United States
Environmental Protection
Agency

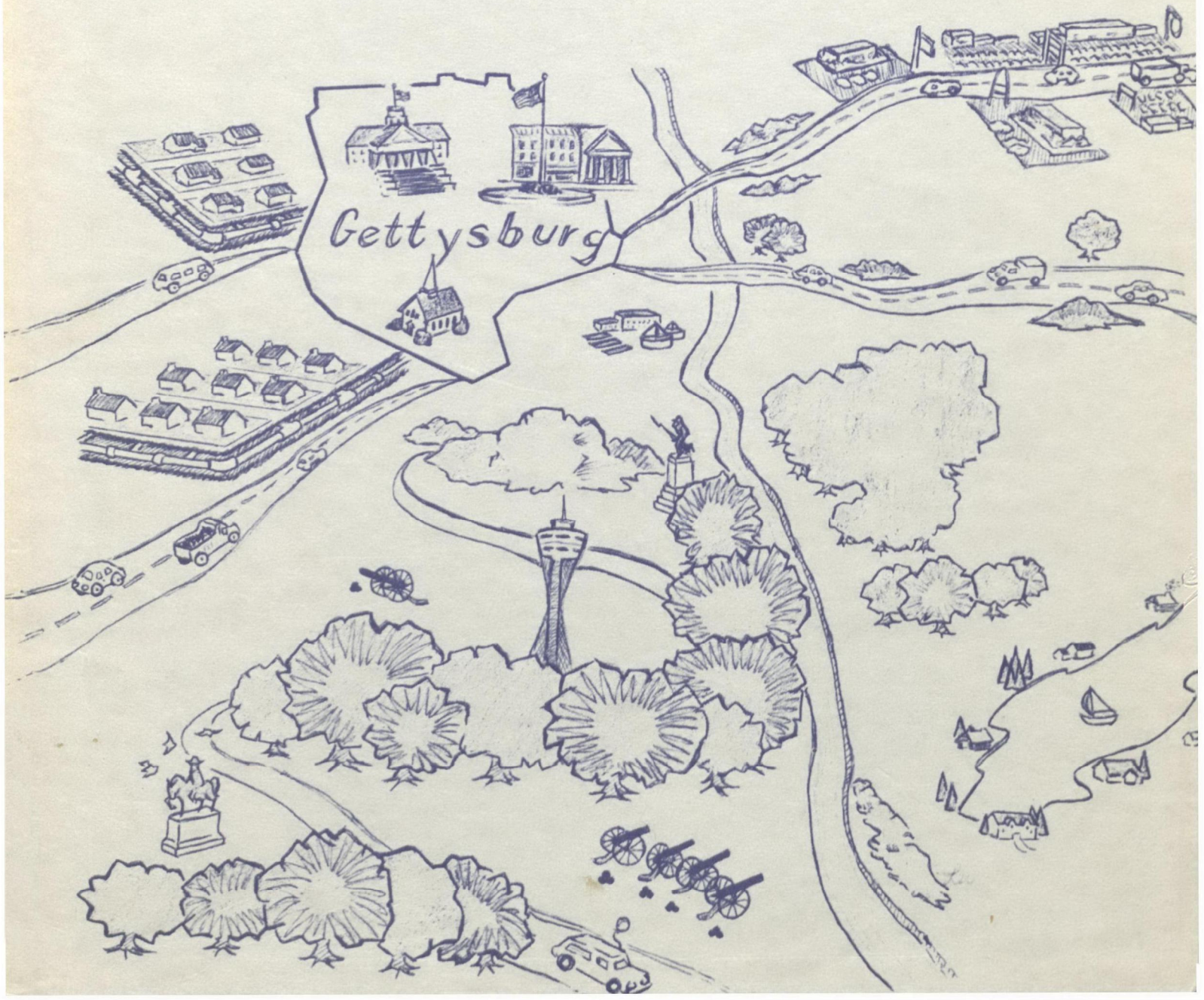
Region 3
6th and Walnut Streets
Philadelphia, PA 19106

December 1980

EPA

Draft Environmental Impact Statement

Gettysburg, PA Area
Wastewater Treatment Facilities



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
6TH AND WALNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

December 12, 1980

TO ALL INTERESTED AGENCIES, PUBLIC GROUPS, AND CITIZENS:

Enclosed is a copy of the Draft Environmental Impact Statement (DEIS) for wastewater management facilities in the Gettysburg, Pennsylvania area. The EIS was initiated after EPA determined that a regional sewerage project proposed for Federal funding by the Gettysburg Municipal Authority could have an adverse impact on historic and archaeologic resources associated with the Gettysburg National Park.

The purpose of this EIS is to inform you of the potential impacts of that project and discuss alternative solutions which were developed through the EIS process. Also discussed are measures which can be taken to minimize the impact of any wastewater treatment facilities on historic/archaeologic resources.

I want to thank everyone who has participated in this EIS process, especially members of a local Public Advisory Group who have monitored EIS progress and helped determine its direction by meeting periodically and raising important questions and comments. Their involvement is reflective, I think, of a desire on the part of local citizens to become part of the decision-making process.

This Draft EIS is issued pursuant to the National Environmental Policy Act of 1969, the Clean Water Act of 1977, and regulations promulgated by this Agency (40 CFR Part 6, November 6, 1979 and 40 CFR Part 35, September 27, 1978). Comments or questions concerning this Draft EIS should be submitted to the attention of Mr. Thomas Slenkamp at the above address by February 10, 1981.

A public hearing to solicit testimony concerning the Draft EIS will be held on January 28, 1981 at 7:30 p.m. in the new Adams County Courthouse. Individuals or organizations wishing to testify at the hearing are requested to furnish a copy of their proposed testimony (if possible) along with their name, address, telephone number, and organization represented (if any) to Mr. Slenkamp by no later than the close of business on January 26, 1981. Everyone wishing to testify will be given an opportunity to do so at the public hearing.

I welcome your interest and encourage your continued participation in the EIS process.

Sincerely,

Jack J. Schramm
Regional Administrator

Enclosure

DRAFT ENVIRONMENTAL IMPACT STATEMENT

on

WASTEWATER MANAGEMENT FACILITIES IN THE GETTYSBURG, PENNSYLVANIA AREA

Prepared by:

US ENVIRONMENTAL PROTECTION AGENCY
REGION III
PHILADELPHIA, PENNSYLVANIA

Thomas A. Slenkamp, Project Monitor

Prepared with the Assistance of:

WAPORA, Inc.
CHEVY CHASE, MARYLAND

Wu-Seng Lung, Project Manager

Type of Action:

Legislative ( )
Administrative (X)

LIST OF PREPARERS

This Environmental Impact Statement was prepared by US Environmental Protection Agency - Region III, Philadelphia, Pennsylvania with assistance from WAPORA, Inc.

Key personnel from EPA included:

Thomas A. Slenkamp	Project Monitor
Rosemarie Baldino	Public Participation

Key personnel from WAPORA, Inc. included:

Wu-Seng Lung, PhD,PE	Project Manager/Water Quality Specialist
Wesley R. Horner	Assistant Project Manager
Henri D. Bartholomot	Project Engineer
J. Charles Varnell	Senior Project Engineer
Elizabeth Righter	Archaeologist
Steven P. Kunz	Socioeconomist
Gregory L. Seegert	Aquatic Biologist
John W. Munro	Terrestrial Biologist
Roger D. Moose	Manager, Geology
Ross Pilling	Environmental Planner
Steven Wolf	Noise Specialist
Judith Wrend	Graphics Specialist
Melissa J. Wieland	Graphics Specialist
Gerald O. Peters	Technical Advisor

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDIXES*

A. Engineering Cost of Alternatives

B. Air Quality

C. Soils

D. Water Resources

E. Aquatic Biota

F. Population, Land Use, and Socioeconomic Conditions

G. Cultural Resources

I. Existing Wastewater Management

*A separate bound volume containing the above Appendixes was only provided to a limited number of those on the mailing list. It will, however, be provided to anyone who requests a copy from the Environmental Protection Agency at the address listed on the front of this volume.

LIST OF ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
ACPC	Adams County Planning Commission
AQCR	Air Quality Control Region
BOD_5	Five-day Biochemical Oxygen Demand
BOD	Biochemical Oxygen Demand
cfs	cubic foot per second
BAQNC	Bureau of Air Quality and Noise Control
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
GASD	Gettysburg Area School District
GFCC	Gannett, Fleming, Corddry, and Carpenter, Inc.
GMA	Gettysburg Municipal Authority
gpcd	gallons per capita per day
gpd	gallons per day
HGAC	Historic Gettysburg-Adams County
HUD	Housing and Urban Development
I/I	Infiltration/Inflow
LASD	Littlestown Area School District
LHMA	Lake Heritage Municipal Authority
mgd	million gallons per day
mg/l	miligrams per liter
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NBOD	Nitrogenous Biochemical Oxygen Demand
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
O & M	Operation and Maintenance
PA-DER	Pennsylvania Department of Environmental Resources
PAG	Public Advisory Group
PIHP	Pennsylvania Inventory of Historic Places
PSD	Prevention of Significant Deterioration
SEO	Sewage Enforcement Officer
SHPO	State Historic Preservation Officer
ST/SAS	Septic Tank-Soil Absorption Systems
STP	Sewage Treatment Plant
TDS	Total Dissolved Solids
TSP	Total Suspended Particulates
TSS	Total Suspend Solids
USDA	US Department of Agriculture
USDOC	US Department of Commerce
USGS	US Geological Survey
7Q10	Seven-day ten-year low flow

Gettysburg EIS
Foreword

The Gettysburg, Pennsylvania area has had for some time a significant water pollution problem. Existing wastewater treatment plants and many individual wastewater treatment systems are not performing effectively and must be renovated or replaced in order to comply with State and Federal water pollution control laws.

The Gettysburg area has also had for some time a National Park commemmorating a most significant battle of the American Civil War. The Park has become increasingly susceptible in recent years to developmental intrusions brought about by continuing growth in the area combined with an absence of any formalized control over how and where this growth is to be accommodated, i.e., land use planning.

Enhancing and protecting the quality of these two resources - water quality and the National Park - and at a cost which represents the least burden to local communities is the central problem which the U.S. Environmental Protection Agency has addressed through this Draft Environmental Impact Statement (DEIS). To do this, the nature and extent of existing water quality problems were carefully studied and then several alternative ways of addressing the problems were developed, taking into account the existing environmental conditions and sensitive resources, including those associated with the National Park.

The EIS process is described in detail in the chapters that follow. EPA is seeking public comments on the alternatives and other information included in the Draft EIS. Following a 45-day comment period, during which a pubic hearing will be held, a Final EIS will be completed which will respond to the comments received and indicate a recommended wastewater treatment alternative.

SUMMARY

GETTYSBURG DRAFT
EIS SUMMARY

Background

The National Environmental Policy Act (NEPA) requires each Federal government agency to prepare an Environmental Impact Statement (EIS) on every major Federal action significantly affecting the quality of the human environment. The major purpose of an EIS is to explain the environmental consequences of pending Federal actions, such as funding for large construction projects, so that government officials and the public can make responsible decisions. Federal funding for wastewater treatment facilities through EPA's Contruction Grants Program is one of the Federal actions subject to the requirements of NEPA.

This Draft Environmental Impact Statement (DEIS) has been prepared by the U.S. Environmental Protection Agency in relation to a request submitted by the Gettysburg Municipal Authority (GMA) for EPA funding to design and construct a regional sewerage system in the Gettysburg area of Adams County, Pennsylvania.

Based upon the recommendations of a "Facilities Plan" report completed in 1976, GMA's proposal consisted of an interceptor sewer adjacent to Rock Creek conveying wastewater from Cumberland and Straban Townships and Gettysburg into a new regional treatment plant located near the intersection of Rock Creek and Route 15. Wastewater would also be conveyed to the new plant from the Lake Heritage community.

EPA's environmental review of the GMA application determined that the proposed project might have an adverse impact on archaeologic/historic resources associated with the Gettysburg National Park. As a result, EPA formally issued a Notice of Intent to prepare an EIS on February 16, 1979; work began in April 1979 with the assistance of a contractor, WAPORA, Inc.

Public Participation/ Coordination

Participation by the general public and coordination with involved government agencies has been continuously encouraged throughout the EIS process. Methods used to involve the public have included newsletters, pamphlets, public informational meetings, media contacts, interviews, meetings with local officials, and telephone calls.

In addition, EIS progress has been monitored and influenced by a local Public Advisory Group which consists of individual citizens, representatives of public interest groups, organizations with economic interest, and public officials. (See Chapter 1 for list of members). Through periodic meetings this group has served as an EIS informational source for the respective organization/constituency each member represents, as well as providing suggestions and specific questions for the EIS from each member's particular perspective. The group has provided direction and focus to the process by determining the nature and depth of issues investigated in the EIS. For

example, it was upon the suggestion of the PAG that wastewater treatment needs in the area were further investigated and that modifications to initially developed wastewater treatment alternatives were made. Although the Group has purposely avoided trying to reach unanimous opinion or consensus, their presence has provided a most important public forum in which to discuss any wastewater management related issue.

Also formed was an Interagency Coordinating Group which consists of involved local, State, and Federal government agencies. This group also monitored EIS progress with specific interest regarding the impact of various solutions on historic and archaeologic resources and methods by which these impacts can be minimized.

Both the Public Advisory Group and Interagency Coordinating Group will be especially important between the Draft and Final EIS stages when an alternative will be recommended for implementaton.

EIS Findings

Although any EIS must address a variety of environmental concerns, most of the Gettysburg EIS effort has been directed towards three key areas:

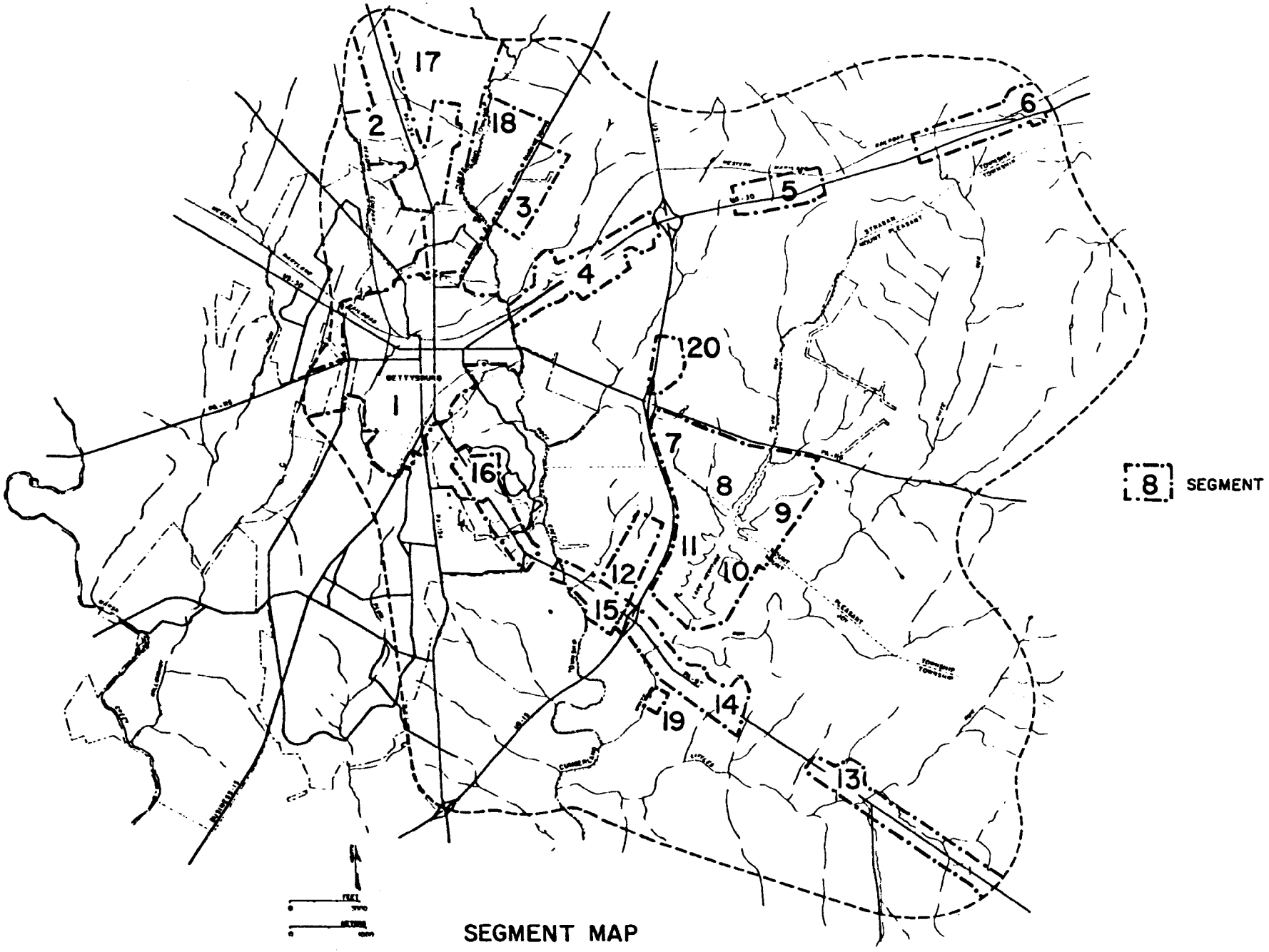
- o Defining existing and expected need for improved wastewater management
- o Developing and analyzing alternative ways of meeting those needs
- o Investigating measures which will minimize the potential adverse impact to the resources of the Gettysburg National Park and Historic District.

Documentation of Need

In response to a number of public and government agency comments questioning the extent of need for improved wastewater treatment, EPA devoted a significant effort in the EIS to analyzing existing water quality problems that are associated with inadequte performance of either sewage treatment plants or individual on-site treatment units. This effort included an inspection/analysis of four STP's, a review of aerial photographs and soils maps, interviews with municipal Sewage Enforcement Officers and local health officials, and conducting of a sanitary survey which included field inspection of individual septic systems and sampling of streams and wells for pollution indicators.

To accomplish this in an effective way, "segments" were delineated within the larger planning or study area, which contained major population concentrations and areas of documented septic system failures (see Segment Map).

EPA concluded that there is a substantiated existing need for better wastewater management in most of the segments studied, including all presently sewered areas, segments north and east of the Borough of Gettysburg in Cumberland and Straban Townships, the Lake Heritage community, and segments along Route 97 south of Gettysburg. (See Chapter 3 for further details). Based on these findings, and consideration of future growth and constraints posed by natural or man-related environmental features, a set of alternative solutions were developed.



SEGMENT MAP

Alternatives Analysis Approach

When the EIS was initiated, GMA's proposed project appeared to represent the best overall sollution; also, there were no alternatives which would altogether eliminate potential adverse impacts on historic/archaeologic resources.

However, early during the EIS process, it became clear that (1) the originally proposed project had lost local support due to high costs and questionable impacts, and (2) other alternatives might now be possible based on updated information concerning demographic conditions and revisions to Federal pollution control laws and EPA's grants program. Rather than having the applicant (GMA) reapply for another planning grant, EPA agreed to fully investigate other possible alternatives through the EIS process which might solve the problems but at a reduced cost burden to local communities.

An alternative consists of an action or actions which can be taken to eliminate water quality problems and address needs as described above. The actions can be non-structural (e.g. water conservation, revised sewer rates) or structural (physical construction/repair of a system which will effectively collect, transport, and treat the wastewater generated).

The two basic structural alternatives examined were (1) sewering an area with conveyance and treatment at a central sewage treatment facility, and (2) constructing or improving the operation of individual on-site treatment units without sewers.

To begin developing alternative solutions, those segments identified as having need for improved wastewater management were evaluated on an independent basis to determine which wastewater treatment technologies would be feasible given the environmental characteristics of the segment (population densities, soils, etc.). In segments where existing projected population densities were fairly low, a cost comparison was performed to determine whether sewers or on-site systems would be the less expensive solution. Those segments which had a substantiated need, but where sewers were determined to be too costly (Segments 12, 14-16) were analyzed separately as to available non-sewering alternatives. Marginal cases were included for further analysis. Feasible options for the remaining segments (Segments 1-4, 7-11, 17, 18, 20) were then selectively combined to avoid an unmangeable number of alternatives.

The resulting twelve planning area alternatives were presented at a public meeting held on June 12, 1980, and then further developed and screened based on public comments, costs and environmental considerations. Six remaining planning area alternatives were then evaluated in detail in terms of costs and environmental impacts. These six were presented to local officials and the Public Advisory Group at separate meetings during the summer. Again, modifications were made to reflect comments received. Three of the six alternatives were eliminated and were replaced by two "hybrid" alternatives, representing combinations of components of previous alternatives.

The following table indicates the major features of the remaining five feasible alternatives. They are listed in order of increasing centralization, i.e., more sewers, less treatment plants.

FEASIBLE ALTERNATIVES

Alternative	Major Components	Segements Served	Sewered?
A	Upgrade Gettysburg STP	1,3	Yes
	Upgrade Cumberland STP	2	Yes
	Construct New STP for Schaff's Trailer Park	Part of 4	Yes
	Construct NEW STP for Lake Heritage holding tanks	7-11	No
	Improve on-site systems as needed	4,7-12,14-17,18,20	No
B	Upgrade Gettysburg STP	1,3,4	Yes
	Upgrade Cumberland STP	2	Yes
	Construct New STP for Lake Heritage holding tanks	7-11	No
	Improve on-site systems as needed	7-12,14-17,18,20	No
C	Upgrade Gettysburg STP	1,3	Yes
	Upgrade Cumberland STP	2	Yes
	Construct Land Application system for Segment 4	4	Yes
	Construct New STP for Lake Heritage holding tanks	7-11	No
	Improve on-site systems	7-12,14-17,18,20	No
D	Upgrade Gettysburg STP	1,3,4,18	Yes
	Upgrade Cumberland STP	2,17	Yes
	Construct New STP for Lake Heritage	7-11	No
	Improve on-site systems	12,14-16,20	No
E	Upgrade Gettysburg STP	1-4,17-18	Yes
	Construct New Lake Heritage STP	7-11,20	Yes
	Improve on-site systems	12,14-16	No

Estimated Costs

A number of different types of costs associated with each alternative were calculated in the Draft EIS. These are detailed in Chapter 4 and Appendix A. The most important of these are the total costs for each planning area alternative, the percentage of available Federal funding, operation and maintenance costs (funding entirely by local jurisdictions), and the estimated costs to individual users.

Total alternatives costs are expressed on a present-worth basis as required by EPA regulations (40 CFR Part 35, Subpart E, Appendix A). The present worth cost is the amount of money that would have to be placed in an interest bearing account at the beginning of the design period in order to cover all capital and operation and maintenance costs throughout the period, assuming a certain salvage value for the facilities at the end of the period. By EPA definition, the most cost-effective alternative is the wastewater treatment management sytem which the cost analysis determines to have the lowest present worth or equivalent annual value, unless non-monetary costs are overriding. Present worth values of the EIS alternatives range from $15.4 million to $23.1 million (the comparable updated cost of the Facility Plan proposal was estimated to be $29.4 million).

The amount of Federal funding available for capital costs of the alteratives depends on (1) the number of cost-eligible features of each alternative, (2) the percentage of Federal funding applied to those features, and (3) the availability of EPA Construction Grant Funds from the Pennsylvania allocation based on the State Priority List. Although no final eligibility determination can be made until detailed design plans are prepared, cost eligible shares were estimated for the EIS in order to estimate local shares and individual user charges. The Federal share of eligible costs is normally 75% but can be 85% for special types of systems termed innovative or alternative. One important recent EPA determination has been that a pressurized sewer system for the Lake Heritage area will now be eligible for Federal funding, which will reduce the previously estimated user charges for a sewered Lake Heritage alternative by over 50 percent.

Individual user charges are those costs levied on system users to cover the local shares of capital costs and total operation and maintenance costs. They depend partly on the Federal/local shares described above. For EIS alternatives, they vary greatly depending on the alternative and the municipality involved. Gettysburg residents will have the lowest costs ($112-$124 annually) because the Borough is already sewered, while Lake Heritage residents will pay the highest charges ($461-$548 annually) because of a lack of sewers combined with presently low population densities.

Environmental Impacts

Environmental impacts are projected in terms of how the alternatives would affect existing environmental conditions as described in Chapter 3. They include both primary (direct) impacts which result from construction and operation of any proposed facilities and secondary (indirect) impacts which accompany the availability of sewerage facilities, such as induced changes to population, land use, and environmental quality. Impacts can be either beneficial or adverse.

While there are some differences in environmental impact among alternatives, these differences are for the most part insignificant. Because of the similar impacts, any measures designed to minimize adverse impacts can usually be applied equally to all alternatives.

Water Quality

In general, all the alternatives excepting No Action would provide a beneficial effect to water quality by upgrading or eliminating poorly performing sewage treatment plants and malfunctioning on-site systems. Concentration of dissolved oxygen in area streams can be expected to increase to above 6.0 milligrams/liter as a result of plant improvements. Algae-inducing nutrient loadings in the form of ammonia nitrogen and phosphorus will be reduced.

Processes for converting ammonia nitrogen to nitrates (nitrification) and for converting nitrates to simple nitrogen (denitirification) were included in all upgraded treatment plants. Although denitrification will provide an effluent discharge that will protect the receiving stream for use as a future water supply source, it is not required in order to meet State water quality standards, and its inclusion will be at the discretion of local authorities.

Dechlorination of treated wastewater is also assumed as a process for any improved treatment plant although it is not required by State standards. This will ensure minimal detrimental impact to aquatic life.

Groundwater quality should improved somewhat by implementing any of the alternatives, although it is not clear to what extent since the EIS analysis did not find any link between the infrequent cases of polluted drinking water samples and malfunctioning septic sytems.

Population/Land Use

The effects of the alternatives on population and land use are closely related and occur mainly as secondary impacts as a result of sewer routings and the amount of treatment capacity provided (or not provided). The EIS alternatives were carefully developed to avoid providing excessive capacities for either treatment plants or sewer lines. However, even if additional capacity wa provided, the amount of total growth expected in the planning area under any one alternative would not differ significantly from "baseline" growth, or that which will occur if none of the alternatives are implemented and present trends and conditions continued. In other words, the introduction of new sewerage facilities is not expected to generate a large influx of new growth. The rate of baseline growth is expected to average 1.6% per year during the 20 year planning period.

While absolute amounts of growth accommodated are similar among alternatives, the pattern of future growth on the landscape may differ somewhat among alternatives. Alternatives involving greater amounts of sewering will generally shift growth away from projected baseline patterns and channel it into those areas where sewers are constructed. For example, alternatives which involve sewering Segment 4 in Straban Township (B-E) will attract approximately 35% of the baseline growth projected to occur north of Gettysburg Borough into Segment 4.

Sewered alternatives will tend to concentrate growth within a smaller land area due to population densities for sewered development being generally higher than those for unsewered development (as allowed by municipal subdivision regulations). In addition, sewered options or alternatives will tend to increase population growth within individual segments (as compared to baseline projections).

