

APPENDIX

SEWERAGE SERVICE MASTER PLAN

INTRODUCTION

Outlined herein is a broad framework of potential sewer system improvements that could be undertaken by the Town to address two main concerns. First, because many citizens who reside in areas that are not currently served by the Town's sewer system have expressed a desire to have their homes connected to the Town's sewer system, the Town wanted to explore what alternatives may be available that might enable the Town to provide such sewer service to those areas. Second, a large portion of the undeveloped portions of Town are proposed for future residential development (i.e., Shackelford Ridge Road area). The Town requested advice about what alternatives may be available that might enable the Town to provide such sewer service to these undeveloped areas.

Consequently, this Plan provides a broad outline for a potential new system of wastewater disposal in the Town, including:

1. Providing sanitary sewer service to the undeveloped areas in Fruedenberg Creek, Stanley Branch and Chestnut Ridge drainage basins;
2. Providing "retrofitted" sewer service to existing homes in the Hiddenbrook North, Hiddenbrook South, Birnam Wood, Applewood and Carriage Hills/Palisades Drive areas in order to eliminate the potential for failed septic systems. For the purposes of this analysis, it is assumed that the retrofitted sewer systems include the abandoning of existing septic systems at each unit and installation of new STEP systems (Septic Tank Efficient-Pumping). The STEP system includes new tanks, service lines, pumps and other appurtenances required to tie to main trunk lines within the basin; and
3. Upgrading the existing sewer system components to handle the increased flow, including upgrading the trunk line in the Old Towne area and the main trunk line to the existing treatment plant and upsizing the treatment plant.

Exhibit E-1 graphically depicts the major components of the Sewer Plan. Outlined below is a brief description of the Plan.

MAJOR COMPONENTS OF SEWER MASTER PLAN

Purpose: To provide reliable and cost-effective wastewater collection and disposal services for the developed neighborhoods and future development areas of the Town of Signal Mountain.

planned in the entire Shackleford Ridge Road development and drainage basin area).

- (2) The following percentages represent the approximate share or portion of new flows generated through the new interceptor line by each respective drainage basin:
- | | |
|--|-----|
| Biram Woods: | 15% |
| Hiddenbrook North: | 9% |
| Hiddenbrook South: | 11% |
| Applewood: | 10% |
| Shackleford Ridge Road basins (composite): | 55% |

Component # 3: Construct new gravity flow sewer basin trunk lines into respective drainage basins to collect flow from individual home sites.

Scope: (1) Construct series of 8" - 15" gravity sewer lines from proposed main interceptor line at western Town limits (Component #2) into each respective drainage basin (i.e. Hiddenbrook North, Fruedenberg Creek, etc.)

Estimated Costs for Component # 3:

Hiddenbrook North =	\$0.24 million
Hiddenbrook South =	\$0.41 million
Biram Woods =	\$0.47 million
Applewood =	\$0.34 million
Palisades/Misc. =	\$0.16 million
Total:	\$1.62 million

NOTE: Shackleford Ridge Road basins trunk lines are to be paid by developers.

Component # 4: Construct new septic tank effluent-pumping (STEP) disposal system for existing residences currently utilizing conventional or alternative septic systems. Connect "retrofitted" STEP system to basin trunk lines (Component # 3).

Scope: (1) Remove existing tanks and drain lines and replace with new watertight tank(s), pump and service lines at all existing residences in the Hiddenbrook North and South, Birnam Woods and Applewood basins.
Approximate number of units = 1140.

- (2) Remove old tanks and provide new STEP system for residences in the older section of Town which are not currently served by public sewer (i.e. Fairmount area, Palisades Drive, east brow area). Approximate number of units = 325

Estimated Costs for Component # 4: 1465 units @ \$6,150 per unit = **\$9,010,000**

Comments: (1) Further, detailed engineering analysis may determine that more efficient and cost effective means are available to service selected areas due to topography,

existing alternative systems, etc. For purposes of this analysis, a STEP system and its associated costs was assumed to be required for all existing residences.

