John Cornelius, New Britain Township Manager, within 60 days of your receipt of this submittal. We would appreciate your copying this office on your correspondence, so we may incorporate your comments into the final documents and address any outstanding issues.

Should you have any questions or require additional information, please feel free to contact this office.

Very truly yours,

CARROLL ENGINEERING CORPORATION

Lane P. Bodley, P.E., CEC

LPB:bl
Enclosure
cc: John Cornelius, Manager, New Britain Township
Carol Bigham, Assistant Manager, New Britain Township
Kenneth E. Heydt, P.E., Executive Vice President, CEC

Carroll Engineering Corporation

NEW BRITAIN TOWNSHIP

6-22-06
DATE RECEIVED

June 21, 2006

Certified Mail

Ms. Gail Friedman
Bucks County Planning Commission
The Almshouse, Neshaminy Manor Center
1260 Almshouse Road
Doylestown, PA 18901

Dear Ms. Friedman:

Subject: New Britain Township Act 537 Sewage Facilities Plan for the On-Lot Sewage Service Area - Request for Comment

On behalf of New Britain Township, we are submitting one draft copy of "Act 537 Sewage Facilities Plan for On-Lot Sewage Service Area, New Britain Township, Bucks County, Pennsylvania", for your review and comment. This document is submitted in fulfillment of requirements established under Pennsylvania Code Title 25, Chapter 71.31.

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CARROLL ENGINEERING CORPORATION

Lane P. Bodley, P.E.

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Enclosure
cc: John Cornelius, Manager, New Britain Township
Carol Bigham, Assistant Manager, New Britain Township
Kenneth E. Heydt, P.E., Executive Vice President, CEC