The impact of wastewater management alternatives on land use is heavily influenced by the limited amount of present local government control over how land is used. If land use plans and zoning ordinances were already established, the prediction of location and type of future growth could be more specific. However, without these governing controls in place, there are a number of possible ways future growth could materialize, with or without sewering. Sewered alternatives can help to guide growth into vaguely defined areas, depending on the size and location of the sewer lines. On-site system alternatives would influence patterns of future growth in a less predictable way, with technical factors such as soils suitability representing the major constraint to development. Compared with existing growth policies or desires which have been articulated by local governments, Alternative B, and to a lesser extent C, appear to conform the most closely.

Archaeologic and Historic Sites/ Aesthetics

Direct impacts upon identified historic and archaeologic resources are expected to be minmal and are generally avoidable by carefully routing sewers and locating treatment facilities during design.

The two issues of greatest concern regarding cultural resources are (1) potential impacts on unknown archaeological remains which may lie beneath the ground in the path of a sewer or treatment plant site, and (2) a lack of control over the type of growth which can occur with additional sewage treatment capacity and which may be incompatible with the historic character or setting of the Park.

The first concern can be alleviated by conducting an archaeologic survey prior to or during design of the selected alternative, which will enable avoidance of construction in areas which contain valuable resources, or allow for their salvage during construction.

The second concern, involving visual effects, is more subjective to evaluate, but represents the greatest potential adverse impact of sewerage facilities upon the National Park and Historic District. Simply stated, it is the possibility of development occurring at an indeterminate location in an unspecified manner through the provision of additional wastewater treatment facilities. This development could be out of character with the setting of the Park and may represent an adverse visual impact to a Park visitor.

Total avoidance of this potential impact is not possible by selecting one wastewater management alternative over another. Even the No Action alternative carries with it the same potential adverse impact, even though in a non-Federally subsidized way. Therefore, attempting to solve this problem strictly within the context of improved wastewater management is

unrealistic. Additional measures must be taken in conjunction with carefully selecting and designing any recommended wastewater treatment facilities. Some possible mitigating measures are discussed in Chapter 5 of the DEIS. These include such things as buffering techniques, conservation (scenic) easements, purchase of critical lands, and establishment or modification of land use plans, zoning ordinances, or building codes. Implementation of some of these measures may be time consuming and difficult and is dependent on a good deal of local government responsiveness and local/Federal cooperation. However, without their implementation, a total solution to the problem is not possible.

Alternative Selection Process

Through the EIS process, several alternatives for improved wastewater management have been developed and evaluated. Details about the five most feasible of these, in EPA's view, are presented for public consideration in the Draft EIS.

Both the costs and environmental impact information should be carefully reviewed by area residents and other interested parties to determine which of the alternatives, if any, is preferable. Reviewers should especially study the support information and methodology upon which the alternatives are based. Opinions about this information and the alternatives themselves should be formulated and comments provided to EPA.

Ample time will be available to study this matter and raise questions. Following public distribution of the Draft EIS, there will be a 45 day review and comment period during which time a public hearing will be held as described in the Draft EIS cover letter.

EPA will carefully evaluate any comments received and make any necessary changes to the alternatives analysis based on these comments. A response to substantive comments will be provided in the Final EIS, which will be completed following the end of the Draft EIS review period. Also in the Final EIS, EPA will identify a recommended alternative for implementation, with consideration given to public comments, local government positions, and the cost and impact evaluations described in the Draft EIS. EPA will also indicate whether other alternatives may also be acceptable and can be considered for Federal funding.

Following publication of the Final EIS, each local jurisdiction or municipal authority must decide which course of action they wish to pursue. If local decisions are consistent with the results of the EIS, applications for Federal funding to design and construct wastewater treatment facilities can then be processed.

SUMMARY OF IMPACTS

Alternative	Air Quality	Earth Resources	Water Quality	Population Growth	Land Use Policies	Economic Conditions	Historic Resources	Archaeologic Resources	Aesthetics
No Action	0	0	--	-	-	-	+	+	++
A	0	-	+	0	-	0	+	0	+
B	0	-	+	0	+	+	0	-	-
C	0	-	+	0	+	+	0	-	-
D	0	-	+	0	0	+	-	-	--
E	0	-	+	+	0	+	-	--	--
Facilities Plan	0	--	+	+	+	+	-	--	--

Key:

++ Significant Beneficial Impact
+ Beneficial Impact
0 Negligible Impact
- Adverse Impact
-- Significant Adverse Impact

CHAPTER I

Public Participation and Coordination

CHAPTER I. PUBLIC PARTICIPATION AND COORDINATION

Introduction

Throughout the preparation of this Draft Environmental Impact Statement, the Environmental Protection Agency (EPA) has continuously sought participation from local, regional, State and Federal agencies; citizen associations; individual citizens; and interested environmental groups. EPA has considered suggestions, criticisms, and objections from the public in documenting the need for wastewater treatment facilities, in developing alternative wastewater management strategies, and in assessing environmental, economic, and social impacts. Methods used to involve the public have included EIS newsletters, pamphlets, advertisement, public information meetings (with the general public and with specially formed groups), meetings with municipal officials, conversations with local citizens, interviews, and telephone contacts; all these methods were used to ensure that as many residents as possible were involved in this EIS decision-making process.

Public Advisory Group

During the early stages of the EIS process, a Public Advisory Group (PAG) was established to provide area citizens an opportunity to closely participate in the development of the EIS, so that local decision which are based on EIS results will reflect local opinions and advice. The Group represents a cross-section of the general public, consisting of equal representation from individual citizens, public interest groups, organizations with economic interest, and public officials. Mr. John Zinn, as Coordinator for the Group, has served as a liaison between those preparing the EIS and the members of the Group, as well as arranging Group meetings, distributing materials, and keeping a written record of the Group's activities. Mr. Allen Larson, as Chairman of the Gettysburg Municipal Authority, has provided invaluable assistance through his knowledge of past planning efforts and local conditions.

Through periodic meetings, the PAG has provided a local perspective on many EIS issues, including water supply and conservation, soil conditions, existing needs, and community growth. Group members have influenced the content of the EIS by making comments and raising questions which could be answered through the EIS. For example, the Group was influential in the decision to conduct a sanitary survey to document the need for wastewater disposal in the study area. Also, as a result of a recent Group suggestion, two revised alternatives were developed.

Since there is a considerable amount of technical and governmental jargon associated with wastewater treatment planning, members of the Group were provided with citizen guides on public involvement in municipal wastewater management, as well as brochure on related wastewater treatment topics. Members were presented with key materials for the EIS (e.g., population projections, service areas, alternatives) as they became available, with the goal of first explaining, and then soliciting comments on the material.

Occasionally, outside people with special knowledge were brought in to provide advice on public involvement or to present informa-

tion on a specific topic (e.g., "innovative" technologies). One session was photographed and tape-recorded by the Pennsylvania State Institute of Regional A ffairs for use as training material for similar advisory groups.

Although at times some group members have undoubtedly questioned their precise role or their effect on the results of the EIS, their presence has provided a most important public forum in which to discuss any wastewater management issue, and has prepared the way for the upcoming selection and implementation of a solution to a longstanding community problem.

Below is a list of the PAG members and their affiliations.

PUBLIC ADVISORY GROUP

John B. Zinn, Jr., Coordinator

Private Citizens

Charles B. Bender*
Walter Lane
George N. Mahaffey
Jack R. Corbin

Public Interest Groups

Ruth Gritsch, League of Women Voters
John Earnst, Superintendent, National Park Service
Charles H. Huber, Jr., Taxpayer Association
Rev. James W. Tipton, Historic Gettysburg/Adams County

Organizations with Substantial Economic Interest

Ronald Hankey, President, Gettysburg Area Chamber of Commerce
L. Hartzell, Jr., President, Retail Merchants Association
Charles A. Strayer, Builders Association
George W. Olinger, Landlords

Public Officials

Robert Heflin, Gettysburg Borough Council Member
Fred M. Shealer, Straban Township Supervisor
Francis W. Weikert, Cumberland Township Supervisor
Willis O. Waybright, Mount Joy Township Supervisor

*Deceased

Newsletters/Pamphlets

At the beginning of the EIS process, EPA prepared and distributed pamphlets about the EIS to the public. The pamphlets were also inserted into the Gettysburg Times. In addition, public meeting announcements were advertised in the Gettysburg Times. EPA prepared periodic newsletters that were distributed to residents, groups and government officials who wished to be kept advised of progress, the preliminary technical findings, the completion of project milestones, and other general information about the EIS.

Public Meetings

Since preparation of the EIS began in March 1979, EPA has conducted three public information meetings in the study area. These meetings were designed to involve the public in all decisions as fully as it was practical to do. The information that EPA obtained from the people familiar with the local situation and with particular problems of the community contributed a great

deal to the preparation of this EIS. During the EIS process, the public has participated enthusiastically: to make their concerns known, and to offer information or suggestions that improved the solution to this wastewater management problem. The following three public information meetings generated considerable dialogue between EPA and the general public:

Date	Location	Topics discussed
May 23, 1979	Adams County Courthouse, Gettysburg	EIS process, scope, and issues
November 1, 1979	Adams County Courthouse, Gettysburg	Proposed service area and preliminary wastewater alternatives
June 12, 1980	Adams County Courthouse, Gettysburg	Sanitary survey results and wastewater management alternatives

Interagency Coordinating Group

An Interagency Coordinating Group was established to monitor progress on the Gettysburg EIS and additional Step I planning efforts, and to expedite negotiations for the required Memorandum of Agreement. The "Memorandum of Agreement" is a formal agreement between EPA, the President's Advisory Council on Historic Preservation, the National Park Service (NPS), the Pennsylvania State Historic Preservation Officer (SHPO), the Pennsylvania Department of Environmental Resources (PA-DER), and local officials. This agreement is to outline the measures that will be taken to preserve the historical and cultural resources of the Gettysburg area. These measures will be based on the selected wastewater management plan that results from the EIS. The following people are members of this interagency coordinating group:

Thomas Slenkamp Steven Torok	EPA -- EIS Preparation Section 6th and Walnut St. Philadelphia, PA 19106
Dennis Capella	EPA -- Construction Grants Section 6th and Walnut St. Philadelphia 19106
John Earnst	Superintendent, NPS Gettysburg National Military Park P. O. Box 70 Gettysburg, PA 17325
Joseph Karban	NPS (Philadelphia Regional Office Dept. of Interior 143 S. 3rd St. Philadelphia, PA 19106
Amy Schlagel	Advisory Council on Historical Preservation 1552 K St., NW Washington, DC 20005

Allen Larson	Gettysburg Municipal Authority (GMA) 223 Baltimore St. Gettysburg, PA 17325
Fred Marrocco Edward Corriveau	PA-DER 407 South Cameron St. Harrisburg, PA 17101
Brenda Barrett	State Historic Preservation Office Penn. Historical and Museum Commission P. O. Box 1026 Harrisburg, PA 17120

Ad-Hoc Committee for Facilities Planning

During the Facilities Planning period (1975-1976), public participation and coordination effort was provided by an ad-hoc committee. The ad-hoc committee consisted of representatives from the five municipalities, the Adams County Planning Office, the National Park Service, and the four municipal authorities involved in the Rock Creek Basin area prescribed by PA-DER. During a period of eleven months in 1975 and 1976, the ad-hoc committee provided many suggestions and recommendations to the Facilities Planning effort.

Individual Contacts

Agencies, offices, companies, and committees, as well as individuals' names and expertises, are presented in Table I-1.

Table I-1. The Offices, Agencies, Companies, Citizens Committees, and Individual Contacted

Agency/Office	Individuals Contacted	Topic
Citizen's Utility Co., Reading, PA	Bill Reitmour	Lake Heritage water pumping records
US Geological Survey, Harrisburg, PA	Chuck Wood	Groundwater
Lake Heritage	Eugene (Bud) Larson	Lake Heritage Water Quality
PA-DER, Community Environmental Control	Daryl Mong	Nitrate standards for drinking water
PA-DER	Jim Fleischer	Sewage treatment--Schaff Trailer Park
Riordan Materials	Tom Schell	Information on RBC's for upgrading Gettysburg and Cumberland STP's
Cumberland Sewage Authority	Lawrence Heltzel	Number of customers and copies of blueprints of Cumberland STP, new effluent requirements on Cumberland STP

Stonehenge Restaurant, Rt. 97, Gettysburg, PA	Roy Sonthermer	Stonehenge motel/ restaurant septic system
Soil Conservation Service (SCS), Gettysburg, PA	Len Bentz	Frost depths in the Gettysburg area
Gannett, Fleming, Corddry and Carpenter, Inc. (GFCC)	Victor Krea	Results of infiltration/inflow study of Gettysburg sewer systems, Excavation costs of gravity sewers, Unit costs of sewers
A & P Water & Sewer Supplies, Middletown, PA		Unit costs for sewers (material only)
Young's Sanitary Service, Dillsburg, PA	Mr. Young	Unit costs for on-site systems
Adams County Planning Commission	John Callenbach, Planning Director	Plans for the partially completed Holiday Inn along Rt. 30
PA-DER	Ed Corriveau, Sanitary Engineer	Permit capacities of Schaff's Trailer Park and Lake Heritage sewage treatment plants, water quality survey and modeling of Rock Creek
Maitland Brothers, Rt. 1, Littlestown, PA	Cyril Schuchert	Unit prices for excavation and sewer in the Gettysburg Area
Gettysburg Travel Council	Mrs. Blucker	Number of hotels, rooming houses, and campsite units in the Gettysburg area
C. E. Williams & Sons, Inc.	Mr. Williams	Unit costs for excavation in the Gettysburg area
Conewage Contractor, Hanover, PA	Mr. Feaser	Unit costs for excavation, backfill, and pipes
Fred Shealer, RD-4, Gettysburg, PA	Fred Shealer	Unit costs for on-site systems
Lake Heritage Association	David Lewis, Chairman	Lake Heritage Package Plant, malfunctions and holding tank flows, holding tank pumping costs
Lake Heritage Property Owners Association	Barbara Heromin	Lake Heritage residence and resident breakdown, in terms of municipalities

Buchart-Horn, Inc.	David Boyer	Discussion of Buchart-Horn's study of infiltration/inflow in Cumberland's sewers systems
Gettysburg Municipal Authority	Allen Larson, Francis Albert	Discussion of infiltration/inflow analysis done for the Gettysburg sewer system, number of customers and blueprints of the Gettysburg STP
Gettysburg College	Charles Glassic	Current and future wastewater needs, plans for expansion, etc.
Lutheran Theological Seminary	Clarence Benson	Current and future wastewater needs, plans for expansion, etc.
Adams County Director of Assessments	Irma Ogburn	Building permits issued, time
PA-DER, Bureau of Water Quality	Daniel Trawbough	Land treatment criteria
PA-DER, Topographic and Geological Survey	Al Gyer	Groundwater systems
Adams County Sanitation	Lee Yohn	Soil capability criteria
SCS Adams County	Lee Benz	Soils capabilities
Pennsylvania Office of State Planning and Development	Natalie Sato	Population projection methodology
Pennsylvania Department of Community Affairs	Steve Fehr and Thomas Kuhn	Cumberland and Borough comprehensive plans
Cumberland STP	John Klunkel	Arrange plant visit
Lake Heritage Package Plant	Robert Bachman	Arrange plant visit
PA-DER Sewage Enforcement Officer (SEO) for Mt. Pleasant, Mt. Joy, and Straban Townships	Dean Schultz	Needs documentation, project history, project costs
Buchart-Horn, Inc.	Raymond Best	Study of Cumberland STP upgrade costs

GFCC	Jay Africa	Lake Heritage Cost Comparison Study
PA-DER	Joseph P. Galant Supervising Sanitarian	Wastewater-related public health problems, septic tank malfunctions
Public Advisory Group	John Zinn, Coordinator	PAG meetings
National Park Service	John Earnst, Superintendent	NPS concerns on the projects

GETTYSBURG EIS MAILING LIST

FEDERAL AGENCIES

Advisory Council on Historic Preservation
Council on Environmental Quality

Federal Emergency Management Agency

National Agricultural Lands Study

US Army Corps of Engineers

US Bureau of Persons

US Department of Agriculture
- Cooperative Extensive Service
- Soil Conservation Service

US Department of Commerce
- Office of Environmental Affairs

US Department of Defense

US Department of Energy
- Office of the Secretary for the Environment

US Department of Health, Education and Welfare

US Department of Housing and Urban Development

US Department of the Interior
- Bureau of Outdoor Recreation
- Fish and Wildlife Service
  - National Water Resource Analysis Group/Eastern Land Use Team
- National Park Service
- Heritage, Conservation and Recreation Service

US Department of Transportation
- Federal Highway Administration
- Marine Environmental Protection Division

US Department of Treasury

US General Services Administration

Water Resources Council

PENNSYLVANIA STATE AGENCIES

Department of Agriculture

Department of Commerce

PENNSYLVANIA STATE AGENCIES (Cont.)

Department of Community Affairs
Department of Environmental Resources
- Bureau of Air Quality and Noise Contol
- Bureau of Community Environmental Control
- Bureau of Radiological Health
- Bureau of Solid Waste Management
- Bureau of State Forestry
- Bureau of State Parks
- Bureau of Topographic and Geological Survey
- Bureau of Water Quality Management
- Division of Coordination
- Division of Solid Waste Management
- Division of Water Supply & Sewerage
- Regional Sanitary Engineer
- State Conservation Commission

Department of Health

Department of Transportation

Environmental Hearing Board

Fish Commission

Game Commission

Governor's Office of the Budget

Historical and Museum Commission

Interstate Commission on the Potomac River Basin

State Clearinghouse

CITIZENS GROUPS

Air Pollution Contol Association
America the Beautiful Fund, Washington, DC
Audobon Naturalist Society of the Central Atlantic States, Inc., Washington, DC
Citizens' Advisory Council to PA Dept. of Environmental Resources
Citizens Environmental Task Force
Environmental Defense Fund
Group Against Smog and Pollution
Lake Heritage Property Owners
League of Women Voters, Gettysburg, PA
League of Women Voters, Philadelphia, PA
National Audobon Society, Harrisburg, PA
National Parks and Conservation Association, Washington, DC
Natural Resources Defense Council, Washington, DC
PA Forestry Association, Mechanicsburg, PA
PA Horticultural Society, Philadelphia, PA
PA Lung Association, Hershey, PA
PA Roadside Council, Inc., Philadelphia, PA
PA State Fish and Game Protective Assocation, Philadelphia, PA
Rachel Carson Trust for the Living Environment, Inc, Washington, DC

CITIZENS GROUPS (Cont.)

Sierra Club, PA Chapter
Sierra Club, Southwestern Group, Pittsburg, PA
Water Pollution Control Association, Washington, DC
Wilderness Society
Wildlife Society

LOCAL AGENCIES

Cumberland Township
Chairman
Engineer
Planning Commission
Solicitor
Cumberland Township Authority

Gettysburg Borough
Council
Engineer
Planning Commission
Solicitor

Gettysburg Municipal Authority

Lake Heritage Municipal Authority

Mt. Joy Township
Chairman
Planning Commission
Solicitor

Mt. Pleasant Township
Chairman
Engineer

Straban Township
Engineer
Planning Commission
Solicitor
Supervisors

ELECTED OFFICIALS

Honorable Richard Thornburgh
Governor of Pennsylvania

Honorable H. John Heinz, III
United States Senator

Honorable Richard S. Schweiker
United States Senator

Honorable William F. Goodling
United States Representative
Mr. & Mrs. Chris H. Walters
(Congressman Goodling's Staff)

Honorable William J. Moore
Senate of Pennsylvania

Honorable Ralph W. Hess
Senate of Pennsylvania

Honorable John D. Happer
Senate of Pennsylvania

ELECTED OFFICIALS

Honorable Kenneth J. Cole
Pennsylvania House of Representatives

Honorable A. Corville Foster, Jr.
Pennsylvania House of Representatives

Honorable Eugene A. Geesey
Pennsylvania House of Representatives

Honorable Fred C. Noye
Pennsylvania House of Representatives

PUBLIC ADVISORY GROUP

Jack A. Corbin
John Earnst - Superintendent, National Park Service
Ruth Gritsch - League of Women Voters
Ronald Hankey - President, Gettysburg Area Chamber of Commerce
Crosby L. Hartzell, Jr. - President, Retail Merchants Association
Charles H. Huber, Jr. - Taxpayers Association
Walter Lane
George N. Mahaffey
George W. Olinger - Landlords Association
Charles A. Strayer - Straban Township Builders Association
Rev. James W. Tipton - Historic Gettysburg Adams County
John B. Zinn, Jr.

MEDIA

Newspapers

Five Star News, Manchester, PA
Gettysburg Times, Gettysburg, PA
Hanover Sun, Hanover, PA
Patroit News, York, PA
Sunday News, York, PA
York Daily Record, York, PA
York Dispatch, York, PA
York News Agency, York, PA

RADIO

WGCB, Red Lion, PA
WGET, Gettysburg, PA
WHVR-AM, Hanover, PA
WNOW AM-FM, York, PA
WSBA, York, PA
WZIX, York, PA

TV

Cypress Cable TV, Reedville, PA
TV Host Inc., Harrisburg, PA
WHP-TV, Harrisburg, PA
WITF-TV, Hershey, PA
WLYH-TV, Lebanon, PA
WSBA-TV, York, PA
WTPA-TV, Harrisburg, PA

CITIZENS

Mr. Francis B. Alberto
Mr. and Mrs. Marvin L. Anderson
Ms. Jane Boblitz
Ms. June Boherg
Mr. Jack Carhon
Mr. and Mrs. Richard Chatelain
Mr. David Clark
Ms. Gloria Clark
Mr. H. Wayne Cluck
Mr. and Mrs. David Cobb
Mr. Joseph L. Cole
Mr. Phillip Cole
Mr. Irvin S. Conover
Mr. Bruce C. Cooper
Elwyne C. Cooper
Mr. William E. Craumer
N. M. Cullison
Ms. Louise F. Daves
Mr. Walton V. Davis
Ms. Ruth M. Detwiler
Mr. Mark A. Eckert
Mr. Frank Ferguson
Mr. Harry Frankhouser, Jr.
Mr. Edwin Frownfelter
Mr. Joseph Galant
Ms. Kathleen A. George
Mr. and Mrs. Bob Greer
Mr. Paul Grumbine
Ms. Bonnie J. Hammond
Mr. J. G. Haney
Mr. Milburn J. Harris
Mr. and Mrs. Clarence H. Hauson
Mr. William F. Hill
Ms. Eileen S. Holmes
A. B. Inskip
Mr. Jordan
Ms. Diana S. Kasu
Ms. Barbara A. Klindt
Mr. Victor Krea
Mr. John K. Latt
Mr. Robert T. Lawn
Mr. Leroy Lesan
Mr. Eugene S. Long
Mr. Harvey F. Ludwig
Mr. Harvey O. Lytle
Mr. Charles Marass
Mr. Edgar May
Mr. Hugh C. McAllheny
Mr. Ed Merrell
Mr. and Mrs. Gerald Miller
Mr. Roger C. Mitterling
F. J. Montgomery
Mr. Phillip O. Neth
Mr. Lonny Nummet
Mr. Joseph J. Pellegrini
Mr. Thomas Phillip, Jr.
Mr. A. F. Premo, Jr.
Mr. Richard C. Price
Mr. Raymond C. Protzman
Mr. Clay Rebert
Mr. and Mrs. M. J. Rockey
Ms. Paula Rubuer
Mr. Michael Rura
Mr. John K. Salt
Mr. Byril Sanders
Mr. Micheal E. Sanders

CITIZENS (Cont.)

Mr. Frank Sheak
Mr. Dean A. Shultz
Mr. Edward Slening
Mr. Edward Smith
Mr. Randy Smith
Mr. J. C. Sneeringer
Ms. Sharon Sontheimer
Ms. Susan Stan
Ms. Pearl Steinour
Mr. John A. Stemen
Mr. Carl T. Swinn
Ms. Peggy Taughenbaugh
Mr. Roy E. Thomas
Mrs. Dorothy Thompson
Ms. Ethel W. Thorniley
Mr. Dave Walters
Mr. John D. Warner
Mr. Allen Weikert
Mr. Leo Weiner
Mr. Steve Wennberg
Mr. Glenn Whaley
Mr. and Mrs. Roger D. Williamson
Mr. Clifford Yarwood
Mr. Lee A. Yohn
Mr. Gary L. Yount

OTHERS

Adams County Library
American Water Works Company, Inc.
Carroll Valley Sewer and Water Authority
Century 21 Real Estate
Environmental Consultant and Testing Services, Inc.
Gannett, Fleming, Corddry & Carpenter
International Research Evaluation

CHAPTER II

Purpose of and Need for Action

CHAPTER II. PURPOSE OF AND NEED FOR ACTION

Introduction

The GMA initially requested Federal financial assistance from EPA in 1976 in order to carry out their proposed plan for a regional wastewater treatment system for Gettysburg and surrounding townships in Adams County, Pennsylvania. Under the National Environmental Policy Act (NEPA), EPA is responsible for making the public aware of any significant environmental consequences that may occur as a result of any proposed project involving a Federal government action. Because questions have been raised about the impacts that this project may have on the local communities and the Gettysburg National Park, EPA decided to prepare an EIS. EPA's Notice of Intent to prepare an EIS with regard to this grant application was issued on February 16, 1979.

The following parts of this background section describe:

- The statutory and regulatory framework of the Federal Construction Grants Program
- The history of the project
- The Facilities Plan proposed action
- The decision to prepare the EIS
- The issues, scope, and goals of the EIS
- The planning areas and subareas for this project

Framework of Construction Grants Program

Title II, Section 201 (g)(1) of the Clean Water Act authorizes the EPA Administrator to make grants to any State, municipality, or intermunicipal or interstate agency for the construction of publicly-owned treatment works. EPA regulations about implementing this section of the Clean Water Act appear in 40 CFR 35, Subpart E, Grants for Construction of Treatment Works. These regulations define:

- Allocation of construction grant funds--These funds are State allotments that come from EPA.
- Responsibility of the State water pollution control agency--In this case, the State agency is the Pennsylvania Department of Environmental Resources (PA-DER) which determines project priority among its list of eligible projects in the State. The State priority rating system takes into account the severity of the pollution problem, the existing population affected, and the need to preserve high quality waters.
- Facility Planning requirements for grant applicants--Facilities Planning consists of those necessary plans and studies that directly relate to the construction of treatment works and that verify the need for proposed facilities. These planning studies must include a systematic evaluation of feasible alternatives. The selected alternative must be demonstrated to be cost-effective.
- Construction grant application requirements--There are separate, but related, requirements for facilities planning (Step I Grant), preparation of construction drawings and specifications (Step II Grant), and building and erection of a treatment works (Step III Grant).

- Stipulations from on EPA in awarding construction grants--Among these stipulations are: satisfactory compliance with EPA facilities planning requirements, consistency with 208 water quality management plans, proven eligiblity for priority funding, agreement to pay non Federal costs, and compliance with requirements to obtain a National Pollutant Discharge Elimination System (NPDES) permit.

