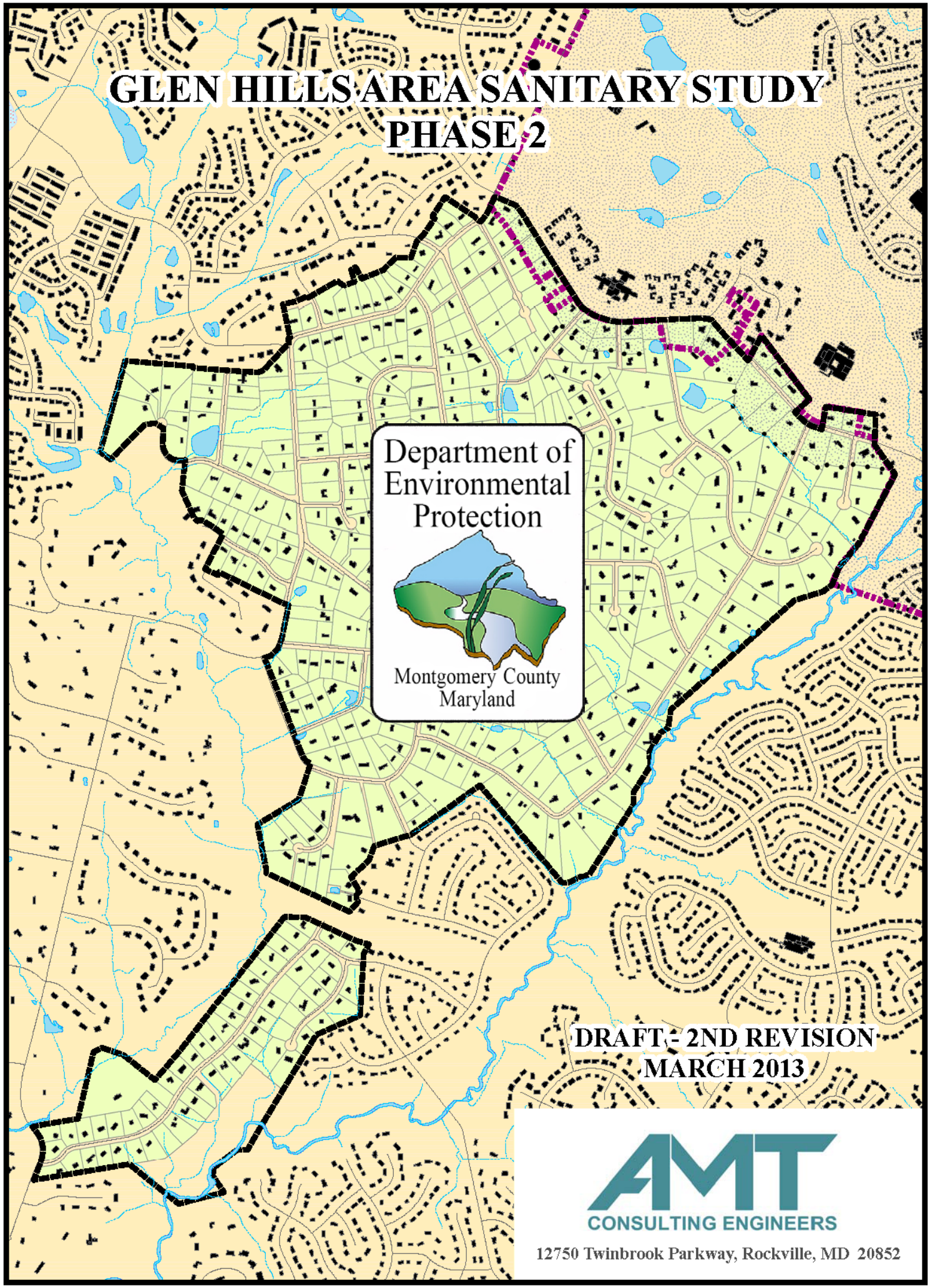
GLEN HILLS AREA SANITARY STUDY
PHASE 2



DRAFT - 2ND REVISION
MARCH 2013

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1. Executive Summary

The *2002 Potomac Subregion Master Plan* recommended that Montgomery County conduct a sanitary survey to evaluate the general condition of the septic systems within the study area, determine the probability of continued reliability of these facilities and, if necessary, evaluate the feasibility of extending public sanitary sewer service to portions of the study area. The project was conducted in two phases. The results indicated in Phase 1 of this report reflect the evaluation of existing conditions that may constrain areas for future septic system use.

This report presents the results of Phase 2 of the Glen Hills Area Sanitary Study. In the Phase 1 report, approximately 36 percent of the study area was potentially affected by constraints that could limit the long-term use of deep-trench septic systems, the type of septic system most commonly installed today for new construction and replacement systems.

The report presents an evaluation of options for providing sewage disposal to parts of the Glen Hills study area. As explained in the Phase 1 report, these are areas where the use of a conventional deep stone trench septic system for future on-site sewage disposal may be constrained by soil characteristics and regulatory requirements. These areas are identified in this report as Review Areas (RAs). Two options are presented for the purpose of wastewater disposal:

- On-site replacement of septic systems, including alternatives for both conventional systems (deep stone trench, shallow stone trench, and sand mound) and innovative systems (drip-disposal).
- Provision of public sewer service.

On-site Sewage Disposal Systems

Based on previous data accumulated in Phase 1 of this report deep stone trench systems within the RAs may not meet today's septic regulations and could be difficult to construct within the RAs predominantly due to poor soil conditions including slow percolation rates, high ground water elevations and high bedrock elevations.

On-site septic systems replacements or expansions will require proper soil testing and evaluations to determine their suitability. With more detailed field soil testing some of the areas within the RAs may reveal better soil conditions than the preliminary data that the Phase 1 report based its delineation of the RAs. If areas within the RAs are found with moderate depths to groundwater or bedrock, shallow trench stone systems could be used as replacements systems in these areas where otherwise deep stone trench systems would not be viable.

Because sand mound systems are built over the existing ground without the need to excavate down into the ground, sand mound systems are better able to function in high ground water and high bedrock areas than stone trench systems. There are areas within the RAs with high bedrock that may be suitable for sand mound systems. Areas within the RAs with high groundwater also had poor percolation rates and therefore would not be suitable for sandmound systems.

Drip systems are innovative systems that are designed by a MDE certified designers who test soils and determine the allowable percolation rate on a case by case basis. Designers could design a system that functions in soils with slower percolation than the normally required 30 minutes per inch. Drip systems may be viable in areas with marginal percolation rates that would not normally be viable for a stone trench system.

Planning level estimates and the associated costs were generated for each option to serve the existing septic systems potentially affected by the conditions in the RAs. The average costs for replacing the 197 septic systems within the RAs ranges from $17,500 to $48,000 for each property depending on the type of on-site sewage disposal system.

Public Sewerage Systems

Existing public sewer service within the study area is provided primarily by the Washington Suburban Sanitary Commission (WSSC). The City of Rockville provides sewer service to properties located within the city limits along the northeastern edge of the study area.

See comment below.

Conceptual public sewer service extension plans were developed to prepare a comparative cost analysis. Sewer main alignments were located within the public roadways and avoided environmentally sensitive stream valleys. The alignments maximized the usage of gravity systems and minimized pump station and pressure lines. The conceptual alignment also avoided the need for any easements from private land owners.

See comment below.

Thirteen separate sewer extension systems were designed. The system included both gravity and pressure main line pipes. Each applicant will require a connection from the existing house to the main line pipe in the road. These connections could be a gravity system or a pump system depending on the topography. To obtain public sewer service several steps are needed. These include a service category change from Montgomery County, which typically takes nine to 15 months from the time of application, and an extension application process through WSSC, which takes four to ten months from the time an engineer is selected for system design to receiving a permit.

3/29/13 note: Will add statement about estimated construction time.

The average cost for extending public sewer to 197 lots and making connections is estimated to range from $33,000 to $71,300 per lot.

3/29/13 note: Will clarify extension and service costs.

3/28/13 Note: DEP will add an explanation of the next steps for the study to the Executive Summary. This will relate to the development of a staff report for the County Executive and transmittal of the staff report and Phase 1 and 2 reports to the County Council and Planning the Board. (See Section 6 for additional details.)

3/29/13 note (see pg. 2, 1st paragraph): DEP will expand this paragraph to provide additional information referencing the 2002 master plan's recommendations.

3/29/13 note (see above, 1st paragraph under "Public Sewerage Systems"): Wastewater treatment for both WSSC and Rockville is provided at the Blue Plains Plant under a regional agreement.

3/29/13 note (see above, 2ndt paragraph under "Public Sewerage Systems"): Cost comparison relates to planning level costs developed for on-site septic system replacements.

2. Introduction

The *2002 Potomac Subregion Master Plan* recommended that Montgomery County conduct a sanitary survey to, "develop the measures necessary to ensure the long-term sustainability of septic service for new home construction and existing home renovations, and to address the need for limited sewer extensions if needed." The entire text of the master plan's recommendations for the Glen Hills area study is included in Appendix 2 of the Phase 1 report. The study was conducted in two phases. The Phase 1 portion of this study has been completed and consisted of the evaluation of existing conditions that potentially constrain areas for future septic system use. The study is to a preliminary level, using only available data and documentation as its basis for the study. It was conducted for planning purposes and did not include a lot by lot investigation or analysis.

The study area is located southwest of the City of Rockville and consists of 542 properties located within several existing subdivisions. (See Figure 2.1. Project Location Map at the end of Section 2). This report collectively refers to these properties as the "Glen Hills study area" or the "study area." Most of the properties are improved with single-family homes, and of these, most are currently served by on-site septic systems. Most of the properties were built 30 to over 60 years ago. Properties at the northeast edge of the study area, along Viers Drive and Scott Drive, are located either within the City of Rockville or within the City's planned public sewer service area.

2.1 Summary of Phase 1 Findings

The Phase 1 report of the Glen Hills Area Sanitary Study, dated August 2012, contains data that was gathered and assessed to evaluate the potential for sustained use of septic systems within the study area. The sources and evaluation of data collected are presented in Sections 3 and 4 of the Phase 1 report and included:

- Well and septic permit records research at Montgomery County Department of Permitting Services (MCDPS)
- General GIS data from Montgomery County Department of Environmental Protection (MCDEP) providing both area and property-specific analysis
- GIS soils information from U.S. Department of Agriculture Natural Resources Conservation Service website
- Property owner surveys conducted as part of this study
- Public meetings
- Glen Hills Study Citizen advisory committee
- Interviews with MCDPS Well and Septic Section staff
- Review of current soil testing requirements and permit regulations for septic systems

Due to the preliminary nature of the report and available funds, the report did not include the lot-by-lot field soil testing that is normally required when designing, permitting and constructing sanitary systems. Only with this type of soil testing can there be certainty regarding the long term sustainability of septic service on individual properties.

Those data evaluated include:

- septic system age
- streams and floodplains
- topography and steep slopes

- depth to groundwater
- depth to bedrock
- percolation and permeability rate
- restrictive soils classification for septic fields
- septic system past failures and replacements.

eight

By evaluating, mapping and compiling the preceding parameters, a map (see Figure 2.2, at the end of Section 2) was prepared to indicate portions of the study area where the relief of existing, aging septic systems may require alternatives to the long-term use of conventional, deep-trench septic systems. The findings of the Phase 1 report showed that these areas, referred to here as Review Areas (RAs), comprise approximately 36 percent of the total study area. Given the extent of the RAs, the Phase 1 report recommended proceeding with Phase 2 of the study to consider wastewater disposal alternatives for the RAs, which included conventional and innovative septic systems and the provision of public sewer service.

Note that as a planning level study, the identification of RAs presented here is based in part on theoretical information about soil conditions within the study area. Depending on the results of County-regulated, on-site septic testing, some properties within the RAs may be suited for deep trench septic systems. Conversely, not every property located outside of an RA can be guaranteed for the long-term use of deep trench systems until testing is completed.

2.2 Phase 2 Study Goals and Objectives

The goal of Phase 2 of the Glen Hills Area Sanitary Study is to identify and evaluate possible sewage disposal options for the Review Areas (RAs) indentified in Phase 1. Within the RAs soil conditions and regulatory requirements may impede the future use of deep-trench septic systems as replacements for, or expansions of, existing septic systems. The primary objective is to consider replacement service for long-term use for existing, improved properties. However, in keeping with the 2002 master plan's recommendations, property owners could also use these alternatives, as appropriate, to replace or enlarge existing homes.