TOTAL ESTIMATED COSTS:

Component # 1 =	\$ 2.60 million
Component # 2 =	2.98 million
Component # 3 =	1.62 million
Component # 4 =	<u>9.01 million</u>
TOTAL	\$16.2 million

FUNDING OPTIONS

Over the past several years, the government funding sources for completing extensive waste water collection and treatment improvements have diminished to the point of being virtually non-existent for communities such as Signal Mountain. Currently, the State of Tennessee's Revolving Loan Fund provides the only government-sponsored funding mechanism for the scope of this project, and due to the Town's relative affluence compared to other Tennessee communities, the discount on loan rates available through the Revolving Fund is negligible compared to the rates the Town could receive through the conventional bond market.

Furthermore, the alternative funding options for the "public" portions of this Plan are limited to two main sources: (1) Users of the services or (2) all property taxpayers within the Town.

Some Tennessee communities have chosen to finance wastewater system improvements and maintenance costs through an increase in the property tax rate for all property owners. The City of Belle Meade (Nashville area) is the most prominent example of this financing methodology. This method spreads costs over a broader base and allows taxpayers to deduct the increases from their taxable income at the Federal level. This method, however, could impose a "double tax" on existing sewer customers of the Town because they not only have paid for the improvements required to provide service in their area, but they may now also have to pay a disproportionate share of costs to provide service for future customers (who did not help fund the original system).

The second method of financing the "public" portions of this program is through the imposition of assessments, fees or minimum monthly billing rates on future users of the new system. This is the predominant means used to finance similar programs across the state of Tennessee. There are generally three user groups who would benefit from these improvements:

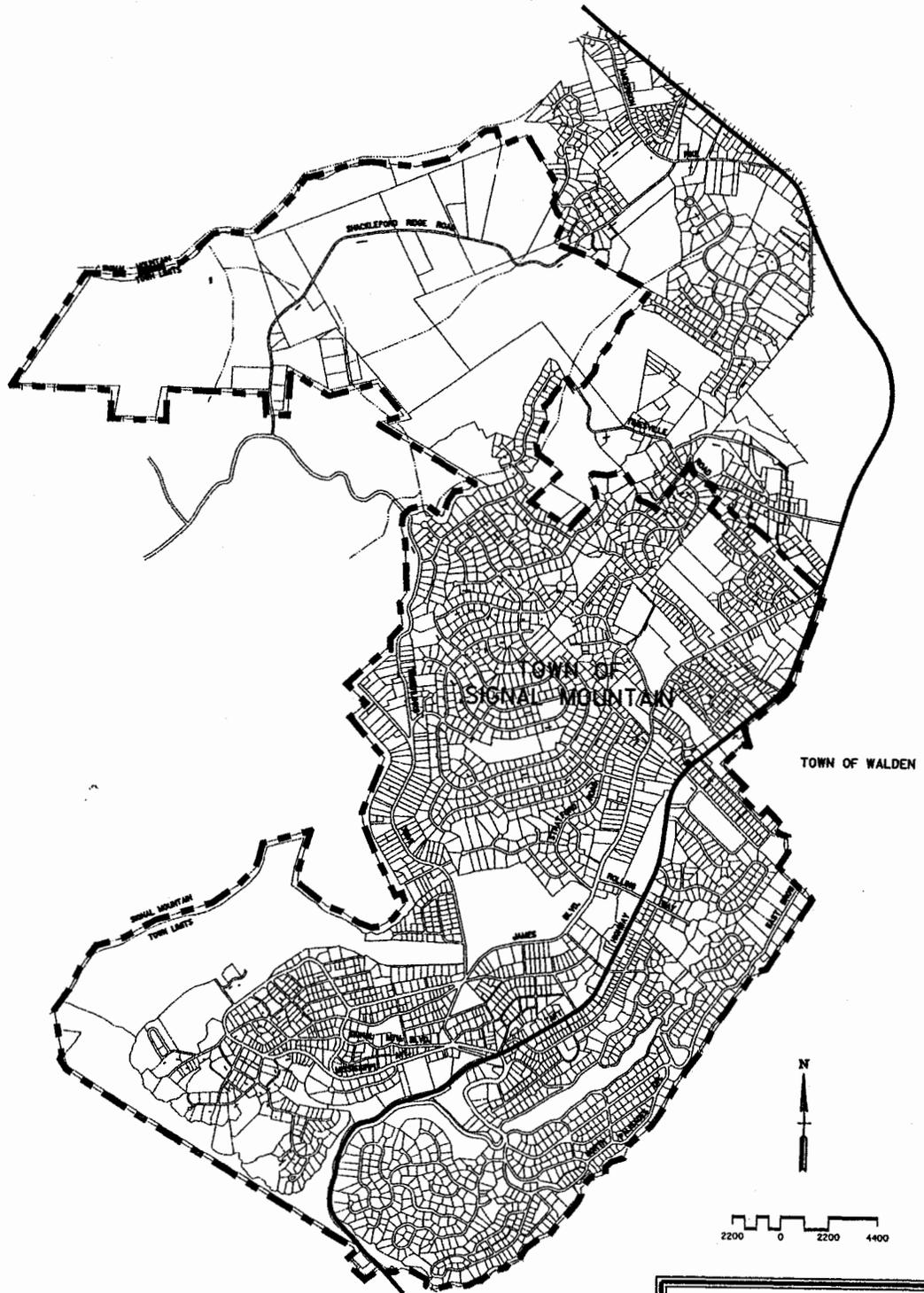
- (1) Existing Sewer Customers: This group receives limited benefits as a result of the improvement in existing lines.

