



SANITARY SEWER SERVICE ASSESSMENT GUIDELINES

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February 2013

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The technical material and data contained in this Report were prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.

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All questions about the meaning or intent of these documents shall be submitted only to the Engineer of Record, stated above, in writing.

BERNALILLO COUNTY, NEW MEXICO
BERNALILLO COUNTY PUBLIC WORKS DIVISION
SANITARY SEWER SERVICE ASSESSMENT GUIDELINES
February 2013

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DISCLAIMER

The Countywide Sanitary Sewer Service Assessment Guidelines is a GUIDANCE DOCUMENT, to be used in the preliminary selection of appropriate wastewater treatment and disposal options in the unincorporated areas of Bernalillo County.

The Guidance Document is to be used as an assessment tool to compare conceptual treatment costs. The Sewer Service Assessment Guidelines are NOT a design tool and should NOT be relied upon in estimating design costs.

EXECUTIVE SUMMARY

Intent

Bernalillo County Natural Resource Services, tasked with permitting wastewater treatment systems in the unincorporated areas of Bernalillo County, desired an assessment tool for evaluating how property owners can best meet their needs for wastewater treatment systems given the Bernalillo County Code Wastewater Systems Requirements. These Sanitary Sewer Assessment Guidelines can help determine if unsewered, unincorporated areas of Bernalillo County are adequately served by traditional onsite treatment or if alternative means of treatment and disposal are necessary to satisfy regulations.

This Guidance Document is an assessment tool, developed using the Bernalillo County Code, Chapter 42, Article IV, Division 10. This document may become partially outdated when the Code is modified. Because modifications to the Code may replace earlier versions, the User is responsible for compliance with the most current version of the Code.

Audience

This document is intended to assist policy makers, technical staff, planners, developers, and homeowners as they select appropriate wastewater treatment techniques. For homeowners and policy makers, the guidelines present sections of the Code in a simplified manner, touching on several key points that should be considered in selection of a wastewater treatment system for a particular site. Several treatment options are described for comparison and further understanding. For technical staff, planners, and developers, the document relates technical insights for the selection of a treatment system or systems for a planned development. A Cost Matrix presented at the end of the document provides an estimated User's share of the expense of the systems discussed. Comparison of treatment alternatives can be conducted for applicable treatment technologies by using the estimated Life Cycle Costs of each treatment described.

Throughout the document, assumptions are identified and implications are explained. The document is not a substitute for site-specific design; instead, it provides an initial guide to the Code and the wastewater treatment requirements that must be met. Treatment techniques and technology are not limited to those presented in this document.

1.0 DIRECTIONS TO USERS

This Decision Chart and accompanying Cost Matrix may be used as a guidance document to determine wastewater treatment options for new and existing dischargers within unincorporated areas in Bernalillo County. The treatment options may be derived by answering several questions regarding site conditions. The Decision Chart has been broken down into three sections: public sewer disposal; onsite decentralized treatment; offsite decentralized treatment. The sections are accompanied by figures designed to help the User evaluate which sewer disposal, onsite treatment, and offsite treatment options are appropriate, based on site characteristics. The figures were developed using the criteria specified in the Bernalillo County Code, Chapter 42, Article IV, Division 10 – Wastewater Systems (Code), as of January 2013.

1.1 Wastewater Disposal Decision Chart

Figure 2-1 examines the availability of nearby existing public sewers for wastewater conveyance to a centralized treatment plant. Figure 2-1 also screens out ground slope site conditions where onsite treatment systems are not acceptable, according to the Code.

1.2 Onsite Decentralized Treatment Decision Chart

Figure 3-1 applies to cases that may utilize onsite decentralized wastewater treatment systems, either because acceptable site conditions exist or a mound disposal system is constructed. Figure 3-1 delineates which of the twelve varieties of onsite treatment options are available based on three categories of site conditions, according to the Code.

1.3 Offsite Decentralized Treatment Decision Chart

Offsite decentralized treatment may be used as an alternative to onsite treatment or when onsite treatment is not permitted. Figure 4-1 is used to determine the type of cluster system(s) (less than 2,000 gallons per day (gpd)) or community system (greater than 2,000) gpd) most appropriate for offsite treatment.

1.4 Cost Matrix

A Cost Matrix is provided to determine how the applicable treatment options compare in terms of costs. Capital, annual operation and maintenance, debt service, and monthly User costs are tabulated in the Cost Matrix. The net present worth of these alternatives is also presented as a means of comparing options.

1.5 Wastewater Characteristics

It is assumed that the wastewater contributed by each lot has characteristics typical of normal domestic wastewater. The Albuquerque Bernalillo County Water Utility Authority (ABCWUA) Water and Sewer Rate Ordinance (the Ordinance) defines normal domestic wastewater as containing levels of biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), and ammonia nitrogen (NH₃-N) equal to or below the concentrations shown in Table 1. Wastewater containing these constituents in excess of the limits is not considered to be normal domestic wastewater.

Table 1-1

**MAXIMUM CONCENTRATION OF FOUR CONSTITUENTS FOUND IN
NORMAL DOMESTIC WASTEWATER**

Contaminant	Maximum Concentration ^a , mg/L
BOD	250
COD	500
TSS	330
NH ₃ -N	25

Source: ABCWUA Water and Sewer Rate Ordinance 1-1-5-A and 1-1-5-E

The Cost Matrix was developed for treatment of normal domestic wastewater. Higher-strength wastewater caused by significant contributions of commercial and other non-domestic wastes may incur greater costs than those suggested by the Cost Matrix. Users or entities expected to generate higher-strength wastewater should consult the County before using this Cost Matrix. Site conditions and wastewater characteristics are recommended to be examined by Bernalillo

County Natural Resource Services on a case-by-case basis to determine if using the Sewer Service Assessment Guidelines is an acceptable method of selecting a wastewater treatment method.

1.6 Maximum Decentralized Wastewater Treatment Sizing Limit

The treatment methods discussed in this Guidance Document consist of onsite treatment, including mound disposal, offsite cluster treatment, and offsite community treatment. At some larger design flow, developers may find that the amount of land required for groundwater disposal is excessive, and it is not practical to rely on groundwater disposal (see Section 5.3). While the maximum design flow is not specified by the Code, this document assumes that areas with sufficient population to generate over 30,000 gpd wastewater are assumed to be served by multiple smaller community systems or by a central, larger-scale treatment plant that discharges to surface waters and/or to irrigation reuse. The largest community treatment system assessed was sized for 30,000 gpd (approximately 80 lots). However, developers are not limited to wastewater disposal fields serving less than 30,000 gpd. Although consideration of a larger treatment plant and surface water disposal is not discouraged, its use is not described further in the Guidance Document and is not included in the Cost Matrix because surface water discharge limits are site-specific and costs for large systems can only be estimated on a case-by-case basis.

1.7 Supporting Documentation

The Code and other supplementary information can be found in the accompanying document entitled “Supporting Documentation for Sanitary Sewer Service Assessment Guidelines Cost Matrix Assumptions”. A copy of Division 10 of the Bernalillo County Code (current as of January 2013) is provided in the supporting documentation for reference purposes. The User may search for the most up-to-date version online at the County website (under Ordinances). Additionally, itemized cost tables and backup calculations are provided for transparency regarding the costs presented in the Cost Matrix.

2.0 WASTEWATER DISPOSAL OPTIONS

Where a wastewater system (public or private) is available, new structures requiring wastewater disposal should be connected to the sewer system prior to being occupied; existing structures must connect within one year of the availability of a sewer line within 200 feet of the property (Code, 42-498). For the purposes of this Guidance Document, the Bernalillo County Public Works Division has determined that structures within three miles of an existing sewer or treatment plant could feasibly tie into a public sewer if a sufficient number of users were located within the 3-mile limit. However, at distances greater than three miles, construction of a connecting public sewer line would be cost-prohibitive, and other options should be explored. Even if the distance is less than three miles, it is likely the User would need to share costs of constructing and maintaining the connecting sewer and pumping facilities with the County, sewer district, or other Users. The User's share is defined in the Cost Matrix discussion.

Although it has been proposed that Users within three miles of an existing public sewer or treatment plant should install a sewer and connect with existing facilities, this alternative may not be practical for every case. One or two Users near the 3-mile limit may be better served by other treatment options. Likewise, large developments slightly over the 3-mile limit may choose to connect to an existing public sewer, especially if development along the line is anticipated. The option to connect to existing public sewers should be considered and weighed against the other treatment options for Users approaching the 3-mile limit.

Another factor affecting public sewer disposal is the capacity of the receiving WWTP to accommodate new flows. Existing treatment facilities may require upgrades or expansions as a result of a large increase in flow from the connecting users. The cost of such upgrades may fall, at least in part, on the newly connecting users.

When the public sewer disposal option is not available, the choices become onsite decentralized treatment and offsite decentralized treatment. Onsite treatment includes the use of a septic tank (primary treatment) or advanced treatment. Advanced treatment may include secondary treatment (biological processes for BOD and TSS reduction) and tertiary treatment (nitrogen reduction). The Code specifies site characteristics that promote effective onsite treatment, and restricts the use of onsite systems to locations that meet several requirements. **Onsite**

wastewater treatment is permitted only in areas where the ground slope does not exceed 15 degrees from horizontal (Code, 42-511a). If the ground slope is 15 degrees or less, onsite and offsite treatment options may be considered. If the ground slope is greater than 15 degrees, onsite treatment options are not appropriate, and offsite options on flatter ground slope must be considered.

Use Figure 2-1 to determine which disposal/treatment options may be applicable, and proceed to the Cost Matrix, Figure 3-1, or Figure 4-1, as instructed.