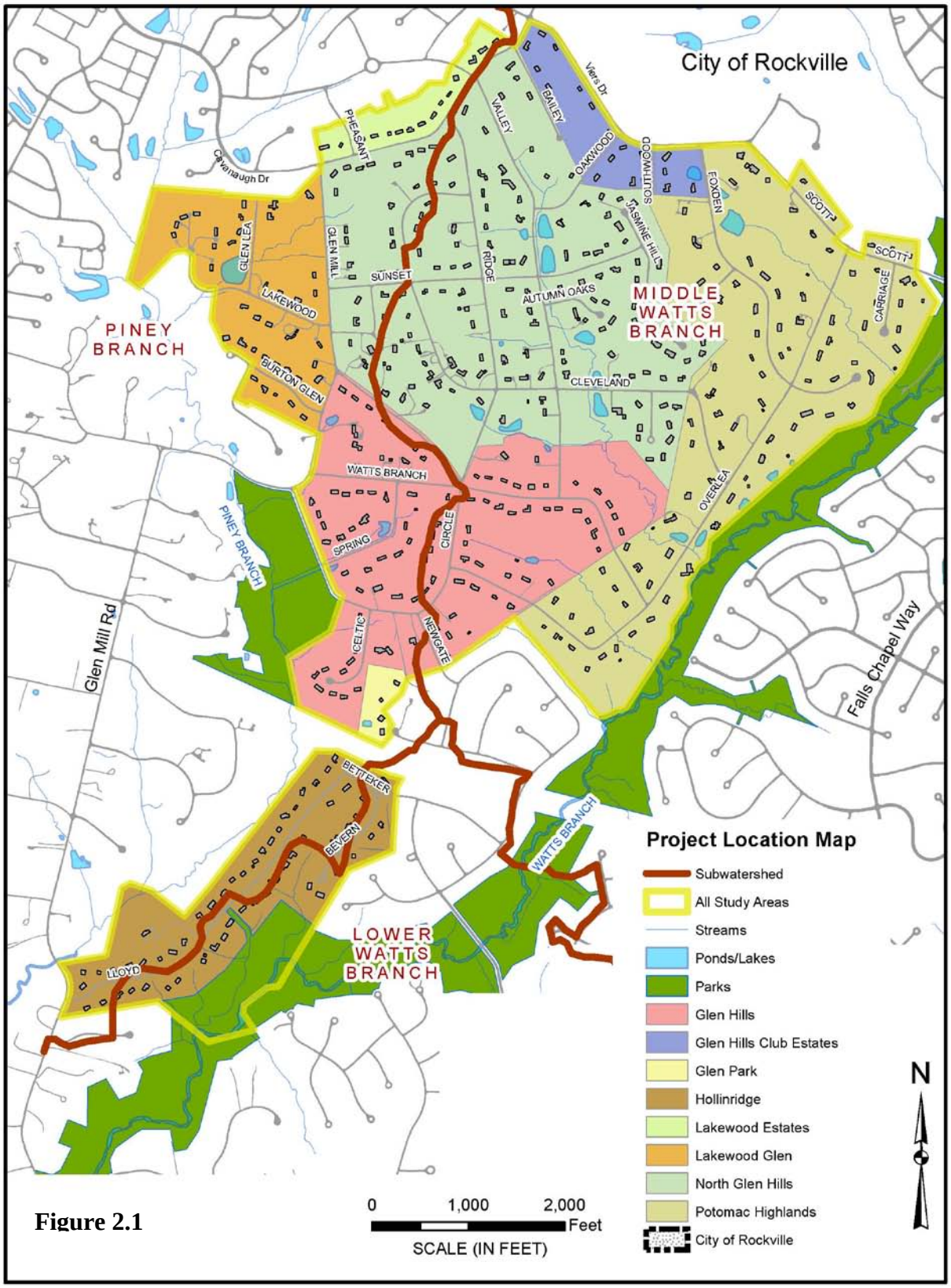

City of Rockville
PINEY BRANCH
MIDDLE WATTS BRANCH
LOWER WATTS BRANCH
Glen Mill Rd
Falls Chapel Way
Cavanaugh Dr
PHEASANT
VALLEY
BAILEY
Viers Dr
OAKWOOD
SOUTHWOOD
FOXDEN
SCOTT
SCOTT
GLEN LEA
GLEN MILL
SUNSET
RIDGE
TASMINE HILL
CARRIAGE
LAKEWOOD
AUTUMN OAKS
BURTON GLEN
CLEVELAND
WATTS BRANCH
OVERLEA
PINEY BRANCH
SPRING
CIRCLE
CELTIC
NEWGATE
BETTEKER
BEVERN
LLOYD
WATTS BRANCH
Project Location Map
Subwatershed
All Study Areas
Streams
Ponds/Lakes
Parks
Glen Hills
Glen Hills Club Estates
Glen Park
Hollinridge
Lakewood Estates
Lakewood Glen
North Glen Hills
Potomac Highlands
City of Rockville
N
0
1,000
2,000
Feet
SCALE (IN FEET)

Figure 2.1

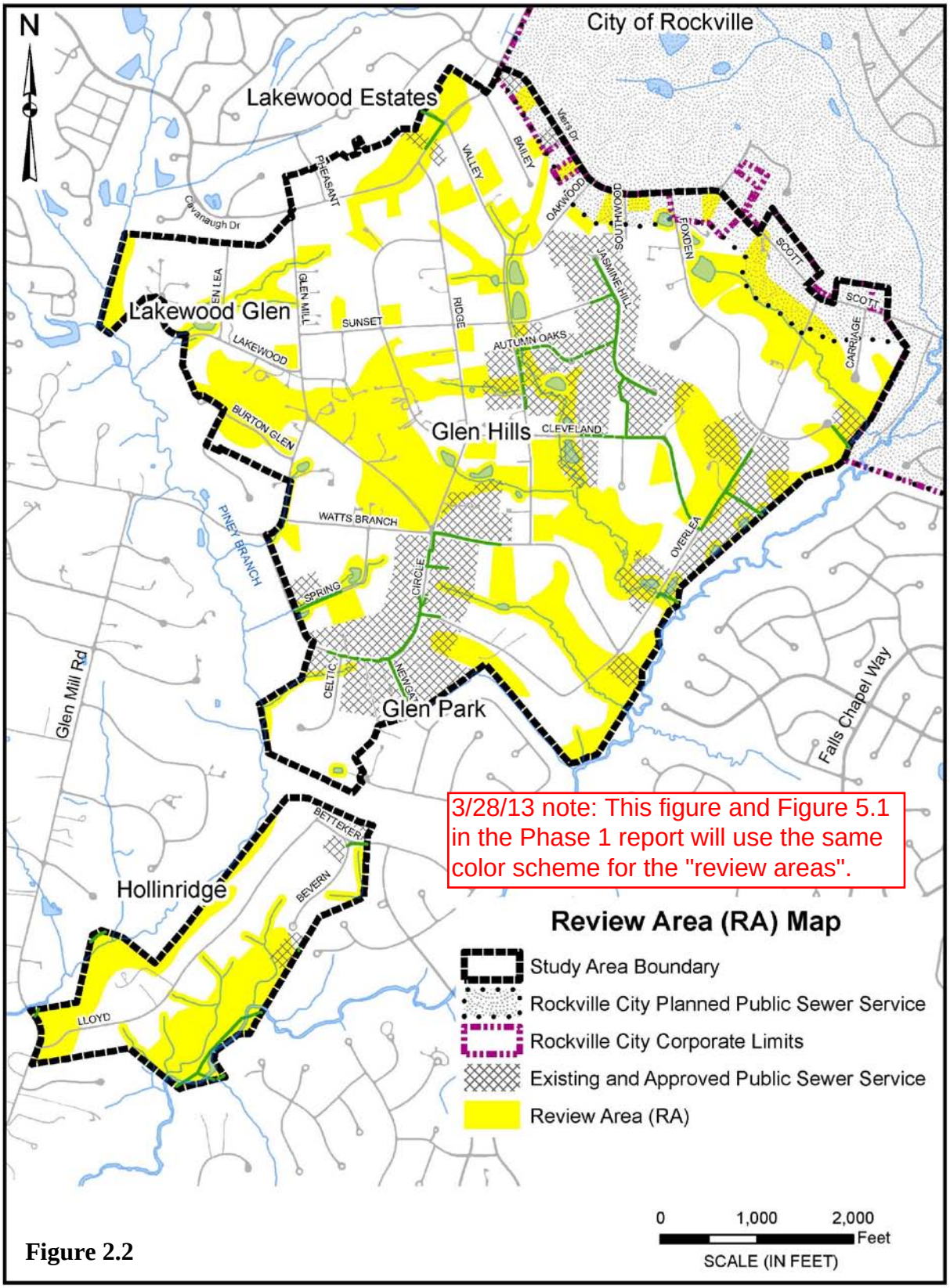

N
City of Rockville
Lakewood Estates
Lakewood Glen
Glen Hills
Glen Park
Hollinridge
Glen Mill Rd
Falls Chapel Way
PINEY BRANCH
WATTS BRANCH
PLEASANT
VALLEY
BAILEY
OAKWOOD
FOXDEN
SCOTT
CARRIAGE
JASMINE HILL
AUTUMN OAKS
RIDGE
GLEN MILL
SUNSET
LAKEWOOD
BURTON GLEN
CLEVELAND
OVERLEA
CIRCLE
SPRING
CELTIC
NEWCASTLE
BETTEKER
BEVERN
LLOYD
3/28/13 note: This figure and Figure 5.1 in the Phase 1 report will use the same color scheme for the "review areas".
Review Area (RA) Map
Study Area Boundary
Rockville City Planned Public Sewer Service
Rockville City Corporate Limits
Existing and Approved Public Sewer Service
Review Area (RA)
0
1,000
2,000
Feet
SCALE (IN FEET)

Figure 2.2

3. General Description of Options

The 2002 master plan requires the consideration of two options for the safe disposal of domestic sewage for the homes located within the study area. The first option uses on-site sewage disposal by one of the septic treatment methods currently accepted by Montgomery County Department of Permitting Services (MCDPS) as described in the Phase 1 report as well as in the following description (see Section 3.1). The ownership, operation and maintenance of these on-site treatment systems is the responsibility of the property owner. The second option uses a public utility to collect and then treat sewage at a central wastewater treatment facility. The design, construction, operation, and maintenance of the public sewerage system throughout the majority of the study area are the responsibility of the Washington Suburban Sanitary Commission (WSSC). For properties located along the northeast edge of the study area, these functions are the responsibility of the City of Rockville (see Figure 2.1 above).

3.1 On-Site Sewage Disposal Systems

On-site systems are typically named by the type of drain field absorption method. The three types of on-site sewage disposal systems accepted by MCDPS are:

- Stone Trenches (deep trench and shallow trench) are installed entirely below grade and utilize gravel fill to surround a perforated pipe covered by soil.
- Sand Mounds are elevated above the natural grade in a sand fill material.
- Drip Disposal uses flexible small perforated tubing to disperse wastewater below ground to the native soil.

Typical components on-site disposal systems are noted below. Additional detail may be found in Section 4.2 of the Phase 1 study as well as Section 4.1 in this study.

Septic System Components: A typical septic system has three main components: a septic tank, a distribution system, and a drain field. Each of the components has a specific function, as follows:

Septic Tank: The septic tank consists of a watertight container that accepts wastewater from the house. The tank design allows for the settling of solids from the wastewater; these solids need to be cleaned out periodically, once every three to five years. The remaining wastewater effluent flows from the tank into a distribution system. The tank provides initial and/or secondary treatment to the wastewater.

Distribution System: The partially treated wastewater is conveyed in pipes from the septic tank and distributed to the drain field for further treatment.

Drain Field: The drain field distributes the wastewater for further treatment into the soil beneath the drain field. The drain field, also known as a soil absorption field, consists of one or more perforated pipes in trenches of gravel, sand mounds, or in the case of drip systems, native soil. The wastewater continues to flow from the perforated pipes through the drain field, where it percolates into the soil which provides final treatment.

3.2 Public Sewerage Systems

The collection of wastewater in a public sewerage system is accomplished by using both gravity sewers and pressure sewer systems to direct wastewater to a central treatment facility:

- Gravity sewerage systems are constructed so that sewage flows downward through the sewer mains towards a wastewater treatment plant. Typically, the slopes of the sewer mains mimic the downward slope of the ground above them. WSSC requires a minimum pipe diameter of 8 inches for gravity sewers for maintenance purposes. Houses usually connect to gravity sewer mains by means of a 4-inch diameter gravity connection that runs from the lowest level of the house down to the public main ~~buried 8 to 15 feet below the street level.~~ In a few cases, where the lowest level of the house is below the elevation of the abutting sewer main, an on-site pump is used to pump sewage flows up into the gravity main at the street.

Revision: "typically buried 8 to 15 feet below ground (street level)".

- Pump/pressure sewerage systems use on-site, electric-powered pumps to pump wastewater through a relatively small-diameter, ~~pressurized~~ sewer main (typically a 1-1/2-inch to 3-inch diameter pipe) until it intersects with and discharges to a gravity sewer. ~~These~~ sewerage systems are typically employed where the use of gravity sewers is not advisable due to the extreme length of gravity extensions needed to reach other existing mains or due to environmental constraints along a proposed gravity sewer alignment (wetlands, sensitive ecologies, etc.) that could preclude sewer construction. An advantage of pressure systems is that they allow sewer mains to function in areas where gravity services are limited or restricted. A disadvantage to the pressure system is that it depends on on-site pumps that require power and periodic maintenance.

Revision: "low pressure"

A more detailed discussion of the types and costs of systems, criteria and the process for system selection may be found in Section 5.

Revision: "Although WSSC and Rockville generally prefer gravity systems, these"

4. On-Site Sewage Disposal Systems

This section addresses the *2002 Potomac Subregion Master Plan's* direction to "… develop the measures necessary to ensure the long-term sustainability of septic service for new home construction and existing home renovations, …" in the study area. It presents and evaluates several types of septic systems as possible on-site alternatives to deep stone trench systems for the replacement of existing septic systems in the Glen Hills Study Review Areas (RAs).

4.1 Options for On-Site Systems

There are four types of on-site sewage disposal systems currently accepted by Montgomery County Department of Permitting Services (MCDPS) for on-site sewage disposal systems. These include:

- Deep Stone Trenches
- Shallow Stone Trenches
- Sand Mounds
- Drip Disposal

Stone trenches and sand mound systems are considered conventional systems by the County and can be used for new house construction, existing house expansions and replacement of existing, failed septic systems. Drip systems are considered innovative and can only be used as replacement systems where conventional systems cannot be approved.

Each of these four types of septic systems may be capable of replacing an existing septic system within the review areas (RAs). Some of these systems may provide a better likelihood of being permitted and functioning successfully in certain soil conditions than others and will be described in more detail below. Note that within the RAs, natural conditions and permitting regulations may be more likely to constrain the use of deep trench septic systems.

4.2 Testing and Permitting Requirements for On-Site Systems

Improvements to or replacement of existing septic systems would be considered on a case-by-case basis. Field testing would be required to determine specific site conditions such as groundwater levels, percolation rates and depth of bedrock before any decision can be made about the type and size of septic system suitable for a specific site. The proposed septic field areas would also require evaluations regarding setback requirements, available reserve area, and slope of ground.

MCDPS issues permits for conventional systems (deep trench, shallow trench and sand mound systems) provided that permitting requirements (reserve areas, percolation rates, and depth to water table and bedrock, etc.) are satisfied. Conventional septic systems can be permitted for both new house construction and substantial additions for existing houses. If conditions do not allow for needed reserve areas, permits for conventional septic systems may carry restrictions on the future use of the property. MCDPS requires these restrictions to help ensure safe operation of the existing system; the restrictions typically limit the size of additions to and the use of existing buildings. MCDPS classifies drip disposal systems as innovative systems, not conventional systems. Drip systems are used only as replacements for existing septic systems. Accordingly, permits for drip systems may also carry restrictions on the future use of the property.