- Grant conditions--Construction grant regulations identify twenty categories of treatment works grant conditions that address grantee responsibilities; acquisition of real property; access to the project; assurance of efficient, economic operation and maintenance of the treatment works; and other issues.

- Determination of allowable costs to be covered by grants--There are nineteen categories of allowable costs.

The construction of Federally financed waste treatment works is generally accomplished in three steps:

- Step I--Facilities Plans and related documents. Information provided by this step includes preliminary engineering data, a description of the complete waste treatment system; infiltration/inflow documentation analysis of the cost-effectiveness of the alternatives for the treatment works, evaluation of compliance with effluent discharge limitations, required approvals of government agencies, a summary of the public participation plan, and estimates of project costs and customer charges.

- Step II--Construction drawings and specifications.

- Step III--Fabrication and building of a treatment works. The actual scope of the project must be defined initially by PA-DER, when priority for the project is established, or by the EPA Regional Administrator, when grant assistance is awarded.

First, construction grant applications must first be submitted to PA-DER. Then, PA-DER determines if the grant application meets the eligibility requirements for a project. PA-DER forwards to EPA the complete project applications for which priority has been determined. Generally, grant assistance for projects will not be awarded until the EPA Regional Administrator determines that the Facilities Planning requirements and grant assistance requirements defined in the regulations have been met. In making this determination, the Regional Administrator must assess at least the following factors:

- The conformance of the proposed facilities with area-wide and basin-wide water quality management plans

- Entitlement of the proposed project to Federal funding (based on the State's priority rating system) and conformity with the overall State allocation plans

- The applicants' agreement and ability to pay non-Federal project costs

- The capability of the applicants to ensure adequate construction, operation, and maintenance of facilities

- The conformance of the proposed wastewater treatment facilities with State and Federal discharge permit requirements

- The cost-effective design of the proposed wastewater treatment facilities
- The conformance of the application with NEPA requirements for environmental review
- The eligibility of proposed sewage collection systems (if any) for Federal construction grants
- The compliance of the application with the Clean Air Act and other environmental laws.

Project History

Gettysburg is primarily a rural community, with approximately 8,000 people, serviced by a limited, relatively old, sewerage system. The community had remained virtually unchanged for fifty years until the early 1960's, when the trend of second home ownership, either for recreation or retirement use, caused the greater Gettysburg area to become a more developed area.

One particular result of this development was an increasingly overloaded Gettysburg sewage treatment plant (STP). By 1973 this plant was treating an average flow of 1.86 million gallons per day (mgd); it had been designed and built twenty years earlier to handle an average flow of 1.0 mgd. In addition, the performance of the plant in terms of pollutant removal was inadequate to meet the discharge limitations stipulated by the PA-DER. The most significant result of this situation was degraded water quality in Rock Creek, which serves as the receiving stream for the Gettysburg STP. The dissolved oxygen level in Rock Creek has been depleted, particularly in areas immediately below the discharge site of the plant. This, in turn, has reduced the quality, quantity, and diversity of aquatic life in Rock Creek.

Meanwhile, growth outside Gettysburg led to increased pressures for additional conventional centralized treatment plants. One such plant, the Cumberland North plant, constructed in 1964, soon became overloaded because excessive storm and groundwater leaked into the sewer system. Other "package" plants were planned or built to serve various sewage disposal needs; these plants range from isolated businesses to the large Lake Heritage development.

As a result of the overloaded STP's, State officials have banned all new connections to the existing wastewater collection systems. All new growth has to be accommodated by on-lot systems in the Borough of Gettysburg and portions of the surrounding townships. This has resulted in bringing new construction to a near standstill and limiting the economic growth and development of central Adams County.

On April 6, 1972, the PA-DER issued an order to GMA to upgrade treatment at the Gettysburg STP so that it would comply with new water quality criteria for treatment requirements in the Pennsylvania portion of the Potomac River Basin. Subsequently, active planning began and produced a variety of studies addressing water quality problems, sanitary needs, and possible solutions for the area. The focus of these planning activities was the Facilities Plan, prepared in 1976 by a consulting engineering firm, Gannett, Fleming, Corddry, and Carpenter, Inc. (GFCC), on behalf of the GMA and associated jurisdictions. This Facilities Plan was prepared as part of the process to obtain EPA construction grant funds.

Facilities Plan Proposed Action

The Facility Plan proposed the construction of a collection and conveyance system, as well as a regional sewage treatment plant. The Facilities Plan document contains a detailed description of the proposed plan.

The Facilities Plan first identified a combination of needs that justified the project:

- Existing sewage treatment plants were overloaded
- Septic tank failures needed to be rectified
- Lake Heritage development was stymied, because it lacked disposal systems
- Future growth could not be accommodated.

Using the available data, GFCC projected a doubling of population in the area over twenty years, with heavy development northeast of Gettysburg, especially along, and directly north of, Route 30. The Lake Heritage residential development was also in the beginning stages, and showed every sign of rapid and full construction. Thus, GFCC developed a wastewater plan (Figure II-1) that would alleviate the existing sewage disposal problems of the affected communities and provide for future growth.

This plan recommended a number of measures involving both management and physical construction:

- Shut down the existing Gettysburg Plant (1 mgd)
- Shut down the existing Cumberland North Plant (0.06 mgd)
- Construct a new 2.5 mgd regional facility near the intersection of Rock Creek and Route 15
- Construct an interceptor along Route 97 and Rock Creek to convey sewage to the new plant
- Construct a force main from Lake Heritage to serve that area
- Provide service for new development along Route 30 east of Gettysburg Borough.

Management features for such a regional plan would be complex, since numerous townships and operating agencies were involved. The features of the agreement that was reached include:

- GMA would handle grant application, construction, and operation of the plant
- A complex formula for sharing costs was established with consideration given to allow for new development

The costs of the project were high; based on the Facilities Plan, the current present worth estimate of the project, in 1980 dollars, is $29,350,000. The cost of the project was presumed to be financed by a mixture of: EPA funding from the construction grants program, low-interest Federal loans, State funds, and local bond issues to be repaid by user charges.

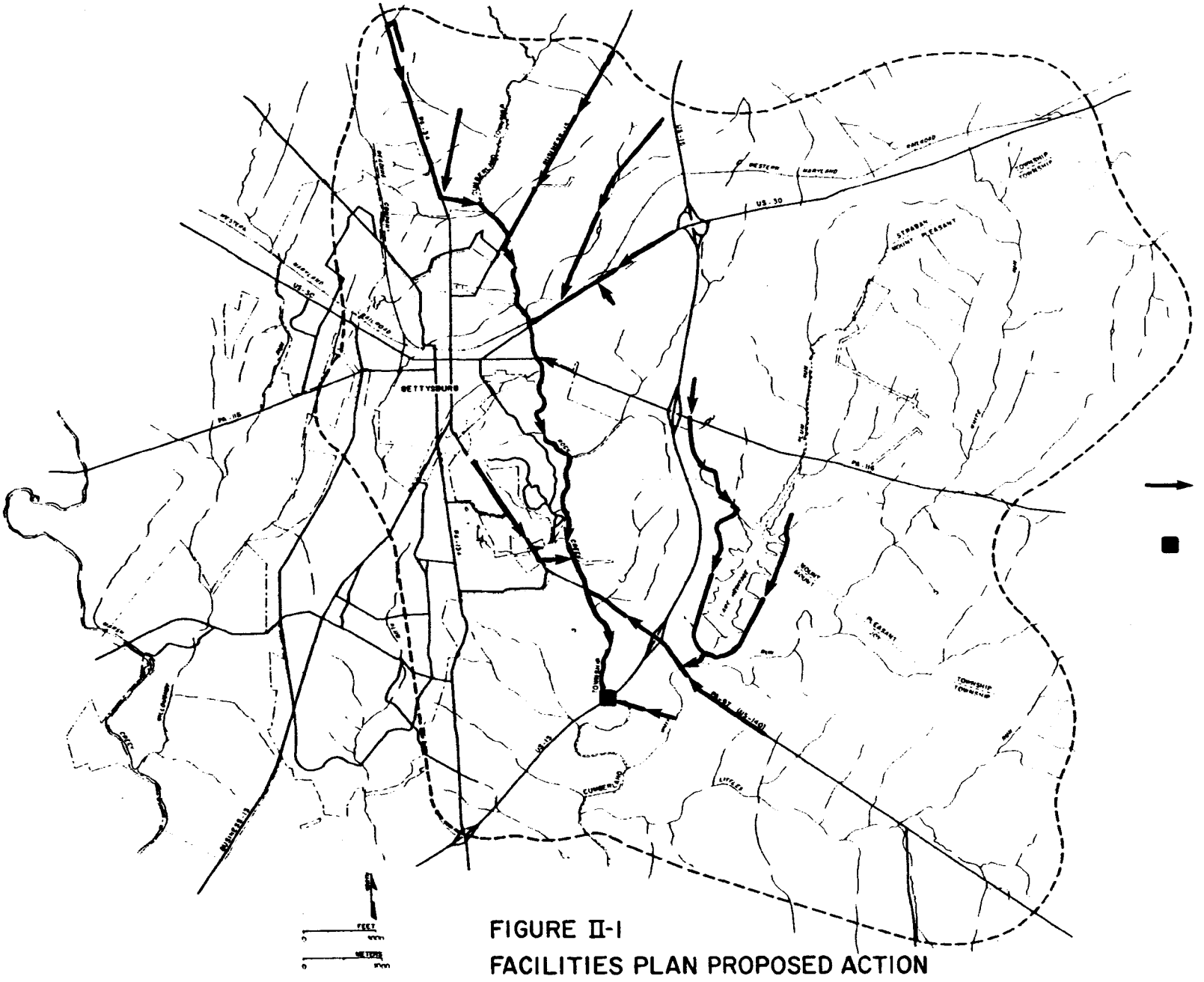


FIGURE II-1
FACILITIES PLAN PROPOSED ACTION

After GFCC completed the Facilities Plan, it was adopted by GMA in 1976. Then GMA submitted the Facilities Plan to PA-DER and applied for a Federal construction grant in November 1976. In this application (#C-421152-01), GMA was the lead agency, acting on behalf of Straban Township, Cumberland Township Authority, and Lake Heritage Municipal Authority (LHMA).

Decision to Prepare EIS

The same grant application was approved by PA-DER and passed on to EPA for review on May 20, 1977. A key decision for EPA under NEPA was whether to issue a "Negative Declaration" (stating that acceptable impacts were involved in the project and granting funds for the project) or to prepare an EIS on the proposed project.

Also to be addressed prior to making any grant awards were the independent requirements of the National Historic Preservation Act (NHPA). Federal regulations under this Act, administered by the Advisory Council on Historic Preservation (ACHP), describe procedures to be followed if a Federally funded project will affect a site listed on the National Register of Historic Places.

EPA's environmental review of GMA's application determined that the propsed project did represent a potential significant adverse effect because uncontrolled development could occur as a result of the new facilities in a manner which might alter the historic and scenic values associated with the National Park. This determination required a Memorandum of Agreement (MOA) under the NHPA, which would describe measure that would be taken to eliminate or minimize the adverse impacts.

EPA also decided to hold the decision on whether to prepare an EIS, pending the attempts to negotiate an MOA with available information. It was felt that successful negotiation of an MOA might also satisfy NEPA requirements without an EIS being necessary.

EPA prepared and submitted a "Preliminary Case Report" to the Advisory Council which served as a basis for consultation among several involved agencies, including EPA, the ACHP, PA-DER, the Pennsylvania State Historic and Museum Commission, the NPS, and local officials. The efforts proceeded well initially resulting in a Draft Memorandum of Agreement which was supported by several of the parties. However, the efforts faltered when a more comprehensive version of the MOA could not gain the necessary support.

EPA recognize the impasse and convened a meeting of all the involved parties on February 8, 1979 where it was agreed that an EIS had to be prepared to more thoroughly study the issue. EPA formally issued a Notice of Intent to prepare an EIS on February 16, 1979 and began work shorty thereafter.

EIS Issues, Scope, and Goals

Shortly after the EIS process began, it became clear that the Facilities Plan proposal had lost local support due to high cost and questionable impacts. Instead of reapplying for a planning grant and beginning the process again, GMA agreed with EPA that the EIS would concentrate on finding other, less expensive, wastewater management alternatives. With that goal in mind, the scope of this EIS was expanded to address Facilities Planning requirements for wastewater management alternatives.

EPA determined that the major issues to be addressed in this EIS were:

- o Water quality problems in the planning area, both in sewered and unsewered areas
- o Development of cost-effective and environmentally sound wastewater management alternatives
- o Impacts on cultural resources from the induced growth that could be caused by any proposed wastewater management alternatives.

Subsequently, the scope of this EIS was designed to answer questions such as:

1. Are the proposed project and population projections compatible with the land use plans of the township and the county's?
2. What are the existing and future sewage disposal needs of the individual communities involved?
3. What are the other alternatives that will meet the affected communities' needs?
4. What environmental, social, economic, and cultural impacts can be expected from other wastewater management alternatives?
5. Will the wastewater management alternatives encourage industrial, commercial, or residential development beyond that already anticipated and planned?
6. Will the increased development result in the loss of prime agricultural land?
7. What effects will the wastewater management alternatives have on the Gettysburg National Military Park and the surrounding Historic District?

The primary goal of this EIS is to develop solutions to the existing and probable wastewater disposal problems for the Gettysburg area. The EIS must establish an information base upon which rational decisions can be made by local jurisdictions and authorities when they apply for construction grant funds, as well as by PA-DER and EPA in deciding whether to award the funds. In order to achieve this goal, the following objectives have been set for the Draft EIS:

- o To eliminate the water quality problems in Rock Creek and other surface waters
- o To minimize costs for wastewater management for the Gettysburg area
- o To minimize impacts on cultural resources and to develop mitigative measures to control secondary impacts resulting from induced growth.

EIS Planning Area and Subareas

The planning area addressed in this EIS (Figure II-2) is identical to the area that the applicant described in the Facilities Plan. The area's southern boundary is about four miles from the Pennsylvania-Maryland border. The entire planning area is lo-

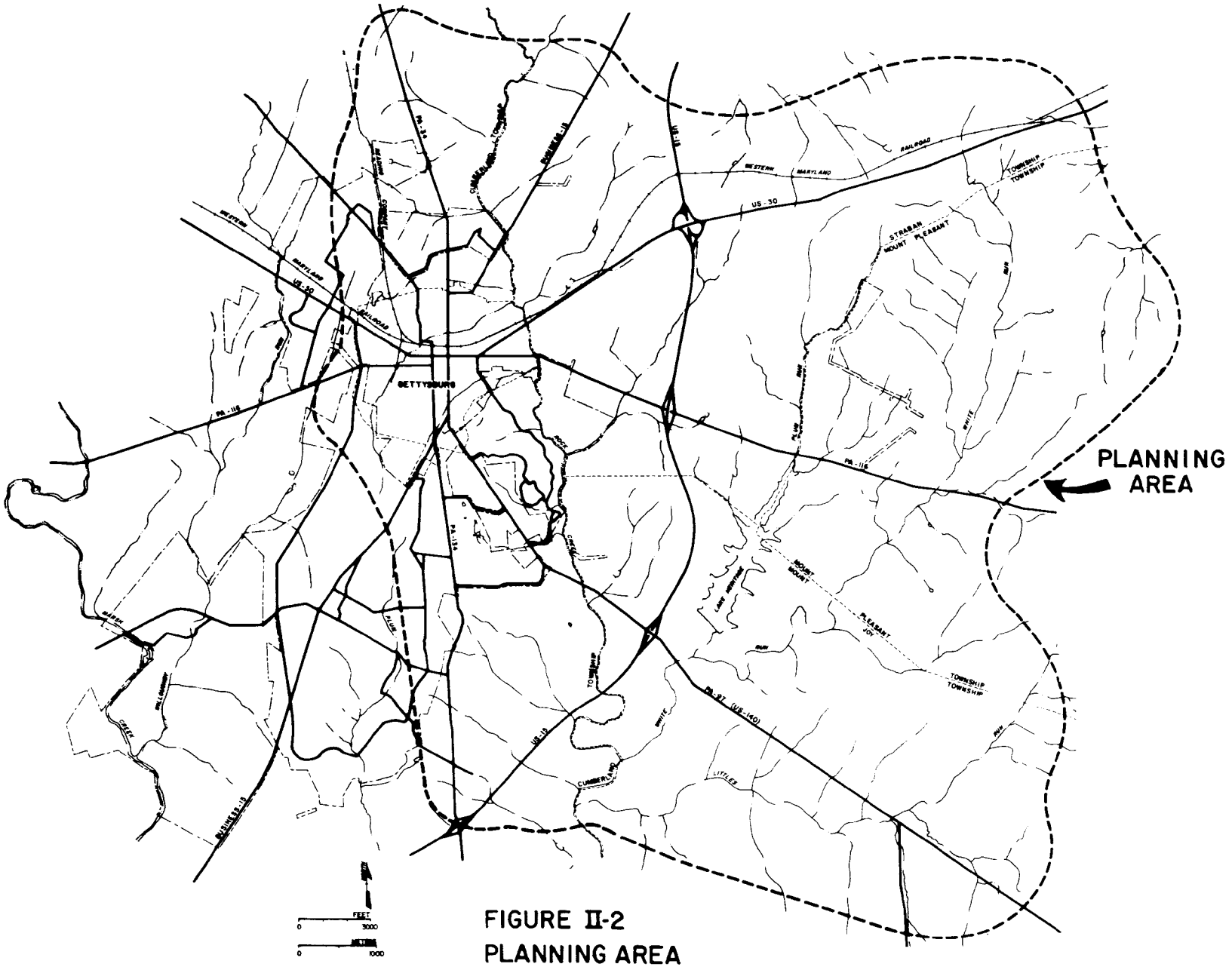


FIGURE II-2
PLANNING AREA

located within the Rock Creek watershed of the Potomac River basin in Adams County, Pennsylvania. Included in the area are portions of Mount Pleasant, Mount Joy, and Straban Townships in the eastern section, and portions of Cumberland Township and the entire Borough of Gettysburg in the western section.

One unique feature of the planning area is the Gettysburg National Military Park, which is located in Cumberland Township. Between two and three million visitors tour the famous Civil War battlefield each year. The NPS controls an estimated 3,000 acres of land surrounding Gettysburg. In connection with the battlefield, the area has numerous archaeological and historic sites.

Except for sections near Gettysburg, the townships primarily contain undeveloped agricultural areas. The areas of Cumberland Township and Straban Township that are north and east of Gettysburg are becoming increasingly more suburban. Lake Heritage, a planned residential community, surrounds the man-made lake of the same name. The development is situated in parts of Straban, Mount Pleasant, and Mount Joy Townships.

CHAPTER III

Existing Environment

CHAPTER III.
EXISTING ENVIRONMENT

Air Quality

Gettysburg, Pennsylvania is located near the Maryland border, about thirty-five miles south-southeast of the state capital at Harrisburg. The climate of the area is characterized by moderate temperatures and a generally adequate amount of precipitation. A summary of meteorological data, as observed at an Environmental Data Service recording station (#36 3218) in Gettysburg, appears in Appendix B-1.

The study area is located in the South Central Pennsylvania Air Quality Control Region (AQCR 196), which consists of Adams, Cumberland, Dauphin, Franklin, Lancaster, Lebanon, Perry, and York Counties. The study area is also subject to regulation by the PA-DER, Bureau of Air Quality and Noise Control (DER-BAQNC). Gettysburg is located in State Air Pollution Control Region III, which includes the same Pennsylvania counties as those listed above under AQCR 196.

The National Ambient Air Quality Standards (NAAQS) for total suspended particulates (TSP), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), non-methane hydrocarbons (NMHC), and lead (Pb) are presented in Appendix B-3. The primary standards are intended to prevent adverse health effects, and the secondary standards are intended to protect the public welfare. For air contaminants whose concentrations are within the NAAQS, the Prevention of Significant Deterioration (PSD) regulations limit any increase above baseline (1974) levels for contaminants in classified areas. The study area has been designated as the Class II type. The PSD limits for TSP and SO_2 are presented in Appendix B-4; PSD limitations have not been established yet for the remaining contaminants. In addition, the State of Pennsylvania has set the standards listed in Appendix B-5 for the following air contaminants: settled particulates, lead (Pb), beryllium (Be), sulfates (as H_2SO_4), flourides (as HF), and hydrogen sulfide (H_2S).

The major point sources of atmospheric emissions in the study area are listed in Appendix B-6. As this Appendix shows, particulate emissions constitute the bulk of emissions from these facilities. Ambient air quality data for 1978 were obtained from DER-BAQNC, and are presented in Appendix B-7. The data indicate the severe ozone problem that is associated with vehicular and other hydrocarbon emissions, and subsequent atmospheric reaction. In addition, the Pennsylvania 30-day sulfate (as H_2SO_4) standard was violated nine times, at both the Manchester and West Manchester sites. In summary, the available air quality data indicate moderately clean air, with occasional problems that are a result of ozone and hydrocarbons, and are typical of problems in the northeastern United States.

According to the staff at the GMA, there was at one time, an odor problem associated with the existing sewage treatment facility at East Hanover Street in Gettysburg, which works above capacity. This problem was associated with the waste gas burner and biofilter rocks, and has been rectified. Occasionally, however, an odor may still be detected.

Because of the size and variation in land use in the study area, a noise measurement survey, to determine the existing day/night sound levels, was not conducted. Instead, the day/night sound

levels of the area were calculated by a methodology developed by the EPA that defines outdoor noise levels as a function of population density (EPA 1974). The methodology assumes, correctly, that airports and freeways are not the primary sources of noise exposure in this planning area. The noise level is calculated to be an average of 50 dBA (sound level in decibels read on the A scale) throughout the area. (As a comparison, an office tabulating machine produces noise levels at approximately 80 dBA.) This level will vary from less than 50 dBA for recreational land uses such as the Gettysburg National Military Park, to greater than 50 dBA for commercial land use and residential developments along major roadways.

Earth Resources

Topography

The study area is located within the Gettysburg Plain of the Piedmont Physiographic Province. The study area has gently rolling hills, with elevations ranging from 400 feet above mean sea level (msl) along Rock Creek to 749 feet above msl at Granite Hill. A majority of the slopes within the study area range from 0 to 8 percent, but slopes are steeper in the foothills of such areas as Wolf Hill, Granite Hill, Culps Hill, and Seminary Ridge.

Geology

The Gettysburg Formation, the New Oxford Formation, and an intrusive diabase (see below) are the three basic rock units found within the study area, and are shown in Figure III-1. The New Oxford Formation is a sedimentary sequence of rocks, Triassic in age, which outcrops at the surface in the southeastern part of the study area. This formation is generally composed of sandstone and shale, interspersed with beds of arkose and conglomerate. Within the study area, the New Oxford Formation is represented by soft red shales and sandstones, and localized beds of light-colored sandstone (Hale 1934).

The Gettysburg Formation, comprising three members, overlies the New Oxford Formation. The lower member, made up of red shale, is the predominant member of the Gettysburg Formation within the study area. The Heildersburg (middle) Member is red shale and sandstone, with numerous interbedded green, gray, and black shales, and gray to white sandstone. Rocks of the Heildersburg Member are harder, and generally more resistant to weathering than rocks of the lower members of this formation (Stose 1932). The upper member of the Gettysburg Formation does not occur within the study area.

The Gettysburg and the New Oxford Formations are intruded by a hard, dense, coarse-grained igneous rock known as diabase, that ranges in thickness from several feet to hundreds of feet. Elevated landforms throughout the study area, such as Seminary Ridge, were formed where these diabase sills and dikes intruded into sandstones and shales. Diabase is more resistant to weathering and erosion than are sandstones and shales, which is why there are rocky hills throughout the study area, particularly in the Gettysburg National Military Park.

Soils

Soils within the study area are generally shallow and poorly drained, with a shallow depth to seasonal high water table. Four soil associations are represented within the study area:

- The Penn-Readington-Croton Association--gently to moderately sloping, well drained, shallow to moderately deep shaly soils
- The Klinesville-Penn-Abbottstown-Croton Associations--gently to moderately sloping, well drained to poorly drained, mostly shallow shaly soils

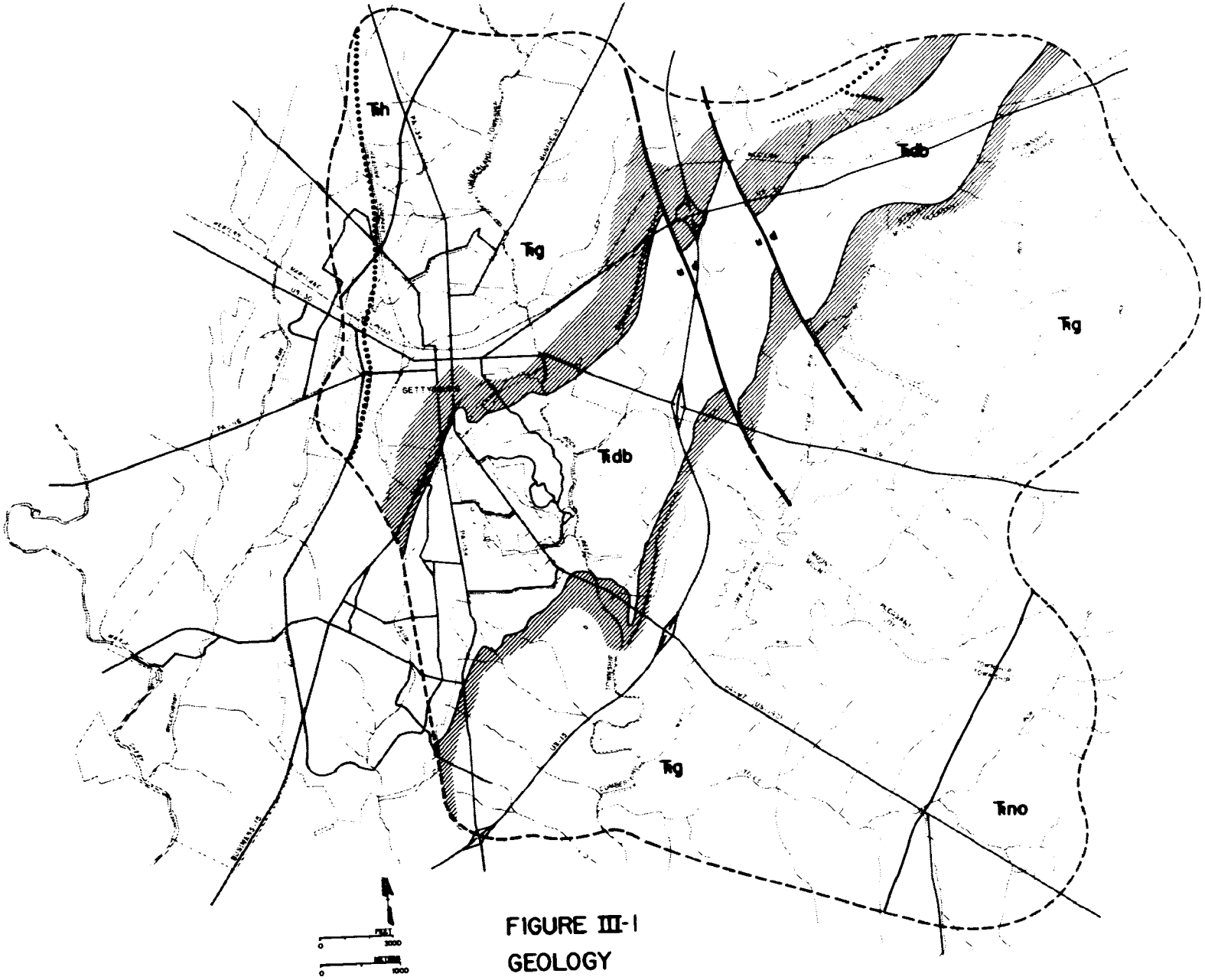


FIGURE III-1
GEOLOGY

SOURCE: USGS.