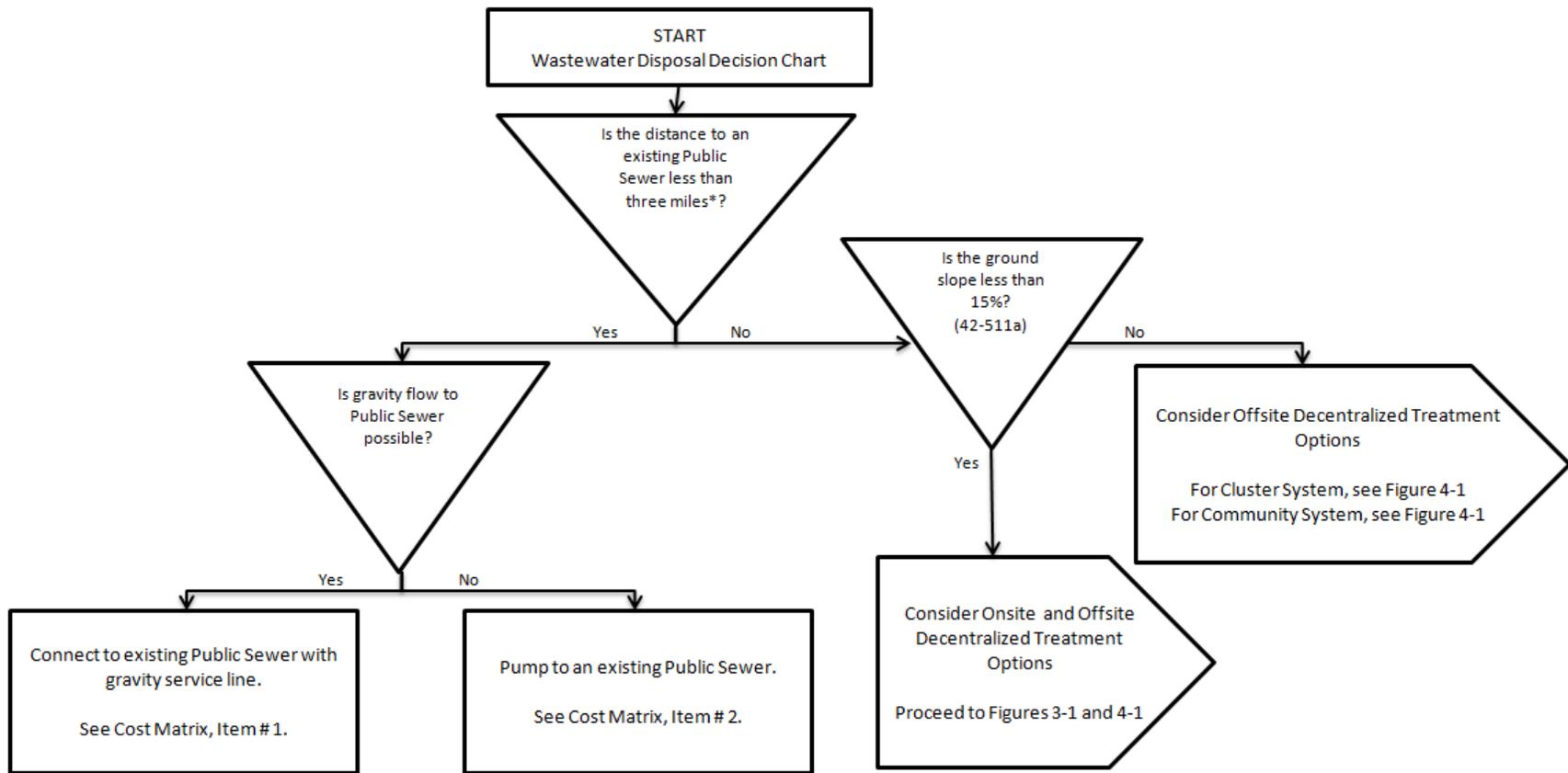


Figure 2-1

WASTEWATER DISPOSAL DECISION CHART

*Note: If the distance to an existing public sewer approaches the 3-mile cutoff and only one or two Users would be serviced by a new sewer, other forms of treatment may be more cost effective. The User may wish to consider the treatment options in Figures 3-1 and 4-1.

3.0 ONSITE DECENTRALIZED TREATMENT OPTIONS

If onsite treatment is permitted according to the Code as outlined in Section 2.0, then this Section may be used to determine which onsite treatment system is appropriate for given site conditions. Do not use Figure 3-1 if ground slopes exceed 15 degrees (Figure 2-1), but continue to Figure 4-1 for offsite treatment. When the appropriate onsite treatment techniques have been determined, please continue on to Figure 4-1 to consider what offsite treatment options may also be available.

The Code outlines requirements for onsite wastewater systems. The regulations regarding onsite treatment systems have been compiled into a circular Decision Chart shown in Figure 3-1. Twelve possible onsite wastewater treatment configurations are derived from the Code and listed in the figure.

The following three code requirements regarding site-specific conditions are addressed in Figure 3-1. Start with the center ring and move outward to derive the appropriate treatment configuration enumerated on the outside of the circle.

1. Center Ring of Figure 3-1: What type of treatment is required based on Chart 1, Maximum Total Flow vs. Lot Size (Code, 42-508b)?

Based on lot size and total daily flow, the required treatment may be primary (septic tank), secondary, or tertiary. If total flow is too great to meet the requirements of the Code as indicated on Chart 1, onsite treatment is not permitted, and offsite treatment options should be explored (Figure 4-1).

2. Middle Ring of Figure 3-1: What is the depth of suitable soil beneath the absorption area (Code, 42-511b)?

Treatment level requirements depend partially on the depth of suitable soil to groundwater or other limiting layers, as shown in Figure 3-1. Secondary treatment and disinfection are

required if the depth is less than four feet, and tertiary treatment with disinfection is required if the depth is less than two feet.

If depth of suitable native soil is less than four feet, onsite treatment incorporating a mound disposal system can likely be utilized to meet depth requirements for primary (septic tank) treatment, instead of needing advanced treatment with disinfection (Code, 42-511b). Mound systems also enable use of secondary or tertiary treatment systems without needing disinfection that would be required when there are less than four feet of suitable soil (Code, 42-511b).

3. Outer Ring of Figure 3-1: What type of soil exists at the site (Code, 42-511b)?

Soil type and texture affect the requirements for treatment. Type Ia coarse sandy soils, which drain easily, require secondary treatment plus disinfection prior to disposal in a drain field. Type IV clay soils, which do not drain easily, require secondary treatment plus low-pressure dosing to disperse the wastewater for treatment.

A mound disposal system may be used to overcome the limitations of Type Ia and IV soils to meet primary (septic tank) treatment requirements instead of needing advanced treatment (Code, 42-511b). Mound systems also enable use of secondary or tertiary treatment systems without needing disinfection or low-pressure dosing treatments that would be required in sandy soil or clay.

Although Figure 3-1 may indicate that advanced onsite treatment is required, offsite treatment options are also available. The Cost Matrix may indicate which choice is more cost-effective.

Illustrations of the treatment systems described in this Section have been provided for visual understanding. A typical septic tank and onsite disposal system (corresponding to Treatment 1 in Figure 3-1) is depicted in Figure 3-2 and Figure 3-3. Wastewater enters a septic tank where solids settle, scum floats, and effluent is discharged to a drain field for final treatment.

Secondary treatment, depicted in Figure 3-4, provides additional biological treatment to reduce

levels of biological oxygen demand (BOD) before effluent disposal occurs in a drain field (Treatment 2 in Figure 3-1). Tertiary treatment, shown in Figure 3-5, provides additional treatment to decrease levels of nitrogen before disposal (Treatment 6 in Figure 3-1).

A mound disposal system is illustrated in Figure 3-6. The disposal field is built above natural grade to overcome soil depth and texture limitations. A mound disposal field can be used in conjunction with primary, secondary, or tertiary treatment. Treatments 10, 11, and 12 in Figure 3-1 use such a mound for disposal of the treated effluent. Figure 3-7 shows a newly constructed mound system prior to vegetation. Typically, mounds are covered with sod to conceal the disposal field and protect the mound from erosion.

Use of certified installers is encouraged for construction of advanced treatment systems and mound disposal systems. Associations such as the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT) and National Onsite Wastewater Recycling Association (NOWRA) offer advanced certification and training.

The permitting process for onsite wastewater systems is described in Section 42-502 of the Code. A permit is required for installation or modification of a wastewater system. An application containing plans and specifications, a site plan, a site evaluation, a management plan, supporting data, a maintenance contract (for secondary and tertiary treatment systems), and fees must be submitted to the County for review. If the application is approved, a wastewater system permit will be issued.