Table 4.1 below presents a comparison of design criteria, guidelines and sizes of drain field footprints for different systems.

Table 4.1 – Comparison of Septic System Types

Septic System Design and Permitting Criteria	System Type			
	Deep Stone Trench	***Shallow Stone Trench***	***Sand Mound***	***Drip Disposal***
Percolation Rate (minutes/inch)	2 to 30	2 to 30	5 to 60	--[A]
Typical Depth of Disposal Installation (ft.)	4 to 11	3 to 6	--[B]	1 to 2.5[C]
Depth of Water Table from bottom of septic system (ft.)	4	4	2	4
Depth of Rock Fragments from bottom of septic system (ft.)	4	4	2	4
Distance from Water Well (ft.)	100	100	100	100
Distance from body of water & intermittent stream (ft.)	100	100	100	100
Distance from lot line/easement (ft.)	5	5	5	5
Distance from structure (ft.)	20	20	30	30
Distance from driveway (ft.)	5	5	25	15
Distance from tree (ft.)	10	10	-[E]	15
Distance from slopes greater than 25 percent (ft)	25	25	25	25
Maximum slope of ground for construction (%)	25	25	12	-[E]
Site compaction constraints for absorption areas[C]	No	No	Yes	Yes
Construction season constraints (dry weather conditions)	No	No	May 1 thru Oct. 31	No
Average size of drain field footprint for three bedroom house w/ perc rate of 20 mins/inch (square ft. (SF))[D]	750 SF	2,700 SF	3,060 SF	2,000 SF
Average size of drain field footprint for five bedroom house w/perc rate of 20 mins/inch (SF)[D]	1100SF	3,420 SF	3,430 SF	3,300 SF

Notes:

[A] Acceptable rate varies with soil conditions and engineering judgment, as well as approving authorities review and approval.

[b] None: the sand mound system is constructed above natural ground surface

[c] Site not to be compacted or altered in any way (by earthmoving or other equipment)

[d] Additional clarifications of criteria and assumptions for footprint calculations are noted below

[E] No Montgomery County criteria found.

The sizes of the drain fields noted above in Table 4.1 are determined for comparison purposes only and do not reflect what may be required for a drain field replacement. Each of the drain field sizing calculations is for an initial (single) field only and does not include required reserve areas. The calculations are based upon the following criteria, guidelines and assumptions:

Criteria:

- Stone Trench Systems - Code of Montgomery Regulations Chapter 27A
- Sand Mound Systems– Design and Construction Manual for Sand Mound Systems as published by Maryland Department of the Environment (MDE)
- Drip Systems – Design example provided by American Manufacturing Company as referenced from MDE

Assumptions:

- For both stone trench and sand mound systems, an increase in the size of the drain field is required as the slope of the site increases. For comparison purposes, an average slope of 6 percent was assumed for all six of the calculations.
- The amount of available trench absorption area per linear foot of trench increases as the sidewall depth of the trench increases. This results in a reduction in the required surface footprint for systems using deeper trenches. Trench heights used in the calculations were assumed to be 2.5 feet for shallow tile and 5 feet for deep trenches.
- For comparison purposes, a percolation rate of 20 minutes per inch was used for each of the drain field sizing calculations.

As stated in section 4.5 of the Phase 1 report, current standards require that "For replacement of an existing failed on-site system, the new septic system must attempt, if possible, to meet current standards." The standards applicable to the Glen Hills area require an initial drain field and two reserve areas or backup drain fields. The minimum area required may be no less than 10,000 square feet (slightly less than one quarter acre). Figure 4.1, which follows, shows how a typical sand mound or a stone trench system for a 5-bedroom house might fit onto an existing one-acre lot. The existing drain field area may not be reused for absorption area. In addition, if a well is present, it must be located at minimum of 100 feet from and at a higher elevation than any existing or replaced absorption area. There are a total of nine distance criteria that all absorption areas must meet as specified in *Code of Montgomery County Regulations* (COMCOR) 27A.00.01 On-Site Water Systems and On-Site Sewage Disposal Systems. It is evident therefore, that the design and layout of any replacement septic system must proceed on a case-by-case basis, with the understanding that soil conditions and/or regulatory constraints could potentially prevent the use of certain types of septic systems.

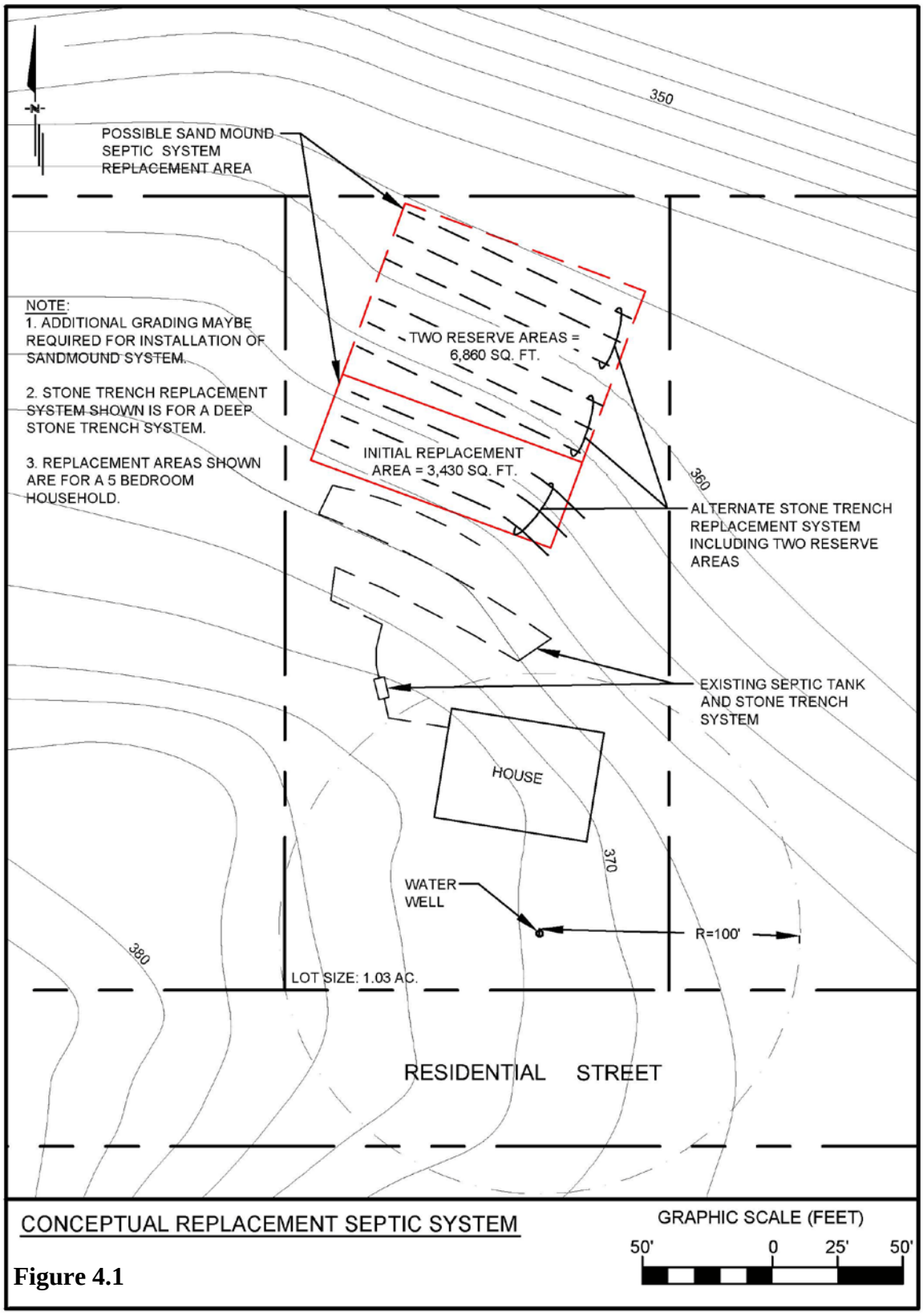

N
POSSIBLE SAND MOUND SEPTIC SYSTEM REPLACEMENT AREA
350
NOTE:
1. ADDITIONAL GRADING MAYBE REQUIRED FOR INSTALLATION OF SANDMOUND SYSTEM.
2. STONE TRENCH REPLACEMENT SYSTEM SHOWN IS FOR A DEEP STONE TRENCH SYSTEM.
3. REPLACEMENT AREAS SHOWN ARE FOR A 5 BEDROOM HOUSEHOLD.
TWO RESERVE AREAS = 6,860 SQ. FT.
INITIAL REPLACEMENT AREA = 3,430 SQ. FT.
360
ALTERNATE STONE TRENCH REPLACEMENT SYSTEM INCLUDING TWO RESERVE AREAS
EXISTING SEPTIC TANK AND STONE TRENCH SYSTEM
HOUSE
370
WATER WELL
R=100'
380
LOT SIZE: 1.03 AC.
RESIDENTIAL STREET
CONCEPTUAL REPLACEMENT SEPTIC SYSTEM
GRAPHIC SCALE (FEET)
50' 0 25' 50'

Figure 4.1

4.3 On-Site Septic System Characteristics and Evaluation

Certain on-site waste disposal systems might be selected to address specific soil constraints for both new site and as replacement systems.

Deep Stone Trench Septic Systems:

Deep stone trench systems must have at least four vertical feet of useable unconsolidated, unsaturated soil buffer between the bottom of a disposal trench and the upper limits of bedrock and ground water. Most deep stone trench systems are constructed at a depth of between 4 and 8 feet from ground surface to the bottom of the trench. Therefore the systems require groundwater to be a minimum depth between 8 and 12 feet. Additionally the soil must have adequate permeability rates (2-30 minutes per inch) to ensure proper effluent treatment.

The record information gathered and analyzed in the Phase 1 Report showed one or more soil variables in the study area that may not meet today's septic regulations making deep trench systems difficult to permit and construct within the RAs. Using a conventional deep trench system within an RA to replace an existing septic system is more likely to be constrained than replacing it with the shallow trench, sand mound, or drip systems described below.

Shallow Stone Trench Septic Systems:

A shallow trench system (also referred to as a shallow tile system) may be employed in areas with moderately high groundwater and moderately high bedrock elevations. Shallow trench systems can be installed at a minimum depth of 30 inches from the existing ground surface (18 inch depth of stone and 12 inch minimum soil cover above stone). The shallow trench system requires a minimum of 4 feet of vertical clearance between the bottom of the trench and groundwater or bedrock elevation. Therefore these systems could function in areas where groundwater and bedrock are at a minimum depth of 6.5 feet. The shallower installation does require more area and lengths of drain fields due to lesser amounts of available trench absorption areas per foot. These shallow systems must have the required percolation rate of 2-30 minutes per inch.

Areas that would be suitable for the shallow trench system would have moderate depth groundwater and bedrock (minimum 6.5 feet depth) and suitable percolation rates. Since conventional systems such as shallow stone trench septic systems or sand mound systems could function in these areas, the Phase 1 report did not consider such areas within the RAs. The Phase 1 report would have considered these areas suitable for conventional on-site septic disposal systems. However due to the preliminary level of soil documentation used for the report ,there could be cases in which actual soil testing within the RAs may reveal better soil conditions than the preliminary data the Phase 1 report based its delineation of the RAs. If areas are found with moderate depths to groundwater or bedrock, shallow trench stone systems could be used as replacement systems in areas where otherwise deep stone trench systems would not be viable.

Sand Mound Septic Systems:

Sand mound systems may be able to function in those high groundwater areas with adequate permeability rates where stone trench septic systems would not, because sand mound systems can be built over existing ground without the need to excavate down into the existing ground. They require only two feet of vertical clearance from the bottom of the sand mound system to the groundwater table. For the same reasons, sand mound systems may be more likely to function in

areas with high bedrock elevations but with adequate permeability rates. Again, the minimum clearance from the bottom of the sand mound system to the bedrock elevation is two feet.

The Phase 1 report for this study identified areas in which the further use of deep trench septic systems may be precluded due to shallow bedrock under the soil. Sand mound septic systems could be better suited for these areas as they can be installed in soil with a minimum two-foot depth to bedrock. Acceptable permeability rates would also be needed (see Table 4.1). These areas are shown on Figures 4.2 and 4.3. According to U.S. Department of Agriculture soil survey information, these shallow bedrock areas were 1.5 to 3 feet deep and 3.5 to 5 feet deep. For the purpose of this planning-level study, these areas were considered to be potential candidate areas for using sand mound systems.