- The Montalto-Mount Lucas-Watchung Association--rolling to gently sloping, well drained, medium acid soils

- The Lehigh-Brecknock Association--gently sloping to moderately steep, well drained to poorly drained, moderately deep soils.

Soils overlying the Gettysburg Formation and the New Oxford Formation include the Abbottstown, Birdsboro, Brecknock, Klinesville, Lansdale, Lehigh, Penn, Reaville, and Steinsburg soil series. These soils are characterized by shallow depth to bedrock (ranging from 0.2 to 3.7 m) and by permeabilities ranging from 0.5 to 16 cm/hr. They vary from well to poorly drained. Depths to seasonal high water table normally range from 0.5 to 1.0 m, although soils are frequently deeper and better drained in upland areas.

Soils overlying the intrusive diabase material include the Legore, Montalto, and Mount Lucas soil series. These soils are generally stonier and deeper than those overlying the sedimentary rock of the Gettysburg Formation and the New Oxford Formation; their profile depths range from 0.6 to 4.7 m. They are generally well drained, with permeability values ranging from 0.5 to 1.6 cm/hr. Depth to seasonal high water table is greater than 1 m.

Soils of the Bowmansville, Chewacla, Croton, Lamington, Readington, Rowland, Watchung, Wehadkee, and Worsham series are found in the floodplains of the study area. These soils are relatively deep (0.8 to 3.6 m) to bedrock and are virtually impermeable (less than 0.5 cm/hr). A complete listing of soil series found within the study area can be found in Appendix C-1.

The soil properties shown in Appendix C-1 are the most important factors in determining the suitability of any site for soil-dependent wastewater treatment systems. Many of the soils in the study area have been rated as unsuitable for conventional subsurface wastewater disposal (e.g., septic tank-soil absorption systems). The major limiting factors cited by the US Department of Agriculture (USDA), SCS, and the Commonwealth of Pennsylvania Chapter 73 Regulations are (1) shallow depth to bedrock, (2) shallow depth to water-bearing strata, (3) seasonal high water table, (4) too rapid or too slow a rate of permeability, and (5) excessively steep slopes.

Soils in the study area were also evaluated to assess their suitability for surface land treatment of wastewater effluent, following guidelines published by EPA. Table III-1 lists EPA criteria for the slow infiltration (spray irrigation), overland flow, and rapid infiltration methods for land application of treated wastewater. Of the approximately twenty-four soils series present within the study area, the Penn and Brecknock soils were found suitable for spray irrigation; the Worsham, Wehadkee, and the Watchung soils were found suitable for overland flow; and no soils were found suitable for rapid infiltration.

Table III-1. Comparison of Site Characteristics for Land Treatment Processes

Characteristics	Principal processes		
	Slow rate	Overland flow	Rapid infiltration
Slope	Less than 20% on cultivated land; less than 40% on noncultivated land	Finish slopes 2 to 8%	Not critical; excessive slopes require much earthwork
Soil permeability	Moderately slow to moderately rapid	Slow (clays, silts, and soils with impermeable barriers)	Rapid (sands, loamy sands)
Depth to groundwater	2 to 3 ft	Not critical	10 ft (lesser depths [minimum] are acceptable where underdrainage is provided)
Climatic restrictions	Storage often needed for cold weather and precipitation	Storage often needed for cold weather	None (possibly modify operations in cold weather)

1 ft = 0.305 m

During the preparation of this EIS, field trips were conducted in the study area to examine soils of the Penn and Brecknock series to assess their suitability for spray irrigation of treated effluent. This field study led to the following conclusions regarding certain study area soils:

- Depending on the location within the study area, Brecknock and Penn soils may be suitable for spray irrigation where depth to bedrock or seasonal high water table are not problems.
- It will be difficult to locate a single spray irrigation site of adequate size to handle all the effluent from the study area.
- Soils with poor drainage and gentle slopes may possibly be suitable for small-scale marsh ponds systems.
- Because of the variability of study area soils, it is recommended that soils at the selected site be analyzed in detail prior to the design of any land treatment system.

Water Resources

Hydrology

Rock Creek watershed is the major drainage basin in the study area, with a drainage area of 66.0 square miles to the Pennsylvania-Maryland state line (Figure III-2). The major stem of Rock Creek originates near Biglerville, flows through Gettysburg and runs south to cross the state line, and eventually joins Marsh Creek in Maryland. Marsh Creek eventually joins Monacacy River and Potomac River. As a result, Rock Creek is within the

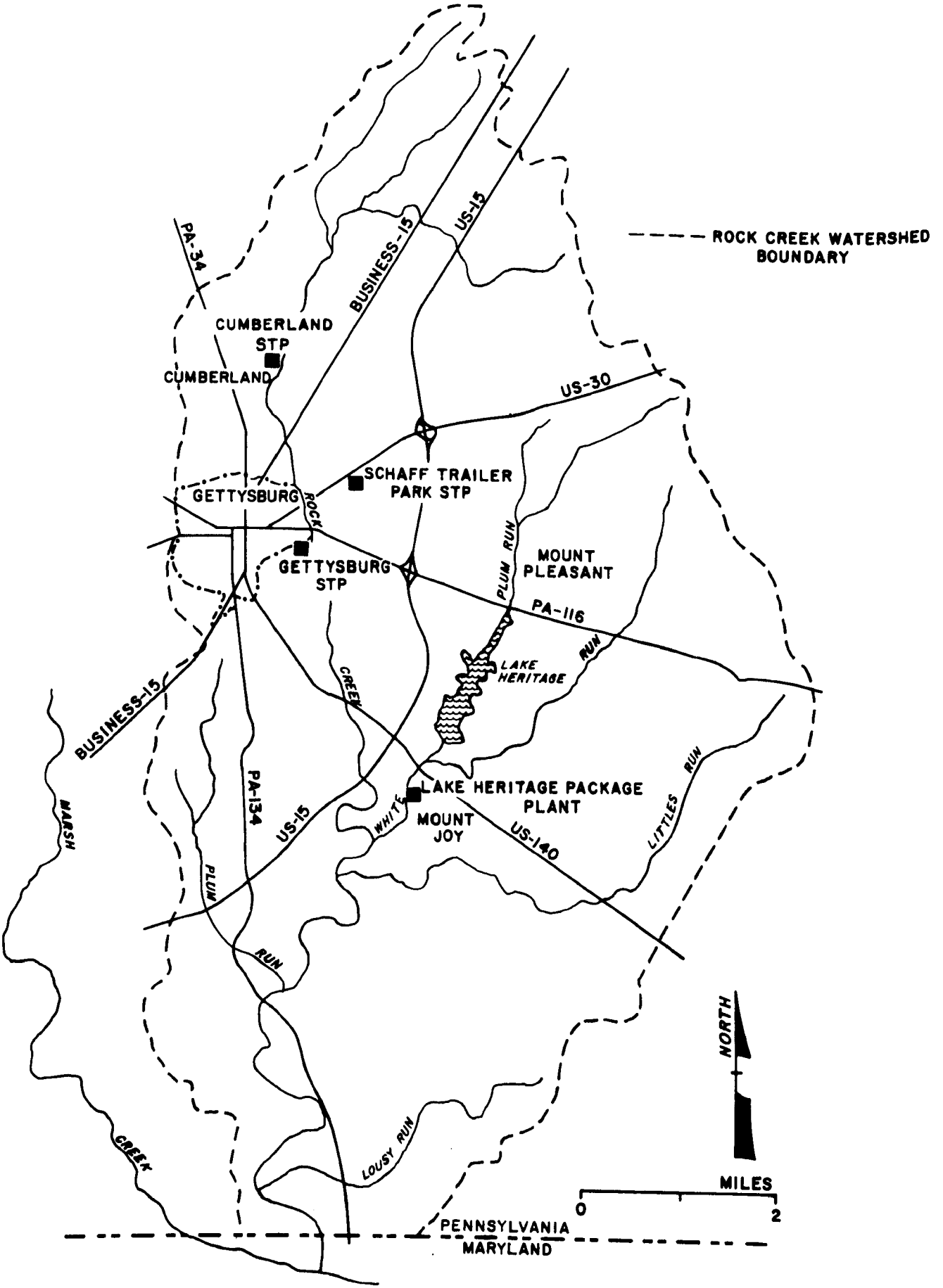


FIGURE III-2 ROCK CREEK WATERSHED, PENNSYLVANIA

Potomac River Basin. The major tributaries of Rock Creek are White Run (which receives flows from Lake Heritage), Littles Run, Plum Run, and Lousey Run. Most of the surface runoff to Rock Creek comes from cultivated areas and small wood lots of the surrounding agricultural areas.

Precipitation within the study area is approximately 41.2 inches per year (SCS 1967). Nearly 40 percent (16 inches) of this amount is lost to runoff. The remaining 25.2 inches is either lost to the atmosphere through evapotranspiration or percolates into the groundwater aquifer systems (McGuiness 1964).

Table III-2 presents the drainage areas and computed 7-day 10-year (7Q10) low flows for the Rock Creek watershed and its subwatersheds. A detailed description of the derivation of these low flows is included in Appendix D-1.

Table III-2. Drainage Areas and 7-Day 10-Year Low Flows in Rock Creek and its Tributaries

Stream	Drainage area (sq mi)	7-day 10-year low flow (cfs)
Rock Creek at Gettysburg STP ----	20.0	1.13
White Run below Lake Heritage ---	13.0	0.73
Littles Run ----------	7.67	0.42
Plum Run ----------	3.84	0.22
Lousey Run ----------	2.93	0.17
Stevens Run ----------	1.15	0.07

Natural discharge of groundwater (i.e., springs) takes place primarily in Rock Creek, Littles Run, White Run, Plum Run, and their tributaries. Some groundwater discharge also occurs in abandoned quarries in the Borough of Gettysburg. Recharge, or replenishment of groundwater, takes place throughout the study area by way of percolation through soil material and bedrock fractures.

Wastewater Discharge

The major wastewater sources that directly discharge into Rock Creek are Cumberland STP and Gettysburg STP (Figure III-2). A small package plant that serves the Schaff Trailer Park empties its flow into a small stream that eventually joins Rock Creek. Another package plant that presently treats holding tank wastes from the Lake Heritage area, discharges into White Run, a major tributary of Rock Creek.

An August 1979 review of recent water quality survey results indicates that effluent limitations are exceeded in terms of the five-day biochemical oxygen demand (BOD_5), ammonia nitrogen, and total phosphorus at Cumberland STP and Gettysburg STP (Table III-3). The modeling study of Rock Creek shows that Gettysburg STP is the most significant contributor of BOD and nutrient loadings to the Creek (see details in Appendix D-1).

Table III-3. Effluent Characteristics at Cumberland and Gettysburg STPs and Effluent Limitations

	Total Suspended Solids (mg/l)	BOD_5 (mg/l)	Ammonia (mg N/l)	Total phosphorus (mg P/l)
Cumberland STP* ---	2.0	34.5	9.6	5.6
Gettysburg STP* ---	5.0	58.5	12.0	6.5
Effluent limitations ----------	15.0	15.0	3.0+	0.5

*Water Quality Survey on August 8-9, 1979
+3.0 mg/l from June 1 to October 31.

Water Quality Criteria

Water quality criteria established for Rock Creek watershed by the PA-DER are summarized in Table III-4.

Table III-4. Water Quality Criteria for Rock Creek Watershed*

Parameters	Criteria
pH	6.0-8.5
Dissolved oxygen	Minimum daily average 5.0 mg/l
	Absolute minimum 4.0 mg/l
Total iron	Below 1.5 mg/l
Temperature	Not more than a 5°F rise above ambient temperature or a maximum of 87°F, whichever is less; not to be changed by more than 2°F during any one-hour period
Dissolved solids	Maximum monthly average 500 mg/l
	Absolute maximum 750 mg/l
Total dissolved phosphorus	Maximum 0.1 mg P/l
Fecal coliform	Below a geometric mean of 200 per 100 ml in five consecutive samples

*Rules and Regulations, Title 25--Environmental Resources, Part I. Department of Environmental Resources Subpart C. Protection of Natural Resources Protection of Natural Resources Article II. Water Resources Chapter 93. Water Quality Standards, Pennsylvania Bulletin, Vol. 9, No. 36, 8 September 1979.

Water Quality of Rock Creek and Lake Heritage

In this section, water quality conditions in Rock Creek and Lake Heritage are discussed, based on historical data and a water quality survey conducted in August 1979. Review of these data has indicated that the present water quality in Rock Creek is relatively poor, particularly during the summer low flow months. Dissolved oxygen levels often drop to 2 mg/l daily. Fecal coliform levels are always high, above the State Water Quality

Criteria of 200 per ml. Very high levels of nutrients (nitrogen and phosphorus) have been observed over the past few years. The data review also shows that the wastewater discharge from the Gettysburg STP is primarily responsible for the degradation of water quality in Rock Creek.

A comprehensive water quality survey was conducted in Rock Creek and Lake Heritage from August 7-9, 1979, as part of this EIS. A complete description of the survey and the survey data are presented in Appendix D-2. The survey shows that temperature in Rock Creek was about 25°C during the survey period. BOD_5 levels peaked at 10 mg/l near the Cumberland STP, and 70 mg/l near the Gettysburg STP. Nitrogenous BOD demonstrates a similar pattern, which reflects the significant impact of wastewater discharge from the treatment plants.

The survey results also show that a major portion of Rock Creek in the study area had a dissolved oxygen level below the State Water Quality Criterion of 5 mg/l. Dissolved oxygen levels as low as 2 mg/l were detected near Spanglers Spring. Organic nitrogen as high as 8 mg/l, and ammonia nitrogen as high as 10 mg/l, were measured immediately downstream from the Gettysburg STP. The subsequent oxidation of these nitrogen components led to significant increases in nitrate levels in Rock Creek. As a result, nitrate nitrogen increased from 1 mg N/l to 8 mg N/l in the downstream direction.

Orthophosphate and total phosphorus levels in Rock Creek exhibit trends similar to the nitrogen components, reflecting the effect of wastewater discharge. With orthophosphate concentration equal to 80 percent of the total phosphorus concentration along the stream, it can be concluded that the treatment plants are the major contributors of phosphorus to the stream because the effluent consists mainly of orthophosphate.

Lake Heritage had fair water quality during the August 1979 survey. The lake was stratified in terms of temperature, varying from 27°C at the surface to 16.5°C at the bottom. Dissolved oxygen levels were about 5.6 mg/l and 6.5 mg/l near the surface and close to zero on the bottom. Nutrient concentrations were relatively low except in the bottom waters, where total phosphorus was 0.265 mg P/l. Bacteria levels were well below the State Water Quality Standards. Overall, the lake does show some sign of eutrophication.

Groundwater Quality

Groundwater quality within the study area is generally good and within an acceptable drinking water range (Wood 1979). Hall (1934) reported that in eight wells tested from the New Oxford aquifer system, the average total dissolved solids (TDS) was 211 mg/l, hardness equaled 136 mg/l, and iron was 0.07 mg/l. In the Gettysburg aquifer system, Hall reported an average TDS of 363 mg/l, hardness at 251 mg/l, and iron at 0.20 mg/l. Groundwater from the igneous diabase was reported to average 176 mg/l for TDS, 114 mg/l for hardness, and 0.15 mg/l for iron.

Analyses made on water from GMA Well #2 shows nitrogen as nitrate at 2.18 mg/l, which is relatively low when compared with the national drinking water standard of 10 mg/l. Bacteriological tests on groundwater from the same well produced a low total coliform level of 2.2 colonies per 100 ml of water. Additional groundwater data obtained during a recent sanitary survey can be found in Appendix I-1.

Water Supply

Surface waters in the Rock Creek watershed are not used for water supply. The water supply of the study area is provided by the GMA water system, using Marsh Creek as the primary source. Presently GMA serves about 9,650 persons in Gettysburg Borough and adjoining portions of Cumberland Township and Straban Township. GMA also has four groundwater wells to supplement the surface water supply from Marsh Creek. Only well #1 is located within the Rock Creek watershed and the study area. Well #1 is used only during emergencies because of the water's extreme hardness. As a result, the water resources within the Rock Creek watershed do not play a significant role in water supply.

One of the problems associated with the Marsh Creek supply is inadequate dry-weather yield. Although the supply allocation is 0.96 mgd, there is no yield available during drought because of upstream irrigation withdrawals for orchards (GFCC 1977). Irrigation withdrawals reduced available stream flow severely in past years, particularly in 1966, and irrigation requirements are projected to increase in the future.

Potential new sources were investigated by GMA (GFCC 1977), including all surface water and groundwater supplies, to determine the best additional source. Surface waters in the study area have not been considered as potential sources of water supply. As to future groundwater supply, the Gettysburg Formation, including the Heidlersburg Member, offers the best potential for groundwater development in the Gettysburg area. The upper Rock Creek watershed was the recommended well drilling area in the Gettysburg Formation (GFCC 1977). These designated areas have favorable separation, geologic, and topographic characteristics.

In addition to the above-described GMA water supply system, the Citizens Utility Company operates a well that serves the Lake Heritage community. That well yields 360,000 gallons of groundwater each day.

Biological Resources

Aquatic Biota

Studies of the aquatic biota in the study area have been conducted by PA-DER (Hughey 1973, 1978). An aquatic biology survey was conducted in August 1979 for this EIS. Detailed results of the earlier surveys and the recent survey can be found in Appendixes E-1 and E-2, respectively.

The low number of fish and macroinvertebrate species found near Spanglers Spring during the 1979 survey indicates that aquatic life in Rock Creek has been adversely affected downstream from the Gettysburg STP. Earlier studies by Hughey (1973 and 1978) reached similar conclusions. The reduction in species diversity is probably the result of the extremely low dissolved oxygen concentrations downstream from the Gettysburg STP (see Appendix D-2), in combination with high levels of ammonia and chlorine.

During the August 1979 survey, fish were found to avoid waters immediately below STPs where the residual chlorine concentrations exceeded 0.05 mg/l. At locations immediately upstream from the outfall of the Gettysburg STP, the number of fish species captured was the same as the number collected upstream from the Cumberland STP. However, macroinvertebrate numbers and diversity were lower at locations immediately upstream from the Gettysburg STP than they were at locations upstream from the Cumberland STP. This lower diversity may have been related to the operations of

the Cumberland STP but other factors, such as the poorer substrate (food supply) at the Gettysburg STP, may have been involved. The fish population of Lake Heritage appears to be healthy (see Appendixes E-1 and E-2). The apparent low diversity in the Lake Heritage macroinvertebrate community cannot be explained at this time. The abundant weed growths observed during the August 1979 survey suggest that problems from eutrophication may arise.

Terrestrial Biota

The vegetation and land cover presently found in the study area consist of several major types: deciduous forest, agricultural and open land, suburban and urban land, and quarry. The category "suburban and urban land" has been subdivided further into several classes of more detailed uses. Open water covers a small part of the study area.

At the present time, stands of deciduous forest cover less than 20 percent of the Study Area. Most narrow ravines, stream valleys and hilltops are forested. Many other tree and shrub species are present in the forests of both the lowlands and the uplands, and some sixty species were noted during the brief field reconnaissance for this analysis during April 1979 (see Appendix E-3). The herbaceous flora in the deciduous forests of the study area is both diverse and abundant (see Appendix E-3). Some of the more common species are mayapple, jewelweed, wild ginger, wild geranium, bloodroot, ground ivy, violets, and jack-in-the pulpit.

Agricultural lands include cropped fields, pastures, feedlots, orchards, vineyards, and the associated farmhouses, barns, and outbuildings. The vegetation primarily consists of grain or forage crops, weedy ruderal (growing where the natural vegetation has been disturbed by man) herbs, hedgerows, fruit trees, and small remnant stands of forest trees. Large, open areas of mowed grass and old fields that apparently are not being used for agriculture are also included.

Suburban and urban lands may be categorized by surface vegetative covering. In suburban parts of the study area, less than one-third of the surface is ordinarily covered by structures and pavement. The vegetation in the remaining areas is, in general, highly managed; usually it is composed of lawns, gardens, and landscaped plantings of shrubs and shade trees. In urban areas, which are typically about two-thirds covered by paved surface and structures, vegetation is generally restricted to small lawns and shade trees, except for occasional parks and vacant lots.

Based upon habitat conditions, available geographic range data, and limited field reconnaissance, twenty-two species of amphibians (salamanders, frogs, and toads) and twenty-four species of reptiles (turtles, lizards, and snakes) are known, or are considered likely to occur, in the study area. These species are all permanent inhabitants of the study area and breed locally. The amphibians require open water, or at least moist soil conditions, for reproductive activities; most amphibian breeding habitats are in stream valleys, in floodplains, or adjacent to ponds or other water sources. Approximately half the study area reptile species require open water habitat for food, cover, or breeding. The remaining reptilian species are less restricted and use a variety of habitats, ranging from moist lowlands to dry upland areas. A list of amphibians and reptiles likely to occur in the study area is provided in Appendix E-4.

There are no available data about study area birds, in part, because there are no organized bird watching clubs, but from the information on bird life to the north and south of the Gettysburg Study Area, it can be assumed that approximately 280 species of birds occur with some regularity there. About 100 species breed in or near the study area.

Forty-eight species of mammals are known or expected to occur in the study area, based upon range and habitat conditions (Appendix E-5). Most of these mammals breed and reside permanently in the study area, with certain species of bats as the only exceptions. The little brown myotis, silver-haired bat, red bat, seminole bat, and hoary bat migrate to warmer southern areas, where they spend the winter months.

Threatened or Endangered Species

There are no known species of aquatic biota in the study area that are listed as endangered or threatened by the US Fish and Wildlife Service or the Pennsylvania Fish Commission. Similarly, no amphibian or reptile classified federally as endangered or threatened with extinction, under the Endangered Species Act of 1973, is known to inhabit the study area.

No plant species currently classified for Federal designation as endangered or threatened are known to occur in the study area. Adams County and the surrounding vicinity have not been studied intensively by trained botanists or ecologists, primarily because a large proportion of the county has been converted to agricultural uses.

Environmentally Sensitive Areas

Environmentally sensitive areas are those geographic areas that are particularly susceptible to damage resulting from man-made uses. In general, intrusion into such areas should be discouraged and, where it does occur, such development should be subject to special restraints or measures to mitigate the negative impacts. Environmentally sensitive areas of concern are discussed below.

Flood-Prone Areas

Flood-prone areas (also known as floodplains) are those areas that are near water courses and are subject to some specified probability of flooding. Flood-prone areas are defined here as the "100-year floodplain," i.e., those areas with at least a 1 percent annual probability of being flooded.

Flood-prone areas were delineated from maps of the Housing and Urban Development National Flood Insurance Program (see Figure III-3). These areas occur as 90 to 200 m (300 to 700 ft) wide bands bordering Rock Creek, Littles Run, White Run, Plum Run, and unnamed tributaries.

Steep Slopes

Steeply sloping land is particularly sensitive to erosion, which produces sediments that affect stream quality. Development on such slopes is usually expensive; possible soil slippage and the provision of public services are other difficulties.