Chart 1. Maximum Total Flow

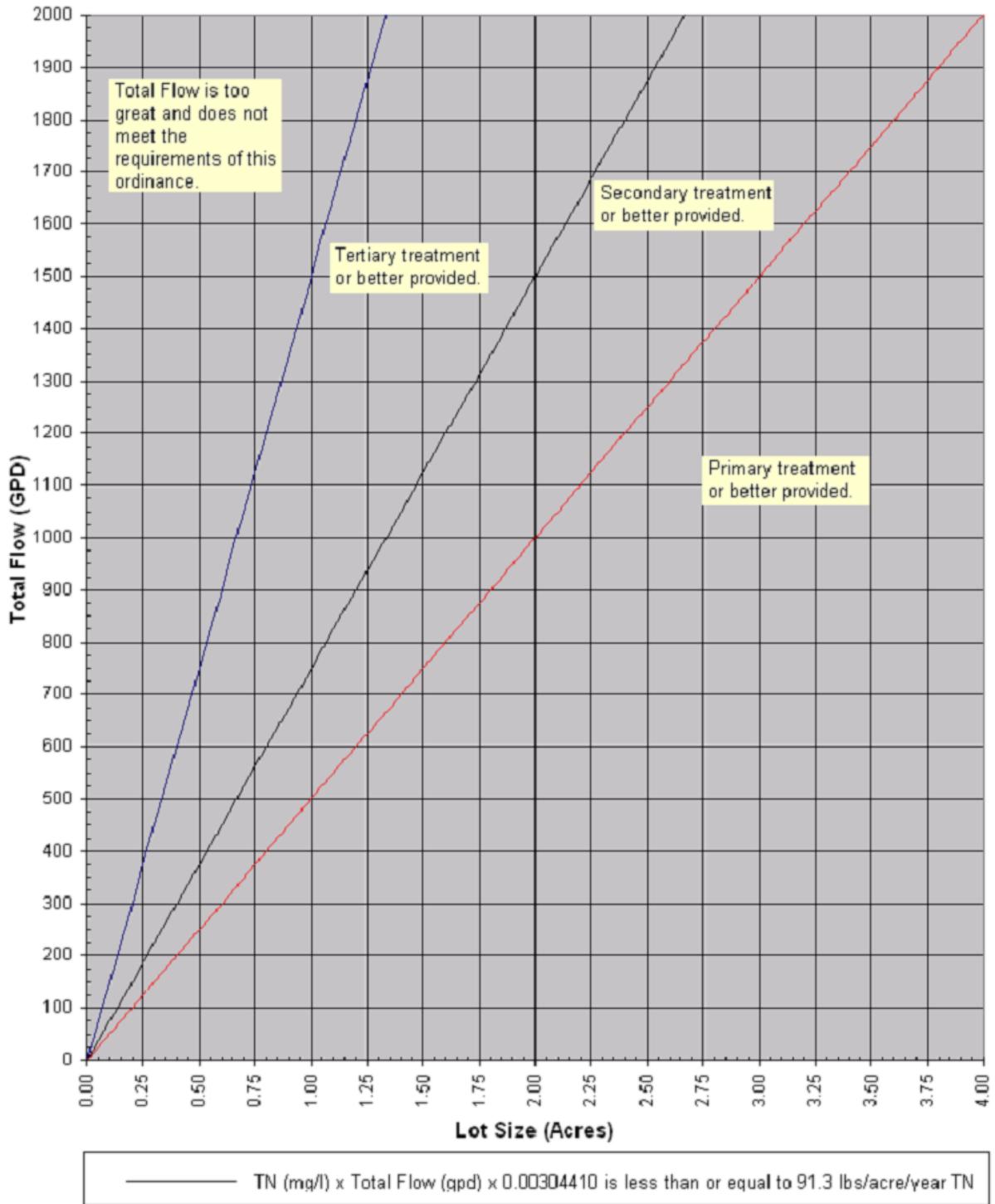
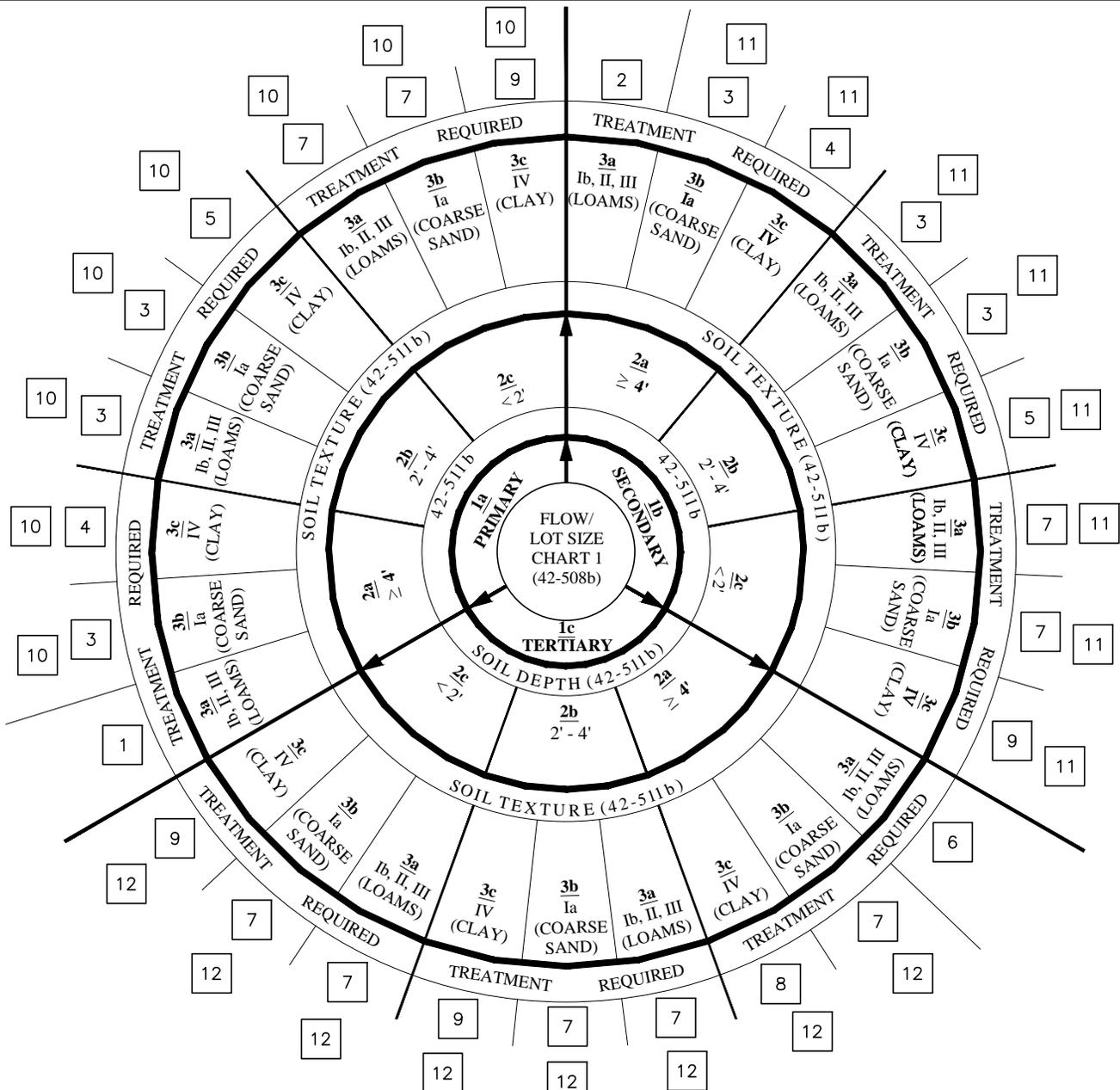


Chart 1. Maximum Total Flow, Bernalillo County Code, Chapter 42, Article IV, Division 10 - Wastewater Systems, subsection 42-508b



TREATMENT LEGEND

- 1 PRIMARY
- 2 SECONDARY
- 3 SECONDARY + DISINFECTION
- 4 SECONDARY + LOW PRESSURE DOSING
- 5 SECONDARY + DISINFECTION + LOW PRESSURE DOSING
- 6 TERTIARY
- 7 TERTIARY + DISINFECTION
- 8 TERTIARY + LOW PRESSURE DOSING
- 9 TERTIARY + DISINFECTION + LOW PRESSURE DOSING
- 10 PRIMARY + MOUND
- 11 SECONDARY + MOUND
- 12 TERTIARY + MOUND

SOIL DEPTH AND TEXTURE LIMITATIONS
 MAY BE OVERCOME BY USE OF A
 MOUND DISPOSAL SYSTEM



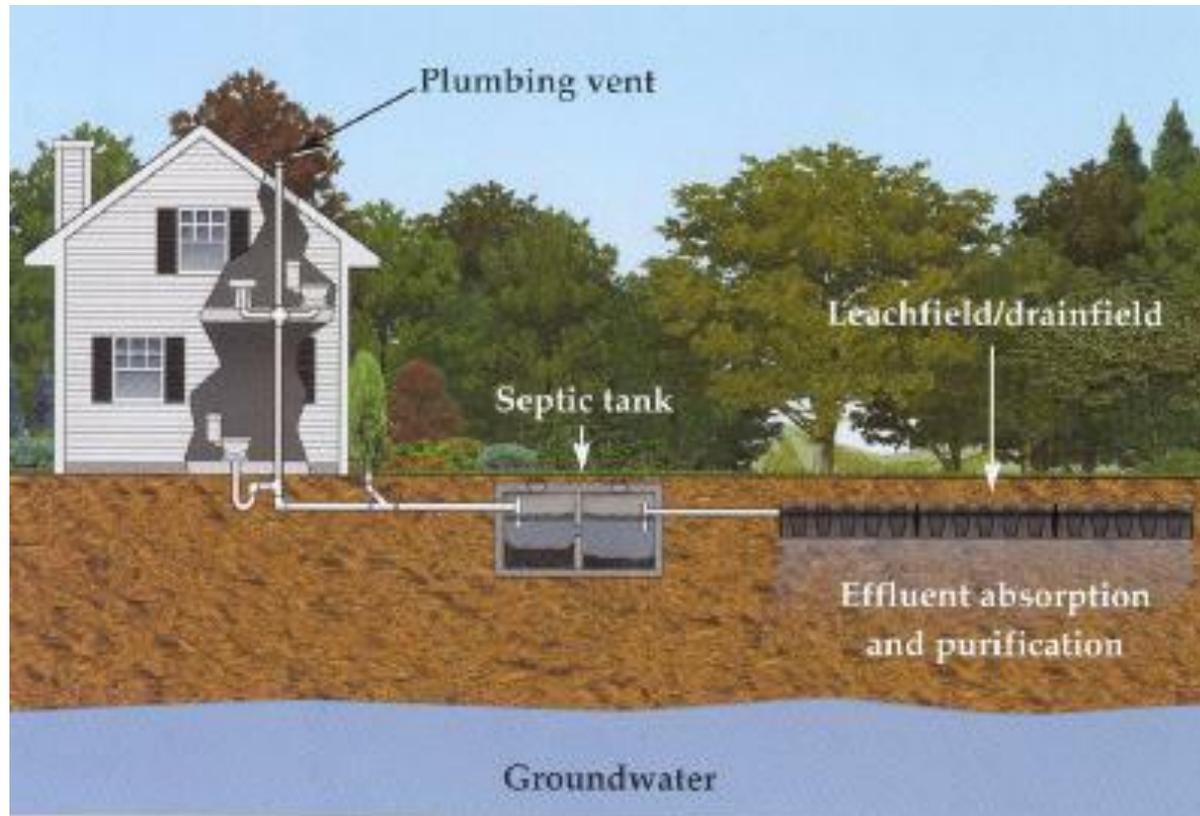
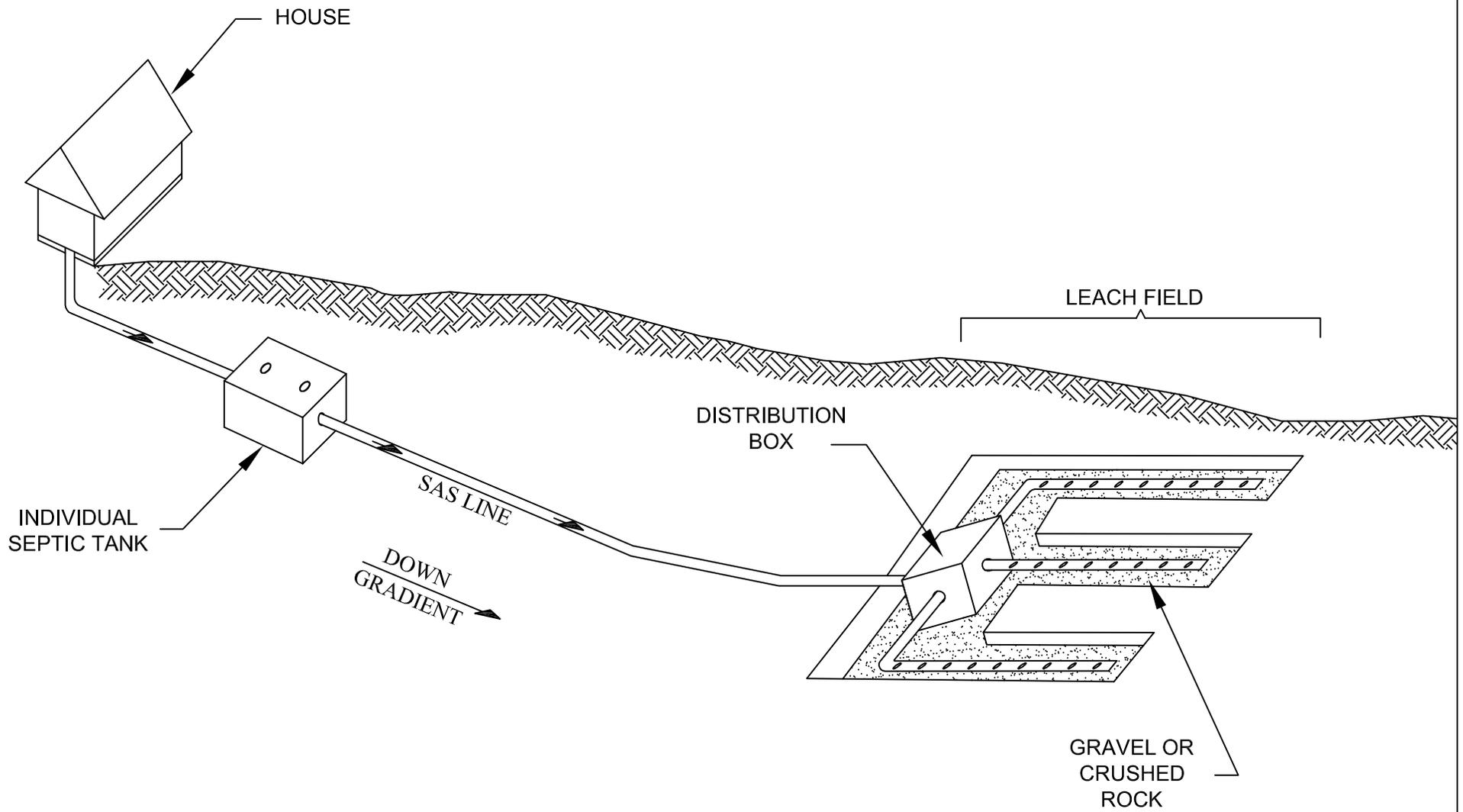