- (2) Future Sewer Customers on the Shackleford Ridge Road area: This group receives direct benefits due to the flexibility in development options (i.e. reduced lot sizes, density increases) provided by sanitary sewer service in the vicinity.
- (3) Future "Retrofitted" Sewer Customers: This group also receives direct benefits due to the reduction in future maintenance problems or renovation costs associated with their existing conventional septic system.

ALTERNATIVE OPTIONS EXPLORED

The review of potential wastewater collection system improvements for the Town included an examination of alternative collection and disposal systems for the retrofitted septic systems and Shackleford Ridge Road areas. Alternative solutions such as recirculating sand filters, collection and spray effluent in open areas, and comprehensive gravity sewer systems were evaluated and deemed unworkable or more costly than the Plan as proposed. Anticipated construction costs, topographic constraints and lack of suitable natural features to accommodate alternative methodologies were primary factors contributing to the dismissal of these alternatives.

An alternative gravity sewer collection system, traveling along Middle Creek, was also evaluated. This system would collect wastewater from the Shackleford Ridge Road areas and the existing residential areas via basin trunk lines and STEP systems similar to this Plan. The main interceptor line would run along Middle Creek, through the Prentice Cooper State Forest, to Suck Creek Road, and then to the existing treatment plant. Under this alternative, Components # 1 (except for cost of treatment plant capacity upgrade) and #2 could be eliminated from this Plan, and instead, a series of 8", 10", 12" and 16" gravity mains would extend from the Town limits at Middle Creek to the treatment plant. The estimated cost for this system of gravity mains would be approximately \$2.2 million. Components # 3 and # 4 of this Plan would remain. This cost estimate does not include a contingency factor for the potential environmental problems or issues arising during design or construction through the State Forest.