For this EIS, slopes of 8 to 15 percent and slopes greater than 15 percent were mapped from USGS 7.5 minute topographic quadrangle maps at the 1:24,000 scale (see Figure III-4). Slopes greater than 8 percent occupy 10 to 15 percent of the study area. These slopes generally occur adjacent to the valleys of Rock Creek, Littles Run, White Run, and Plum Run, and on the diabase

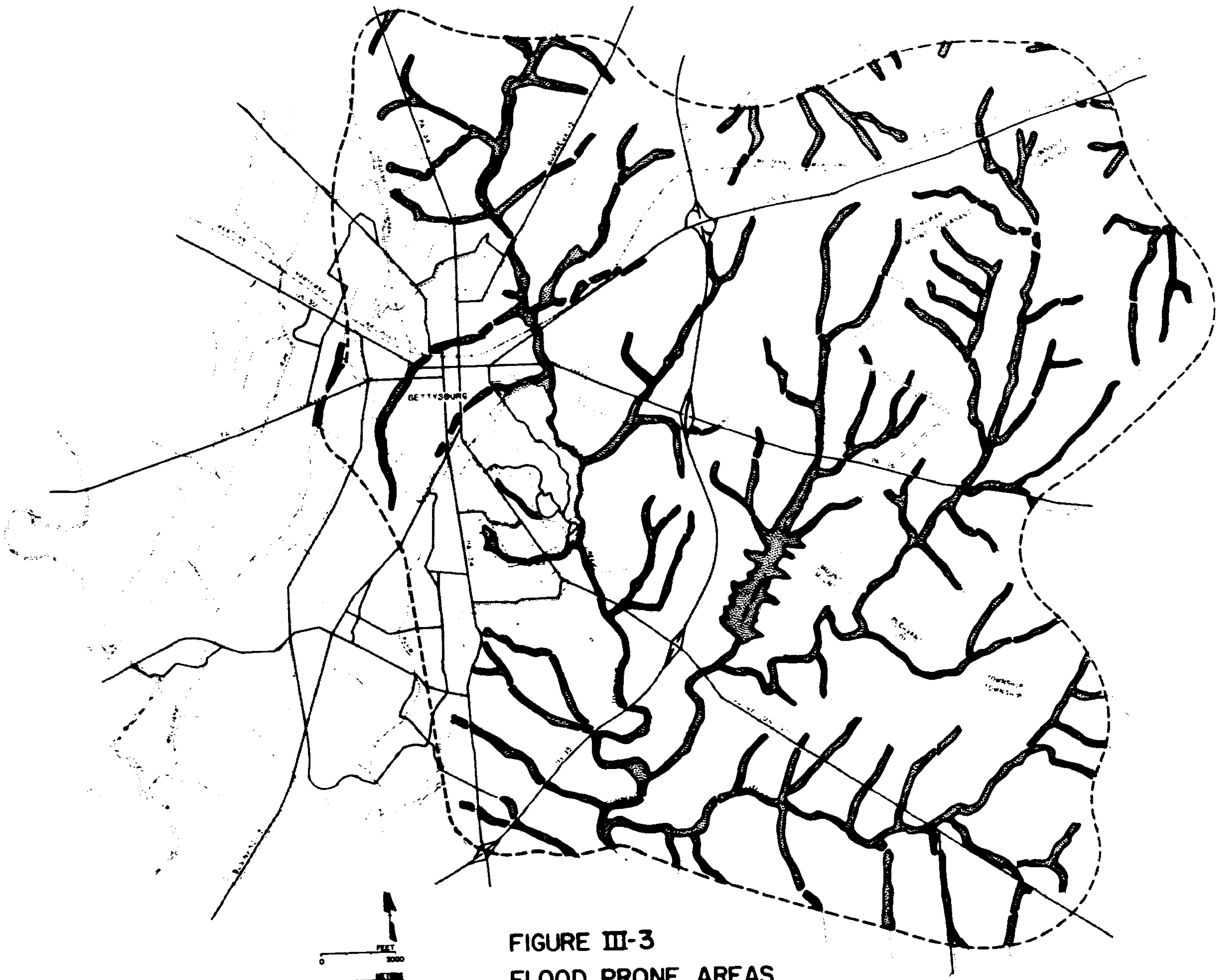


FIGURE III-3
FLOOD PRONE AREAS

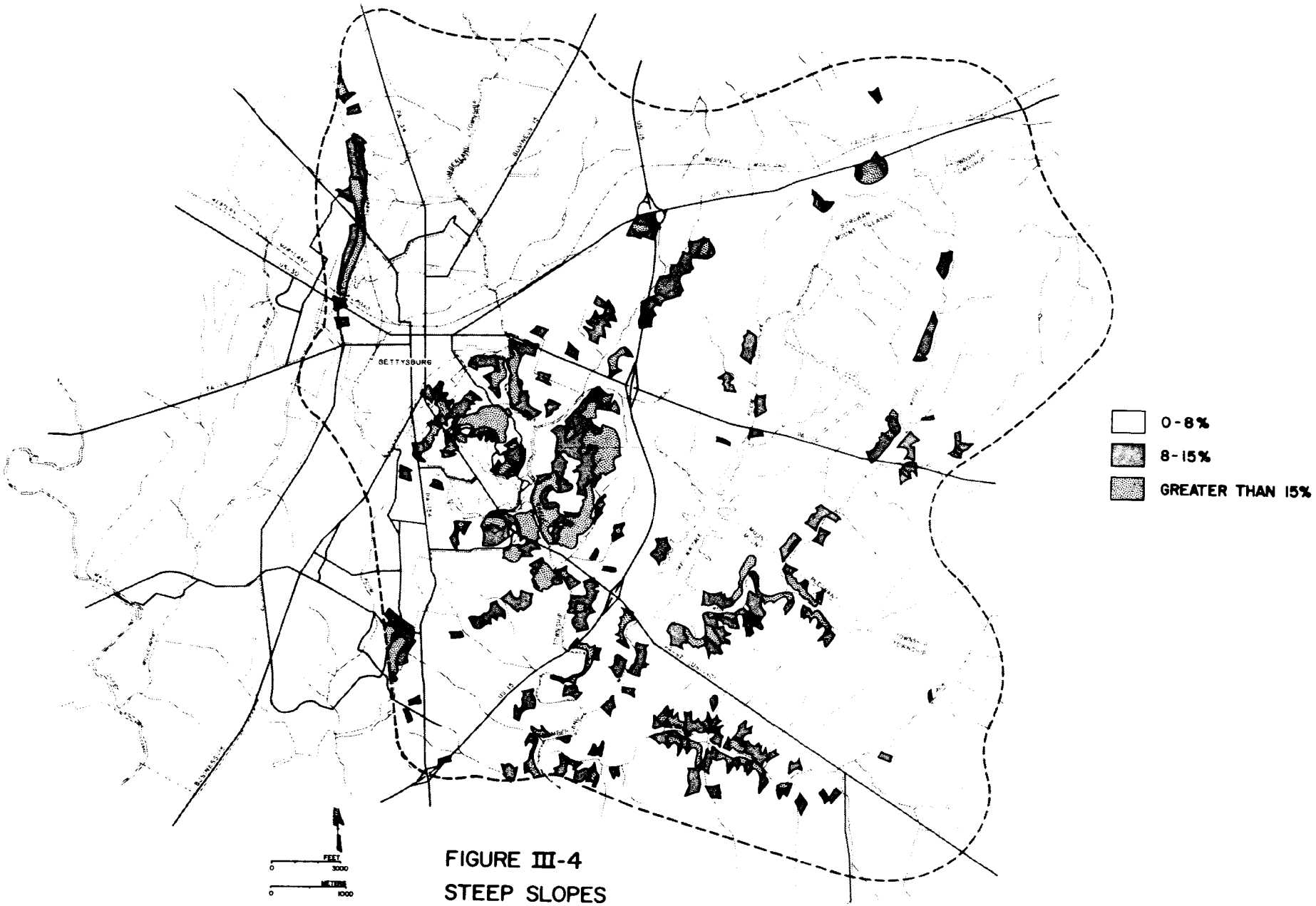


FIGURE III-4
STEEP SLOPES

ridges of Seminary Ridge, Oak Ridge, Culp's Hill, Wolf Hill, Granite Hill, Sheep Heaven, and Round Top.

Prime Agricultural Lands

SCS has established criteria to use in identifying prime agricultural lands. This category includes high quality soils that yield food, feed, and fiber, with minimal adverse environmental effects, and with the lowest expenditure of energy, labor, and capital. These lands have adequate and dependable moisture supplies; a favorable temperature and growing season; acceptable pH and salt content; permeability to air and water; and freedom from coarse fragments, excessive erosion, and severe ponding or flooding (SCS 1977).

The criteria used to identify agricultural lands of statewide importance are less stringent. These farmlands include soils that produce high crop yields economically with proper management, but that are not sufficiently productive to be considered prime agricultural land. The distribution of prime agricultural lands and farmlands of statewide importance is illustrated in Figure III-5.

While there are presently no Federal or State regulations governing land application of treated wastewater on either prime agricultural land or agricultural lands of statewide importance, these uses can be highly compatible. Steepness of slope, depth to water-bearing zone, permeability, and depth to bedrock should all be examined before any site is chosen for land application of treated wastewater.

Aquifer Recharge Areas

Because many parts of the study area rely upon groundwater for domestic and other uses, it is essential to recognize those areas where percolation of rain waters recharges the groundwater. The geology indicates that the recharge area for most of the study area water supply lies inside the study area, although recharge from outside certainly does occur. Therefore, the entire study area is considered to be a recharge area. Consolidated rocks and the overlying soil are hydraulically connected and aid in the recharge of groundwater (Wood 1979). However, the anisotropic nature of the rocks and the lack of a specific aquifer make it impossible to delineate specific aquifer recharge areas.

Wetlands

Undeveloped wetlands, the landward edges of open water, and open water itself, are valuable to many species of wildlife. Generally, these transitional areas, between terrestrial and aquatic environments, support diverse vegetation and therefore provide a variety of resources for wildlife.

No continuous, vegetated wetlands large enough to be mapped are present in the study area, although scattered wetland plant species are found at the edges of streams and in wet agricultural meadows.

Wildlife Habitats

The general character of the study area during the late 1970s was agricultural and rural; the developed area (suburban and urban) is limited to about 15 percent of the study area. The remainder, including the nearly 4,000 acres of land owned by the Federal Government as part of the Gettysburg National Military Park, is agricultural or forested land. Wetlands, streambanks, and open water habitats are present in the study area, but they are limited in extent.

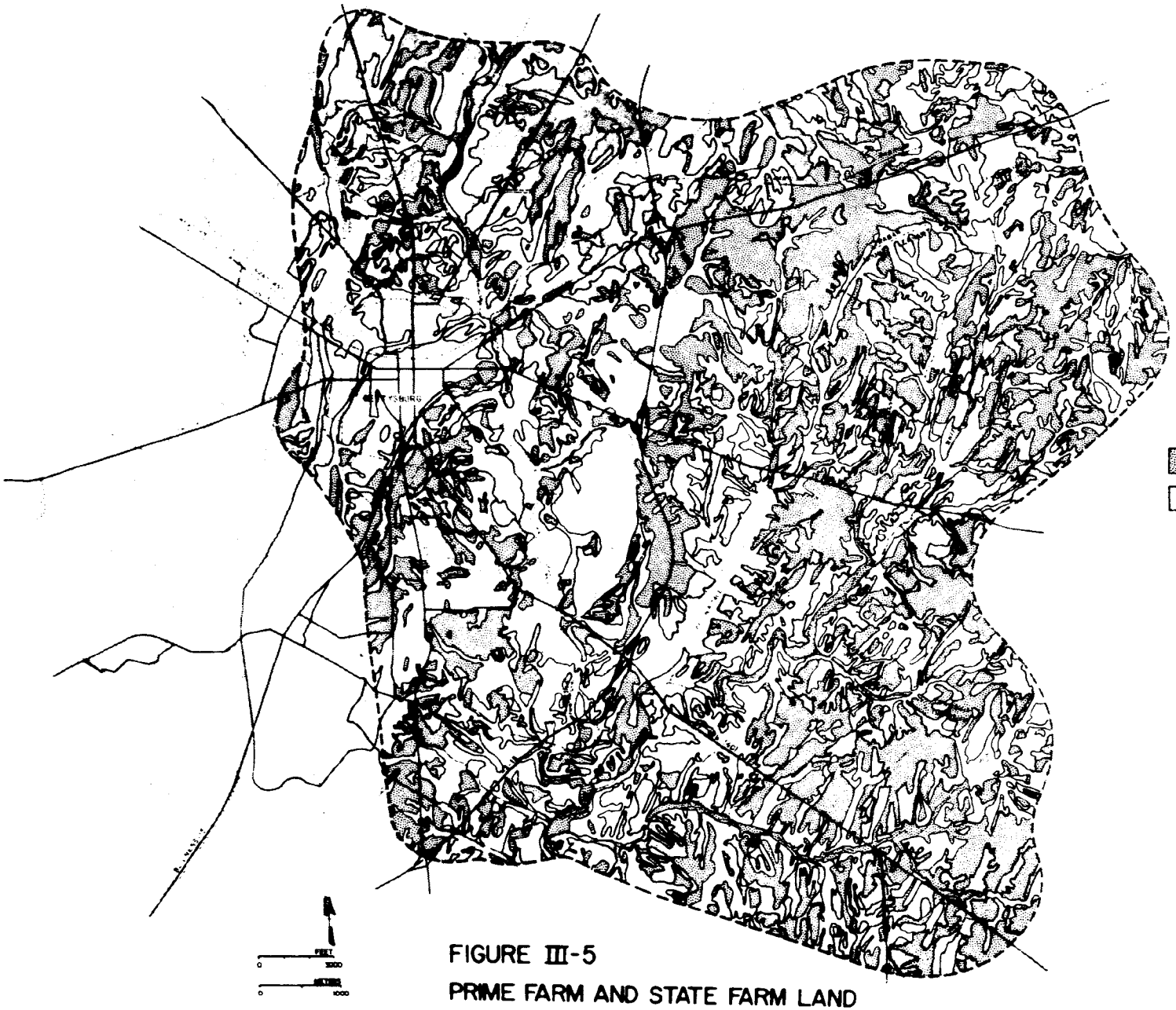


FIGURE III-5

PRIME FARM AND STATE FARM LAND

SOURCE: USDA-SCS, 1967

Open habitats (agricultural land and fields and grasslands) provide less cover for larger species of wildlife than woods, do but they support a highly productive herbaceous flora (including crops) that provides food for many wildlife species.

Forest stands and second growth scrub areas are valuable habitats because they provide substantial cover and food for wildlife. Because forested land in the study area is limited in extent and is usually on isolated, steep slopes, it has a particularly high environmental value. The diversity of herbaceous plants in these areas is considerable. Major construction on forested areas, particularly those with steep slopes and correspondingly great erosion potential, should be avoided.

In rural areas such as Gettysburg, development usually takes place on parcels of land accessible to major transportation routes. Over a period of time, development tends to compartmentalize the available wildlife habitat and restrict the movements of wildlife among alternate cover and feeding habitats. As development continues, the parcels of habitat shrink in size and in wildlife carrying capacity. The less tolerant species, such as gray fox and whitetail deer, are reduced in number first. Other species, usually smaller animals which can better survive and in some cases can thrive in the developed areas, become more numerous following development. Typical tolerant and adaptive species are cottontail rabbit, gray squirrel, American robin, mockingbird, rock dove, starling, and sparrow.

The absence of large continuous strips of forest suggests that there are few major corridors for optimal wildlife movement throughout the Study Area. Nevertheless, the numerous small parcels of forests in the northeastern and eastern parts of the Study Area, interspersed with open habitats, create a significant amount of edge habitat (ecotone). With development limited except around the borough and the major transportation routes, the edge habitat supports a diversity of wildlife in the Study Area.

Although a third of the Study Area consisting of Gettysburg Borough and the Gettysburg National Military Park is closed to hunting, the remaining two thirds is generally open and used for moderate hunting and trapping. No data are available from the PA Game Commission on the number of hunter-use days in the Study Area or County. Data also are lacking for non-consumptive uses of wildlife such as birdwatching and nature walks. However, the open land in the Gettysburg Study Area probably provides thousands of hours of outdoor recreational experience for residents and visitors to the region each year.

Population Trends and Projections

The Gettysburg EIS Study Area encompasses all of Gettysburg Borough, but only portions of the four other municipalities involved. However, population data gnerally is compiled on a municipal level. It is necessary, therefore, to make a distinction between information that refers to the entirety of all of the municipalities and that which refers to the portions of municipalities actually within the EIS study area. In the following sections, reference to the entirety of each municipality will be called Total Municipalities; that referring only to the Study Area specific part will be called Study Area Portion. Population data presented in Table III-5 is distinguished in this manner.

Table III-5. Population Trends and Projections (1980-2005) for Total Municipalities and Study Area Portions. (Population trends for Total Municipalities are derived from ACC 1970 and US-DOC 1977. The development of population projections for Total Municipalities is described in Appendix F-3. Study Area Portion population figures are based on the proportion of the municipality's population which is within the EIS Study Area, as described in the text.)

Municipality	Population Trends				Population Projections					
	1950	1960	1970	1976	1980	1985	1990	1995	2000	2005
Cumberland Twp. (Total)	1,999	2,925	3,497	3,738	4,305	4,802	5,298	5,878	6,521	7,234
(Study Area Portion)	-	-	-	1,540	1,774	1,978	2,183	2,422	2,687	2,980
Gettysburg Boro. [1]	7,046	7,960	7,275	7,470	7,219	7,236	7,254	7,272	7,289	7,306
Mt. Joy Twp. (Total)	1,143	1,380	1,795	2,056	2,397	2,647	2,922	3,228	3,564	3,935
(Study Area Portion)	-	-	-	835	973	1,075	1,186	1,311	1,447	1,598
Mt. Pleasant Twp. (Total)	1,867	2,531	1,817	2,221	2,669	2,947	3,253	3,592	3,966	4,379
(Study Area Portion)	-	-	-	493	593	654	722	797	880	972
Straban Twp. (Total)	1,941	2,387	3,221	3,717	3,574	3,946	4,357	4,810	5,311	5,854
(Study Area Portion)	-	-	-	2,275	2,187	2,415	2,666	2,944	3,250	3,589
Total Municipalities	13,996	17,183	17,605	19,202	20,164	21,578	23,984	24,780	26,651	28,718
Study Area Portion Total	-	-	-	12,613	12,746	13,358	14,011	14,746	15,553	16,445

[1] Data for Gettysburg Borough are listedonly once since the entire Borough is within the EIS Study Area.

Past population growth for the Total Municipalities, and for Adams County as a whole, has been moderate (Table III-5). The most rapid rate of growth occurred between 1950 and 1960 when the Total Municipalities averaged a 2.3 percent per year growth rate. Population growth slowed considerably between 1960 and 1970 (averaging 0.3 percent per year), but then increased somewhat between 1970 and 1976. During the latter period, the average annual rate of increase (1.5 percent) for the Total Municipalities was nearly identical to that for Adams County (1.6 percent).

Population projections for the Total Municipalities from 1980 to 2005 also are presented in Table III-5. These projections represent a reasonable rate and level of population growth for each municipality in light of current and past trends. The development of the Total Municipalities projections was based on recent local subdivision and building activity, detailed PA-DCA analyses, average household size trends, US Bureau of the Census estimates, as well as other county- and state-level projections and assumptions. A complete description of the projection methodology for Total Municipalities is provided in Appendix F-3.

The 1980 population estimates presented here for Total Municipalities is approximately 6 percent lower overall than the preliminary 1980 Census figures. These preliminary Census figures were not used for the 1980 estimate in this EIS because these figures are not official and have not been verfied fully, because these figures evidence anomalies when compared to earlier US Census population estimates, and because these figures have emerged very late in this EIS process and could not be evaluated by EPA or its contractor. An examination of population data provided by the Census Bureau for 1970, 1976, and 1977 suggests a very modest rate of growth between 1970 and 1976, and subsequent population declines estimated for Gettysburg, Mt. Joy, and Straban (and the Total Municipalities as a whole) between 1976 and 1977. The 1980 Census data, in contrast to these previous Census estimates, indicate population levels which would suggest an extremely large increase in population berween 1977 and 1980 for each of the four Study Area townships. Furthermore, this increase is not supported by the moderate amount of local building activity which has occurred, as reflected in the issuance of building permits, in recent years. Therefore, the 1980 Census figures (preliminary) have not been incorporated directly into population estimates developed for this EIS.

As explained previously, the EIS Study Area does not encompass all of each of the five municipalities involved. Consequently, with the exception of Gettysburg Borough, the Study Area Portion of the population of the four Townships is less than that of the Total Municipalities. Specific Study Area projections for use in the EIS require the disaggregation of the total population of Cumberland, Mt. Joy, Mt. Pleasant, and Straban Townships into that proportion of each which is located within the Study Area. This disaggregation process is described in detail in Appendix F-1. Basically, US Census Bureau estimates of Total Municipal populations for 1976 and aerial photographs of the Study Area (also dated 1976) were analyzed to determine a proportion for each municipality of the population timing within the Study Area. The results of this analysis revealed the following proportions:

Jurisdiction	% of Total Population within the Study Area
Cumberland Township	41.2
Gettysburg Borough	100.0
Mt. Joy Township	40.6
Mt. Pleasant Township	22.6
Straban Township	61.2

A variety of checks were performed as part of the methodology to insure that the proportions and courts of dwelling units were reasonably accurate. It was determined that these proportions have been relatively constant over recent years and that the proportions (and distributions of people on the land) are not expected to change significantly during the EIS planning period.

The above proportions were applied to the population for Total Municipalities to calculate the 1976 Study Area population and the 1980-2005 Study Area portion population projections for use in this EIS (Table III-5). These projections reveal that the Study Area population is expected to increase from 12,746 in 1980 to 16,445 in 2005, or approximately 1.2 percent annually.

Land Use

Existing Land Uses and Trends

With the emergence of tourism in the middle of this century as a major component of the local economy, the relative decline of agriculture, and the growing attractiveness of the area as a "bedroom community", land use patterns changed from low density farmsteads interspersed with small villages. Commerce related to Park visitation developed rapidly along Steinwehr Avenue, Baltimore Pike, Carlisle Street, and virtually all major thoroughfares, using land in a linear and highway-oriented manner. The sprawling pattern of commercial uses now stands in sharp contrast to the older agriculture/village pattern which is still in evidence. Residential subdivisions have developed in ever-widening concentric zones between the highway strip commercial zones. These residential developments have not always been contiguous; those leapfrog development patterns that often resulted are difficult to service efficiently.

Nevertheless, the Gettysburg Study Area is still predominantly rural and undeveloped. With the exception of Gettysburg Borough, over 75 percent of the land in each of the Study Area portions of the municipalities is undeveloped. Naturally, a larger proportion of the land of the Borough-market center, county seat, transportation hub, college town, and historic center is developed. Figure III-6 and Table III-6 illustrate the pattern of land uses in the study area. Note that nearly 84 percent of the land is in forest or agricultural open space, with the remainder in various stages of development, with about one-fourth of that in Gettysburg Borough. Also note that the National Military Park is included in the agricultural open space category, where it represents 28 percent of the area.

Major developments in the recent past include the Lake Heritage subdivisions southeast of the Borough on Rt. 97. The nearly 1,100 single-family lots represent the largest existing and future residential development to date in the study area even though it is presently less than 40 percent complete. Major new industrial uses such as the Westinghouse Plant, have located north of the Borough in the Rt. 34 vicinity, while other existing plants have shut down. Gettysburg College and the Lutheran Theological Seminary have expanded their physical plants on the periphery of the Borough.

The Federal government has had a major influence on land use in the study area. Much of the land in the western and southern portions is controlled by the NPS as part of the Gettysburg National Military Park, the Gettysburg National Cemetery, and the Eisenhower National Historic Site (outside the study area, in Cumberland Township). NPS land area currently totals 4,279

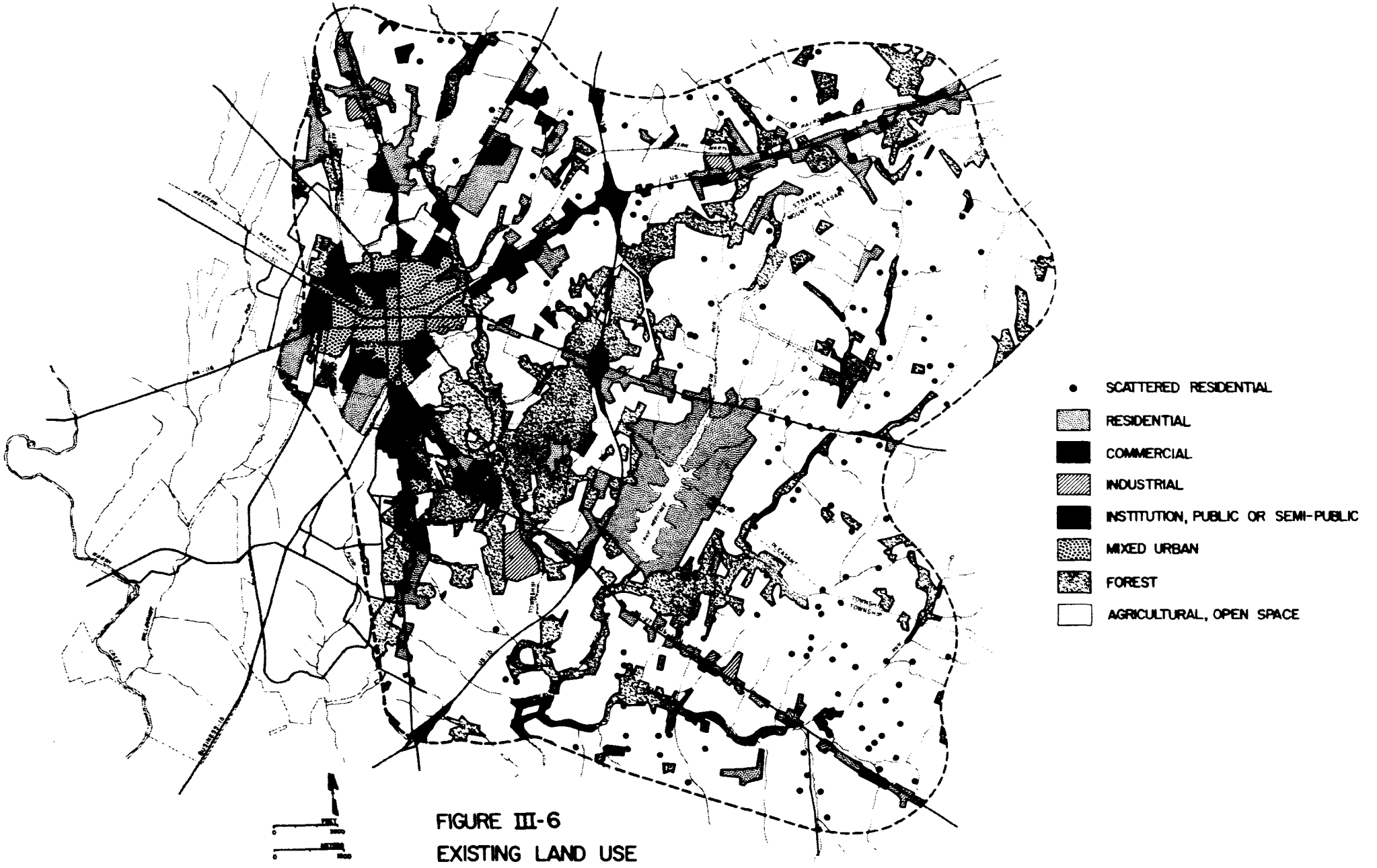


FIGURE III-6
EXISTING LAND USE

acres, most of which is contained within the Study Area; development of this land by NPS has been limited. Acquisition of an additional 374 acres, to complete the Gettysburg National Military Park, has been authorized. Much of this additional acreage is located north of the Borough in the Barlow Knoll area and to the east below Benner Hill; small acquisitions are also authorized along Rt. 97 and Rt. 134 (these areas have not been presented as Federally owned on the Existing Land Use map [see Figure III-6] or on the Historical Values in the Gettysburg Study Area map, and they have been assumed to have no development potential in the analysis of the future land use).

The "Draft General Management Plan for the Gettysburg National Military Park," further lists critical areas which NPS should acquire in the future, if given Congressional authorization. These areas, consisting of 915.5 acres, lie west of Rt. 34 north of the Borough, north of Rt. 116 in the East Cavalry Field, south of Rt. 116 below Benner Hill, along Rt. 97 southeast of the Borough (Culp's Hill and Spangler's Spring), and south of the Borough along Rt. 134 near Round Top (NPS 1979).

Table III-6. Existing land use by municipality, in the Gettysburg 201 study area, in acres and percent of municipal study area portion total (totals may not add to 100.0 because of rounding)

Land Use Category	Cumberland Township		Gettysburg Borough		Mount Joy Township	
	Acres	Percent	Acres	Percent	Acres	Percent
Scattered residential	6	0.1	0	0.0	46	0.8
Residential	441	9.2	27	3.1	557	9.8
Commercial	150	3.1	0	0.0	33	0.6
Industrial	113	2.3	0	0.0	17	0.3
Institutional Public or Semi-Public	286	5.9	227	26.1	25	0.4
Mixed urban	19	0.4	488	56.1	0	0.0
Forest	833	17.3	40	4.6	991	17.5
Agriculture open space	2,964	61.6	88	10.1	3,993	70.5
Total	4,812	100.0	870	100.0	5,662	100.0

Land Use Category	Mount Pleasant Township		Straban Township		Study Area Total	
	Acres	Percent	Acres	Percent	Acres	Percent
Scattered residential	44	0.9	32	0.6	128	0.6
Residential	259	5.1	616	10.6	1,900	8.5
Commercial	0	0.0	155	2.7	338	1.5
Industrial	0	0.0	20	0.3	150	0.7
Institution, public, or semi-public	0	0.0	102	1.8	640	2.9
Mixed urban	0	0.0	0	0.0	507	2.3
Forest	429	8.4	1,086	18.8	3,379	15.2
Agriculture open space	4,391	85.7	3,775	65.2	15,211	68.3
Total	5,123	100.0	5,786	100.0	22,253	100.0

SOURCE: 1975 and 1976 aerial photos; consultant planimetry

Presently, NPS maintains a large number of facilities and structures. These include the Visitor Center, Cyclorama, 92 historic-scene buildings, 31 farms, 1,310 markers and monuments, and 31 miles of roads. These facilities are described in detail in Appendix F-4.