Figure 3-2

TYPICAL SEPTIC TANK AND ONSITE DISPOSAL SYSTEM (TREATMENT 1 IN FIGURE 3-1)

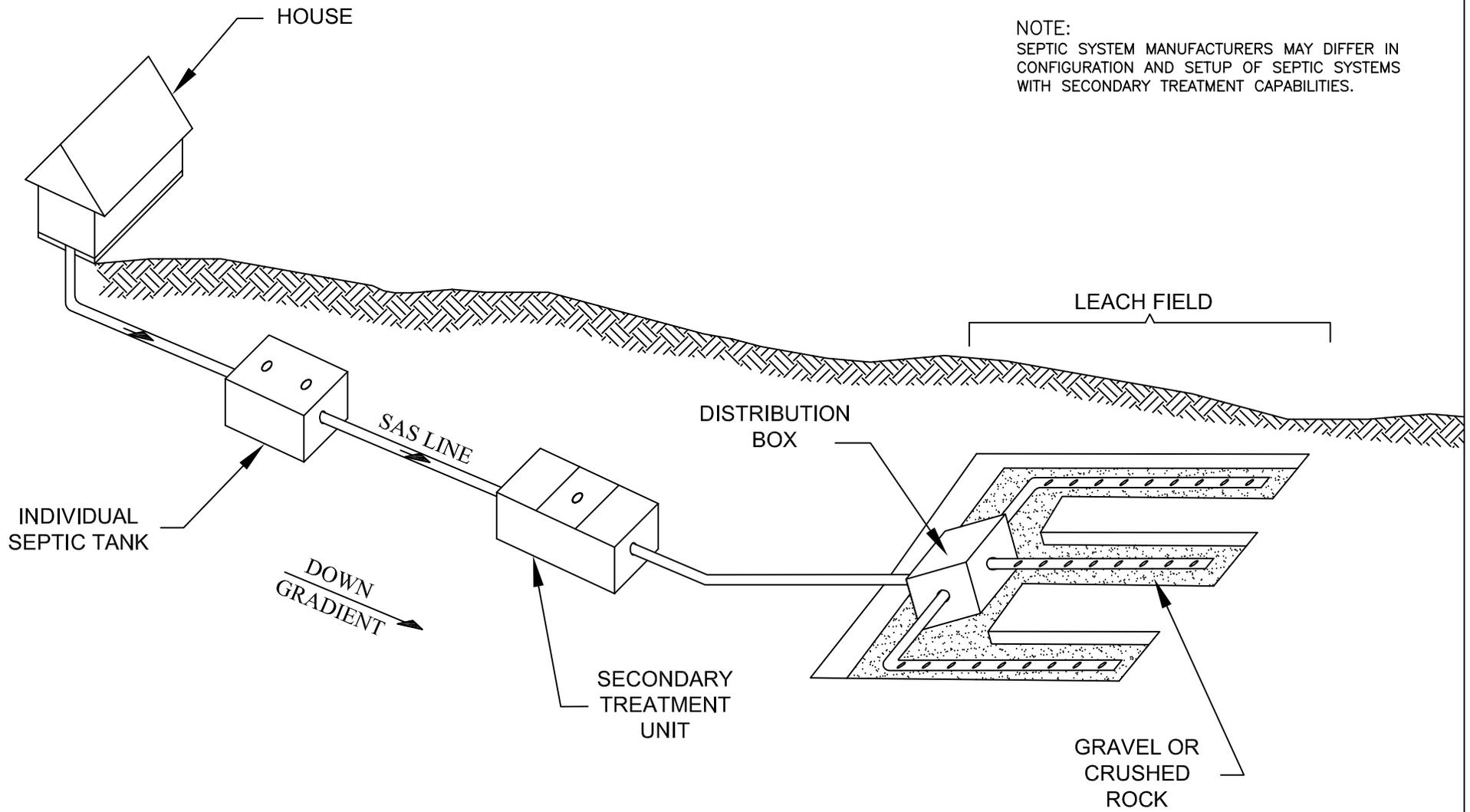
Courtesy of The Natural Home

<https://www.thenaturalhome.com/septic.html>



PRIMARY TREATMENT SCHEMATIC



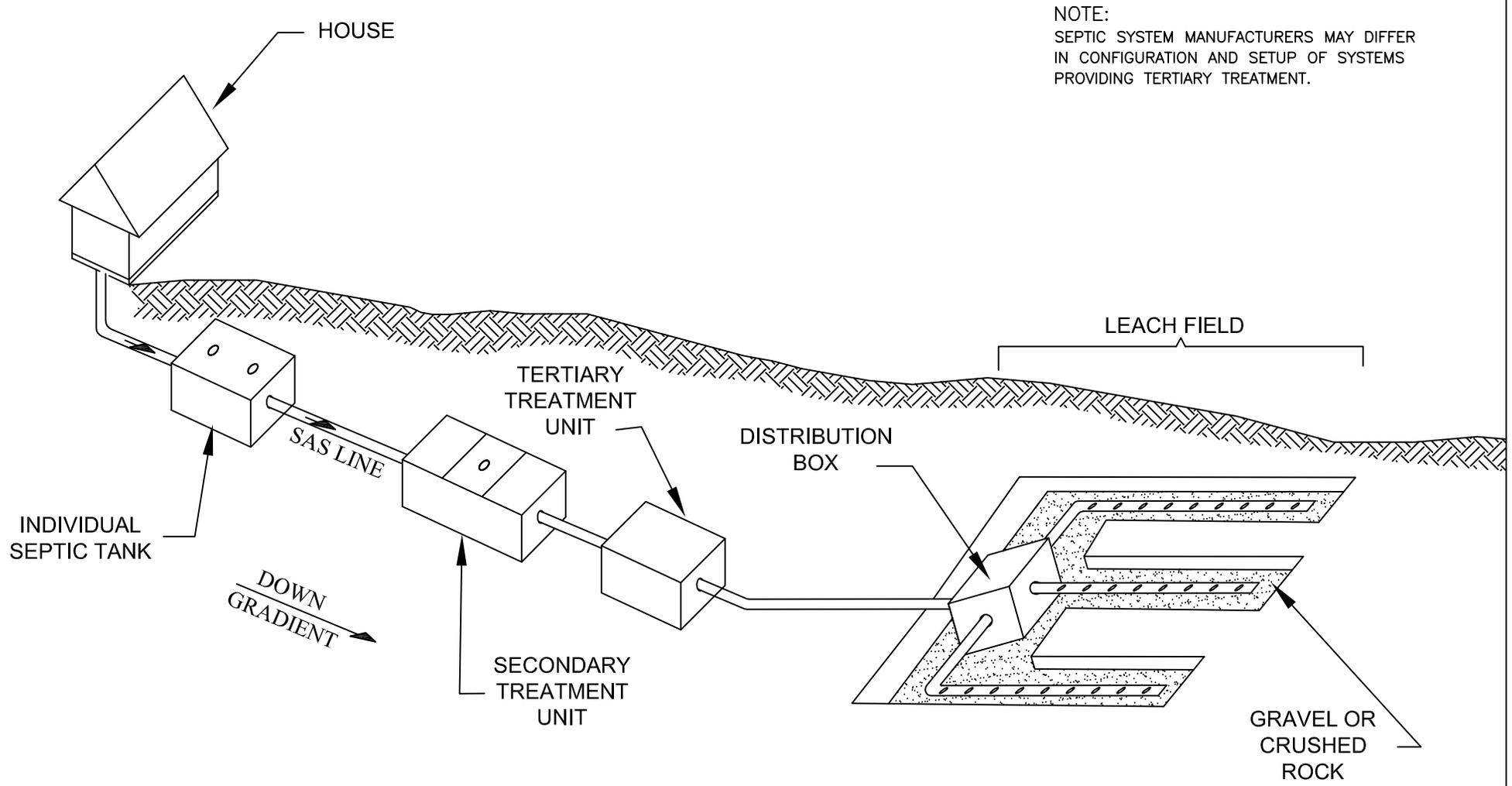


SECONDARY TREATMENT SCHEMATIC



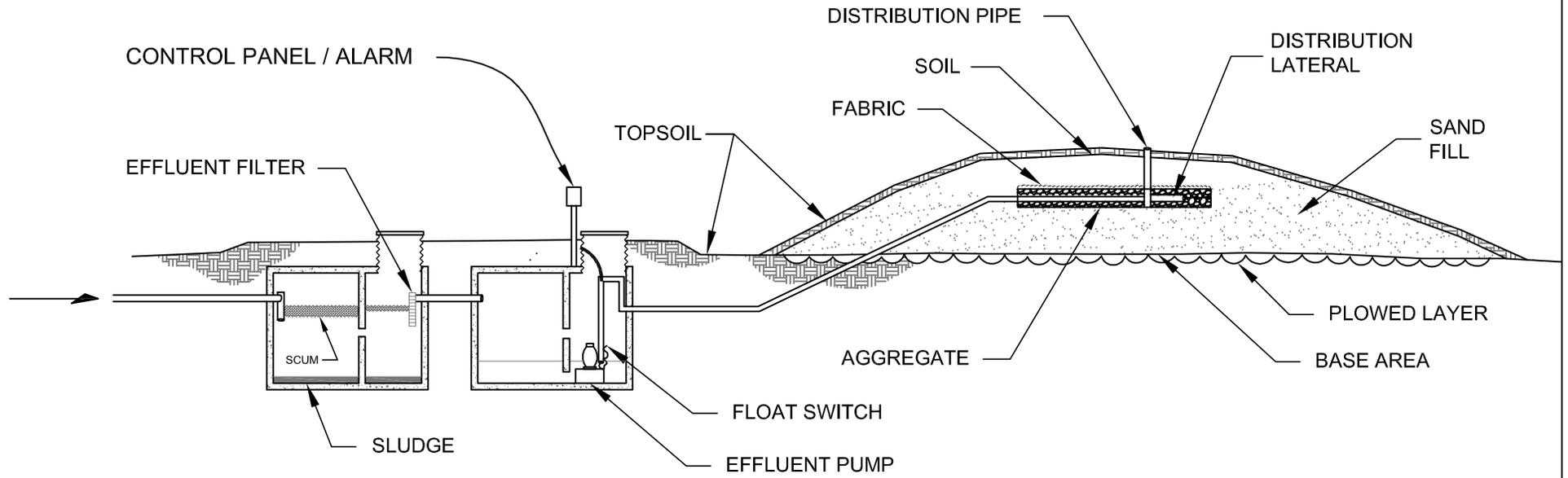
COUNTYWIDE SEWER ASSESSMENT 2012 - BERNALILLO COUNTY, NM