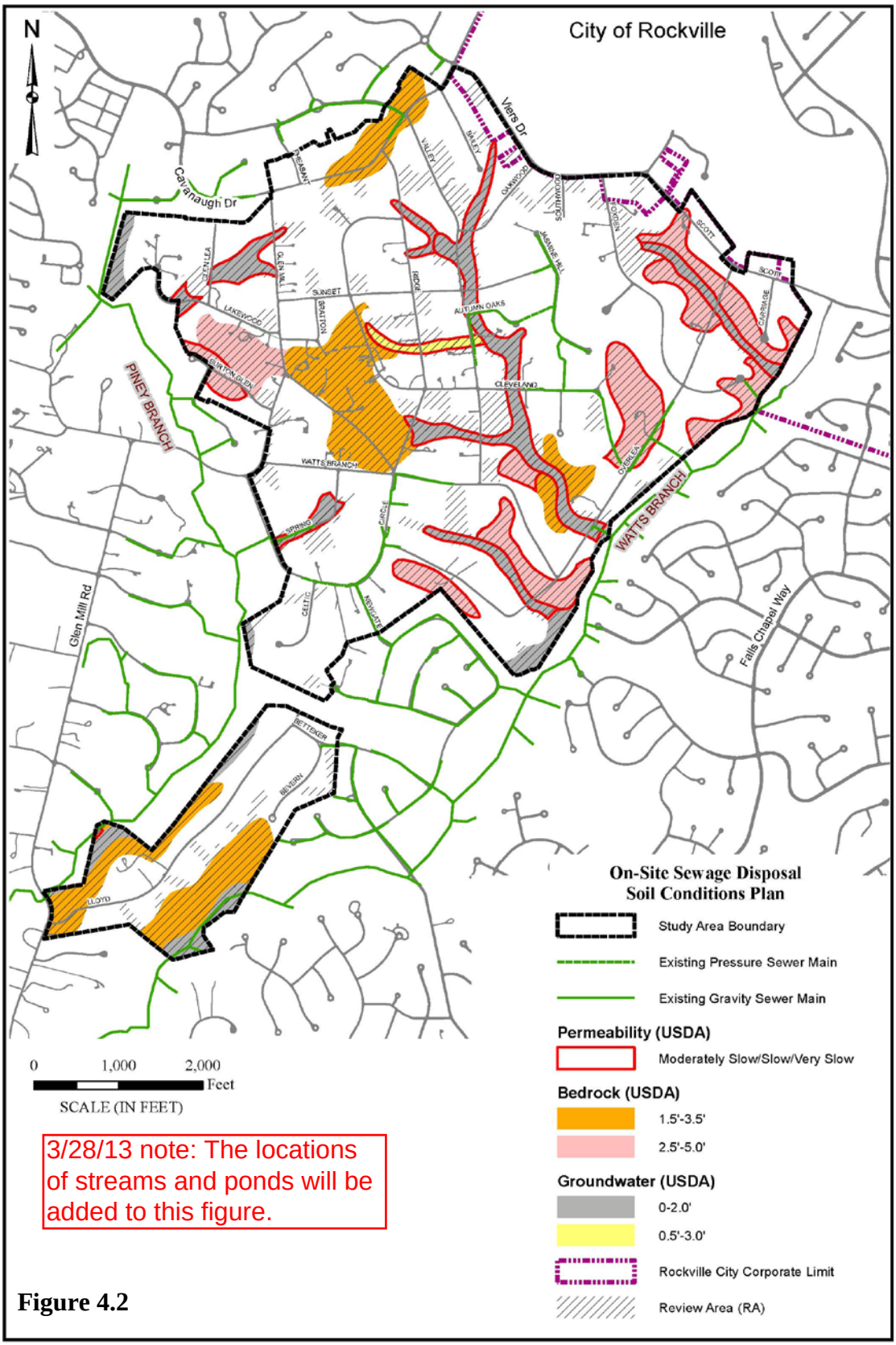
High water table areas as indicated on Figures 4.2 and 4.3 were also investigated to determine whether sand mound systems would provide an option for on-site septic disposal. Unlike the high bedrock areas, all of the high groundwater areas also have poor soil permeability rates in the Moderately Slow/Slow/Very slow categories. This combination of potential constraints could make the approval of a sand mound system difficult.

Drip Disposal Septic Systems:

Drip disposal septic systems are considered innovative systems by Montgomery County. These systems are considered in cases in which an existing system has failed and the lot can no longer support a conventional system. The systems are adaptable for situations that, due to existing soil conditions, require shallow installation or in soils with moderate percolation rates. Drip disposal septic systems require more site area than conventional systems. This requirement may constrain the use of drip systems on smaller lots within the Glen Hills area. Because of the use of small-diameter flexible tubing, the absorption system may be placed around trees and other site features with relative ease. The drip systems, like stone trench septic systems, still require a minimum of four feet of clearance from the bottom of the septic system to the upper limits of both groundwater and bedrock elevations. The designs are furnished by industry design experts certified by MDE, but paid for by the applicant. The design criteria, including the allowable percolation rate, is the designer's responsibility based upon certified expertise, soil testing, and evaluation of the existing soil profile. The designs are reviewed and permitted through MCDPS. Drip systems may be viable in areas with percolation rates greater than 30 minutes per inch. Therefore, drip systems may be a good option for areas with marginal percolation rates but with the required clearances to groundwater and bedrock.

While there may be locations within the RAs that would fit into this category, recorded soil permeability information was not specific enough or reliable enough to make judgments regarding where these locations exist within the Glen Hills Study area RAs. DPS permit records show that there are nine lots within the study area that have successfully installed drip systems. The locations of these nine lots (See Phase 1 Report Fig. 4.5) are spread throughout the study area with seven of the nine in the north central part of the study area (roughly area bounded by Cleveland Drive, Valley Drive, Oakwood Drive and Sunset Drive). Each of these lots are very close to bordering, or within the RAs.

3/29/13 note: Will add information concerning State-required inspections of drip systems.



3/28/13 note: The locations of streams and ponds will be added to this figure.

Figure 4.2

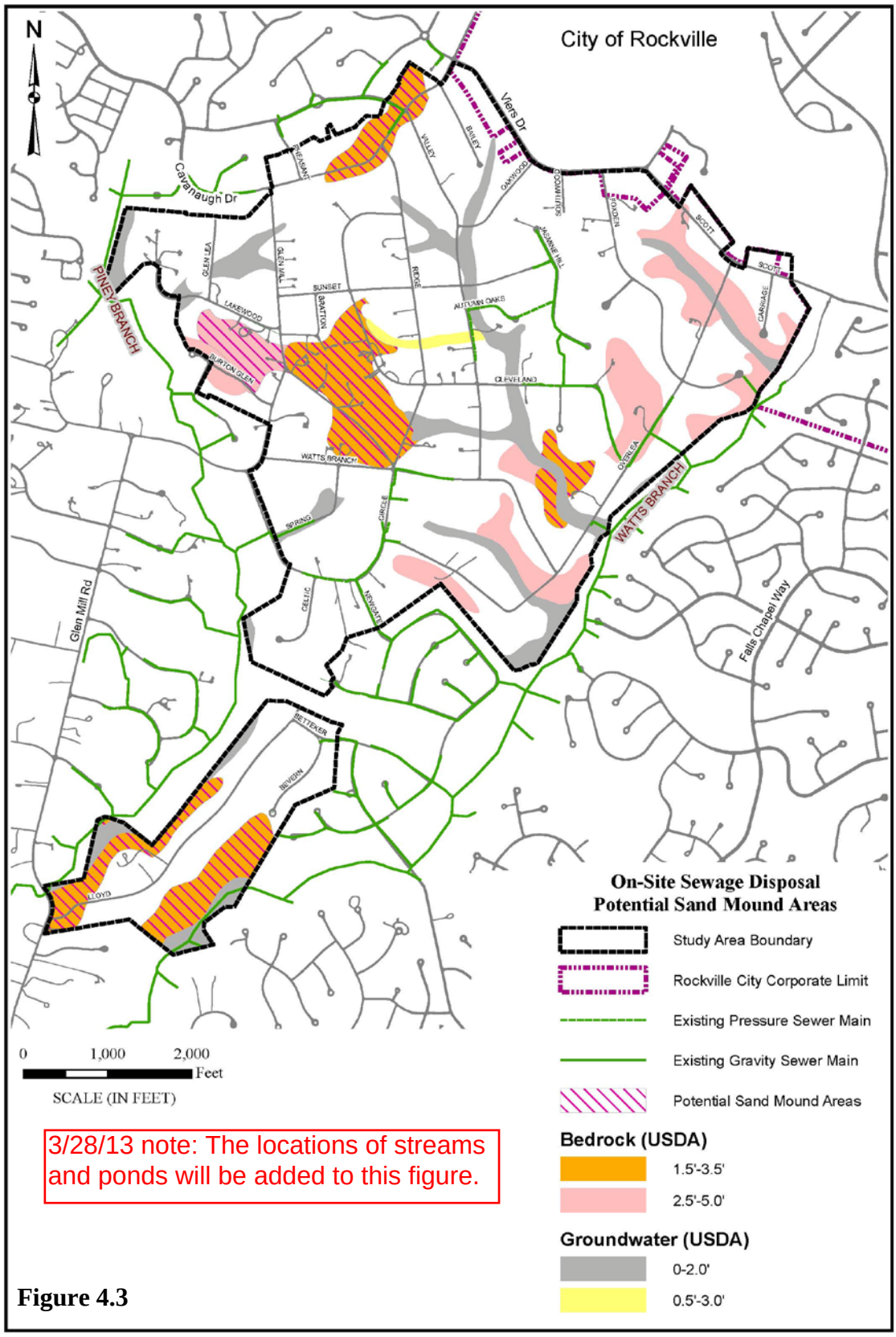

N
City of Rockville
Vlers Dr
Cavanaugh Dr
PINEY BRANCH
WATTS BRANCH
Glen Mill Rd
Falls Chapel Way
0
1,000
2,000
Feet
SCALE (IN FEET)
3/28/13 note: The locations of streams and ponds will be added to this figure.
On-Site Sewage Disposal
Potential Sand Mound Areas
Study Area Boundary
Rockville City Corporate Limit
Existing Pressure Sewer Main
Existing Gravity Sewer Main
Potential Sand Mound Areas
Bedrock (USDA)
1.5'-3.5'
2.5'-5.0'
Groundwater (USDA)
0-2.0'
0.5'-3.0'

Figure 4.3

4.4 Planning Level Costs

Planning Level Costs:

A substantial concern for property owners facing the need to replace a septic system is the cost for that replacement system, which can vary significantly based on the type of on-site system required or if only portions of a system need replacement. For the purpose of this report, estimated costs for replacement septic systems were developed based upon individual costs for components for each type of on-site system considered. The estimates were based on numbers provided from technical publications, *Bay Restoration Program Implementation Guidance*, manufacturers, and local contractors. Additional data is provided in the Appendix 2.

MCDPS adopted regulations in January 2013 which require the installation of a Best Available Technology (BAT) for nitrogen removal in septic tank. The BAT system is a nitrogen removal system approved by MDE for use in Maryland. A list of approved BAT systems can be found on the MDE/BRF webpage at:
http://www.mde.state.md.us/programs/Water/BayRestorationFund/OnsiteDisposal
The technology currently consists of approved pretreatment systems installed in a septic tank which is often a two stage tank. BAT is required as part of any drip system and for new construction. BAT technology is not required for the repairs to and/or replacement of conventional systems. If the replacement is for building expansion, then a BAT system could be required. BAT system adds to the cost of conventional septic tanks but provide cleaner wastewater meeting the nitrogen removal requirements of the new regulations.

The costs listed in Table 4.2 are for new construction, but excludes the cost of BAT technology, except in the case of drip systems. The cost of engineering design, permit application fees and testing have also been excluded. BAT technology can add $6,000 to $8,000 or more to the cost of a system.

3/29/13 note: BAT requirements for "new construction" can also include system systems expansions for home additions.

Replacement

Table 4.2 – Range of Costs of On-Site Disposal Systems

Septic System Type	Estimated Cost of installed system - 3 or 5 Bedroom House [A]	
	3 Bedrooms	***5Bedrooms***
Deep Stone Trench [B]	$10,000	$17,500
Shallow Stone Trench [B]	$11,500	$20,500
Sand Mound [C]	$20,000	$30,000
Drip Disposal [D]	$37,000	$48,000

Cost of Best Available Technology (BAT) Tank included [A]

Deep trench and shallow trench costs also include excavation, trenching, fill, piping, and seeding. Costs taken from RMS Means (2012). [B]

Sand mound system costs provided by MCDPS (April 2011). [C]

Drip disposal system costs provided by MCDPS and discussions with manufacturer. [D]

3/28/13 note: Will revise Table 4.2 to note that BAT tanks are required only for replacement drip disposal septic systems.

Estimated

Operating & Maintenance Costs:

The costs shown in the following table are summaries of data published by the Water Environment Research Federation and are intended to be used for comparison purposes only. Additional information is provided in Appendix 2.

The annual costs include items and assumptions such as:

- Electrical costs for pumps, blowers, and other electrical operations
- Annualized costs for replacement drain field in 30 years
- Septic tank pump outs (every 3 to 5 years)
- Annualized costs for sand mound system replacement in 30 years
- Annualized costs for drip system replacement in 30 years & annual maintenance
- Pump life of 7 years (parts replacement)

Table 4.3 – Comparison of Operating & Maintenance Costs of On-Site Disposal Systems

System Type	Estimated Annual Costs
Trench	$260-$570
Sand Mound	$620-$1,000
Drip Disposal	$512-$748

Estimated Service Life: On-Site Disposal Systems

The service life data in the table below are taken from an on-line reference tool, "InspectAPedia" as well as other published data. The actual lives of individual components are known to vary widely. For instance, there many examples of pipe distribution systems aged 100 years old and older.

Table 4.6 – Estimate Service Life – On-Site Disposal Components

Component	Estimated Service Life (years)
Distribution System Piping (Gravity and Pressure)	50
Septic Tank (Concrete)	40 or more
Septic Tank Treatment Components (e.g. pumps, motors)	16-20
Drain Fields	20-50

5. Public Sewer Service

The *2002 Potomac Subregion Master Plan* acknowledges the potential need for the extension of public sewer service within the study area, but "… recommends restricting further sewer extensions in Glen Hills to those needed to relieve documented health problems resulting from failed septic systems." The purpose of this section is to evaluate the use of public sewer service as a potential relief method for sewage disposal for the previously identified review areas (RAs). Beginning in the 1960's limited public sewer service has been extended to properties in neighborhoods some as part of new construction or where septic systems have failed. Nineteen percent of the 542 lots within the study area currently receive public sewer service; and throughout much of the study area, the RAs are not in close proximity to existing public sewer mains.

In most cases, the use of public sewer service as a relief method would require the construction of new sewer mains within these neighborhoods. The sewer extension layouts provided in this study are conceptual and only for the purposes of comparing study alternatives. Any actual new sewer design and construction within the study area would be subject to County and WSSC review and approval.

5.1 Options for Public Sewage Systems

Design Considerations:

Conceptual alignments for public sewer extensions were laid out according to design criteria and guidance from the *2002 Potomac Subregion Master Plan, the WSSC Design Manual* and the *Montgomery County Comprehensive Water Supply and Sewerage Systems Plan*. Four key criteria were considered in for sewer extension options designed for the purposes of this study:

- Alignments were chosen for the purpose of extending sewer service to properties with existing houses using septic systems. None of the extensions were designed for the sole purpose of providing sewer service to unimproved properties.

- Alignments were chosen as much as possible to locate the sewer mains within public road rights-of-way. This would avoid the effects of sewer construction on the environmentally-sensitive stream valley areas of the study area.

- Alignments were designed to maximize the use of gravity lines where possible and minimize the use of pumping systems and pressure sewers. WSSC generally prefers the use of gravity sewer systems over the use of pressure sewer systems. Some areas did require pressure systems to avoid placing sewer alignments in stream valley areas.