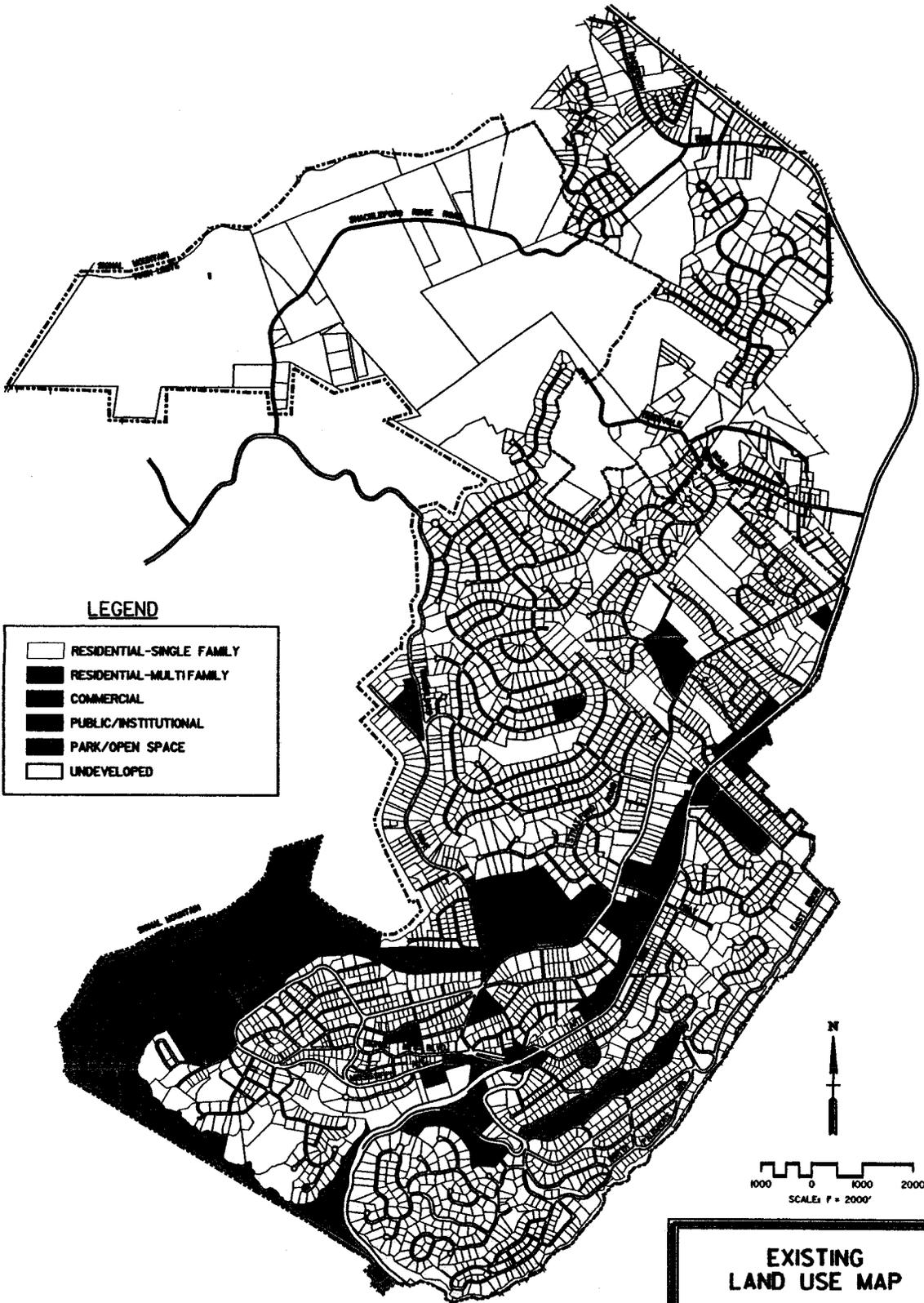
STUDY AREA CHARACTERISTICS

Size: 4,522 Acres
 1995 Population : 7,446
 Population Density (per sq. mile): 1,063.7
 Number of Residential Units: Approx. 2,536

**STUDY AREA
 MAP**
**TOWN OF
 SIGNAL MOUNTAIN**

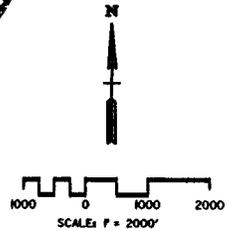
Donna
 Wagoner
 Planner and
 Designer Inc.
 Engineers, Planners, Surveyors,
 Landscape Architects and Surveyors