FIGURE 3-4
SECONDARY TREATMENT SCHEMATIC



TERTIARY TREATMENT SCHEMATIC





TYPICAL SEPTIC TANK AND ONSITE MOUND DISPOSAL SYSTEM





FIG 3-7—MOUND DISPOSAL FIELD (FOR TREATMENTS 10, 11, AND 12 IN FIGURE 3-1)

Courtesy of the Cuyahoga County Board of Health

<http://www.ccbh.net/basic-sewage-system-design/>

4.0 OFFSITE DECENTRALIZED TREATMENT OPTIONS

When conditions warrant, wastewater from multiple adjacent lots may be transmitted offsite for collective treatment and/or disposal. **For the purposes of this Guidance Document, it is assumed that all existing and new lots will have onsite septic tanks and that the septic tank effluent will be conveyed offsite to a collective treatment and/or disposal site.** This assumption implies that the burden of solids treatment rests on the individual User rather than on the cluster or community system. Users are responsible for their own solids management, including the installation and maintenance of their own septic tanks. Only septic tank effluent (no solids) is conveyed away from the property and treated by the cluster or community treatment system. Conveying only the effluent to a centralized location (either a cluster or community system) is generally less costly than conveying raw sewage, which contains solids. When only effluent is to be conveyed, smaller sewer lines and pumps can be used.

Offsite treatment and/or disposal may be warranted by any of the following reasons:

1. Slope of individual lots exceeds 15 degrees (Code, 42-511a).
2. Individual lot sizes are too small to treat the maximum required total flow (Code, Chart 1).
3. Soil conditions on individual lots would require advanced treatment (Code, 42-511).

Small cluster-scale systems may be used to treat low-volume wastewater flows, whereas larger, community-scale systems may be used to treat larger wastewater flows. The Code defines a cluster system as being designed to serve more than one lot and treat less than 2,000 gallons of wastewater on a daily basis (Code, 42-497).

A New Mexico groundwater discharge permit is not required for systems discharging less than 2,000 gallons per day (gpd). However, a groundwater discharge permit must be obtained from the New Mexico Environment Department (NMED) for systems discharging more than 2,000 gpd. A community system requires a groundwater discharge permit, because it is designed to treat more than 2,000 gallons of wastewater per day (Code, 42-497).

Groundwater discharge permits outline the acceptable method(s) of discharge and quantity of wastewater that may be discharged under the permit, nutrient concentration limitations (such as nitrogen loadings), and maintenance/monitoring requirements. These systems must be operated and maintained by a licensed operator who holds a valid wastewater operator license, issued by the State of New Mexico. The application for an NMED GWQB Discharge Permit can be found online at the NMED website.

Assuming three-bedroom dwellings are located on each lot, up to approximately five lots (or dwelling units) producing a combined sewer flow of 1,875 gpd can be serviced by one cluster system. (Per Code 42-509b(2). The Code assumes one person generates 75 gpd of wastewater and that five people reside in a three-bedroom dwelling, generating a total of 375 gpd per lot). Multiple cluster systems can be used to serve combined flows greater than 2,000 gpd in lieu of a community system, eliminating the need for a discharge permit. However, suitable land must be available for disposal for both cluster and community systems. If an appropriate disposal site is not available, wastewater must be treated onsite or sent to a public sewer.

Offsite cluster treatment systems (less than 2,000 gpd) are subject to the NMED Liquid Waste Disposal Regulations. As such, the offsite treatment requirements are similar to the onsite treatment requirements, dictated by the amount of flow, soil depth, and soil texture. **Figure 3-1 is applicable to offsite cluster treatment systems.** However, one distinction is noted: With regards to the Center Ring of Figure 3-1, the **Flow vs. Disposal Area** determines the type of treatment required (primary, secondary, or tertiary). The User should realize that the land application site (not the lot size) should be considered to determine advanced treatment required from Chart 1. Figure 3-1 can also be used to determine if soil depth and texture limitations require additional treatment. However, for the purposes of this document, it is assumed that offsite disposal systems are selected with soil conditions that are suitable for disposal without disinfection or low-pressure dosing.

Offsite community treatment systems (greater than 2,000 gpd) require a groundwater discharge permit issued by the Ground Water Quality Bureau (GWQB), and are subject to the NMED Water Quality Control Commission (WQCC) Regulations included in the New Mexico State

Administrative Code (NMAC). The regulations limit Biological Oxygen Demand (BOD) to 30 mg/L and total nitrogen (TN) loading to 200 lb/acre-year (20.6.2 NMAC). **Figure 3-1 does not apply to offsite community treatment.**

Secondary treatment is generally required to reduce BOD levels below the 30 mg/L limit, whereas tertiary treatment is required to reduce TN levels below 20 mg/L. While the effluent is analyzed for concentrations of BOD and TN, the maximum loading for TN is given in lb/acre-yr. The allowable concentration of TN in the effluent is a function of the wastewater characteristics, discharge, and disposal area, as follows:

$$200 \frac{lb}{acre \cdot yr} \geq \left(\frac{lb}{454g} \right) \left(\frac{g}{1000mg} \right) \left(\frac{365d}{yr} \right) \left(\frac{Q \cancel{acre}}{A \cancel{acre}} \right) \left(\frac{3.785L}{gallon} \right) \left(TN \left(\frac{mg}{L} \right) \right),$$

where TN (concentration) is measured in mg/L, A (area of land application site) is measured in acres, and Q (discharge) is measured in gpd. As long as the yearly loading is less than 200 lb/acre of TN, tertiary treatment is not needed. However, if the loading will likely exceed the yearly limit, the effluent should be treated to a higher standard or disposed of over a larger area.

Design constraints for disposal systems are outlined in the Code (42-511). Disposal fields are to be used for discharging the treated wastewater. The wastewater should not be discharged in any other manner (including discharge to arroyos, ditches, groundwater, or surface waters) except when a Discharge Plan is approved by the NMED GWQB (Code, 42-511a).

Setback limitations should also be considered in the selection of area for disposal. Disposal fields must be at least 100 feet away from a private drinking water source and 200 feet away from a public drinking water source. Other setback distance requirements can be found in the Code (42-512) or in the NMED GWQB Discharge Permit Application.

Use Figure 4-1 to determine which offsite disposal options may be appropriate. Conveyance options of wastewater to offsite treatment facilities include Septic Tank Effluent Gravity (STEG) systems and Septic Tank Effluent Pumped (STEP) systems for both cluster- and community-scale treatment systems. When cluster and community treatment options have been evaluated, continue to the Cost Matrix to compare the costs of the applicable treatment alternatives.

Illustrations of cluster and community treatment and disposal are provided for visual understanding. A typical septic tank effluent pump (STEP) system conveying effluent offsite for treatment and/or disposal is illustrated in Figure 4-2. The effluent sewer may be gravity-fed or pressurized, as depicted in Figure 4-3. Up to 2,000 gpd (approximately five (5) lots) may discharge to an effluent sewer for cluster treatment and/or disposal offsite.

When the effluent from a shared system exceeds 2,000 gpd, community treatment is used. Mid-scale systems are assumed to be designed to treat between 2,000 gpd and 30,000 gpd. An example of secondary or tertiary treatment units for a community system is shown in Figure 4-4. A large community treatment system is illustrated in Figure 4-5. Effluent may be pumped or gravity-fed to the treatment and/or disposal site, depending on site conditions.

As the complexity of the decentralized wastewater system increases, it is recommended that owners and developers consider the qualifications of installers prior to installation to ensure the quality of the system they are purchasing. Septic tank installers are required by State regulations to hold a valid New Mexico Construction Industries Division (CID) license with the proper classification. However, it may be advisory to pursue additional certifications for the design and installation of larger, more complex systems. Certifications and training may be provided by associations such as the Consortium of Industries for Decentralized Wastewater Treatment (CIDWT), the National Onsite Wastewater Recycling Association (NOWRA), and the National Association of Wastewater Transporters (NAWT). Additionally, the State of New Mexico is in the process of creating the classification of “Master Installer”.

The permitting process for onsite and offsite cluster wastewater systems is described in the Code, Section 42-504. A permit is required for installation and modification of a wastewater system. The application contains plans and specifications, a site plan, a site evaluation, a management plan, supporting data, a maintenance contract (for secondary and tertiary treatment systems), and fees that are submitted to the County for review. If the application is approved, a wastewater system permit will be issued.

As the system complexity increases, the permitting process becomes more complicated and time-consuming. The offsite community wastewater system permitting process includes the application described in the Code, Section 42-502, as well as additional requirements described in Section 42-503. Among the requirements are a discharge plan approved by the New Mexico Environment Department Groundwater Quality Bureau (NMED GWQB) and public notice of the intent to discharge. Also, the system design must be prepared by a Professional Engineer licensed in the State of New Mexico.