- Alignments were designed to avoid the need for public utility easements that would have to cross private properties.

The study area primarily drains to two sewersheds that follow the stream valleys of Piney Branch and Watts Branch. Piney Branch is a tributary of the larger Watts Branch watershed and flows into Watts Branch southwest of the study area. See pg. 21.

Within these two main drainage basins, the neighborhood consists of numerous subwatersheds which result from the area's hilly, rolling character. Because of this, each individual sewer

service extension can provide service to only part of the RAs identified in the study area. The design of a sewer extension layout, constrained by the design criteria described previously, resulted in thirteen separate sewer system extensions connecting to existing sewer systems in or near the study area as shown on Figures 5.1 and 5.2. Five extensions originate from the Piney Branch sewerage system; nine extensions originate from the Watts Branch sewerage system.

The provision of public sewer service to additional properties within the study area will increase wastewater flows collected within these two sewer basins. WSSC staff has reviewed the public sewer options developed for this report and concluded that the increased wastewater flows from the number of potential sewer connections from the study area could be adequately accommodated within the existing drainage basin collection systems.

Figure 5.2 shows the conceptual sewerage system design in relation to the existing property and house layout of the study area. Based on this design, these sewer extensions could serve as many as:

- 197 total improved properties with existing houses.
  - 121 improved properties via the Watts Branch sewerage system.
  - 76 improved properties via the Piney Branch sewerage system.
- 26 total vacant properties.
  - 12 vacant properties via the Watts Branch sewerage system.
  - 14 vacant properties via the Piney Branch sewerage system.

A more-detailed listing of properties potentially served by each individual sewer extension system is available in Table 5.1 which follows.

3/29/13 note (see pg. 20): The entire study area, both Watts Branch and Piney Branch drainage areas are part of the Blue Plains Treatment Plant service area. Wastewater treatment for both WSSC and Rockville is provided at the Blue Plains Plant in Washington DC under a regional agreement.

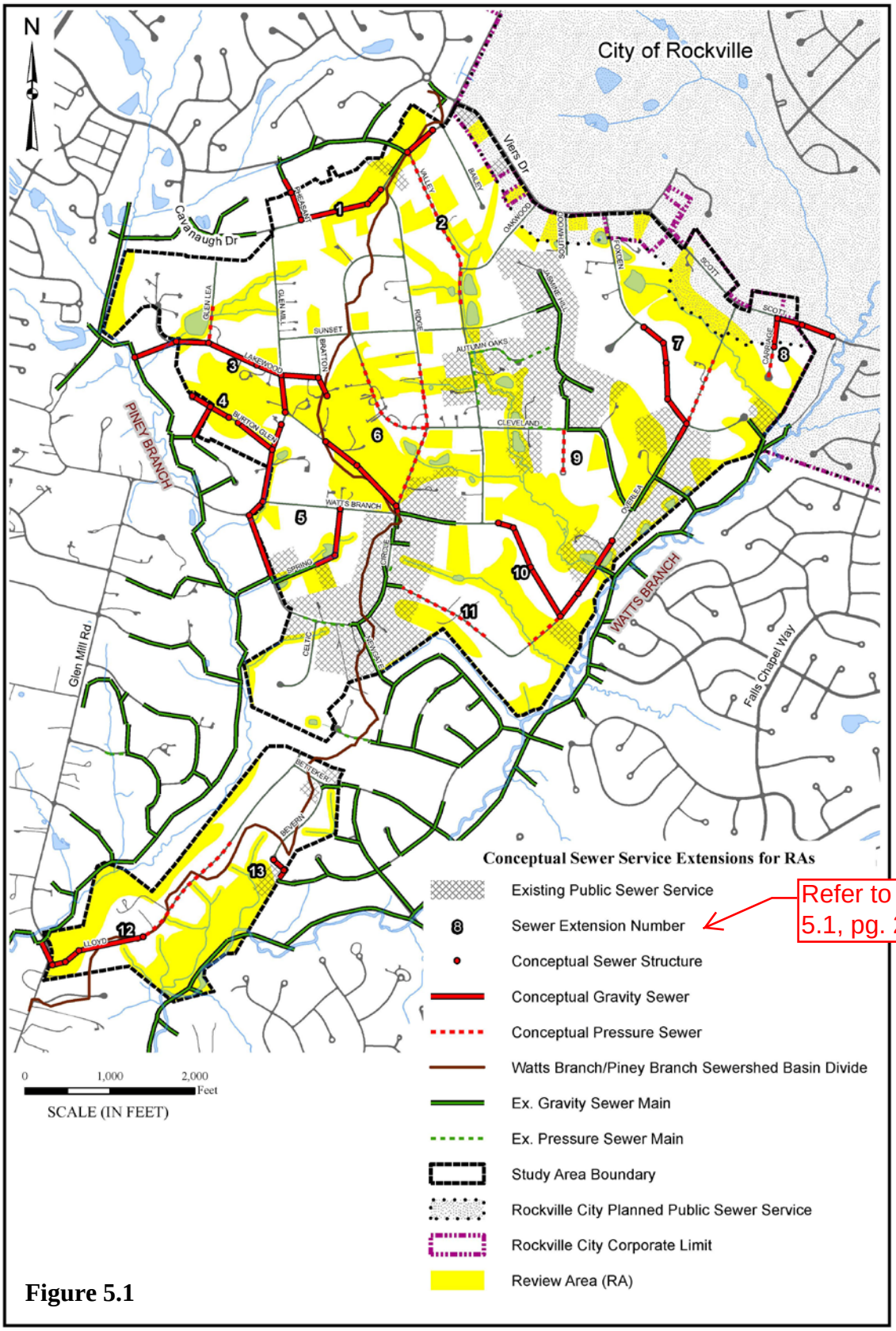
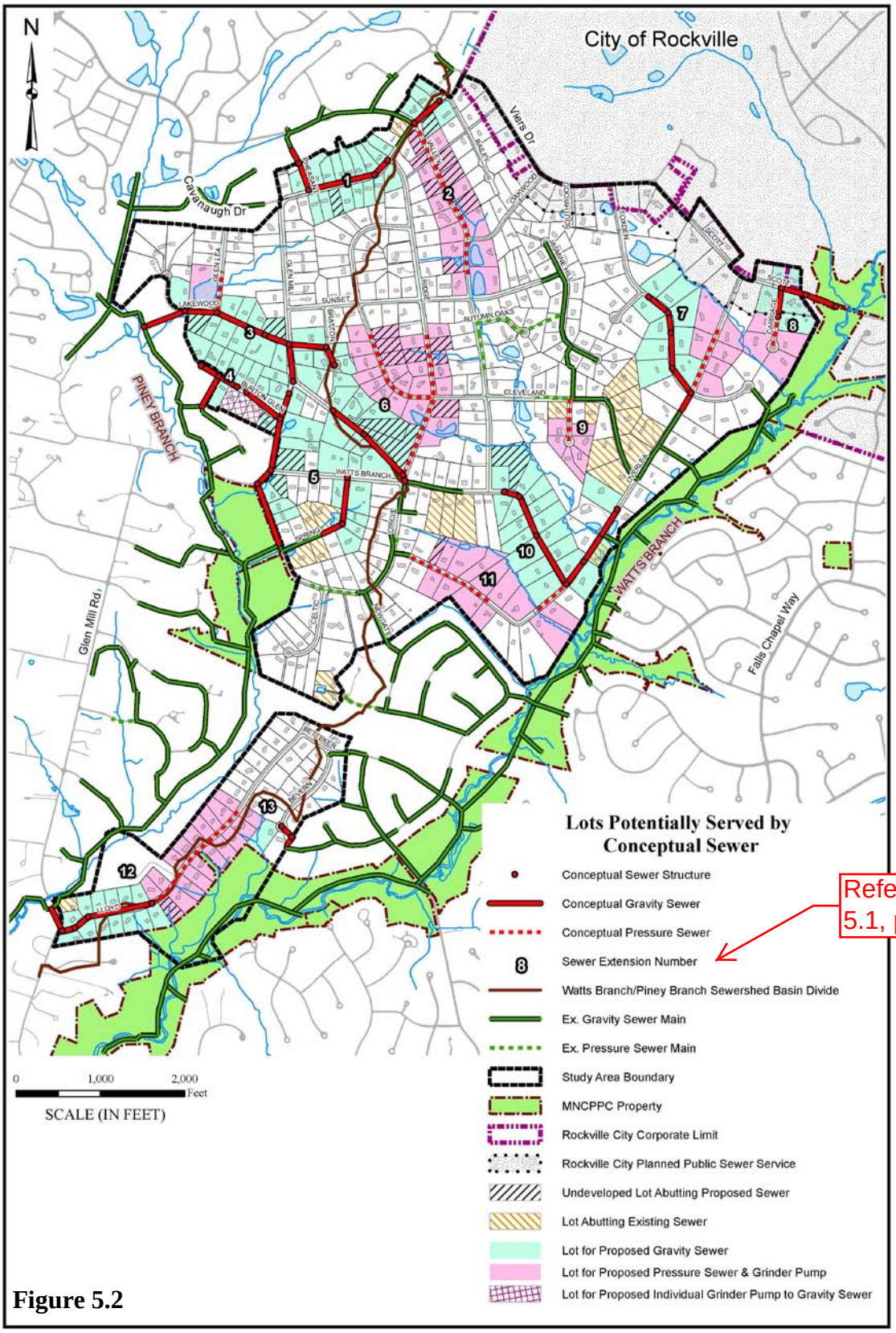

N
City of Rockville
Viers Dr
Cavanaugh Dr
Glen Mill Rd
PINEY BRANCH
WATTS BRANCH
Falls Chapel Way
1
2
3
4
5
6
7
8
9
10
11
12
13
0
1,000
2,000
Feet
SCALE (IN FEET)
Conceptual Sewer Service Extensions for RAs
Existing Public Sewer Service
Sewer Extension Number
Conceptual Sewer Structure
Conceptual Gravity Sewer
Conceptual Pressure Sewer
Watts Branch/Piney Branch Sewershed Basin Divide
Ex. Gravity Sewer Main
Ex. Pressure Sewer Main
Study Area Boundary
Rockville City Planned Public Sewer Service
Rockville City Corporate Limit
Review Area (RA)
Refer to Table 5.1, pg. 24

Figure 5.1


N
City of Rockville
Vears Dr
Cavanaugh Dr
PINEY BRANCH
WATTS BRANCH
Glen Mill Rd
Falls Chapel Way
1
2
3
4
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6
7
8
9
10
11
12
13
0
1,000
2,000
Feet
SCALE (IN FEET)
Lots Potentially Served by Conceptual Sewer
Conceptual Sewer Structure
Conceptual Gravity Sewer
Conceptual Pressure Sewer
Sewer Extension Number
Watts Branch/Piney Branch Sewershed Basin Divide
Ex. Gravity Sewer Main
Ex. Pressure Sewer Main
Study Area Boundary
MNCPPC Property
Rockville City Corporate Limit
Rockville City Planned Public Sewer Service
Undeveloped Lot Abutting Proposed Sewer
Lot Abutting Existing Sewer
Lot for Proposed Gravity Sewer
Lot for Proposed Pressure Sewer & Grinder Pump
Lot for Proposed Individual Grinder Pump to Gravity Sewer
Refer to Table 5.1, pg. 24.

Figure 5.2

Potentially

Table 5.1 – Numbers of Properties Served by Sewer Main Extensions

Extensions to Piney Branch System		Adjacent Properties with Existing Houses		Vacant Adjacent Properties	
Extension Number [A]	Location	No. of Possible Connections		No. of Possible Connections	
		Gravity	Pressure	Gravity	Pressure
1	Glen Mill Rd./Pheasant Dr.	16	0	1	0
2	Glen Mill Rd/ Valley Dr./ Bailey Dr.	5	11	0	8
3	Lakewood Dr./ Glen Lea Way./ Glen Mill Rd.	16	1	2	0
4	Burton Glen Dr.	6	1	0	0
5	Burton Glen Dr./ Glen Mill Rd./ Spring Dr.	18	2	3	0
Piney Br. Sewerage System Subtotals		61	15	6	8
Piney Br. Sewerage System Totals		76		14	

Extensions to Watts Branch System		Adjacent Properties with Existing Houses		Vacant Adjacent Properties	
Extension Number [A]	Location	No. of Possible Connections		No. of Possible Connections	
		Gravity	Pressure	Gravity	Pressure
6	Circle Dr./ Cleveland Dr./ Ridge Dr.	9	17	1	8
7	Foxden Dr./ Overlea Dr.	8	7	0	0
8	Carriage Ct./ Scott Dr.	4	5	0	0
9	Cleveland Dr./ Cleveland Ct.	0	7	0	0
10	Valley Dr./ Watts Branch Dr./ Overlea Dr.	18	3	1	0
11	Overlea Dr.	0	10	0	1
12	Lloyd Rd.	14	18	0	1
13	Bevern La.	1	0	0	0
Watts Br. Sewerage System Subtotals		54	67	2	10
Watts Br. Sewerage System Totals		121		12	

Complete Systems Totals	197	26

[A] Extension numbers are keyed to the numbered symbols on Figures 5.1 and 5.2.

Table 5.2 – Potential Sewer Service Type

Sewer Service Type	No. of Houses	% of Total
Potential Service by Gravity to Gravity Sewer Extensions	115	58
Potential Service by Pumping to Pressure Sewer Extensions	79	40
Potential Service by Pumping to Gravity Sewer Extensions	3	2
Total Number of Served Houses	**197**	**100**

In either of the preceding public sewer alternatives, the existing connection to the septic system is disconnected from the house and rerouted to the public sewer. MCDPS advises property owners switching from septic systems to public service to properly abandon their septic tanks by filling them with gravel (See Figure 5.4) at the end this section.