Of special importance is the NPS proposal to relocate the Visitor Center north of the Borough, possibly in the Federally owned Butterfield Farm, a move that may depend upon construction of the Rt. 30 bypass. If the Visitor Center should be relocated, it, as well as the bypass, would affect land use significantly. While the proposal is still "alive", it appears at this time that both the Rt. 30 bypass and the Visitor Center relocation will not occur within the 20-year planning period, if ever.

The cooperation between NPS and the local governments needed to preserve the Federal holdings and additional scenic lands adjacent to them has been improving in recent years. At the same time, the existence of Federally owned land restricting development in that area, could increase pressures for development on non-federal land east of Gettysburg Borough. All these continuing pressures for additional development will probably lead to further changes in the character of the undeveloped areas around the Borough.

Land Use Controls

Gettysburg Borough is the only municipality in the study area which has a zoning ordinance; the remaining townships have not adopted this most basic land use control and do not appear to be likely to "zone" in the foreseeable future. Consequently, land use is not guided by a formalized set of principles in these municipalities, and the respective planning commissions (advisory in function) and governing bodies (boards of supervisors) of these municipalities thus impose what are, in effect, non-formalized land use criteria in lieu of zoning during the process for review and approval of proposed development (see the next section for a discussion of these criteria).

Gettysburg Borough adopted its zoning ordinance in 1975 and revised it in 1977. The ordinance was developed jointly by the Borough Planning Commission and DCA, Bureau of Planning (see Appendix F-5). Because vacant developable land in the Borough is relatively scarce, and demolition and rebuilding on already-developed sites infrequent, the issue of land use control is not so critical in the Borough as it is in the surrounding, less developed municipalities.

On the other hand, all study area muncipalities have either adopted their own subdivision regulations or relied on the Adams County Subdivision Regulations. The Adams County regulations, which are presently being modified, and the others are summarized in Appendix F-6. They establish performance standards and design requirements, including minimum lot sizes for housing developments and other proposed construction, and describe application procedures and requirements of the State which must be followed.

In general, these subdivision regulations prohibit or limit development in floodplains. All require soil-suitability (percolation) tests to be performed where on-site sewerage facilities are proposed. Most of the regulations suggest that minimum lot sizes be increased when the development is located on steep slopes. All plans for development must be compatible with PA-DER and other State and Federal regulations, and must be reviewed by the County prior to approval. Most of the municipal regulations

(as well as the proposed County regulations) cite as a guideline that all new developments must be coordinated with existing development. However, they control only the manner in which new development is to be constructed; they affect the location of development only indirectly, through their floodplain, slope, and soil provisions mentioned above. Thus, although a new house or structure must be built to particular specifications, new housing or commercial uses may still be constructed on farmland, without regard to land use planning principles.

Although several plans drafted for different parts of the study area are in various stages of completion, none has yet been approved, and the Adams County Comprehensive Plan, adopted in 1971, remains the only comprehensive planning document in effect in the study area. It is general in nature and, as indicated above, is only advisory; having no legal or regulatory force.

To summarize the status of land use controls in the area: The only zoning powers are in the Borough of Gettysburg, with the surrounding areas subject only to subdivision regulations and the indirect guidance of various land use plans, some of which are seriously out-of-date. The status of these controls is crucial, in that one of the major issues of this EIS is the possible negative effect on NPS lands of possible growth induced by sewage treatment facilities. The efforts to control such effects in most areas of the county would normally rely very heavily on land use controls.

Future Land Use

Land development for year 2005, calculated for this EIS, is depicted in Figure III-7 as Future Land Use - Baseline. The new development projected thereon is a function of projections by Study Area Portions of the municipalities, of population, housing units, and employment. The analysis of employment trends (see Economic Characteristics) led to a projection of no net change in the employment base through 2005.

These land use projections present a reasonable rate and pattern of growth for the study area portion of the municipalities, if the present conditions continue during the planning period.

These "baseline" projections represent a reasonable pattern and rate of growth for the Study Area Portions of the municipalities if present conditions and trends continue during the EIS planning period. Future Land Use Baseline is further defined by the assumptions that are made concerning the continuation of existing conditions. One assumption is that existing land management regulations by the public sector (or lack thereof) will continue; current regulations of the Gettysburg Zoning Ordinance will remain in effect and none of the other municipalities will adopt or enforce zoning restrictions. A second assumption is that existing private sector (i.e., developers') constraints will continue; current housing market conditions (supply and demand) will continue to focus new development in the apparently more desirable locations north of the Borough. A further assumption is that the general rate of growth, in response to growth pressures on the county and region, will not be atypical; no exceptional events are expected to occur to influence any radical deviation from the present, rather moderate, pressures for new housing development in the Gettysburg area. Finally, sewer and water services are assumed to be available in the areas of Cumberland and Straban Townships north of the Borough, extending outward from existing service areas. This availability is assumed to occur in a variety of ways: reduction in current usage resulting primarily from decreasing household size (and

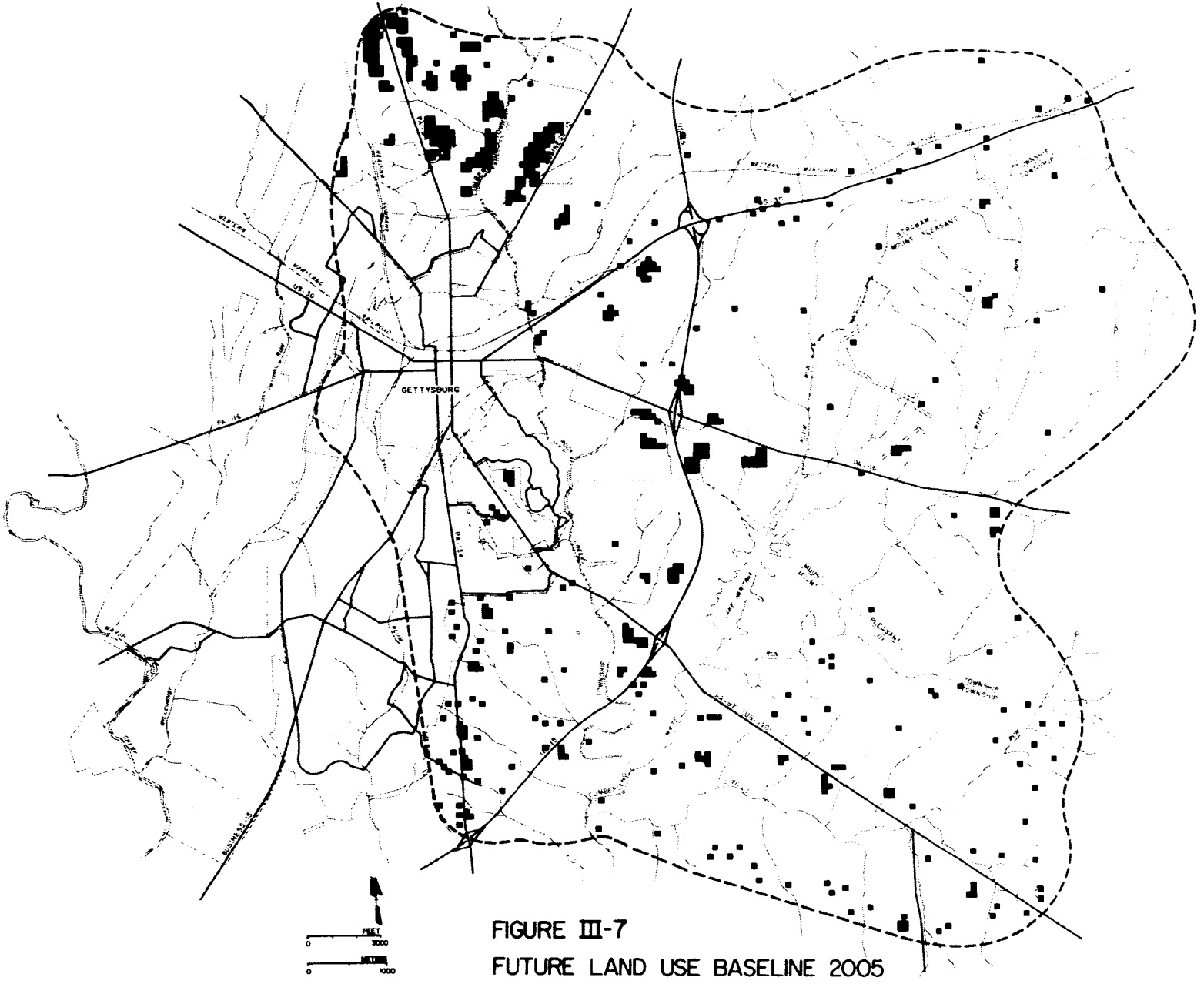


FIGURE III-7
FUTURE LAND USE BASELINE 2005

the users) in existing service areas; reduction in infiltration and inflow problems; other improvements to the efficiency of the existing system; an effective water conservation program effort; or private construction of small new systems. A complete description of the methology and assumptions used to develop the Baseline Future Land Use Scenario is included in Appendix F-1.

The Future Land Use - Baseline map (see Figure III-7), based on population and employment projections and land use plans, does indicate commercial and industrial changes in uses of land beyond Gettysburg Borough employment. These changes are based not on expansion but on redistribution of employment within the study area, mainly from the developed Borough to less developed surrounding townships.

Future Land Use Baseline (Figure III-7) is a general map, not drawn along zoning or parcel ownership boundaries. It should only be interpreted as a "scenario"-- the likely representation of future land development if certain "baseline" conditions are assumed. Note that it is not a "future land use plan", based on detailed parcel-specific evaluation. That kind of detailed, comprehensive planning is a local function, and such an exercise would exceed the scope of the EIS process. The results of the Future Land Use Baseline analysis are as follows:

Gettysburg Borough: The Borough is projected to show a net increase of only eighty-seven persons by the year 2005. All of this net increase will be accommodated on the small and scattered vacant developable parcels within the borough or by in-filling on land already developed (at higher densities). All eighty-seven persons will receive public sewer and water services. Approximately 305 new housing units will be constructed. In the borough, as in other parts of the study area, new housing is partially for an expanded population, and partially to meet the needs of smaller household sizes.

Cumberland Township: Approximately 75 percent of growth projected for the study area portion is assumed to be served by sewer and water systems. The recently adopted Comprehensive Plan recommends the provision of such services north and northwest of the borough adjacent to the existing systems as projected here. Sewered development through 1990 will consist of 25 percent multi-family units, increasing to 50 percent between 1990 and 2005. Over the entire 25-year planning period, sewered development will total 231 single-family units on 132 acres and 158 multi-family units on 17 acres. Scattered single-family units represent 10 percent of total future development (52 units on 47 acres); all are non-sewered. Non-sewered, grouped singles (defined here as part of the subdivision process) represent 15 percent of total future development and include 78 units on 73 acres.

Mount Joy Township: Approximately 50 percent of projected growth in this township is assumed to be located in Lake Heritage (123 units). These projected units have not been shown separately on Figure III-7 because of the small map scale; development of units throughout the existing single-family subdivision can be expected. Also, the projections assume that sewage will be accommodated in some fashion, although not by on-site septic tanks. Costs of wastewater treatment can be expected to be high throughout all of Lake Heritage and will, to some degree, inhibit future growth. Ultimately, the amount of growth projected for Lake Heritage in all municipalities is very much related to the

strength in future housing demand. If this demand decreases, disproportionately large reductions in growth can be expected in Lake Heritage because added infrastructure costs would confront developers there. Remaining projected growth in the township is split between scattered single-family (25 percent) and grouped single-family units (25 percent), all of which are unsewered. No multi-family units are anticipated.

Mount Pleasant Township: Proportions employed for Mount Joy are applicable for Mount Pleasant Township as well. Fifty percent of future growth is located in Lake Heritage (77 units); 25 percent of projected units consist of scattered singles (39 units on 18 acres); and 25 percent are grouped singles (38 units on 18 acres). No multi-family units, and no sewered units other than at Lake Heritage, are assumed.

Straban Township: Since most recent development in Straban has been sewered, notably the Twin Oaks subdivision and several mobile home parks, most projected development is assumed to be sewered also. Sewered single-family units can be expected to be built in the Twin Oaks vicinity along Business Rt. 15; these 396 units on 72 acres would represent approximately 65 percent of all projected development. Lake Heritage (not mapped) will attract an additional 84 units, 15 percent of total projected growth for Straban Township. Scattered, non-sewered single-family units represent a total of 43 units on 40 acres (10 percent of total development until 1990 and 5 percent thereafter). Non-sewered, grouped single-family units will represent about 10 percent of development until 1990 and 15 percent thereafter.

In Figure III-7, projected baseline growth (i.e., all additional development), has been overlaid on existing land use. This development is primarily residential; densities will vary according to municipal subdivision regulations. Although some redistribution of industrial uses can be expected, no additional industrial land uses are projected, and any redistribution would not significantly alter wastewater treatment demands. Finally, although other population-serving uses, including tourist facilities and commercial uses can also be expected to increase slightly as population increases, this expansion has not been represented on Figure III-7. Any expansion in commercial uses would be minimal because a considerable amount of existing population-serving acreage in the study area is under-utilized and has only seasonal use: it can accommodate increased year-round demand quite easily.

The Future Land Use - Baseline map (Figure III-7) also assumes no new major highway construction or new Federal facilities, any of which would result in significant land use effects. No such proposal has been endorsed or supported sufficiently to warrant incorporation into the baseline future.

Socioeconomic Conditions

Demographic

An understanding of past social and economic trends in the Study Area allows predictions to be made about its social and economic future, which shape growth patterns and wastewater treatment needs. The following sections describe demographic and economic conditons, including discussions of employment, municipal budgets, housing, and community services. Unless otherwise noted, all of information presented below refers to the Total Municipalities.

Age information in Table III-7 indicates sizable populations of persons 65 or older in Gettysburg and Cumberland. These proportions are significantly higher than those for either Adams County or Pennsylvania. Older populations generally have fixed or low incomes, a fact that is particluarly relevant when impacts of additional sewer charges are evaluated. Also, these populations tend to require special facilities and often need such housing as smaller units in groups (i.e., multifamily configurations), typically calling for some type of common sewerage.

The under 18 age group is especially large in Mount Joy. Mount Pleasant and Straban figures reflect their agricultural orientation, with large families, as well as a recent influx of new households with younger children. Data for Cumberland and Gettysburg are complicated by the institutional (school) populations in both municipalities.

Table III-7. Age Characteristics of Study Area Total Municipalities, Adams County, and Pennsylvania 1970 (US-DOC 1972)

	Median Age	% Under 18	% 65 or Over
Cumberland Township	32.3	33.7	12.9
Gettysburg Borough	24.4	19.9	13.2
Mount Joy Township	24.6	40.6	7.7
Mount Pleasant Township	24.5	40.1	11.1
Straban Township	28.0	37.0	8.8
Adams County	26.8	35.3	10.1
Pennsylvania	30.7	32.6	10.8

Income information for the Total Municipalities is displayed in Table III-8. Borough data, with the exception of family median incomes, show incomes consistently lower than Adams County figures. This finding is compatible with age information but is complicated by the large student population, whose inclusion lowers the calculated incomes. The various categories of "below poverty level" incomes also are higher than the county in most municipalities. Relatively, Cumberland and Straban appear to be the wealthier of the municipalities.

Table III-8. 1969 Income characteristics for selected study area total municipalities and Adams County* (DOC 1973, Mount Joy Township is not included as data were tabulated with Union and Germany Townships by the Census)

	Cumberland Township	Gettysburg Borough	Mount Pleasant Township	Straban Township	Adams County
Family Income					
Median	10,000	9,451	8,167	9,063	8,821
Mean	11,327	-	-	9,596	12,337
Unrelated Individuals					
Median	3,871	1,503	1,469	1,971	1,770
Mean	5,666	2,540	2,847	3,337	4,346
Total Income					
Median	9,401	3,126	7,420	8,056	7,264
Mean	10,356	-	-	8,808	10,228
Percent of all Families Below Poverty Level	11.0	8.0	9.9	6.9	7.7
Percent of all Unrelated individuals Below Poverty Level	27.7	44.4	50.4	46.3	43.6
Percent of all Persons Below Poverty Level	9.4	14.2	11.5	8.1	10.5
Percent of all Households Below Poverty Level	12.6	18.1	16.4	9.7	12.8

Housing data (Appendix F-2) indicate that nearly the entire housing stock is year-round in nature. Even Lake Heritage, originally intended as a seasonal community, has rapidly evolved into a year-round community. Residences are primarily owner-occupied, except in Gettysburg Borough, where rental housing reflects the demands of a sizable student population.

A series of tables containing detailed information about social, income, and housing characteristics is included in Appendix F-2.

Economic Conditions

In the past century, Gettysburg Borough was the service and supply hub for the surrounding agricultural community and became the center of finance, business, and trade. More recently, the economy has diversified. Manufacturing has joined the earlier agriculture-related activities and is now the single largest sector of county employment. As the popularity of the archaeological and historic resources of Gettysburg has grown, tourism-related employment (generally considered to be service sector

employment) has also expanded considerably. Expansion of both the Lutheran Theological Seminary and Gettysburg College has brought a further, significant diversification. The role of the borough as county seat has also had a major economic impact: the new and larger courthouse facilities symbolize the considerable growth in government and professional services that the Borough now provides to the entire county.

These economic changes have been reflected in employment trends. Overall, there is a generally steady rise in the total employment base, though agricultural and manufacturing jobs have declined. The decline in basic manufacturing employment is particularly significant because there is a multiplier effect in other employment categories since each manufacturing job tends to support one to two non-manufacturing jobs. Appendix F-7 shows trends in the manufacturing sector of study area total municipalities.

Retail and commercial employment associated with tourism have been and currently are major sources of employment for study area residents. Over one-third of the retail trade and service firms are small businesses which rely heavily upon tourism, and approximately 25 percent of total gross receipts for services and merchandise have been directly attributable to tourist spending (DCA 1975). Trends in rates of visitation to the National Military Park (see Appendix F-3 for rates of visitation in the past ten years) suggest that tourism peaked in 1975 and 1976 during the Bicentennial celebration, and generally declined in the two years following. This decline predated the large 1979 decline (reported in recent Gettysburg Times articles to be approximately 50 percent), which appears to have been related to the increased price and scarcity of fuel. Though NPS itself assumes that visits will continue at about the two million per year level, continued modest declines in tourism can probably be anticipated in the near future, and may be accelerated by continuing price increases for gasoline and curtailment of supply. A decline in tourist activity will have serious effects on the study area economy.

Employment Projections

The decline in the general manufacturing industries, in agriculture, and in tourism-related services is expected to be balanced to some extent by continued growth in specific manufacturing industries (DCA 1972b). The net outcome for employment is expected to approximate existing employment levels. A steady employment force was assumed throughout the planning period of the EIS.

Municipal Revenues and Expenditures

The real estate tax is the largest local tax revenue for Gettysburg Borough and Straban Township. In Mount Joy and Mount Pleasant Townships, the earned income tax is the chief source of tax revenues. Cumberland Township derives more revenue from its amusement tax than from any other source, tax or non-tax (DCA 1970-1978). In the study area, reliance on the real estate tax as a revenue source has been decreasing since 1970 (DCA 1970-1978). With the exception of Mount Joy Township, all municipalities have increased the proportion of total revenues received from non-tax sources since 1970. Mount Joy followed this trend during the early 1970's, but since 1975 has decreased the proportion of non-tax revenues (DCA 1970-1978).

Public works is the largest category of operation and maintenance (O&M) expenditures for Study Area municipalities (DCA 1970-1978). The public works category includes sanitation, water and sewer,

and streets. In most cases, public works expenditures have been primarily for streets and highways. Mount Joy, Mount Pleasant, and Straban generally spend 50 to 80 percent of their O&M budget on public works (principally streets). Gettysburg Borough and Cumberland Township, each with a full-time police force, are the only two study area municipalities that make significant expenditures for public safety--approximately 33 and 20 percent of their respective O&M budgets (DCA 1978).

Capital expenditures for each of the municipalities have been reserved almost exclusively for streets and highways. Only Gettysburg Borough has consistently spent capital funds for public safety and for recreation, in addition to highways (DCA 1970-1978).

Housing

The decennial Census of Housing and Population is the basic source of information regarding housing characteristics in the study area. An analysis of these 1970 Census data has been performed by the Adams County Planning Commission in their Housing Study. The following discussion is based on this existing information to the maximum extent. Because the housing market situation does not appear to have changed significantly since the census data were prepared, the use of these 1970 data is reasonable at this time.

In 1970, the five study area total municipalities had a combined total of 5,628 housing units, of which 94 percent were occupied, leaving 6 percent of the housing stock vacant for one reason or another. Similarly, Adams County had a total vacancy rate of 6 percent. Mount Joy and Straban Townships had higher vacancy rates than the average, at 14 and 8 percent, respectively. Gettysburg Borough and Cumberland Township were lowest, at 4 percent each.

Vacant units for sale accounted for 0.7 percent of all units, and those for rent accounted for 1.5 percent of the total. In the total municipalities of the study area, the vacancy rate for sale housing was close to the standard suggested by the Regional Science Research Institute (1976), but for rental housing, the rate was considerably lower than the suggested standard.

For all occupied housing, the proportion of owner-occupied units in study area total municipalities is fairly typical of other Pennsylvania municipalities, with the exception of Gettysburg Borough. In 1970, all four of the townships had an owner-occupied/renter-occupied mix of approximately 80/20, while the County's average of all boroughs was 60/40. In contrast, Gettysburg Borough had a 40/60 mix, or a much larger percentage of renter-occupied units. This larger proportion of renter-occupied units, in conjunction with a very low (2 percent) vacancy rate for rental units, suggests a very popular, and very tight, rental market. The overall picture is one of a reasonable market for owner-occupied housing in the area, and a tight rental housing market.

Community Services

Schools--Residents of the Gettysburg Study Area are served by two public school districts: the Gettysburg Area School District (GASD) and the Littlestown Area School District (LASD). The GASD covers most of the study area, while the LASD serves Mount Pleasant and parts of the Lake Heritage area, and the Conewago Valley School District covers a small portion of Straban Township (School district budgets are included in Appendix F-8). Four elementary, one middle, and one high school are located within

the study area and are operated by the GASD. The study area also contains six non-public schools, all of which are in Gettysburg Borough. Gettysburg College and the Lutheran Theological Seminary, both in the Borough, complete the list of educational facilities within the study area.

The seven schools that make up the Gettysburg Area School District have a total rated capacity of 5,016 pupils (Department of Energy 1979). Enrollments during the 1970s have been stable, and projected enrollments are not expected to surpass 3,900 students (78 percent of capacity) during any school year through 1988 (GASD 1978).

The Littlestown Area School District, with a total capacity for 2,711 students, began the 1978-1979 school year with 1,969 enrolled, or 73 percent of total capacity. Enrollments district-wide have declined moderately since 1973 and are projected to decline through 1980. By 1983, the enrollments are expected to increase slightly to the 1975-1976 level of about 2,050 (LASD 1978b). No need for additional facilities is anticipated through 1985.

Police--Only Gettysburg Borough and Cumberland Township have full-time police staffs. The other study area municipalities utilize the State Police, who maintain a barracks along Rt. 116 in Cumberland Township. None of the three study area townships without police forces anticipates the hiring of professional staff in the near future. The Lake Heritage area receives protection from the State Police as well as from a small, private security force paid by the Property Owner's Association.

Given the rural nature, the moderate rate of growth, the various integrated systems of security, and local officials' satisfaction with existing systems and levels of service, police service in the study area can be considered adequate for the present and the near future.

Fire--As with police, only Gettysburg Borough and Cumberland Township have established fire companies serving study area residents. The Gettysburg Fire Company serves all of the Borough, about 75 percent of the residents of Cumberland Township, 50 percent of Straban's residents, 35 percent of Mount Joy, and 20 percent of Mount Pleasant. The Barlow Fire Company, of Cumberland Township, is located in the Township and serves the southern portion of that Township, and portions of Mount Joy and Mount Pleasant Townships. Two nearby boroughs, Bonneauville and Littlestown, have fire companies that serve the southern portion of the study area. All study area residents live within a three-mile radius of one of the fire companies described above. Other fire companies close enough to provide quick assistance in an emergency include Biglerville and Greenmont (Freedom Township).

Transportation--Gettysburg Borough is the hub of a transportation network from which roads radiate outward like the spokes of a wheel. These "spokes" consist of two major arterials (US 30 and US 15 Bypass), three minor arterials (PA 97, PA 116, and PA 34), and four collectors (Business Route 15, PA 134, LR 889, and LR 01006). Tourists, students and faculty, local merchants and businessmen, shoppers, truckers, and traffic passing through the study area form the major categories of highway system users.

Compared to typical highway capacities of 8,000 to 10,000 vehicles/day, the average daily volumes do not appear to be

heavy. However, common experience in the area shows serious peak traffic problems, especially when peak tourism flows result in severe congestion in Gettysburg itself.

The Gettysburg area is served by rail, but only for freight service. The Gettysburg Railroad provides service between Gettysburg and Mount Holly Springs (Cumberland County). The Western Maryland Railroad, which parallels Rt. 30, also serves the Gettysburg area.

There is limited public transportation in the study area. In addition to local tour buses, several charter buses connect Gettysburg with nearby cities, while Capitol Trailways, Greyhound, Clyde's, and Lincoln Bus Lines provide limited scheduled service.

Doersom Airport, west of Gettysburg, provides limited general aviation services to the Gettysburg area. The airport has 3,000 feet of paved runway and can be used only in fair weather. There are no scheduled commercial arrivals or departures; however, the airport is open to general aviation and charges no landing fee. Aircraft servicing is available.

Health Care--Adams County is in the South Central Pennsylvania Health Planning Region. Within this region, the study area is contained wholly within the Adams-Hanover Medical Service Area (MSA). Two hospitals in this MSA provide medical care to study area residents, the Annie M. Warner Hospital (Gettysburg) and Hanover General Hospital.

In view of the fact that national guidelines set 80 percent as the minimum occupancy rate standard for acute care hospitals in a region, and the existing hospital facilities (occupancy rate of 63.3 and 77.2 percent for the Warner Hospital and Hanover General Hospital, respectively) in the study area are currently used below their capacity, they appear to be capable of absorbing project population growth (Department of Housing 1977).