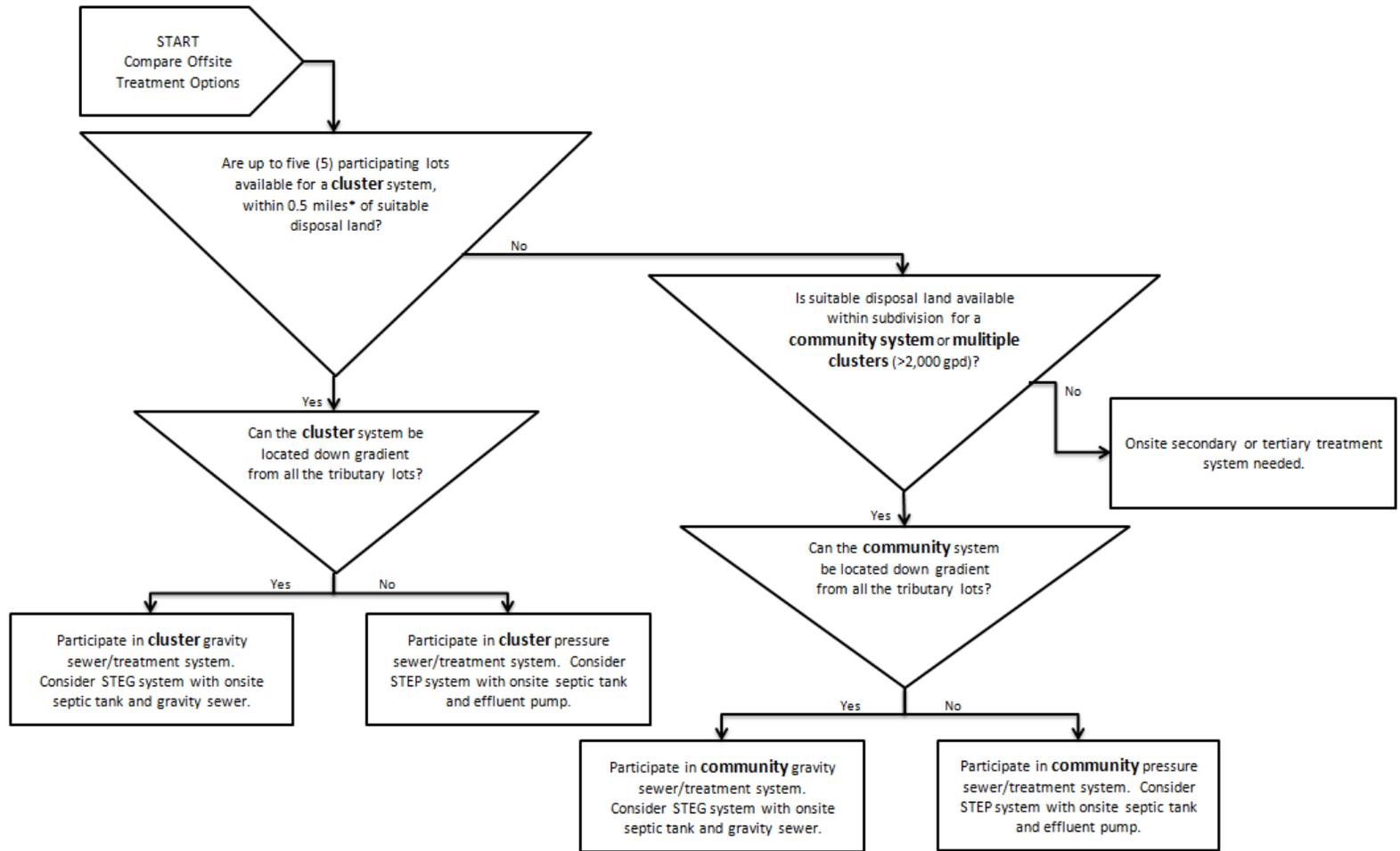


Figure 4-1

OFFSITE DECENTRALIZED TREATMENT DECISION CHART

*Note: At some distance between lots and disposal system, use of a cluster treatment system and disposal area may be impractical, suggesting other forms of treatment should be considered. For the purposes of this document, the cut-off distance is assumed to be approximately 0.5 miles. Participating lots are assumed to be adjacent or relatively close together.

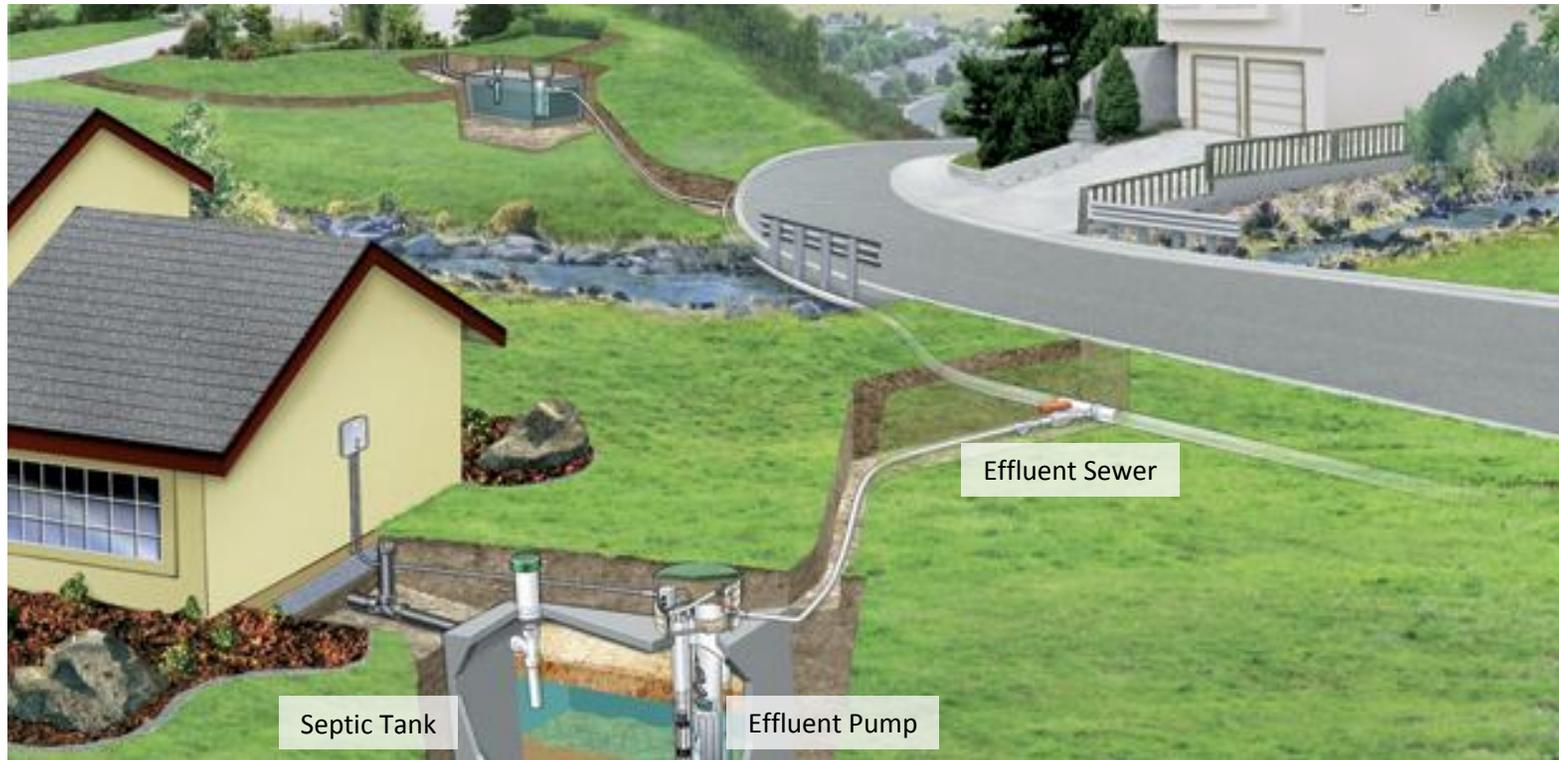
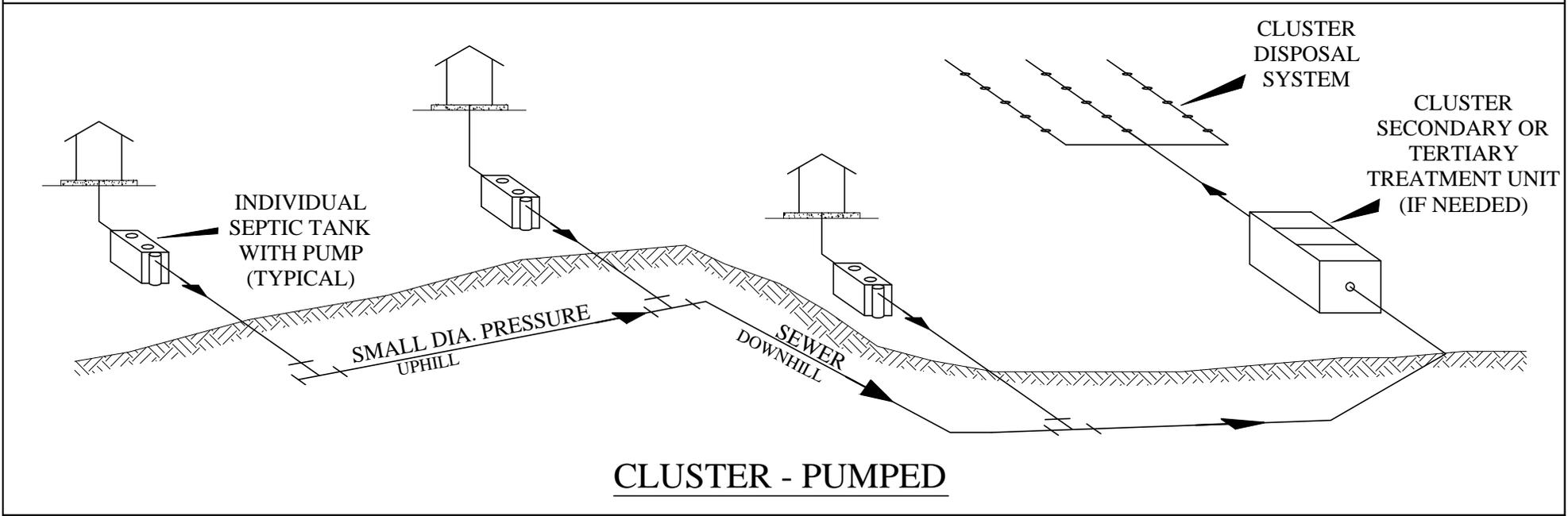
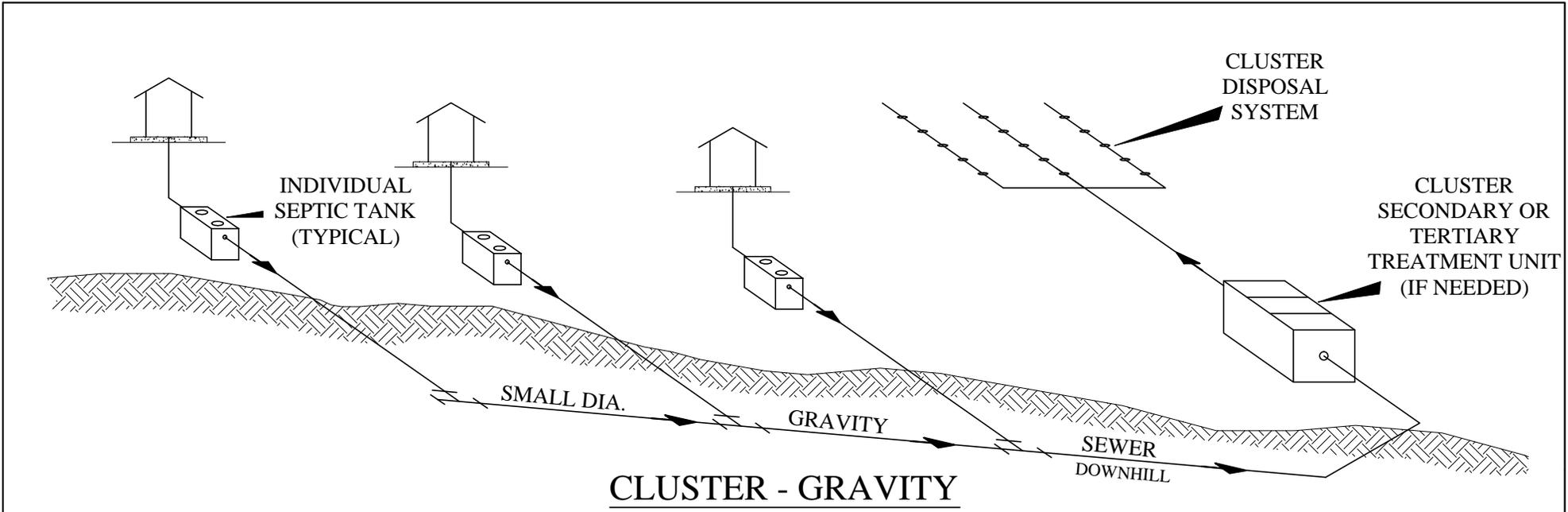