System Extension Process:

The majority of study area property owners who pursue the provision of public sewer service will need to proceed through the following process:

- Apply to the County Department of Environmental Protection (MCDEP) for a sewer service area category change from the existing category S-6 to S-3.*
- Assuming the sewer category change request is granted by the County, apply to WSSC for a sewer main extension, service connections, and on-site plumbing permits. This evaluation has assumed that owners will apply for main extensions under the System Extension Permit (SEP) program, WSSC's most commonly used extension process. This and the following steps are typically managed by a project engineer hired by the owner. The project engineer will design the needed main extension and follow up with WSSC to ensure that the design is approved and appropriately permitted.
- Construct the main extension, sewer service connection, and on-site plumbing.
- Upon WSSC approval and acceptance of the sewer main extension, complete and cover all construction, then dedicate the new main and service connection to WSSC for operation and maintenance. Abandon the existing septic system according to MCDPS requirements. Public sewer service will then be available and ready for use.

As shown on Figure 5.2, there are 21 improved properties in the study area that abut existing sewer mains, but are not currently approved for public sewer service. These property owners will not need to construct new sewer mains in order to access public sewer service, and would need to proceed through the following process:

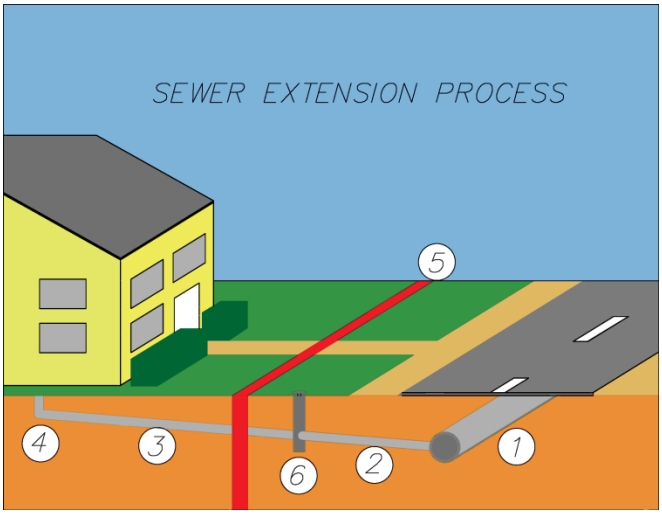
- Apply to MCDEP for a sewer service area category change from the existing category S-6 to S-1.*
- Assuming the sewer category change request is granted by the County, apply to WSSC for a sewer service connection and on-site plumbing permits. This and the following steps are typically managed by a WSSC-registered master plumber hired by the owner. The plumber will work with WSSC to ensure that the service connection and on-site plumbing needs are approved and appropriately permitted.
- WSSC will typically construct the sewer service connection, and the owner's plumber will perform the on-site plumbing work.
- Upon WSSC approval and acceptance of the on-site work, cover all open excavated construction. Abandon the existing septic system according to MCDPS requirements. Public sewer service will then be available and ready for use.

  **Additional information on the category change process, application information and fees, etc. is available at MCDEP's webpage: www.montgomerycountymd.gov/waterworks.*

Property owners seeking public sewer service within the City of Rockville service area will substitute the City's Dept. of Public Works for WSSC in the above procedures. City service

polices allow for the provision of public sewer service only to those properties within the city limits. Therefore, some cases may require annexation into the city.

Figure 5.3 – Typical Gravity Sewerage System Components



1. Sewer Main Extension
2. Sewer House Connection
3. Sewer House Hookup
4. Building Hookup
5. Property Line
6. Clean-Out

Table 5.3: Sewerage System Components & Responsibilities

Figure 5.1 Item	**Design & Construction Process**		***Post-Construction Ownership & Maintenance***
	WSSC SEP	**WSSC Non-SEP**	
Sewer Main Extension (1)	Applicant	WSSC	WSSC
Sewer House Connection (2)	Applicant	WSSC	WSSC
Sewer House Hookup (3)	Applicant	Applicant	Applicant
Grinder Pump[A]	Applicant	Applicant	Applicant

[A] Not shown on Figure 5.1

The first step in establishing sewer service for most lots with septic systems will be to obtain a service category change. The application is available and the process explained at the MCDEP website. This process will typically take nine to 15 months from the time of application.

The permitting and plan approval process for extension and connection to the public sewer will be obtained through WSSC Development Services Group (DSG)--specifically the permit services unit of that group. Figure 5.3 above, indicates some of the processes and responsibilities. In the figure, SEP stands for systems extension plan and SCP stands for system connection permit. For planning purposes, an applicant should anticipate a four- to six-month time period from the time an engineer is selected to approval of plans for a sewer extension and connections.

3/29/13 note: DEP received several useful comments on ways to clarify the cost explanations in this section. DEP will work to incorporate these, and any comments from the upcoming public meeting, to improve the explanations of the cost issues presented here.

5.2 Planning Level Costs

As with septic system replacements discussed in the preceding sections, the costs involved with the provision of public sewer service, if needed, will be of concern for property owners facing such a need. The topography and the zoning of the Glen Hills study area do not contribute to an economical public sewerage system. The numerous hills and valleys in the neighborhood create a need for many separate possible main extensions to provide sewer service. In addition, as the frontage of lots and the distance between houses increase, the cost to provide public service to each lot increases.

Planning level costs for the purposes of this study were developed based on sewer main extension lengths and connections for 197 developed lots. Costs have been broken down as indicated in Appendix 3 between work within the public right of way and for work on each individual lot (see Figure 5.1, for additional information).

The cost estimates and assumptions generated for these system extensions figures are included in the Appendix 3. The costs provided are for construction only and do not include design, testing and permitting costs. The pipeline costs are inclusive of excavation and backfill, piping, manholes, and other items to make a complete functioning sewer system,. Pavement restorations are added to this cost. The basis of the costs is from information gathered from local contractors, utility contractors and WSSC bid tabulations. Bid tabulations are from recent publicly bid projects that show each bidder's bid amount for construction items and are a part of the public record.

Estimated costs* for new public sewer service include the following:

- $40,000 per property for gravity sewer main extensions.
- $10,000 per property for low-pressure sewer main extensions.

- $4,500 per property for a gravity connection to a gravity sewer main.
- $4,500 per property for a pressure connection to a gravity sewer main.
- $900 per property for a pressure connection to a low-pressure sewer main.

- $26,800 per property for a gravity hookup and other on-site work.
- $22,100 per property for a pressure hookup and other on-site work.

Combined, the above cost components provide a range of costs from $33,000 to $71,300 per lot.

*Tables providing additional factors for the preceding estimated costs are provided in the Appendix 3.

In considering sewer extension costs, it is important to understand that the estimated cost per property needs to be evaluated cumulatively for a proposed main extension.

- In the simplest example, a gravity sewer extension to an existing main one lot away from the property to be served will likely abut two lots, one on each side of the street. Together, the estimated extension cost would be $80,000 or $40,000/lot x 2 lots.
- A gravity extension to a main three lots away from the property to be served would likely abut six lots. The estimated extension cost would be $240,000 or $40,000/lot x 6 lots.

The preceding sewer extension costs were developed on the basis of using WSSC's standard system extension permit (SEP) process, which is used for almost all new main construction projects in the county. Under the SEP process, an application seeking an extension of public service is required to provide:

- The main extension design.
- Any easements needed for the main and/or service connections.
- All necessary permitting for construction.
- Construction of the main, connections, and all on-site work.
- All funding for the extension project. (Note that under the SEP process, the applicant receives no compensation from other property owners that may choose to connect to the new main at a later time.)

Following construction and WSSC's approval, the parts of the project within the public right-of-way (mains and house connections) are dedicated to WSSC for operation and maintenance. Typically, an individual property owner hires a civil engineering firm to design and manage the project.

Alternatively, WSSC also provides the non-SEP main extension process, under which, WSSC provides the main design, permits, construction of the mains and service connections, and a set financing mechanism. On-site work is still the responsibility of the applicant. The applicant pays for WSSC's work through a combination of annual front foot benefit assessment (FFBA) charges and deficit payments. Other abutting property owners are required to start paying FFBA charges when connecting to the new main, so costs are spread out somewhat among those benefitting from the new service. In cases where the County declares a public health problem due to a failed on-site system, WSSC does provide a construction cost subsidy for each property abutting the new main. Note however, that overall project costs under the non-SEP process are typically higher than project costs encountered under the SEP process. See note on pg. 29.

Appendix 3 provides addition information regarding costs such as additional detail of on-site costs, grinder pump systems purchase and installation

Operating & Maintenance Costs:

The costs that WSSC incurs for operation and maintenance of its water supply and sewerage systems are passed along to the agency's customers through quarterly utility bills. Billing is based on water use, and the more water used during a billing cycle, the higher the charge per gallon. Typical WSSC residential quarterly bills for 3-5 bedroom homes range from:

- $280 to $500 for both water and sewer service.
- $165 to $290 for sewer service alone

The use of an on-site grinder pump for public sewer service does add some additional cost to the property owner beyond the initial costs for purchase and installation. These costs include both electricity for operation the pump, and an annualized investment for pump repairs and overhaul. According to the Water Environment Research Federation, a home owner would incur an annual cost of approximately $165 to $305 for the electricity to run the pump system and for annualized maintenance costs. (Details are included in Appendix 3)

Estimated Service Life: Public Sewerage Systems

Table 5.4 – Estimate Service Life – Public Sewer Components

Component	Estimated Service Life (years)
Piping (Gravity and Pressure)	50
Grinder Pump Replacement)	16-20

The service lives in the table above are based upon the published WEF data and the current accepted industry standards. The life of individual components are known to vary widely. For instance, there many examples of pipe distribution systems 100 years old and older.

3/28/13 note (from pg. 28): DEP will provide additional language explaining that currently the non-SEP process is rarely used given the high cost of WSSC-constructed mains, and that WSSC and the County are pursuing alternative means of main extension financing to make costs more reasonable for property owners using septic systems.

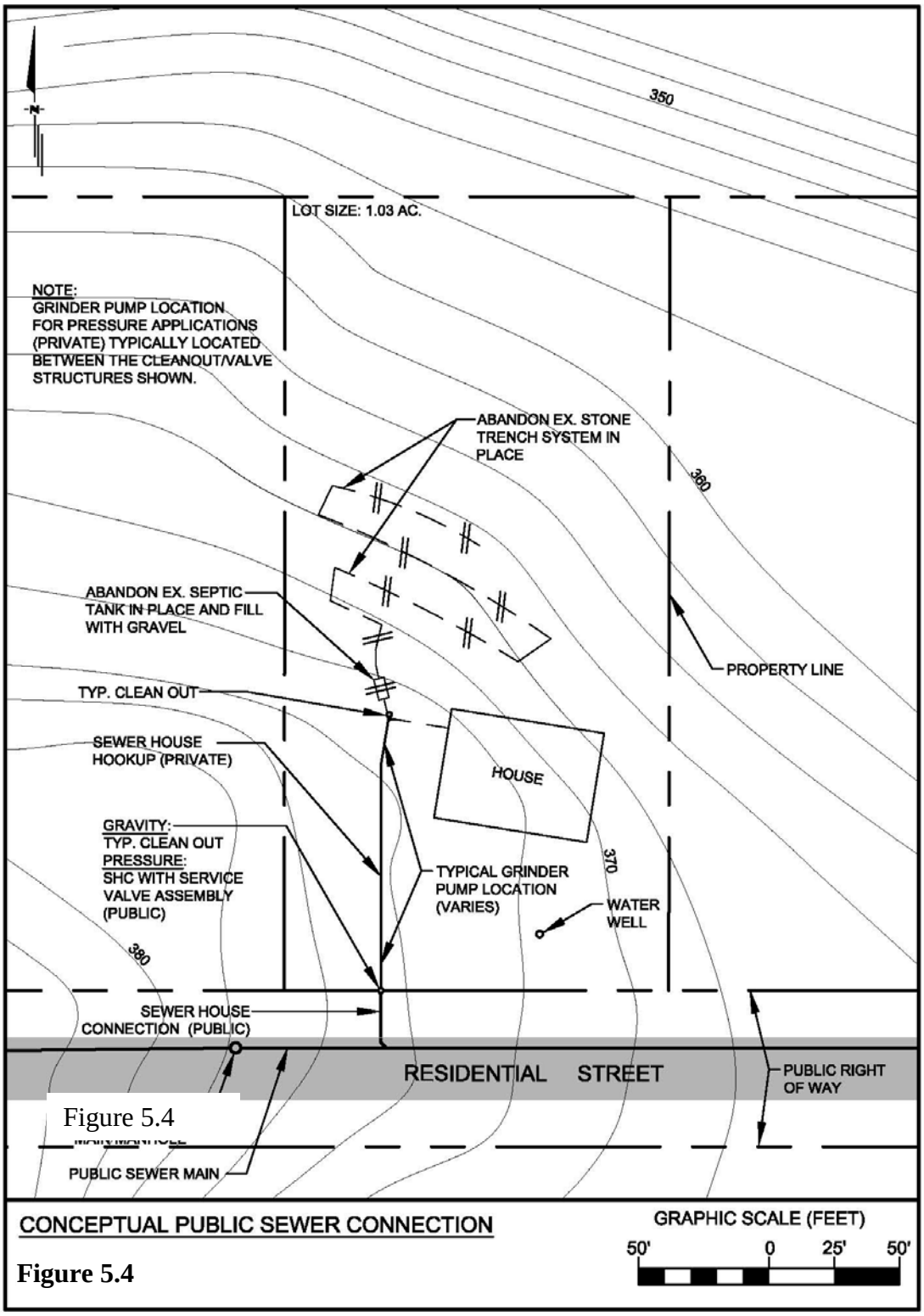


Figure 5.4

Figure 5.4

6. Summary and Next Steps

At the direction of the County Council, the Montgomery County Department of Environmental Protection (MCDEP) conducted the Glen Hills Area Sanitary Study to address the recommendation in the *2002 Potomac Subregion Master Plan* that the County undertake:

> "… a study of septic failures in Glen Hills to develop the measures necessary to ensure the long-term sustainability of septic service for new home construction and existing home renovations, and to address the need for limited sewer extensions if needed."