Solid Waste Disposal--study area residents are served by two private haulers which provide solid waste disposal service for a fee. Both of these contractors utilize landfills located outside of the study area. Adams Sanitation uses a landfill located in Tyrone Township, while Keystone Sanitation uses one in Union Township.

Residential service is provided at an individual cost of $3.00 per month for a weekly pickup of three twenty-gallon cans. All responsibilities for service, billing customers, purchasing equipment, and suitable disposal of refuse are borne by the contractors. In Gettysburg Borough, contractors must conform with the regulations of a Solid Waste Storage and Collection Ordinance. This ordinance was adopted to insure proper sanitary collection and disposal of solid waste within the Borough limits.

Utilities--Metropolitan Edison Electric Company and Adams Electric Cooperative, Inc. provide residents of the study area with electric power. Adams Electric does not generate its own electric power, but buys it wholesale from Metropolitan Edison or the Pennsylvania Electric Company, then distributes it.

Columbia Gas of Pennsylvania, Inc. is the sole source of pipeline gas energy in the study area, with 7,000 customers in Adams

County. According to corporate officials, Columbia is capable of serving a large number of new residential customers. Commercial and industrial accounts are also being accepted, subject to prior study of their usage requirements. The fluctuations in supplies or costs that occur seasonally are also related to market conditions (Estep 1979).

Public water is supplied to all residents of Gettysburg Borough, the Twin Oaks Development (Straban Township), and the Woodcrest Development (Cumberland Township) through the Gettysburg Municipal Authority (GMA). Marsh Creek is the primary source of GMA water, and is treated by a rapid flow filtration system. Secondary (back-up) sources include four wells owned by GMA, one of which is reserved for emergency use due to the hardness of its water. The GMA system includes 38.72 miles of water mains; two tanks provide storage capacities of 1,000,000 gallons and 500,000 gallons.

Lake Heritage Utilities, Inc. supplies public water to residents of the Lake Heritage community. It has 360,000 gallons per day of groundwater available. Approximately 300 customers in 1976 were served through this system, which is estimated to be able to serve 3,000 persons at 120 gpcd (GFCC 1976).

Sewerage facilities in the study area are discussed in detail in a later section. Appendix F-9 presents the water rates and sewer rates of Gettysburg Municipal Authority.

Recreation--The sole municipal recreation agency in the study area is the Gettysburg Area Recreation Department. It is staffed by a full-time director and about 30 part-time employees. The Borough's 1979 budget expenditure for recreation is $29,603. Other sources of funds for the Recreation Department's $60,000 annual budget include the Gettysburg Area School District and the Townships of Cumberland and Straban.

There is a year-round recreational program at the department's main facility, a 55-acre park located within the Borough. Gettysburg College tennis courts, playgrounds and gymnasiums of several elementary schools, the Junior and Senior High School gymnasiums, and several tot lots around the Borough are utilized also (DCA 1979).

Although their municipal park and recreation acreage is small when figured on a per capita basis, study area residents enjoy immediate access to over 3,700 acres of NPS land (Military Park, Eisenhower Farm, National Cemetery). With the inclusion of these lands, they benefit from ample public recreation and open space areas.

Library--The Adams County Library System consists of a central facility in Gettysburg Borough (80,000 volumes) and a branch at the East Berlin Community Library. There is also a Bookmobile that makes forty stops throughout the county in two-week cycles. The library is supported by County funds, United Fund contributions, and local municipal contributions (DCA 1979).

Archaeological and Historical Inventory

Background and Issues

The Gettysburg National Military Park and Gettysburg National Cemetery are two of the most significant historic properties currently under Federal control. These sites and the surrounding territory have inspirational meaning to the American public as

well as special scenic values that reflect the historic setting of the Battle of Gettysburg in the American Civil War. Gettysburg Borough and the surrounding area are unique because they retain almost one-half of the structures that were extant at the time of this battle, as well as uninterrupted vistas and landscapes similar to those in which the historic events at Gettysburg took place. Because of its aesthetic and historic integrity, much of the area surrounding the Gettysburg National Military Park and the Gettysburg National Cemetery has been designated as the Gettysburg Battlefield Historic District and listed on the National Register of Historic Places. Part of this Historic District is within the study area. The National Register and other lists, legislation, and regulations are described in Appendix G-1.

Evidence of the historic potential in Gettysburg may be seen in museums and collections of private citizens in the Gettysburg area. The numerous sites of skirmishes and temporary hospitals make the area extremely sensitive archaeologically; the effects of any action on potential historic archaeological remains should be a major concern. As Dr. John R. Earnst, Superintendent of the Gettysburg National Military Park, has indicated (1979), "The National Park Service is especially concerned both with potential direct effects of the proposed Facilities Plan on historic archaeological resources" within the National Military Park and also with "effects on lands that would be developed as a result of the availability of facilities constructed under the 201 plan."

For this study, review of the National Register of Historic Places (44 FR 26:7571) and monthly supplements provided a list of historic and archaeological sites of recognized national significance (see Appendix G-2). In order to identify additional resources that might be eligible for the National Register and that might be affected by the proposed Gettysburg wastewater facilities, other documentary sources were also consulted, including State and County cultural resource inventories. A visual survey of the area was conducted in order to locate significant sites that might be affected.

Another resource was a survey conducted earlier by Ms. Paula Stoner, a consultant retained by Historic Gettysburg-Adams County (HGAC), in compliance with historic preservation legislation. Stoner had surveyed historic sites and structures in Adams County as part of a statewide comprehensive survey of historic values; her evaluations of those sites that appear to satisfy eligibility criteria for inclusion in the National Register of Historic Places have been incorporated into the historic sites and structures inventory of this EIS.

Dr. Fred Kinsey also conducted a recent preliminary archaeological field reconnaissance of the proposed interceptor corridor that is adjacent to Rock Creek for the 201 Facility Plan, as required by the Pennsylvania SHPO. Only the area of potential primary impact on archaeological resources was surveyed (by phone, Mr. Vance Packard, Office of Historic Preservation, 1979). The results and recommendations of Kinsey's survey, and the NPS response to the survey methodology and findings will be addressed in the discussion of archaeological resources that follows.

It is the policy of the State Office of Historic Preservation not to disclose locations of archaeological sites in order to safeguard them. In accordance with this policy, archaeological sites

outside Federally protected lands will not be shown in the cultural resources inventory maps of this EIS. Nevertheless, the values of, and impacts on, these sites are addressed fully in the evaluation of alternative wastewater management systems.

Historic Sites

Prior to initiation of this EIS process, EPA and ACHP determined that the regional wastewater treatment facilities that were proposed in the 201 Facilities Plan for the study area would have adverse effects on the Gettysburg Battlefield Historic District. Consequently, as the Federal laws and regulations mentioned in the preceding section require, the potential impacts of proposed wastewater treatment facilities on the Historic District had to be considered.

The Gettysburg Battlefield Historic District (see Figure III-8), which is partly within the study area, encompasses Gettysburg National Military Park (including the site of the East Cavalry Battlefield), the Gettysburg National Cemetery and the Eisenhower National Historic Site, all owned by the Federal government and under jurisdiction of the NPS, plus the entire Gettysburg Borough. Although the Eisenhower Site is situated outside the EIS Study Area, it is included in this discussion as part of the Gettysburg Battlefield Historic District. In addition to the above-named areas, six sites and structures within this district are designated individually on the National Register of Historic Places (see Appendix G-3). A list of historic sites and structures in the Gettysburg Battlefield Historic District is included in the National Register nomination forms prepared for the district (on file at the Pennsylvania Historic and Museum Commission, Office of Historic Preservation [PHMC-OHP] and at the NPS in Gettysburg). Copies of the most recent forms available at the PHMC-OHP are provided in Appendix G-3.

A portion of Gettysburg Borough has been separately identified and certified by PHMC-OHP as the Gettysburg Borough Historic District under provisions of Pennsylvania Act 167 (see Appendix G-4). The present Gettysburg Borough Historic District plus areas proposed for inclusion therein as of 1978 are indicated in Figure III-8 (HGAC 1979; files).

Within this State-designated historic district, proposed development, alteration of existing structures, and demolition are subject to review and approval by the Pennsylvania Historical Architectural Review Board, although ultimate authority rests with the local governing body. In addition, as part of the Gettysburg Battlefield Historic District, the entire Borough of Gettysburg comes under the provisions of the Federal laws for the National Register of Historic Places, mentioned in the second paragraph of the preceding section; any proposed project that will be Federally funded, licensed, permitted, or sponsored is subject to their provisions. Historic site forms and photographs of each structure in the Gettysburg Borough Historic District are on file at HGAC in Gettysburg.

The Pennsylvania Inventory of Historic Places (PHMC 1979) in the study area lists twelve historic places, each of which is also listed on the National Register or located within National Register Historic Districts. The Pennsylvania Historic Architectural Review Board has determined these properties to be sufficiently important to Pennsylvania history to merit classification as State historic sites (see Appendix G-4).

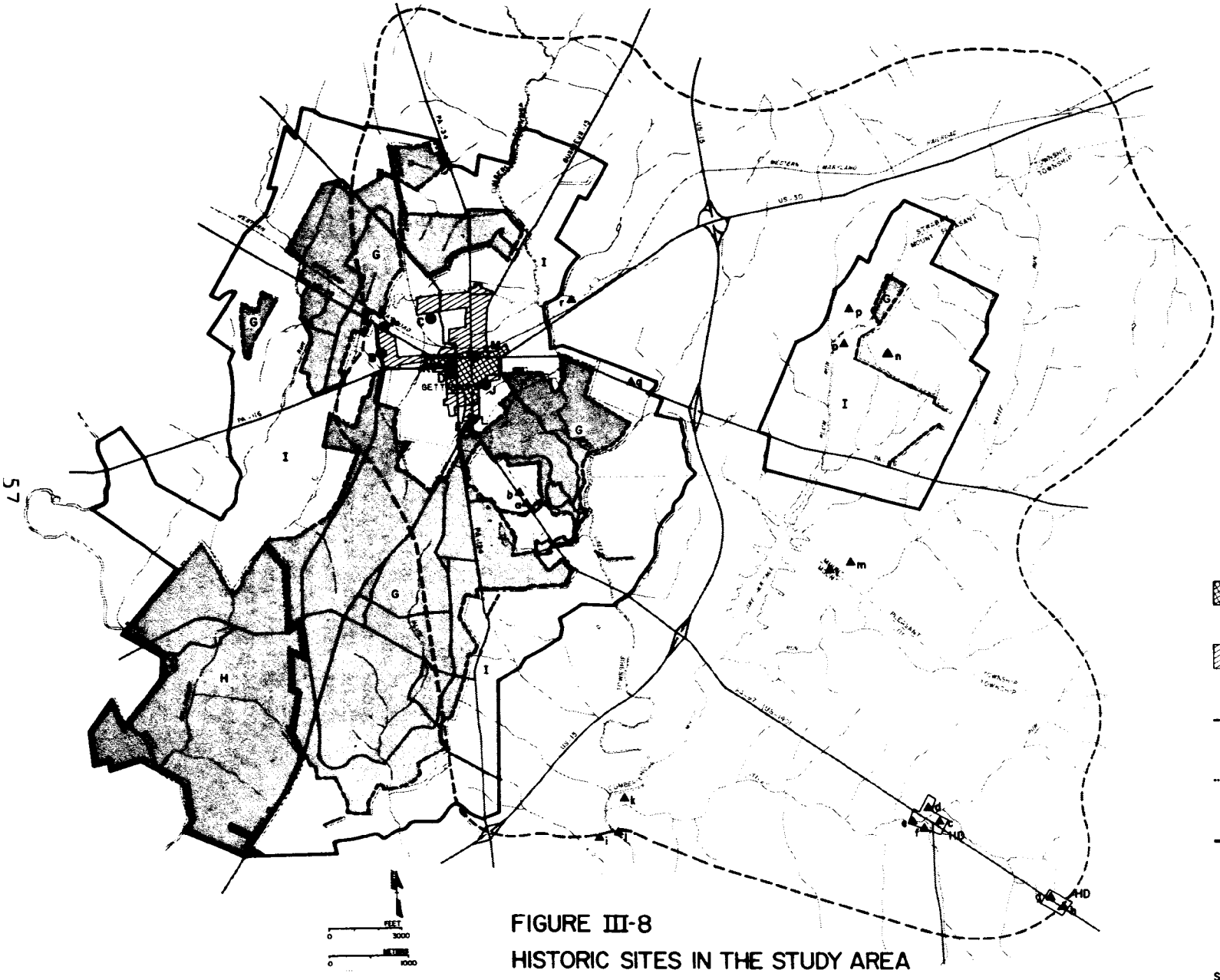


FIGURE III-8
HISTORIC SITES IN THE STUDY AREA

SOURCE: THOMAS HARRISON, NATIONAL PARK SERVICE, GETTYSBURG.

For her recent PHMC-funded Statewide historic sites and structures survey for HGAC, Stoner conducted a windshield survey of all historic structures and sites in Adams County. The approximately 3,000 historic sites and structures included on the resulting Adams County inventory range in date of construction from pre-1800 to ca 1925. Locations of the historic sites that Stoner identified in the study area are shown in Figure III-9.

Although the surveyed sites have not been nominated to the National Register yet, Stoner helped to make a preliminary evaluation of the sites in the study area for this EIS (Appendix G-5). A total of thirteen historic sites and structures in addition to structures in two potential historic districts in the study area appear to satisfy Criteria of Eligiblity for the National Register of Historic Places; these sites were photographed and included in the present inventory.

Archaeological Sites

The study area is rich in archaeological resources, both historic and prehistoric. However, a complete archaeological survey has not been conducted in the vicinity of Gettysburg, and recorded sites primarily consist of reports by local collectors and amateur archaeologists. During 1934, S.W. Frost reported that Indian relics representing at least seventy-five distinct sites had been collected from more than 200 farms in Adams County (1934:1). Frost mapped fourteen prehistoric sites adjacent to Rock Creek in Adams County. At present, PHMC files (May 1979) list four recorded prehistoric archaeological sites in the study area (see Appendix G-6). Because of the potential for vandalism, PHMC has requested that the locations of unprotected historic and prehistoric archaeological sites remain confidential.

In addition, numerous historic sites, such as Civil War temporary hospital and battle sites, occur throughout the study area and may contain buried historic archaeological material. These site locations are recorded by the NPS at Gettysburg National Military Park.

During GFCC's preparation of initial environmental studies in the study area, the Pennsylvania Office of Historic Preservation expressed concern for archaeological resources that might be disturbed or destroyed by the proposed project. Those resources were in areas that were determined to be the corridors of the main sewer interceptor and all branches of the interceptor (by telephone, Mr. Vance Packard, Associate Curator, April 3, 1979).

Accordingly, Dr. Fred Kinsey conducted a preliminary evaluative archaeological survey of the interceptor corridor during the facilities planning process, under subcontract to GFCC. Kinsey has now completed a preliminary assessment of the archaeological potential of part of the study area (the right-of-way of proposed construction), based on a literature review and "walking and driving reconnaissance" (Kinsey 1979a:1). Kinsey's work area is confined to the vicinity of Rock Creek within the study area, and his evaluations and recommendations are limited to a consideration of prehistoric archaeological resources. Kinsey's evaluations of the prehistoric archaeological potential for ten sections of the proposed interceptor corridor plus the treatment plant site are provided in Table III-9, which is keyed to Figure III-10. In the five sections where there was more than a low probability that archaeological resources exist, Kinsey recommends that additional surveys and investigation be made. Thus, a follow-up survey is recommended once the design of any proposed facilities is complete.

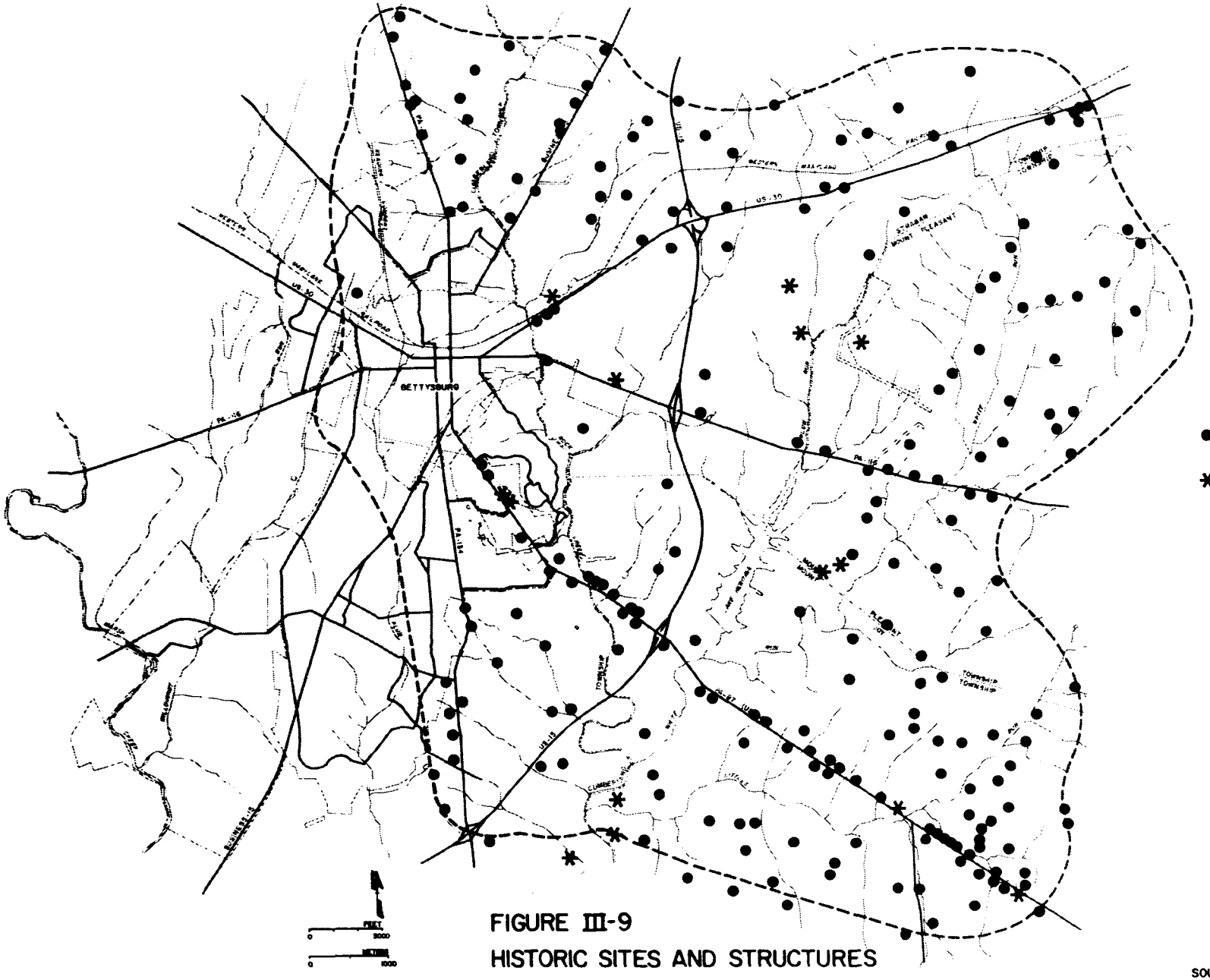


FIGURE III-9
HISTORIC SITES AND STRUCTURES
INVENTORIED IN THE STUDY AREA

SOURCE: PAULA STONER, HISTORIC GETTYSBURG-ADAMS COUNTY.

In addition, three sites are recorded as having high potential for prehistoric sites in the PHMC archaeological site files: site 36-AD-47, Barlow Knoll; site 36-AD-48, Wolf Hill; and site 36-AD-45, Harry Heck Rock Shelter. Kinsey considered these sites (Kinsey, 1979:5), however, he concluded that the proposed 201 Facilities Plan would have no adverse effect on prehistoric archaeological resources of Wolf Hill and Barlow Knoll. On the basis of his own 1958 evaluation he does not expect the latter to have major archaeological potential. (In accordance with PHMC's resolution to maintain confidentiality about prehistoric site locations, the locations of these three sites have not been included in Figure III-10.)

A substantial amount of additional information relating to both prehistoric and historic potential archaeological sites in the study area has been provided by the NPS at Gettysburg National Military Park.

Table III-9. Sections of interceptor corridor adjacent to Rock Creek.

Map Location	Archaeological Potential	Description
A	low**	Interceptor corridor adjacent to Barlow Knoll--primarily floodplain
B	low	Right-of-way between Rt. 15 and Rt. 30
C	moderate	Zinkand Pond
D	low	Right-of-way floodplain between Rt. 30 and Rt. 116
E	low	Interceptor corridor in the Beaver Hill and Culps Hill Areas
F	low	Spanglers Spring and interceptor corridor along Rt. 140 (This section is part of Gettysburg National Military Park)
G	moderate to high	Rock shelters in interceptor corridor north of Rt. 140
H	low to moderate	Wooded floodplain of right-of-way south of Rt. 140
I	low or moderate	Right-of-way northeast of Rt. 140
J	low	Right-of-way southwest of Rt. 140
K	low to moderate	STP site

SOURCE: Kinsey 1979.

* These results are illustrated on Figure III-10.
**No further investigation is recommended in six areas of low archaeological potential.

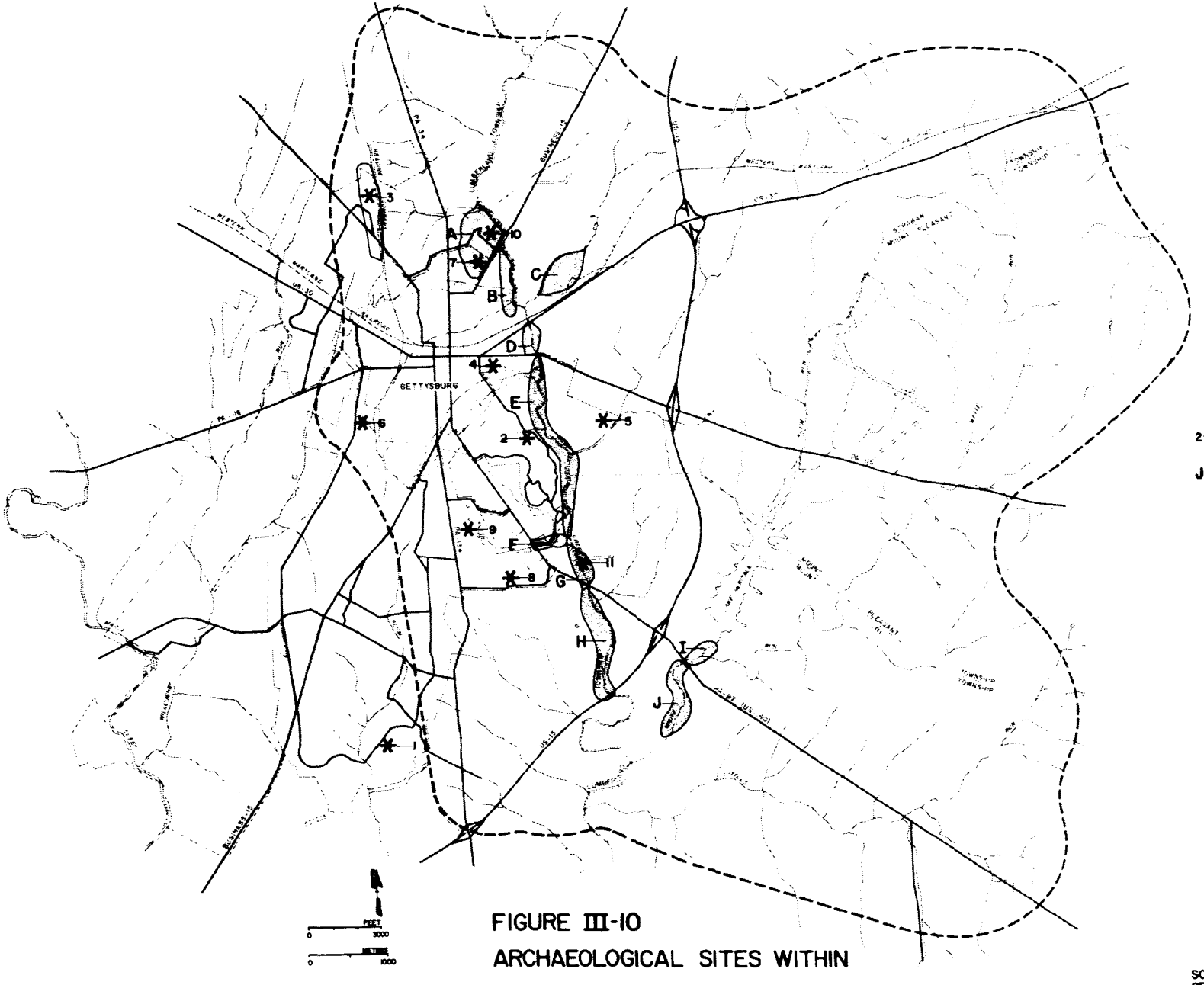


FIGURE III-10
ARCHAEOLOGICAL SITES WITHIN
FEDERAL HOLDINGS AND AREAS SURVEYED FOR
ARCHAEOLOGICAL RESOURCES BY KINSEY

SOURCE: THOMAS HARRISON, NATIONAL PARK SERVICE, GETTYSBURG. FRED KINSEY, 1979.

Another prehistoric site, 36-AD-49, was identified in PHMC records. Park Superintendent John Earnst stated his concerns in his comments to Dr. Kinsey about the findings of the preliminary evaluation of the archaeological potential in the study area. Earnst's concerns include the archaeological potential of lands that might be developed as a result of the availability of facilities constructed under the 201 Plan, (concern about indirect impacts of the project) and the numerous important historic archaeological sites that Kinsey did not consider.

A map of historic sites and structures, including hospital and cemetery sites in the study area, was prepared by Mr. Thomas Harrison, NPS historian. In accordance with the non-disclosure policy, this map is being used only in-house, to assess the potential impacts of interceptor, secondary conveyance line, and treatment plant construction on these sites. Figure III-10, which illustrates the results in Table III-10, also depicts archaeological sites Mr. Harrision identified that are within Federal holdings, or only the Gettysburg National Military Park and the Eisenhower

Table III-10. Archaeological sites on Federal Holdings in the Study Area*

Map Location	Registry	Description
1	NPS	Old Indian Field site
2	NPS	Third Bridge Stie
3	NPS	Indian trail along railroad tracks Indian Springs
4	NPS	Henry Culp Civil War Hospital site
5	NPS	Christian Benner Hospital
6	NPS	McMillan Hospital
7	NPS	Alme House Hospital Site
8	NPS	Granite School House Site, US Hospital
9	NPS	P. Frey US Hospital
10	NPS	Barlow Knoll Battlefield Site
11	NPS	McAllister farm and Mill Site, hospital, and underground railroad.

*These results are illustrated on Figure III-10.