Figure 4-2

**TYPICAL SEPTIC TANK EFFLUENT PUMP (STEP) SYSTEM
CONVEYING EFFLUENT TO OFFSITE DISPOSAL AND POSSIBLY OFFSITE TREATMENT**

Courtesy of Orenco Systems, Inc.

http://www.orenco.com/systems/wastewater_collection.cfm



COUNTYWIDE SEWER ASSESSMENT 2012 - BERNALILLO COUNTY, NM

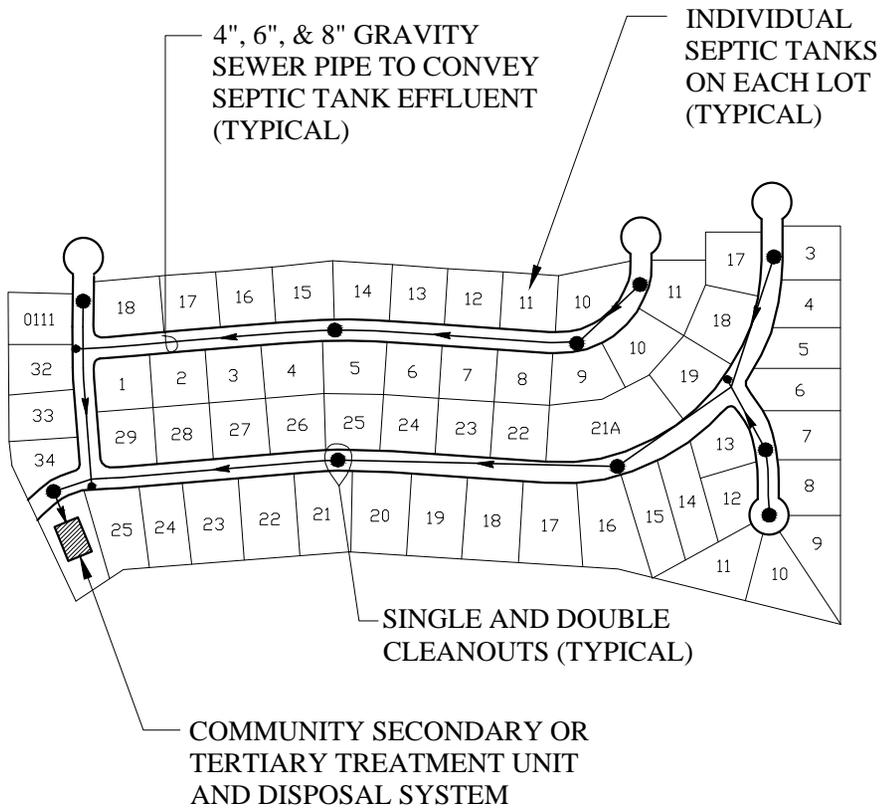


Figure 4-4

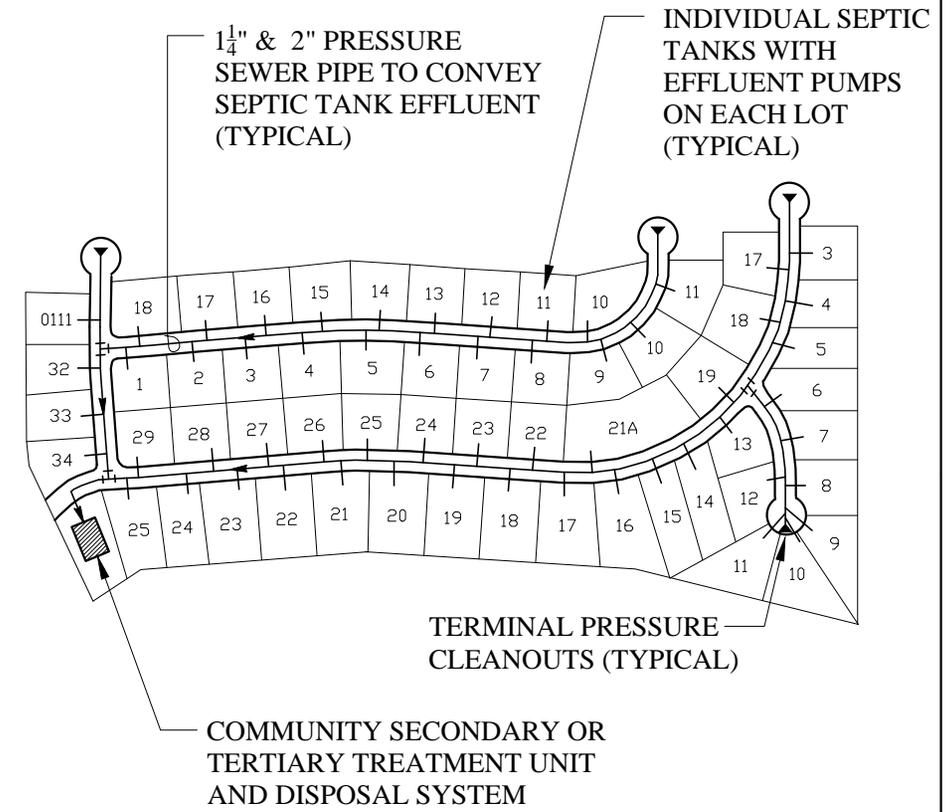
**EXAMPLE OF SECONDARY OR TERTIARY TREATMENT UNITS
FOR OFFSITE COMMUNITY SYSTEMS**

Courtesy of Orenco Systems, Inc.

<http://www.orenco.com/systems/technologies.cfm>



COMMUNITY - GRAVITY



COMMUNITY - PUMPED

COUNTYWIDE SEWER ASSESSMENT 2012 - BERNALILLO COUNTY, NM



5.0 ASSUMPTIONS WITHIN THE COST MATRIX

The Cost Matrix presented in Table 5-1 provides a rough comparison of User costs for the different treatment systems discussed in the preceding sections. Costs are meant to be a guide and are expected to vary on an individual basis.

5.1 User's Share

The costs shown in the Cost Matrix are representative of one User's share. For the sewer option, the User's share does not include any costs for onsite treatment; no septic tanks are included in the sewer costs. However, the other User's shares were determined based on the assumption that each lot utilizes a septic tank for onsite primary treatment. For the offsite systems, the User's share includes the cost of an onsite septic tank plus the cost of an offsite system divided by the number of Users it serves.

5.2 Public Sewer

Costs of discharging to a public sewer are included in the Cost Matrix to compare with onsite (decentralized) treatment costs. The costs shown in Table 5-1 (Cost Table Nos. 1 and 2), Capital Costs, include the User's share of the capital cost of constructing the sewer from the lot to the public sewer main trunk line, including individual grinder pumps for pressurized systems, plus the User's share of the utility expansion charge (UEC) for the tap. Operating costs include a fixed monthly charge for disposal to the public sewer.

The costs are based on two assumptions:

- 1) The length of sewer from the midpoint of the lots to the public sewer tap is one mile (5,280 feet).
- 2) The costs are shared equally among 40 Users.

If fewer or greater than forty Users intend to compare the option to tie into a public sewer, the costs shown in Table 5-1 should be adjusted accordingly. Generally, more Users will result in

lower costs per User. The costs of constructing a sewer for only a few Users may be significantly greater than other treatment options. Similarly, if the length of the sewer is less than or greater than 5,280 feet, the costs should be adjusted accordingly. When the distance from the lots to the main trunk line approaches three miles, it will likely become impractical for a single User to pay for the sewer option, and the User should consider decentralized systems.

Costs associated with construction of the main trunk public sewer line to a centralized treatment plant are not included. Costs of such large-scale sewer construction require site-specific analyses and are outside the scope of this evaluation.

The costs presented for the public sewer option assume the new sewer will tie into an existing public wastewater system, such as that of the Albuquerque Bernalillo County Water Utility Authority (ABCWUA). Separate costs are shown for gravity and pressure conveyance to the public sewer. Wastewater is pumped into pressure systems by grinder pumps at each dwelling. Disposal to public sewer assumes no septic tank is used. The responsibility of solids management does not fall on the User.

User rates were selected using the ABCWUA Sewer Rates Ordinance effective July 1, 2013. Forty (40) Users (lots) were assumed to each generate approximately 1,500 cubic feet (15 CCF) of wastewater per month, for a collective generation of 60,000 cubic feet (600 CCF) per month. The UEC for 600 CCF is approximately \$70,000, whereas the UEC for 15 CCF is \$3,500. Assuming the community collection system taps into the main public sewer line at only one location, (the Users all tie into a smaller line that runs from the lots to the main trunk line), the Users would share the cost of the 600 CCF UEC (included in the in the Cost Matrix in Table 5-1). However, the monthly disposal fee is assumed to be paid per lot. Users are not assumed to share the monthly disposal fee for the combined 600 CCF, but are responsible for their individual sewer bills (approximately \$13 per month). These assumptions are reflected in the Cost Matrix; the shared cost of the UEC is included in the User's Share of Capital Cost and the individual sewer bill is represented by the Public Sewer Monthly Service Fee. (See ABCWUA Water and Sewer Rate Ordinance (amended June 2012) for water and sewer rates).

The costs for gravity sewer in the Cost Matrix assume the use of an 8-inch PVC gravity sewer from the midpoint of the lots to the main trunk line. The costs for sewer in a pressurized sewer system assume the use of a 2-inch pressure sewer line from the midpoint of the lots to the main trunk line. Each lot on the pressurized system is assumed to utilize an individual grinder pump, enabling the use of a smaller sewer line with shallower bury than the traditional gravity sewer. Planners and developers are not restricted from considering other sewer options (such as a vacuum sewer); however, the values in the Cost Matrix reflect the assumptions stated above.

5.3 Onsite Decentralized Treatment

Costs provided in the Cost Matrix include materials and installation for a septic tank, potential treatment options, and a disposal field. The costs assume the septic tank and disposal field are sized for a three-bedroom house (approximately 375 gpd). Capital costs assume no substantial rock excavation is necessary.

Included in O&M costs are costs for septic tank pumping and effluent filter cleaning, likely to be required every 3 to 5 years. A written contract and an approved management plan are required, per the Code (42-515), when advanced treatment systems are installed. The cost of the maintenance agreement for secondary or tertiary treatment is also included.