The master plan further recommended that the study include the following elements:

- **"Delineation [of] and possible reasons for known septic failures."** Phase 1 of the study included research into Department of Permitting Services (MCDPS) well and septic system permit records. As part of this research, septic system failures were noted and were then mapped as part of the Phase 1 report.
- **"Groundwater testing if needed."** As MCDEP developed the scope of this study, it became clear that, given the resources and timing involved, a planning level effort would be an appropriate approach. This effort would include researching permit records and information on the condition of natural features readily available from reliable, known sources. The collection of site-specific information, requiring well sampling and soils testing, was not consistent with the planning focus of this study. The collection of water and soil testing data would provide a database of questionable value since the presence of typical contaminants (coliform bacteria, nitrogen compounds, etc.) would not directly relate to septic system failures. It is DEPs belief that the author(s) of the master plan did not know that testing water and soils would require a level of detail that could not be justified in a planning study.
- **"Preparation of a logical and systematic plan for providing community [public] sewer service if needed."** The Phase 2 report includes a conceptual design for sewer main extensions that could serve those parts of the study area in which the long-term use of deep stone trench septic system may be constrained by soil conditions or regulatory requirements. The concept sewer system layout developed for this study was to show a "logical and systematic plan" for those areas that may need sewer in the future if replacement of on-site systems proves to be problematic.
- **"Emphasis on extension of sewer mains within public right-of-way rather than within stream valleys."** As described in Phase 2 Section 5.1, the sewer extension concepts developed for the purposes of this study were designed to maximize the use of public rights-of-way and avoid stream valleys and stream buffers.
- **"An evaluation and recommendation of the abutting mains policy for this area."** Phase 2 Section 5.1 provides information on properties that now abut existing sewer mains in the study area and on properties that could abut the sewer mains designed for the purposes of this study. The Executive's report to the Council will include a policy recommendation based on this report and community input. It is not a determination that can be made based solely on the analytical data collected in this study.
- **"Exclusion of properties that are environmentally sensitive and cannot be developed in conformance with established environmental guidelines."** MCDEP has determined that no lots can be determined to be unbuildable ("cannot be developed") based on the planning level data collected and the large size of many lots having environmentally sensitive traits. This determination can only be made on a lot-by-lot basis for the

development being proposed. Accordingly, this study did not exclude any properties from possible consideration.

Phase 2 of the Glen Hills Area Sanitary Study identified and evaluated potential sewage disposal options for the Review Areas (RAs) where Phase 1 of the study indicated that the long-term use of conventional deep-trench septic systems may be constrained by local soil and other conditions. When an existing septic system fails, a property owner, working with the County Department of Permitting Services (MCDPS), may find that a lot is unable to satisfy deep trench septic testing requirements with regard to soil percolation rates, depth to groundwater or bedrock, or setbacks from floodplains or stream buffers. In such cases, the owner will need to consider one of the alternatives presented in this report:

- A conventional shallow stone trench septic system.
- A conventional sand mound septic system.
- An innovative drip septic system.
- An extension of and/or connection to the public sewerage system.

Each of these options has advantages and disadvantages, resulting in better applicability in some situation as opposed to others. Given the conditions in the study area, it is unlikely that any one option provides a universally better choice than all of the others for the relief of existing septic systems.

The option of using replacement on-site septic systems will ultimately depend on the results of the required on-site testing to determine soil, groundwater and bedrock conditions. The results of this study indicate that within locations identified as RAs, testing for shallow stone trench, sand mound or drip systems instead of a traditional deep stone trench system could increase the probability of successful permitting, construction, and long-term operation of an on-site septic system.

The option of using public sewer service for the replacement of existing on-site septic systems will depend, in part, on sewer service policies adopted by the County Council in the County's *Comprehensive Water Supply and Sewerage Systems Plan*. (At present, new sewer service is allowed only in cases where the failure of an existing on-site system is confirmed.) Conceptual designs for public sewer extensions to RA locations were developed for this report to better understand the impact and cost of extending public sewer service further into these neighborhoods, if needed. These systems were located within the roadway to avoid stream valleys and the need for easements from private landowners. The systems consisted of both gravity lines and, where needed due to the terrain and sensitive environmental features, on-site grinder pumps and pressure sewers.

A planning-level construction cost estimate was prepared for each of the options.
The on-site sewage disposal option construction costs per lot for system replacement ranges from $17,500 to $48,000.

The public sewer extension option construction cost is a per lot cost ranging from $33,000 to $71,300 when considering 197 lots.

The following table summarizes and compares the options of on-site disposal and public sewer extension for the Glen Hills Area in the following categories: public disruption during construction, operation and maintenance, costs, and longevity.

Table 6.1 – Summary & Comparisons of Options

Comparison Topic	Use of an On-Site Septic System	Use of Public Sewer Service
Construction/ Installation	Property owner	Under SEP: Property owner requesting new service. Under non-SEP: WSSC constructs new main and service connections. Property owner requesting new service constructs all on-site components.
Construction Costs	Generally lower than public sewer, but can vary substantially according to the type of system used. All costs fall to the property owner.	Generally higher than for on-site septic systems. Affected by length of sewer extension required; this can raise costs to substantially more than for an on-site system. Under SEP: All on the property owner requesting new service. Under non-SEP: Mostly on the owner requesting new service; some cost sharing with other abutting owners. Main and connection construction cost can be deferred over 23 years.
Construction Impacts and Disruption	Mostly on-site for the owner	Mostly off-site for the public; some on-site as well.
Operation and Maintenance (O&M) Responsibility	Property owner	On-site components: Property owner. Off-site mains and connections: Utility (WSSC or Rockville)
Operation and Maintenance Costs	Depends on system type. Stone trench systems: Lowest annual O&M cost for periodic tank pumping. Sand mound and drip systems: O&M costs are higher due to pumping systems (electricity and maintenance) added to tank maintenance.	Gravity service: Very low annual cost. O&M by utility is included in quarterly utility billing. Pumped service: O&M costs are higher due to pumping systems (electricity and maintenance).
Direct Use Cost	None	Billed by utility (WSSC quarterly) based on water usage.
Useful Life of Components	Drain fields: 20 to 50 years or more Septic tanks: 40 years or more Pumping systems: 16-20 years	Mains (gravity & pressure): 50 years or more Pumping systems for subdivisions and larger flows: 25 years or more Grinder Pump Systems: 16-20 years
Feasibility of Service	Service is dependent on testing results affected by soil conditions and on regulatory requirements.	Service is dependent on technical and financial feasibility.

This study was conducted at the request of the County Council based on recommendations from the 2002 *Potomac Subregion Master Plan*. It is intended to provide the Council with background information on conditions in the study area and on how those conditions can affect the available options for the relief of failed septic systems. The Council will decide whether or not these conditions warrant a reconsideration of the recommendations and policies affecting on-site septic service and public sewer service for the study area in the master plan and in County's *Water and Sewer Plan*.

Towards accomplishing that goal, MCDEP will:

- Develop a staff report to accompany the study's Phase 1 and Phase 2 Reports for review by the County Executive.

- Forward the Executive's report and recommendations on the study to the County Council for consideration.

- Continue to coordinate public outreach with the Glen Hills study area community throughout the Council's consideration of the study.

- Work with the Council, the Planning Board, and other appropriate agencies to implement service policy changes the Council deems appropriate, if any.

References

Maryland National Captial Park and Planning Commission, *Master Plan for the Potomac Subregion*, May, 1980.

Maryland-National Capital Park and Planning Commission, *2002 Potomac Subregion Master Plan*, April, 2002

Hoover, Michael T., "Septic Systems and Their Maintenance" *North Carolina Cooperative Extension Service, Publication AG-439-13* http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-13/.

United States Department of Agriculture, National Resources Conservation Service, *Soil Survey of Montgomery County Maryland*, US Department of Agriculture, December, 2011.

Department of Environmental Protection Watershed Management Division, "Chapter 1, Objectives and Policies, b. Facilities Located Outside the Community Service Envelopes" *Ten-Year Comprehensive Water Supply and Sewerage Systems Plan*, http://www6.montgomerycountymd.gov/dectmpl.asp?url=/Content/dep/water/wasupCompplan.asp#organized.

National Small Flows Clearinghouse, "Subsurface Drip Irrigation Systems Have Many Advantages," *Pipeline newsletter*, Winter, 1999, Vol. 10, No. 1.

Montgomery County, "Chapter 27A Individual Water Supply and Sewage Disposal Facilities," *COMCOR Code of Montgomery County Regulations*, http://www.amlegal.com/nxt/gateway.dll?f=templates&fn=default.htm&vid=amlegal:montgomeryco_md_mc

State of Maryland Office of the Secretary of State "Title 26 Department of the Environment,Water Supply, Sewage Disposal and Solid Waste, Regulation of," *COMAR*, Pages 720-748.

Montgomery County Department of Permitting Services, "Well and Septic Conventional Sandmound Septic Systems," handout, April, 2011. http://permittingservices.montgomerycountymd.gov/DPS/pdf/WellAndSepticConventionalSandmoundSepticSystems.pdf

Washington Suburban Sanitary Commission, "Pipeline Design Manual," 2008. http://www.wsscwater.com/home/jsp/content/design-man-index.faces

Washington Suburban Sanitary Commission, "Standard Details for Construction," 2005. http://www.wsscwater.com/home/jsp/content/permit-details2005.faces

Washington Suburban Sanitary Commission, "Residential Fees & Charges Effective July 1, 2012". http://www.wsscwater.com/file/EngAndConst/DevServices/RESIDENTIAL%20Fees%20&%20Charges%20Effective%207-01-12.pdf

Environmental Protection Agency, “Collection Systems Technology Fact Sheet”. http://water.epa.gov/scitech/wastetech/upload/2002_10_15_mtb_congrasew.pdf

Environmental Protection Agency, “Wastewater Technology Fact Sheet”. http://water.epa.gov/scitech/wastetech/upload/2002_10_15_mtb_presewer.pdf

Tyler J. Molatore, "Operational Cost of Two Pressure Technologies: Effluent (STEP) Sewers and Grinder Sewers", *Orenco Systems Inc*, 2010.

RMS Means Online, 2012

Water Environment Research Foundation “Gravity Sewer Systems,” *Performance & Cost of Decentralized Unit Processes*, 2009. http://www.werf.org/i/c/DecentralizedCost/Decentralized_Cost.aspx

Ibid “Pressure Sewer Systems,” *Performance & Cost of Decentralized Unit Processes*, 2009. http://www.werf.org/i/c/DecentralizedCost/Decentralized_Cost.aspx

Ibid “Gravity Distribution,” *Performance & Cost of Decentralized Unit Processes*, 2009. http://www.werf.org/i/c/DecentralizedCost/Decentralized_Cost.aspx

Ibid “Low Pressure Distribution,” *Performance & Cost of Decentralized Unit Processes*, 2009. http://www.werf.org/i/c/DecentralizedCost/Decentralized_Cost.aspx

Ibid “Drip Distribution,” *Performance & Cost of Decentralized Unit Processes*, 2009. http://www.werf.org/i/c/DecentralizedCost/Decentralized_Cost.aspx

APPENDIX 1

Glen Hills Recommendation from 2002 Potomac Subregion Master Plan

Sewer Service Policies

A critical policy related to water quality is the provision of community sewer service. Providing community sewer service to relieve failed septic systems minimizes groundwater contamination. However, the provision of community sewer service can damage the environment and water resources by facilitating development to the maximum zoning density. Extensions along stream valleys can also create habitat disturbance, threatening species survival, and can adversely affect the natural hydrologic system due to wetland fragmentation. Once sewer lines are in place, their structural integrity may deteriorate over time, resulting in sewage leaks and further disturbance to the ecosystem. This is particularly troublesome where eroding or shifting stream channels expose sewer mains and manholes, leaving them more susceptible to damage.

In general, the County's water and sewer policies allow the provision of sewer service only to those areas zoned for moderate to dense development (i.e., greater than or equal to one unit per 20,000

square feet). However, at the recommendation of the 1980 Master Plan, sewer service has been provided to some areas zoned for one- and two-acre lots, creating both a policy dilemma and, in some cases, environmental damage. Typically, low zoning densities (such as RE-1 and RE-2) are used to protect the natural environment by minimizing development impacts. Low and, in some cases medium, density areas (such as R-200) are dependent on septic suitability, often resulting in actual development yields well below the maximum allowed by zoning. Extending sewer lines into these areas has the potential to allow development density at or near the zoned maximum, to disrupt the environment and to provide rationale for further extensions and greater density. One of the greatest challenges facing the Potomac Subregion and this Master Plan has been to develop compatible land use and sewer service recommendations which protect the Subregion's environmental quality. The section addressing sewerage systems provides detailed recommendations regarding these sewer service issues.

Community sewer service in the Subregion is provided through trunk lines which parallel most of the major tributaries. These trunk mains drain to the Potomac Interceptor, a large sewer line that parallels the Potomac River and conveys sewage to the Blue Plains Treatment Plant in the District of Columbia.

The County's policies on the provision of community sewer service are governed by the *Water and Sewer Plan*, the County's *General Plan*, master plans, the State's Smart Growth policies, and other policy documents. Master plans recommend where sewer service is to be provided, generally in areas of dense development, consistent with *Water and Sewer Plan* policies. The *1980 Potomac Subregion Master Plan* is one of the County's few master plans recommending sewer service for zones such as RE-1 and RE-2, an exception to the general policies for sewer extension. The County Council has asked that as part of the Potomac master plan update, the Planning Board study the effects of sewer service in these areas on land use, infrastructure, the environment, and budget.

Low-Density Areas

In part, the 1980 Potomac Master Plan's intent was to use community sewer service to take maximum advantage of the allowed density in lower-density zones such RE-1 and RE-2 where it was appropriate. Much of the undeveloped area zoned RE-1 and RE-2 was placed in master plan sewer stage IV where the provision of community sewer service was evaluated case-by-case on the basis of logical, economical, and environmentally acceptable service. Twenty years later, a comprehensive evaluation indicates that providing community sewer service to areas zoned for one-and two-acre development, and contrary to smart growth policies, has undermined the environmental emphasis of zoning areas for low-density development, especially where septic suitability is marginal. With increasing demand for homes and recent development and redevelopment trends, especially where sewer service is provided, this exception to the general sewer service policy is no longer effective. Much of the remaining undeveloped RE-1 and RE-2 land is beset by environmental constraints limiting development potential without sewer.