Exhibit No. 3-1



LEGEND

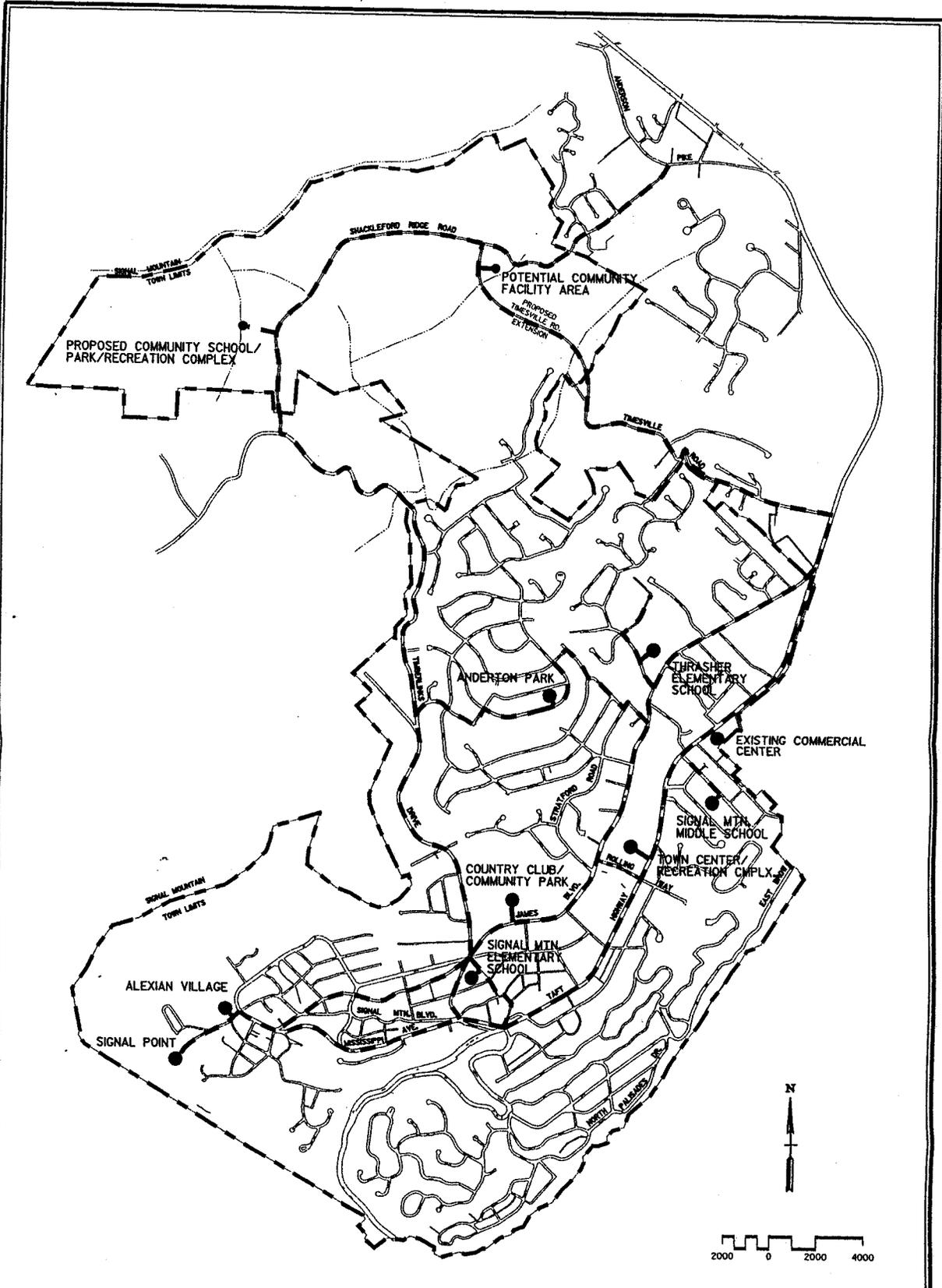
	RESIDENTIAL-SINGLE FAMILY
	RESIDENTIAL-MULTIFAMILY
	COMMERCIAL
	PUBLIC/INSTITUTIONAL
	PARK/OPEN SPACE
	UNDEVELOPED