5.4 Offsite Decentralized Cluster Treatment

Offsite cluster treatment (less than 2,000 gpd) costs are presented for the share paid by one User (lot), assuming that all the lots on the system participate equally in cost-sharing. Separate costs are given for the gravity collection option (Septic Tank Effluent Gravity – STEG) and pressure collection option (Septic Tank Effluent Pumped – STEP), as shown in the Decision Chart in Figure 4-1. Costs are presented in Table 5-1 for two sizes of cluster systems: one containing three lots (approximately 1,125 gpd) and another composed of five lots (approximately 1,875 gpd). Costs for other sizes of cluster systems can be approximated by interpolation.

For each of the two sizes of cluster systems, the Cost Matrix provides costs for the following treatment/disposal variations:

- Gravity collection (STEG) component
- Pressure collection (STEP) component
- Disposal system only
- Secondary treatment plus disposal
- Tertiary treatment plus disposal

Costs provided in the Cost Matrix for offsite disposal assume a septic tank (primary treatment) is already in place. If primary treatment is not in place (as for an undeveloped lot), the cost of a septic tank without disposal system should be added to the costs derived from the Cost Matrix. (Note: The onsite primary treatment cost provided in the Cost Matrix includes a disposal system. A septic tank alone could be expected to cost between \$2,000 and \$3,000, installed.) Costs for secondary and tertiary treatment were determined assuming Orenco Advantex treatment technology was used. The cost of advanced treatment will vary by manufacturer.

For the purposes of this Guidance Document, these costs were prepared assuming that the soil depth and texture at the offsite disposal site are acceptable for a normal application rate, and the effluent does not require disinfection.

Dosing pumps are required for disposal systems greater than 2,000 square feet (Code, 42-511). Such systems require a maintenance agreement for the dosing system (Code, 42-511 (e) (2)). Dosing equipment is included in the construction costs. Maintenance agreement costs are included in O&M costs.

5.5 Offsite Decentralized Community Treatment

The costs for offsite community treatment shown in the Cost Matrix are for one User in a system where the total cost is shared equally among all the Users. Costs are presented for three sizes of community systems: 3,000 gpd (approximately 8 lots), 15,000 gpd (approximately 40 lots), and

30,000 gpd (approximately 80 lots). Costs for intermediate sizes of community systems can be roughly approximated by interpolation.

Treatment systems with land disposal may become impractically large beyond 30,000 gpd. Based upon the disposal application rates specified in Table 4, subsection 42-511 of the Code, for suitable texture soil, and applying a 30-percent absorption area reduction allowed for advanced treatment (Code, 42-511f(1)(m)), the absorption area required for a 30,000 gpd system requires approximately one acre of disposal area. Devoting disposal areas of this magnitude of prime developable land often becomes financially impractical. At some point, a larger centralized sewer treatment facility is more prudent than use of multiple smaller cluster treatment systems or multiple community treatment systems. However, costs of a larger treatment plant must be estimated on an individual basis and are not included in the Cost Matrix.

For each of the three sizes of community systems, the Cost Matrix provides costs for the following treatment/disposal variations:

- Gravity collection (STEG) component
- Pressure collection (STEP) component
- Disposal system only
- Secondary treatment plus disposal
- Tertiary treatment plus disposal

Costs provided in the Cost Matrix for offsite disposal assume a septic tank (primary treatment) is already in place. If primary treatment is not in place (as for an undeveloped lot), the cost of a septic tank without disposal system should be added to the costs derived from the Cost Matrix. (Note: The onsite primary treatment cost provided in the Cost Matrix includes a disposal system.) Costs for secondary and tertiary treatment were based on Orenco Advantex treatment technology. The cost of advanced treatment will vary by manufacturer. Other advanced wastewater treatment systems approved by NMED are listed on the NMED Liquid Waste Program website. Follow links to: *Information / Approved Products / Advanced Treatment Systems*.

For the purposes of this Guidance Document, these costs were prepared assuming that the soil depth and texture at the offsite disposal site are acceptable for a normal application rate, and the effluent does not require disinfection.

Dosing pumps are required, however, for these large community disposal systems (Code, 42-511). Such systems require a maintenance agreement for the dosing system (Code, 42-511(e)(2)). Dosing equipment is included in the construction costs. The maintenance agreement costs are included in O&M costs.

5.6 Debt Service Costs

It is uncommon that a homeowner or developer can pay for capital improvements upfront. Usually a loan is required to fund the initial investment, and regular payments are made until the debt is repaid. The Cost Matrix presents the cost of debt service, or the cost of interest on money borrowed to fund a capital investment. This is presented as an annual expense (loan payment) based on the present worth of the capital investment, the interest rate, and the loan term. The Owner will pay more by choosing to spread payments out over time.

The total cost of the debt (principal plus interest) is divided by the number of Users assumed to share the cost of the system. An annual interest rate of three percent and a term of 20 years were assumed for the loan. These result in an annual principal plus an interest capital recovery factor of 0.06722.

**Table 5-1
COST MATRIX**

Itemized Cost Tables	Treatment Type	User's Share of Capital Cost	User's Share of Annual O&M Cost	Annual Debt Service Cost ^a	Public Sewer Monthly Service Fee	Life Cycle Present Worth ^b
	PUBLIC SEWER^c					
# 1	Gravity to Public Sewer, 8" pipe, based on 1 mile of pipe and 40 Users	\$6,900	--	\$460	\$13	\$9,200
# 2	Pump to Public Sewer, 2" pipe, based on 1 mile of pipe and 40 Users	\$9,000	--	\$600	\$13	\$11,300
	ONSITE TREATMENT^d					
# 3	1 - Primary	\$4,600	\$300	\$310	--	\$9,100
# 4	2 - Secondary	\$8,900	\$500	\$600	--	\$16,300
# 5	3 - Secondary + Disinfection	\$10,200	\$500	\$690	--	\$17,600
# 6	4 - Secondary + Low Pressure Dosing	\$13,000	\$500	\$870	--	\$20,400
# 7	5 - Secondary + Disinfection + Low Pressure Dosing	\$14,500	\$500	\$970	--	\$21,900
# 8	6 - Tertiary	\$11,600	\$500	\$780	--	\$19,000
# 9	7 - Tertiary + Disinfection	\$12,900	\$500	\$870	--	\$20,300
# 10	8 - Tertiary + Low Pressure Dosing	\$15,700	\$500	\$1,060	--	\$23,100
# 11	9 - Tertiary + Disinfection + Low Pressure Dosing	\$17,200	\$500	\$1,160	--	\$24,600
	MOUND OPTIONS^e					
# 12	10 - Primary Treatment with Mound & Pump	\$9,300	\$400	\$630	--	\$15,300
# 13	11 - Secondary Treatment with Mound & Pump	\$11,700	\$500	\$790	--	\$19,100
# 14	12 - Tertiary Treatment with Mound & Pump	\$13,000	\$500	\$870	--	\$20,400
	OFFSITE CLUSTER TREATMENT^f					
# 15	3 lots (1,125 gpd), gravity, disposal only	\$20,400	\$80	\$1,370	--	\$21,600
# 16	3 lots (1,125 gpd), gravity, secondary	\$32,000	\$530	\$2,150	--	\$39,900
# 17	3 lots (1,125 gpd), gravity, tertiary	\$32,000	\$530	\$2,150	--	\$39,900
# 18	3 lots (1,125 gpd), pressure, disposal only	\$25,300	\$120	\$1,700	--	\$27,100
# 19	3 lots (1,125 gpd), pressure, secondary	\$37,500	\$570	\$2,520	--	\$46,000
# 20	3 lots (1,125 gpd), pressure, tertiary	\$36,500	\$570	\$2,450	--	\$45,000
# 21	5 lots (1,875 gpd), gravity, disposal only	\$20,400	\$80	\$1,370	--	\$21,600
# 22	5 lots (1,875 gpd), gravity, secondary	\$34,500	\$380	\$2,320	--	\$40,200
# 23	5 lots (1,875 gpd), gravity, tertiary	\$39,600	\$400	\$2,660	--	\$45,600
# 24	5 lots (1,875 gpd), pressure, disposal only	\$24,900	\$120	\$1,670	--	\$26,700
# 25	5 lots (1,875 gpd), pressure, secondary	\$38,400	\$420	\$2,580	--	\$44,600
# 26	5 lots (1,875 gpd), pressure, tertiary	\$44,000	\$440	\$2,960	--	\$50,500
	OFFSITE COMMUNITY TREATMENT^f					
# 27	8 lots (3,000 gpd), gravity, disposal only	\$23,000	\$80	\$1,550	--	\$24,200
# 28	8 lots (3,000 gpd), gravity, secondary	\$34,100	\$280	\$2,290	--	\$38,300
# 29	8 lots (3,000 gpd), gravity, tertiary	\$35,300	\$290	\$2,370	--	\$39,600
# 30	8 lots (3,000 gpd), pressure, disposal only	\$27,500	\$120	\$1,850	--	\$29,300
# 31	8 lots (3,000 gpd), pressure, secondary	\$36,500	\$320	\$2,450	--	\$41,300
# 32	8 lots (3,000 gpd), pressure, tertiary	\$38,100	\$330	\$2,560	--	\$43,000
# 33	40 lots (15,000 gpd), gravity, disposal only	\$16,300	\$80	\$1,100	--	\$17,500
# 34	40 lots (15,000 gpd), gravity, secondary	\$22,000	\$140	\$1,480	--	\$24,100
# 35	40 lots (15,000 gpd), gravity, tertiary	\$22,100	\$140	\$1,490	--	\$24,200
# 36	40 lots (15,000 gpd), pressure, disposal only	\$19,000	\$120	\$1,280	--	\$20,800
# 37	40 lots (15,000 gpd), pressure, secondary	\$24,400	\$190	\$1,640	--	\$27,200
# 38	40 lots (15,000 gpd), pressure, tertiary	\$24,700	\$190	\$1,660	--	\$27,500
# 39	80 lots (30,000 gpd), gravity, disposal only	\$16,600	\$80	\$1,120	--	\$17,800
# 40	80 lots (30,000 gpd), gravity, secondary	\$28,500	\$120	\$1,920	--	\$30,300
# 41	80 lots (30,000 gpd), gravity, tertiary	\$28,900	\$120	\$1,940	--	\$30,700
# 42	80 lots (30,000 gpd), pressure, disposal only	\$19,500	\$120	\$1,310	--	\$21,300
# 43	80 lots (30,000 gpd), pressure, secondary	\$31,300	\$170	\$2,100	--	\$33,800
# 44	80 lots (30,000 gpd), pressure, tertiary	\$31,600	\$170	\$2,120	--	\$34,100

^a Capital Recovery Factor (20 yr at 3%): $A/P(3,20) = 0.06722$

^b Present Worth Factor (20 yr at 3%): $P/A(3,20) = 14.87747$

^c Capital costs include User's share of sewer from lot to main public sewer trunk line (and individual pump for pressure systems) plus the utility expansion charge for the tap; cost of public sewer trunk not included. Monthly User sewer service fee divided between 40 Users.

^d Onsite capital costs include septic tank, treatment options, and disposal field.

^e Mound disposal capital costs include septic tank, treatment options, and mound disposal field.

^f Offsite disposal costs assume each lot has existing septic tank. Capital cost includes effluent sewer, treatment unit, and disposal field.