Under the prior master plan, the Subregion has experienced substantial provision of community sewer service to lower-density areas. Because of this, and because the County considered the approvals for much of this service on a case-by-case basis, the current Potomac community sewer

envelope is irregular, established by demand rather than by plan. Voids within the envelope and irregular boundaries along its perimeter abound. Although this Master Plan generally recommends against the continued provision of community sewer service to low-density (RE-1 and RE-2) areas, it does support limited approvals for community sewer service for the low-density areas within the envelope and along its currently-established edge. The focus of this limited service and expansion should be on properties which already abut existing or proposed mains and on properties which can be served by sewer extensions within public rights-of-way. Main extensions that would disrupt streams and their undisturbed buffer areas should be avoided. Any approvals granted along the currently-established edge should not be cited as justification for expanding the sewer service envelope beyond the limits recommended in this Plan.

Sewer Service Recommendations

- **Provide community sewer service in the Subregion generally in conformance with *Water and Sewer Plan* service policies. This will generally exclude areas zoned for low-density development (RE-1, RE-2, and RC) not already approved for service from further extension of community service.**

- **Allow for the limited provision of community sewer service for areas zoned RE-1 and RE-2 within and at the periphery of the proposed sewer service envelope. (See Foldout Map D.) Exclude from this peripheral service policy properties adjacent to and in the vicinity of the Palatine subdivision and the lower Greenbriar Branch properties, and all properties within the Piney Branch Subwatershed, the Darnestown Triangle, and the Glen Hills Area (until completion of the study described on page 24, which will evaluate whether this exclusion should continue in the future). Emphasize the construction of sewer extensions, if needed, along roads rather than through stream valleys.**

- **Help to protect water quality in the Stoney Creek subwatershed of Watts Branch by requiring that sewer main extensions to serve the few properties approved for community service be located along River and Stoney Creek Roads, rather than along the stream valley.**

- **Deny the provision of community sewer service to the areas zoned R-200 near the intersection of River and Seneca Roads.**

Glen Hills Area

The Glen Hills area consists of several established subdivisions with lots generally at least one acre in size. Most of the lots were established in the 1950's and 60's using septic systems. At that time, septic standards did not include septic buffers, water table testing, multiple depth testing, and the consideration of fractured rock. The Department of Permitting Services (MCDPS) has raised concerns about the periodic septic failures which occur in the neighborhood because subsurface conditions often do not allow for replacement systems which satisfy current septic regulations. This Plan supports a study of the septic failures in Glen Hills to develop the measures necessary to ensure

the long-term sustainability of septic service for new home construction and existing home renovations, and to address the need for limited sewer extensions if needed. This study, conducted in conjunction with the citizens of this area and the appropriate public agencies, shall include the following elements:

- Delineation and possible reasons for known septic failures.
- Groundwater testing if needed.
- Preparation of a logical and systematic plan for providing community sewer service if needed.
- Emphasis on extension of sewer mains within public right-of-way rather than within stream valleys.
- An evaluation and recommendation of the abutting mains policy for this area.
- Exclusion of properties that are environmentally sensitive and cannot be developed in conformance with established environmental guidelines.

This Plan recommends restricting further sewer extensions in Glen Hills to those needed to relieve documented public health problems resulting from failed septic systems. New sewer main extensions needed to relieve public health problems will be evaluated on a case-by-case basis for logical, economical, and environmentally sensitive extensions of service, with an emphasis on locating main extensions along public right-of-way, rather than stream valleys. Because of the concern that the sewer envelope will expand inappropriately, the abutting mains policy should be deferred subject to the results of the Glen Hills study.

Glen Hills Recommendation

- **Conduct a study described above of the Glen Hills area. Based on the results of that study develop a policy outlining the measures needed to ensure the long-term sustainability of septic service for new home construction and existing home renovations, minimizing the need for future sewer service extensions. Under this policy the sole basis for providing new sewer service would be well-documented septic failures where extension could be provided consistent with results of the study and in a logical, economical, and environmentally acceptable manner. Until a policy is developed, restrict further sewer service extensions in Glen Hills to properties with documented public health problems resulting from septic system failures.**

Piney Branch Subwatershed

The Piney Branch subwatershed presents a specific sewer service issue. Shallow bedrock and poor percolation rates severely limit development potential in the Piney Branch, Sandy Branch, and Greenbriar Branch basins unless sewer service is provided. However, these areas tend to have fragile or rare plant and animal communities as well as good water quality. The Piney Branch Trunk Sewer was constructed to serve development generated by TDRs in the upper subwatershed in North Potomac. Concerned over the potential environmental damage that could result from increased development density due to the availability of community sewer service along the rest of Piney Branch, the Council adopted a restricted sewer access policy for the subwatershed. This restricted

APPENDIX 2

On-Site Sewage Disposal Systems

- **Operating and Maintenance Costs for On-Site Disposal Systems**
- **On-site Sewage Disposal Systems – Sizing Calculations And Cost Comparison**

Operating and Maintenance Costs for On-site Disposal Systems

Trench Systems (deep & shallow)		
On-Lot Cost	Cost Issues	Estimated Annual Costs
Annual electrical ($0.15 per kW-hr)	Assumed gravity flow from primary treatment	-0-
Annual O&M	Annualized cost to drain field in 30 years	$200 – $400 per year
Septic tank pump out ($300 - $500 per service call)	Annualized cost for every 3 to 5 years	$60 - $170 per year
	Range of Annualized Costs	**$260 - $570**
Sand Mound Systems		
On-Lot Cost	Cost Issues	Estimated Annual Costs
Annual electric($0.15 per kW-hr)	based on ½-hp pump, operating 1 hr/day	$20 – $30 per yr
Annual O&M	Annualized cost to move to reserve area in 30 years	$540 - $800 per yr
Septic tank pump out ($300 - $500 per service call)	Annualized cost for every 3 to 5 years	$60 - $170 per year
	Range of Annualized Costs	**$620 - $1,000**
Drip Disposal Systems		
On-Lot Cost	Cost Issues	Estimated Annual Costs
Annual electrical ($0.15 per kW-hr)	Based on ½-hp pump, operating 1 hr/day at 0.15/kW-hr	$12 – $18 per year
Annual O&M	Annualized cost to replace system in 30 years and annual maintenance	$500-$740
	Range of Annualized Costs	**$512 - $748**

On-site Sewage Disposal Systems - Sizing Calculations And Cost Comparison

Drip Disposal

# BR	Perc (mpi)	Flow (GPD)*	Area Loading (gal/ft2/day)	Calc. Area (sq.ft.)	**Min Area (sq.ft.)**
3	20	450	0.228	1973.7	**2000**
5	20	750	0.228	3289.5	**3300**

Deep Trench

# BR	Perc (mpi)	Flow (GPD)*	Avg sq. ft.**	Length Reqd. (ft.)	**Min Area (sq.ft.)**
3	20	450	1500	150	**750**
5	20	750	2200	220	**1100**

30" Shallow Trench

# BR	Perc (mpi)	Flow (GPD)*	Avg. Length (ft.)**	**Min Area (sq.ft.)**
3	20	450	310	**2070**
5	20	750	455	**3420**

*Use: 150 GPD/PP
**Use averages from COMAR tables.

Assumption/Criteria Used:

Sand Mound

Minimum area is per a chart

Drip Disposal

Area required is the Flow divided by the Area Loading. Area Loading is provided by chart and is based on Perc Rate

Deep Trench

Length Requried is Avg. Sq. Footage divided by 2 x the depth of trench (per Comar Regs); Depth of trench is assumed to be 5'.

Required Length is split into two even sections (both 3BR and 5 BR) spaced 10 feet apart
Area is calc'ed based on split length and spacing between the two sections

Shallow Trench

Avg. Length is provided

Length is divided into equal sections (3 section for the 3 BR and 4 sections for the 5 BR) with sections spaced 10' apart

Minimum Area is length of the sections multiplied by the number of 10' spacing between sections.

On-site Sewage Disposal Systems - Sizing Calculations And Cost Comparison

Item	Description of Sewer System Type	Cost Range of installed system - 3 to 5 Bedroom (BR)	
		3 BR	*5 BR*
Private/Septic Sewer Types*			
1	Stone Trench	$19,500	$30,000
2	Sand Mound	$27,000	$38,000
3	Drip Disposal	$37,000	$48,000
*Includes 1200 to 1500 gal BAT septic tank system and:			
	Septic Tank costs		
	Drain field installation costs		
	Pipe installation costs		

Replaced by Table 4.2, pg. 18.

APPENDIX 3

Public Sewer Service Systems

- **Public Sewer Service Systems – Overall Costs**
- **Public Sewer Service Systems – Cost Per Lot (Connection in Public Space)**
- **Public Sewer Service Systems – Cost Per Lot (Connection on Private Property)**
- **Public Sewer Service Systems – Sewer Extension Lengths**

Public Sewer Systems – Overall Costs

Sewer Service Costs: Public Main Extensions

Type of Extension	Unit Cost	Quantity	Total Extension Cost	No. of Lots Served	Extension Cost/Lot	
					Calculated	Planning Purposes
Gravity Sewer Extensions	$310/ft.	17,080 ft.	$4,512,000	115 lots	$39,235/Lot	$40,000/Lot
Pressure Sewer Extensions	$75/ft.	10,400 ft.	$780,000	79 lots	$9,873/Lot	$10,000/Lot

Sewer Service Costs: Service Connections and On-site Work

Type of Sewer House Connection and Hookup	Cost per Connection [A]	On-Site Work Cost per Property [B]	No. of Properties & Connections
Gravity SHC [A] & SHH [B] to Gravity Main	$4,500	$26,800	115
Pressure SHC & SHH to Gravity Main	$4,500	$22,100	3
Pressure SHC & SHH to Low-Pressure Main	$900	$22,100	79

[A] The sewer house connection (SHC) runs from the sewer main in the street to the property line.

[B] On-site costs include:

- Sewer service hookup (SHH) that runs between the service connection at the property line and either the house or the outfall to the existing septic tank.
- Grinder pump unit purchase and installation (if needed).
- Existing septic system abandonment.

Conceptual Pressure Sewer Service Operating & Maintenance Costs

Annual electrical	Estimated at 1 kW-hr per day (paid by the lot owner)*	$44 - $66 per yr
Annual O&M	Annualized major pump overhaul every 10 years	$120 - $240 per yr

*Pump size of 1-hp running 1kW-hr per day at $0.15 per kW-hr

Public Sewer Service Systems - Cost per Lot
(Connection in Public Space)

Material & Installation Costs for Public Sewer Extension

Costs breakdown				
Type	**[1]Utility Costs/LF**	**[2]Trench Pavement Costs/LF**	**[3]Mill/Overlay Pavement Costs/LF**	**Total**
Gravity	$250	$40	$18	**$308**
Pressure	$30	$30	$13	**$73**

[1] Costs includes: material, excavation, installation, and backfill to subgrade.

[2] Assumes a 36" width for pressure & a 48" width for gravity for pavement restoration.

[3] Assumes a 12' lane width for 1/2 of roadway.

Overall Public Extension Costs		USE
Type	**Unit Price/LF**	**Unit Price/LF**
Gravity	$308	**$310.00**
Pressure	$73	**$75.00**

Service Connection in Public Right of Way

Type	Avg. Distance (ft.)[3]	Unit Price/LF	Costs
Gravity	30	$150	**$4,500**
Pressure[1]	30	$30	**$900**
Pressure/Gravity[2]	30	$150	**$4,500**

[1] Grinder pump to pressure sewer in street.

[2] Individual Grinder pump to transition manhole at property line is a pressure system. Transition manhole to main in street is a gravity system.

Overall Cost for Public Sewer Connection Types within Public Right of Way			Use
1	Standard SHC (gravity)	$4,500	**$4,500**
2	Grinder Pump (pressure)	$900	**$900**
3	Individual Grinder Pump S	$4,500	**$4,500**

Note: All unit costs estimated from current WSSC bid tab data (2011-2012). WSSC fees are from WSSC's "Residential Fees & Charges Effective July 1, 2012" document.

Public Sewer Service Systems - Cost per Lot
(Connection on Private Property)

Service Connection Piping on Private Property

Type	Avg. Distance (ft.)	Unit Price/LF	Costs
Gravity	120	$150	**$18,000**
Pressure[1]	120	$30	**$3,600**
Pressure/Gravity[2]	120	$30	**$3,600**

[1] Grinder pump to pressure sewer in street.

[2] Individual Grinder pump to transition manhole at property line is a pressure system. Transition manhole to main in street is a gravity system.

Pump material costs

Item	Costs
Pressure Grinder Pump (each)	$6,500
Pressure Grinder Pump Install (each)	$3,200
Total	**$9,700**

WSSC Fees (incurred by all public connections)

Item	Costs
Service Connection Fee	$3,675
System Development Charge (SDC)	$5,090
Total	**$8,765**

Overall Cost for Public Sewer Connection Types on Private Property			Use
1	Standard SHC (gravity)	$26,765	**$26,800**
2	Grinder Pump (pressure)	$22,065	**$22,100**
3	Individual Grinder Pump System (pressure/gravity)	$22,065	**$22,100**

Note: All unit costs estimated from current WSSC bid tab data (2011-2012). WSSC fees are from WSSC's "Residential Fees & Charges Effective July 1, 2012" document.

Public Sewer Service Systems - Sewer Extension Lengths
(Reference Figure 5.2)

Sewer Extension Number	Description	Type of Extension	
		Gravity (ft.)	Pressure (ft.)
1	Glen Mill Rd./Pheasant	1550	-
2	Glen Mill Rd./Valley Dr./Bailey Dr.	400	-
		-	2010
3	Lakewood Dr./Glen Lea/Glen Mill Rd.	2525	495
		425	-
4	Burton Glen	500	-
		415	-
5	Burton Glen/Glen Mill Rd./Spring	510	-
		320	-
		1620	-
		810	-
6	Circle Dr./Cleveland Dr./Ridge	1220	1230
		-	1800
7	Foxden Dr./Overlea Dr.	1595	-
		-	800
8	Carriage Ct./Scott Dr.	1040	365
9	Cleveland Dr./Cleveland Ct.	-	-
		-	510
10	Valley Dr./Watts Branch/Overlea Dr.	1390	-
		1030	510
11	Overlea Dr.	-	1145
12	Lloyd Rd.	1435	1535
13	Bevern La.	295	-
	TOTAL (FT.)	17080	10400
	TOTAL (MI.)	3.23	1.97