**EXISTING
LAND USE MAP**

**TOWN OF
SIGNAL MOUNTAIN**

Exhibit No. 3-2



LEGEND

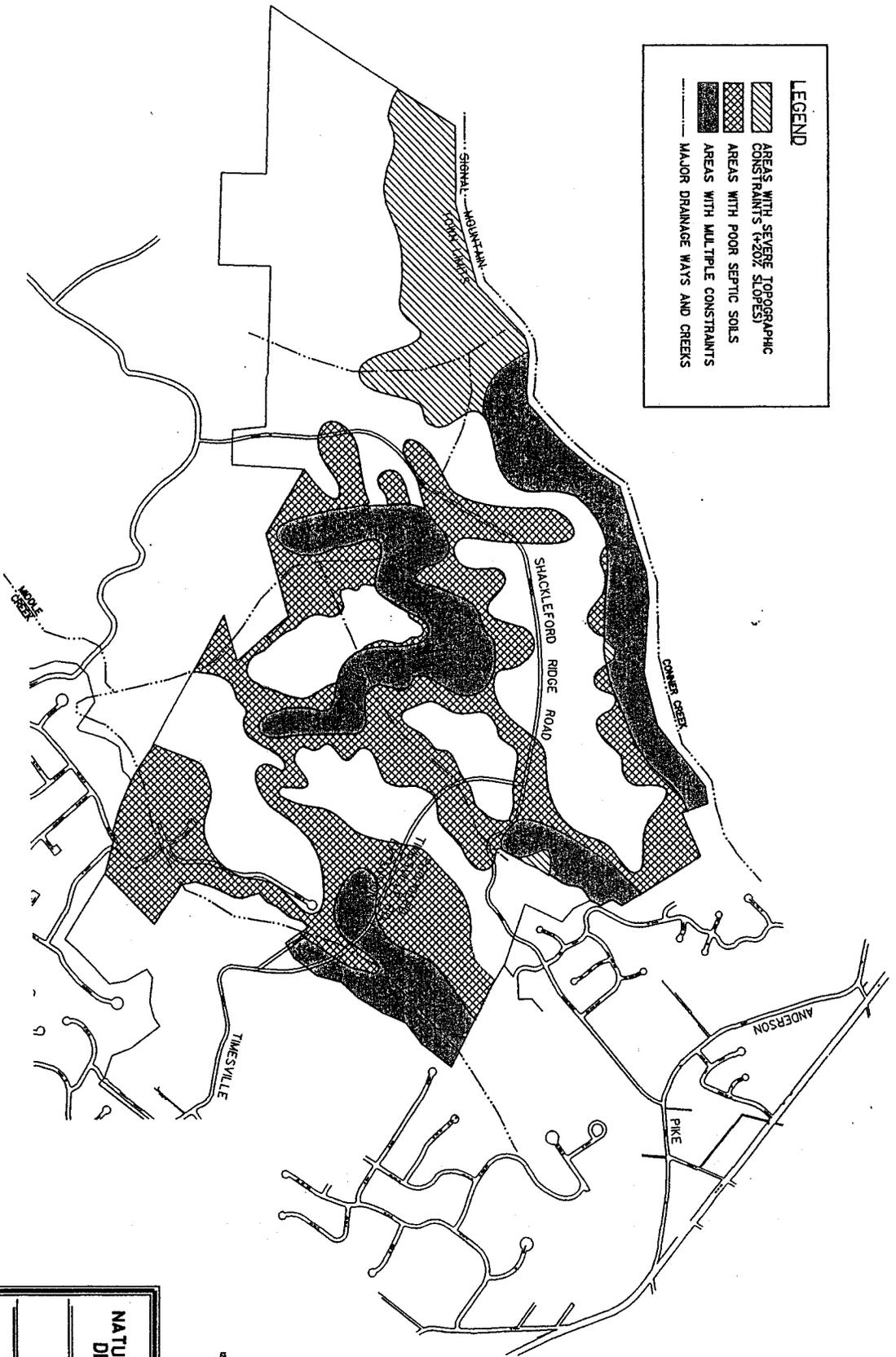
- PROPOSED PEDESTRIAN TRAIL/BIKEWAY
- MAJOR LAND USE ATTRACTORS AND GENERATORS OF BICYCLING/PEDESTRIAN ACTIVITIES

NOTE:
 This bikeway/pedestrian system plan should be used in conjunction with the official transportation plan to implement the indicated improvements. All roadway improvements required by the Transportation Plan should include sufficient right-of-way to install the appropriate bikeway or trail system.

PEDESTRIAN TRAIL BIKEWAY PLAN	
TOWN OF SIGNAL MOUNTAIN	
Prepared by: Wuesthler Speicher and Cannon Inc. <small>Engineers, Architects and Planners License No. 20000000000000000000</small>	
Exhibit No.	3-6

LEGEND

-  AREAS WITH SEVERE TOPOGRAPHIC CONSTRAINTS (>20% SLOPES)
-  AREAS WITH POOR SEPTIC SOILS
-  AREAS WITH MULTIPLE CONSTRAINTS
-  MAJOR DRAINAGE WAYS AND CREEKS

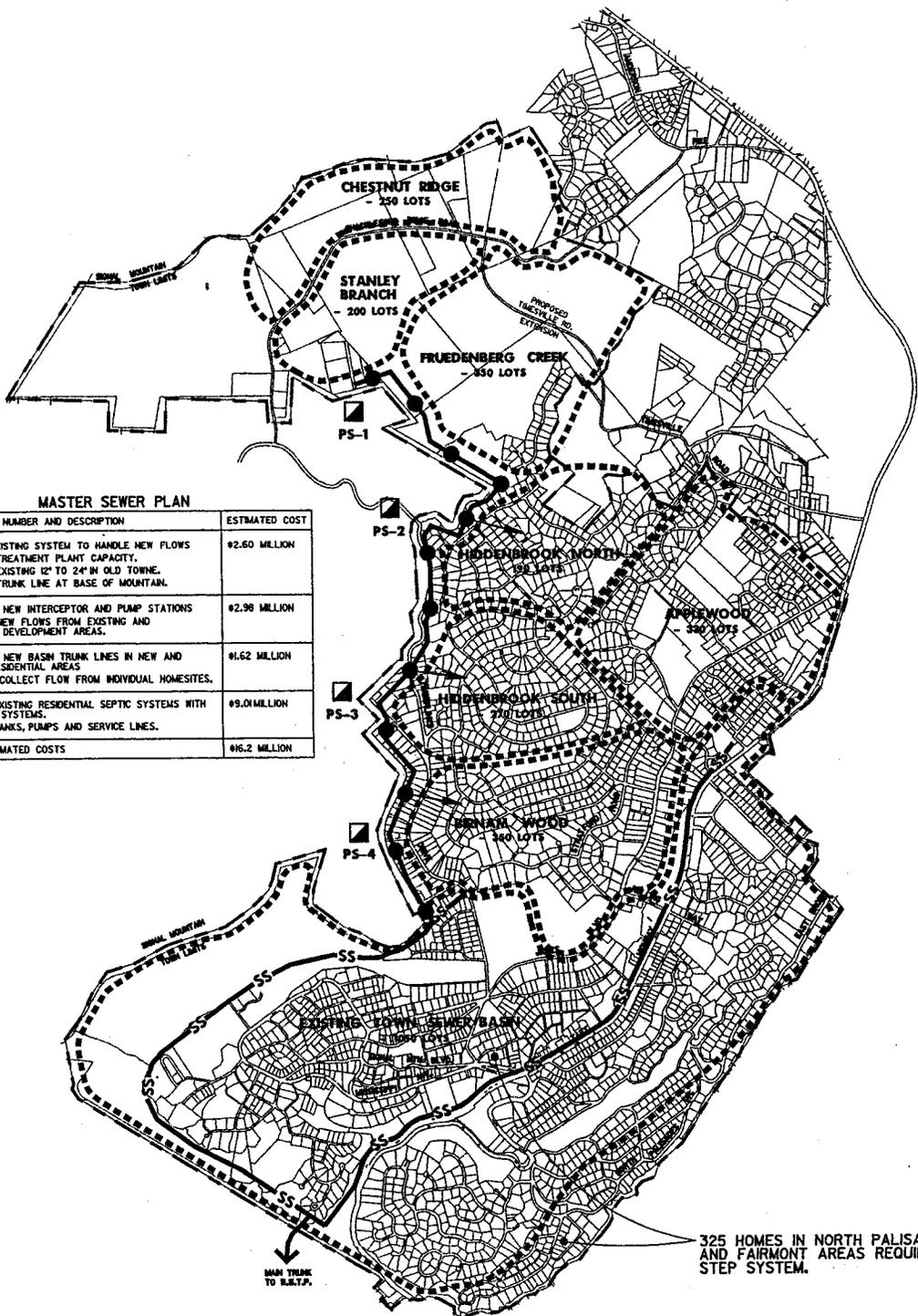


NATURAL CONSTRAINTS IN DEVELOPPING AREAS

TOWN OF SIGNAL MOUNTAIN

SECTION 1
SUMMIT AND
SIGNAL MOUNTAIN
COMMUNITY DEVELOPMENT DISTRICT

Exhibit No. 3-7

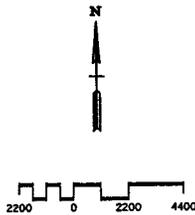


MASTER SEWER PLAN

COMPONENT NUMBER AND DESCRIPTION	ESTIMATED COST
1. UPGRADE EXISTING SYSTEM TO HANDLE NEW FLOWS • UPGRADE TREATMENT PLANT CAPACITY. • UPGRADE EXISTING 12" TO 24" IN OLD TOWNE. • UPGRADE TRUNK LINE AT BASE OF MOUNTAIN.	\$2.60 MILLION
2. CONSTRUCT NEW INTERCEPTOR AND PUMP STATIONS • COLLECT NEW FLOWS FROM EXISTING AND PROPOSED DEVELOPMENT AREAS.	\$2.98 MILLION
3. CONSTRUCT NEW BASIN TRUNK LINES IN NEW AND EXISTING RESIDENTIAL AREAS • LINES TO COLLECT FLOW FROM INDIVIDUAL HOMESITES.	\$1.62 MILLION
4. RETROFIT EXISTING RESIDENTIAL SEPTIC SYSTEMS WITH NEW "STEP" SYSTEMS. • INCLUDE TANKS, PUMPS AND SERVICE LINES.	\$9.01 MILLION
TOTAL ESTIMATED COSTS	\$16.2 MILLION

LEGEND

- SS — EXISTING SEWER TRUNK LINE
- PROPOSED MAIN INTERCEPTOR LINE
- ▣ PROPOSED PUMPING STATION
- PROPOSED BASIN TRUNK LINE
- - - - DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN TITLE
- MAXIMUM RESIDENTIAL UNITS TO BE SEWERED



POTENTIAL
SEWER MASTER PLAN

TOWN OF SIGNAL MOUNTAIN

Bruce
 Wadsworth
 Sewer and
 Cession Inc.
 Engineers, Architects, Planners,
 Landscape Architects and Surveyors

Exhibit No. E-1