National Historic Site. It is assumed that these sites are protected by NPS, under provisions of the Antiquities Act of 1906, and will not be subject to vandalism. The locations of other historic archaeological sites and structures (except established cemeteries and ground adjacent to standing historic

structures that may contain archaeological material) are shown in Figure III-9. A complete list of documented historic and prehistoric archaeological sites in the study area is contained in Appendix G-6.

Superintendent Earnst suggests six specific areas where additional investigations should be conducted to determine the presence or absence of potential historical archaeological remains (Earnst 1979:23; Appendix G-6). Like Kinsey, Earnst recommended archaeological reconnaissance of the proposed treatment plant site. He also suggested that each known hospital site be investigated in order to determine whether artifacts and burials are present. If artifacts and burials indicate the need, such studies will be recommended before constructing any proposed action.

Potential indirect effects that are related to any wastewater facilities on known historic and prehistoric archaeological sites will be considered, when areas of induced growth have been determined (see Chapter V). EPA Region III and the SHPO will then assess the need for archaeological field surveys of areas where potential development threatens these values.

Aesthetic Values

What is or is not an aesthetically pleasing view is a matter of individual perception. Frequently, it is assumed that alteration of a natural landscape is aesthetically undesirable, but this is not always the case. Today a colonial village that once intruded on the natural landscape but has retained its original character is usually considered "quaint," a desirable configuration on the landscape and all the more pleasing when it is compared with many other intrusions that have altered American natural landscapes significantly in the 19th and 20th centuries. Historically, settlement patterns have been shaped by topography, water supply, transportation routes, sources of raw materials, and soils.

The unique character of a settlement has developed in response to the needs of its inhabitants throughout changing economies. Now, however, modern technology has made it possible to build on many landforms that were formerly uninhabitable, and large-scale development can often proceed without concessions to topography, natural landscape, or cultural context. Obvious incompatibilities emerge. Often, contemporary configurations reflect a mixture of current development patterns with those of earlier periods. Unfortunately, much 20th century development has been mass-produced, without regard for the natural landscape; this type of production has resulted in a "sameness" that has destroyed the unique qualities of towns and villages.

The value of these sites was recognized when the area surrounding Gettysburg National Military Park--including the Eisenhower National Historic Site and the Gettysburg National Cemetery--was officially designated as an aesthetic/historic district, the "Gettysburg Battlefield Historic District." By designating this district to the National Register of Historic Places, several laws pertaining to historic preservation and Federally sponsored projects were extended to these sites. (Private development, however, is exempt from these provisions, unless there is some Federal involvement.)

The Advisory Council Procedures for the Protection of Historic and Cultural Properties includes among the definitions of adverse effects on historic places the "introduction of visual, audible, or atmospheric elements that are out of character with the pro-

perty or alter its setting," or activities that create "isolation from or alteration of its surrounding environment" (36 CFR 800, as amended, implementing the National Historic Preservation Act of 1966).

It is the alteration of the surrounding environment that is of paramount concern in assessing the probable aesthetic effects of the proposed wastewater treatment facilities. For the present project, effects on the larger Gettysburg Battlefield Historic District and the Eisenhower Site must be considered, as well as effects on the National Military Park itself because the scenic quality of the surrounding landscape is important to the aesthetic/historic integrity of the historic district. Because the natural and historic man-made beauty of the district and its setting have remained virtually intact, "adverse impacts" of any proposed Federal project would include not only primary (direct) impacts but also secondary (indirect) impacts that might alter the scenic quality of the landscape surrounding the Gettysburg Battlefield Historic District. Secondary impacts, in this case, are created primarily by the development that accompanies wastewater treatment facilities.

Potential effects may be beneficial as well as adverse, and may be direct (related to construction of a project or its alternative) or indirect (related to induced population growth and land development). Adverse impacts would include those that might alter the landscape in a way that would disturb views from the historic district as well as from prominent vantage points within the National Military Park, the National Cemetery, and the Eisenhower Site. Therefore, it was decided to inventory views from the periphery of, and from strategic locations within, the Gettysburg Battlefield Historic District. This inventory was in order to assess the scenic quality of the setting so that the potential aesthetic effects--both beneficial and adverse -- of any proposed action could be evaluated.

For this EIS, land uses depicted on the inventory of scenic views in the Gettysburg area (see Appendix G-7) have been classified as "compatible" or "incompatible" with the historic/aesthetic integrity of the Gettysburg Battlefield Historic District. "Compatible" land use conforms to the historical pattern of development, as well as to the natural landforms in the area. Intrusive, discordant, or monotonous development patterns that occur without consideration for the natural landscape or a sense of historical appropriateness are considered "incompatible." Within each of these two major categories, scenic views from the Gettysburg Battlefield Historic District were classified by land use (Figure III-11).

In order to assess the relative qualitative value of the scenic views associated with the Gettysburg Battlefield Historic District, judgments must be made about the type and quality of existing views. Subsequent to these judgments are decisions about the extent to which these views may be affected by growth and development related to proposed wastewater treatment facilities. While these judgments rely on perception of aesthetic quality and are, to a degree, subjective, criteria can be developed to evaluate aesthetics and scenic views in a orderly, disciplined manner. In the present case, these criteria are related to the existing land use and to the "sense of place" that has evolved since colonial times.

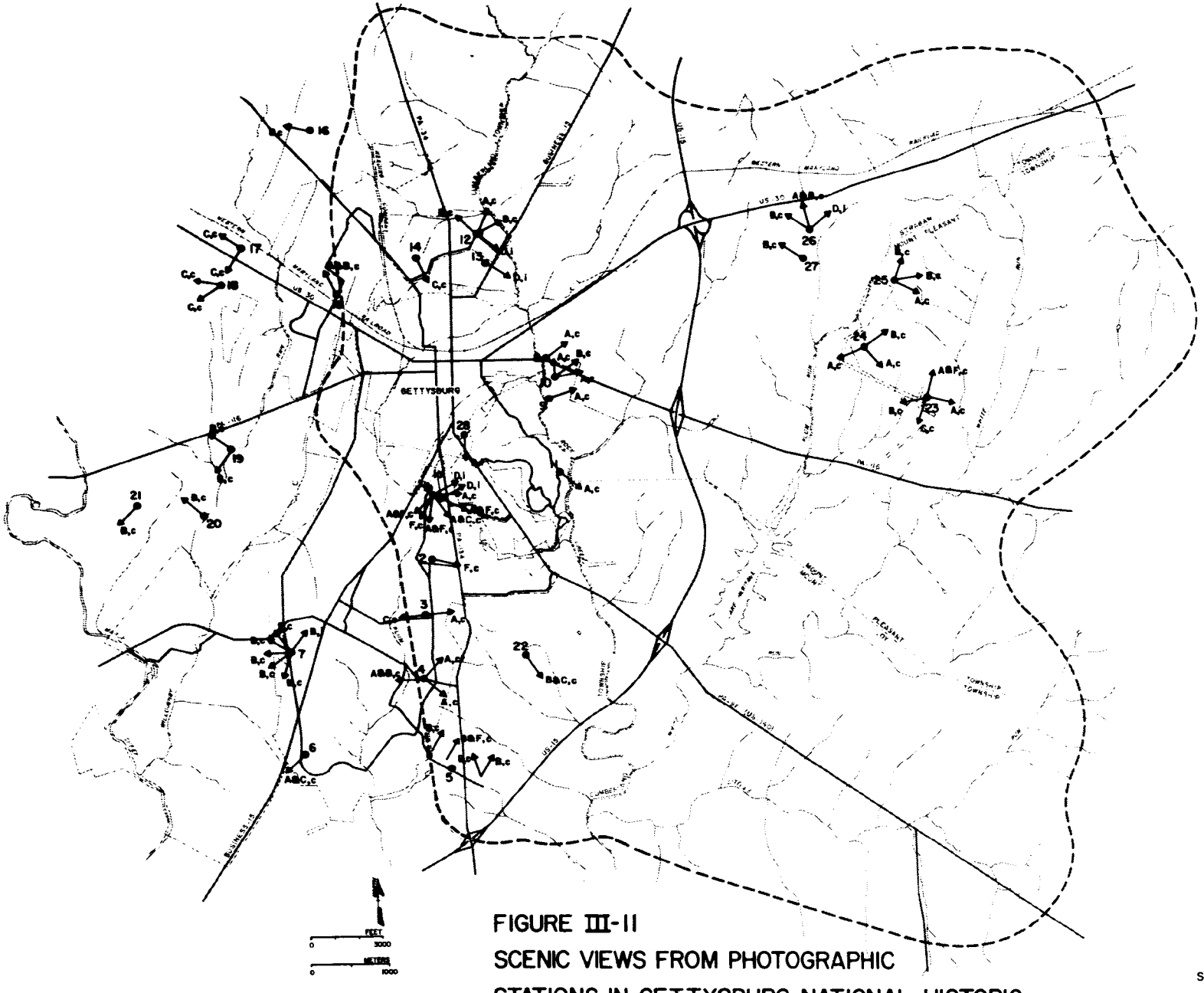


FIGURE III-11
SCENIC VIEWS FROM PHOTOGRAPHIC STATIONS IN GETTYSBURG NATIONAL HISTORIC DISTRICT, JUNE, 1979

SOURCE: FIELD SURVEY

We have reviewed these scenic views further, and have evaluated them on the following scale:

1 highest quality
2 scenic
3 moderate aesthetic quality
4 poor quality view.

These ratings are listed in Appendix G-7. With relatively few exceptions, the views are quite good; 76 percent of the views are of grade 1 or 2, while only 8 percent are grade 4, or "poor quality." These percentages cannot be applied precisely in evaluating the scenic quality of the area; however, they do show that most areas have been fairly well preserved and have not been spoiled.

The development of the aesthetic inventory is also described in Appendix G-7. No views were taken looking into the Gettysburg National Military Park because we expected that the major effects on the scenic and historic integrity of the Historic District and surrounding area would stem from intrusions on lands outside Federal jurisdiction. Typical examples in each grade assigned to the photographed views are offered in Appendix G-7.

Existing Wastewater Management Facilities

Presently, there are four sewage treatment plants operating in the Gettysburg Study Area. They are Cumberland STP, Gettysburg STP, Schaff Trailer Park Package Plant, and Lake Heritage Package Plant. Figure III-12 shows the locations of these facilities and the associated serviced/sewered area(s).

The areas served by Cumberland STP and Gettysburg STP are presently sewered. The sewage from Schaff Trailer Park is collected and treated by the small package plant. Lake Heritage area is served by holding tanks and septic tanks. The sewage from holding tanks is pumped periodically and transported to the package plant for treatment. Other communities within the study area are using septic tanks for wastewater disposal. The following sections describe the collection and conveyance system, the wastewater flows, and treatment and sludge disposal facilities at each of these plants as well as the on-site septic systems.

Cumberland STP

The sewered area extends along PA 34 from the junction with LR 1006 to North Avenue, then along LR 1006 to TR 341. The sewers, constructed of vitrified clay in 1965, consist of 16,700 feet of 8-inch pipe, exclusive of house connections.

Flow to the plant through these sewers averaged approximately 57,000 gpd during the period from January 1978 to April 1979. The significant amount of infiltration/inflow (I/I) has been the subject of extensive study by Cumberland Township because peak flows much higher than the plant capacity often lead to overflows of raw sewage from the sewer system. Additional evidence of the I/I in the sewers can be seen from the raw sewage characteristics at the plant. From January 1978 to February 1979, the BOD_5 and total suspended solids (TSS) concentrations of the plant influent averaged 116 mg/l and 142 mg/l, respectively--a strong indication of weak sewage, presumably resulting from dilution of the sanitary flow with unpolluted water.

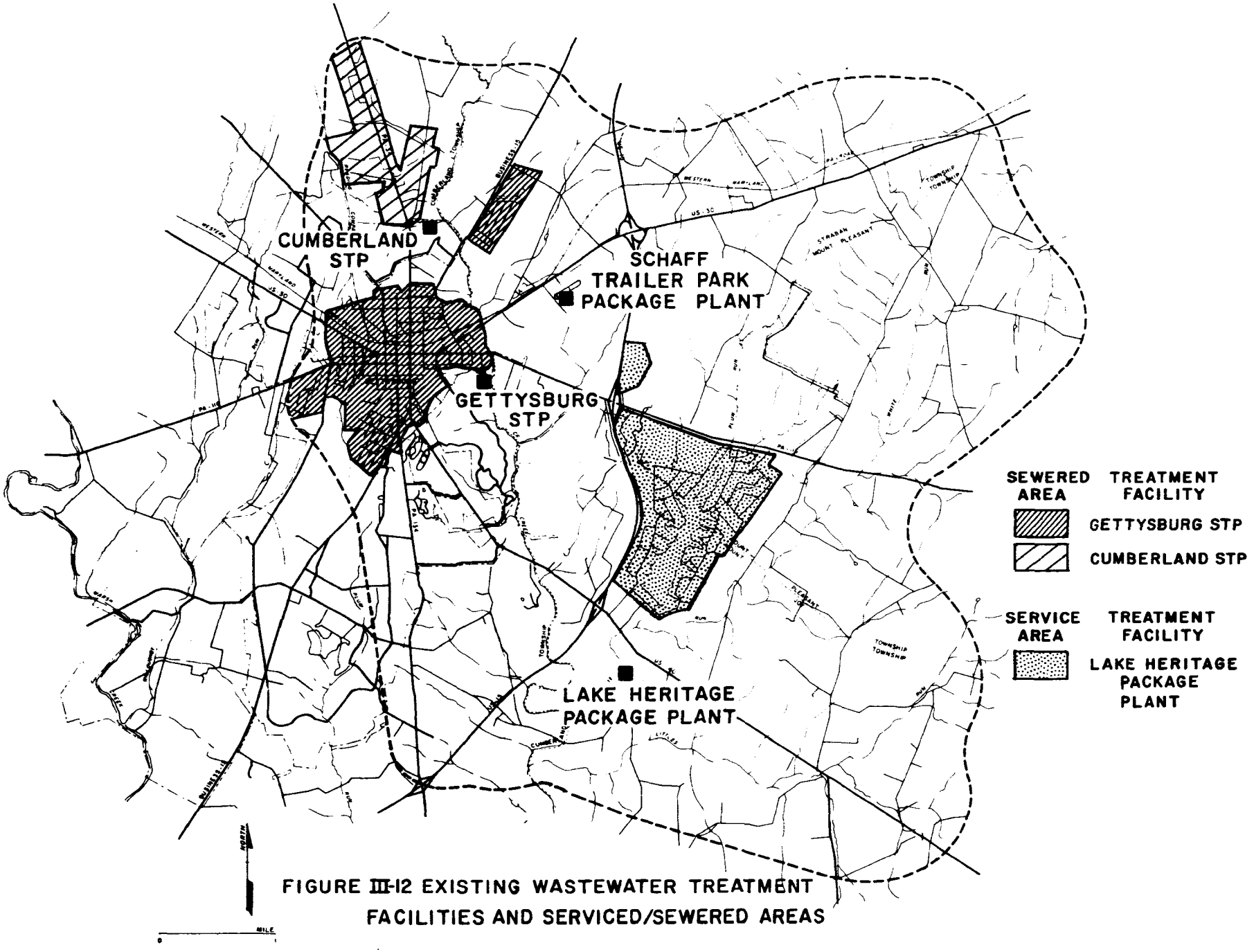


FIGURE III-12 EXISTING WASTEWATER TREATMENT FACILITIES AND SERVICED/SEWERED AREAS

Repeated I/I studies by Buchart-Horn, Inc. in 1975 and 1979 have concluded that inflow (due to illegal connections to-or-with stormwater), rather than infiltration (attributable to defective manholes and sewer joints), is the major problem in the sewer system. The peak flow was estimated at 592,000 gpd, nearly ten times the estimated average flow. The reports by Buchart-Horn also indicated that the removal of most I/I and the rehabilitation of sewers would be more cost-effective than providing excess treatment capacity at the plant (Buchart-Horn 1976). The costs to correct the I/I problem were estimated as follows:

- to eliminate 10 percent of the I/I--no cost (privately owned)
- To eliminate 80 percent of the I/I--$6,500
- to eliminate 94 percent of the I/I--$15,500
- to eliminate over 99 percent of the I/I--$94,550

One industrial wastewater pretreatment facility exists in Cumberland Township. The Meadow Valley Abattoir uses a holding tank to partoa;;u clarify the wastewaters generated at the plant. Pretreated effluent is then discharged to the Cumberland Township sewers and conveyed, together with domestic sewage, to the North Plant.

Wastewater influent to the North Plant passes first through a comminutor, in which large solids are ground, then to either of two aeration tanks. In the extended aeration process, wastewater is retained in the aeration tank for 24 hours in order to permit the degradation of pollutants. The liquid is then clarified and chlorinated, and the disinfected effluent passes through a sand filter before it is discharged to Rock Creek. For the period from January 1978 to February 1979, the average efficiency of removal was 91 percent for BOD and 92 percent for TSS. Such treatment efficiency is above average for the extended aeration process and reflects the care with which the plant is operated.

The North Plant is an outstanding example of a well-maintained and operated wastewater treatment facility. Besides the good housekeeping that was evident throughout the grounds, the process equipment and tanks were neat and clean. Attention to operation was apparent not only on the basis of records, but more importantly, from the clarity of the effluent from settling tanks, even before sand filtration. The sand beds themselves showed similar evidence of good housekeeping.

Given the present operating efficiency and attention to maintenance, Cumberland North is suitable for future use throughout the design period of this EIS. If I/I were controlled, it appears that the plant would have sufficient capacity for flows from existing housing. Expansion, if it should become necessary, would then be only for future growth, and land is available near the plant for such an expansion. If the plant were to be retained/expanded the new effluent standards would be more restrictive: 15 mg/l of BOD, 15 mg/l of TSS, 0.5 mg/l of phosphorus (as P) and, in the summer, not more than 3 mg/l of ammonia nitrogen. The plant has the potential to be upgraded to meet these standards.

Sludge from the North Plant currently is dried in drying beds and hauled to agricultural sites. This procedure is not expected to change if the plant is upgraded or expanded.

Gettysburg STP

Gravity sewers serve the entire Borough of Gettysburg. In addition, both the Twin Oaks section of Straban Township and the Woodcrest Development in Cumberland Township discharge their wastewater to the Gettysburg system. The Gettysburg sewer system contains approximately 131,000 feet of 6-inch to 20-inch gravity sewers, exclusive of house connections. A detailed discussion of the systems can be found in the GFCC Facility Plan.

In the latter part of 1973, GFCC examined the sewers and concluded that the average flow was 1.85 mgd and that sanitary sewage contributed 0.87 mgd of the flow; I/I, the remainder. For the period from November 1977 to June 1979, flows through these sewers averaged 1.06 mgd; the reduction since 1973 has been attributed (Alberts 1979) to a borough program of removing inflow (and some infiltration) from the system. However, a calibration of the flow meter indicated that the meter was in error. The corrected flow of 1.3 mgd still appears to be well below the 1973 values.

From November 1978 to June 1979, the BOD_5 in the raw wastewater averaged 139 mg/l, the TSS averaged 110 mg/l. Both of these values are typical of weak wastewater. Because the weak values presumably result from dilution of the wastewater with unpolluted water, they provide additional evidence of I/I in the sewers. There are overflow points in the sewer system, which discharge during periods of high rainfall. These overflows are the result of excessive inflow. At this time, the GMA is undertaking a Step 2 survey of the facilities; they are using televisions and other techniques to inspect the sewers. Repairs that are scheduled in 1980 are expected to reduce I/I to EPA recommendations.

There is one industrial wastewater treatment (or pretreatment) facility in the Gettysburg sewer service area. The Gettysburg Times' printing plant adds chemicals to remove silver from the wastewater that is generated by its operations, and the pretreated wastewater is then discharged to the Gettysburg sewers for conveyance to the Gettysburg plant.

Additions and alterations to accommodate growth have been made to the Gettysburg plant, constructed in 1895. The plant was last upgraded in 1952, when it was expanded to its present status. The first sewers serving the plant were constructed about 1890; they have been modified and extended often since then. The plant employs a comminutor, primary clarifiers, trickling filters, secondary clarifiers, and disinfection. Sludges from the primary and secondary clarifiers are digested anaerobically, dried on sand beds, and applied to farmland.

The Gettysburg plant, although old, is fairly well maintained and operated. An existing raw sewage bypass at the head of the plant is used frequently, but the most serious operating problems are related to inadequate settling in the clarifiers, and the absence of a parallel flow stream for the trickling filters. In the clarifiers, solids that should be trapped and collected escape either to the trickling filters or to the plant effluent, depending upon the type of clarifier. As a result, treatment efficiency is impaired and effluent standards are frequently not met. For the period from November 1978 to June 1979, the average efficiency of removal was 72 percent for BOD and 74 percent for TSS, which is below average for the trickling filter process.

Structurally, the plant facilities appear to be sound. Although some components, such as the chlorine contact tank, may require

extensive reworking, in general the plant is suitable for future use. However, because the plant cannot presently meet current effluent standards, upgrading will be necessary. The Gettysburg plant has been required by PA-DER to discharge an effluent containing not more than 15 mg/l of BOD_5 and 15 mg/l of TSS. In addition, the effluent may not contain more than 0.5 mg/l of phosphorus (P) and, in the summer, not more than 3 mg/l of ammonia nitrogen (NH_3N). Furthermore, the 1973 I/I study indicated that the plant is hydraulically overloaded, which also makes expansion necessary.

Sludge from Gettysburg is currently dried in drying beds (under glass) and hauled to agricultural sites. This procedure is expected to continue no matter which alternative is chosen, although alternative sludge handling facilities may be desirable, particularly to allow the existing drying bed space to be used for other treatment processes.

Lake Heritage Package Plant

At present, the Lake Heritage Community has no sewers. Of approximately 280 dwellings, 126 discharge their pumped by trucks that are owned and operated by the LHMA. The remaining homes are on septic systems or sand mounds. Drummer Boy Campground also uses a large holding tank, which is emptied by LHMA.

On the basis of limited data (last quarter, 1978) the Lake Heritage Plant treated an average of approximately 11,600 gpd. Flows ranged from as low as 5,000 gpd to as high as 15,000 gpd. None of the flow stemmed from I/I because there are no sewers to allow such extraneous flows.

Finally, a new development is being built near the treatment plant. This development, Hillcrest Subdivision, currently has three homes but is planned and already sewered for 37 homes. These sewers are connected to the LHMA plant. A part of this system is used, in conjunction with a large receiving tank, to transmit sewage from the collector truck to the treatment plant.

The Lake Heritage treatment facility is a small package plant that was purchased used. It operated on the extended aeration principle and has a design capacity of 30,000 gpd. Although maintenance at the Lake Heritage plant could be improved, the plant effluent appeared to be clear and odor-free. There are no data available on which to base a discussion of raw wastewater characteristics, both BOD and TSS in the effluent were well within the requirements of the discharge permit.

With proper maintenance, the Lake Heritage plant may be expected to continue operating for some time. However, it is questionable whether the facility will last for the 20-year design period of the EIS.

Although the Lake Heritage facility was not designed to be upgraded, expansion of the facility appears to be feasible; additional treatment units would be necessary to achieve such an expansion.

Digested sludge from Lake Heritage is hauled to agricultural sites. This procedure is expected to continue if the plant is retained.

Schaff's Trailer Park Package Plant

The sewers serving Schaff's, constructed in 1974 of terracota and plastic, consist of 4,000 feet of 6-inch pipe. Approximately 125 residences (mobile homes) are served by the system.

During the period from April 1978 to September 1978, flows through these sewers averaged 11,700 gpd. The condition of the sewers is unknown, but wastewater quality data indicate that some I/I may be present.

From May 1978 to May 1979, the BOD_5 in the raw wastewater averaged 184 mg/l; TSS averaged 152 mg/l. The lowest values reported for BOD_5 and TSS during this period were 90 mg/l and 64 mg/l, respectively; these values are evidence of diluted wastewater and indicate inflow. By comparison, the maximum values reported for BOD_5 and TSS for the period were 300 mg/l and 275 mg/l, respectively. The maximum values are typical of concentrated wastewater and may have represented a period when no I/I was present.

The treatment facilities at Schaff's Trailer Park consist of a small extended aeration plant, followed by sand beds to provide additional removal of BOD_5 and TSS. Maintenance at the site appeared to be good, although the sand beds needed leveling. Treated effluent was channelled through the beds, rather than being evenly distributed across them. The plant effluent appeared to be clear and free of odors, and no odors were detected anywhere at the site.

With proper maintenance, the Schaff's Plant may be expected to continue operating for some time. However, it is questionable whether the facility will last for the 20-year design period of the EIS.

Although the Schaff's Plant was not designed to be upgraded, expansion of the facility appears to be feasible; additional treatment units would be necessary to achieve such expansion.

Digested sludge from Schaff's is hauled to agricultural sites. This procedure is expected to continue if the plant is retained.

On-Site Wastewater Disposal Systems

Not all residences within the Study Area are serviced by one of the wastewater collection and treatment systems described previously. Instead, some method of on-site wastewater disposal is used, including conventional septic tank-soil absorption systems (ST/SASs), and various alternative methods, such as sand-lined systems, elevated sand mounds, and holding tanks.

Generally, the soils within the study area are not suitable for conventional septic systems. High levels of groundwater and bedrock, and/or poor soil permeability are soil characteristics in virtually all of the study area. Most documented problems of on-site disposal systems are recorded by the Sewage Enforcement Officers (SEO) as they inspect and permit on-site wastewater systems.

The SEO program has been in operation for ten years; the program has concentrated on new systems and the correction of known failures. Therefore, there is relatively little documentation of current problems, although some evaluation has been done in areas on Rt. 30 and Rt. 97.

During the EIS process, public concerns (in terms of needs documentation to confirm or deny the need for sewer service in certain areas) were raised. As a result, a survey of on-site sanitary facilities in the study area was conducted during this EIS. A comprehensive report of the survey is included in Appendix I-1. Only the salient features of the survey and a summary of the results are presented in the following paragraphs.

For analytical purposes, major population concentrations were divided into a series of "segments" (as shown in Figure III-13). Segments 1, 2, and 3 are sewered and are served by the Gettysburg and Cumberland STPs. Segments 4 through 20 are not sewered presently.

Segments 4, 12, 15, 16, and 18 were considered for sewering in the GFCC Facilities Plan and were included in this sanitary survey to document their needs for improved sanitary facilities. Segment 17 was included in the survey because of the significant growth that is projected to occur in the segment. The outer segments, 5, 6, and 13, were marginal in terms of their potential need for sewer service and were surveyed at a reduced level of effort. Segment 19 does not have any current development and Segment 20 does not have permanent residents at the present time; therefore, Segments 19 and 20 were not included in the survey. The surveyed segments (4, 5, 6, 12, 13, 14, 15, 16, 17, and 18) are shown in Figure III-14.

The survey team attempted to visit each home or business in Segments 4, 12, 14, 15, 16, 17, and 18, but they attempted to visit only 25 percent of the homes in Segments 5, 6, and 13. On some occasions, residents were not at home or did not wish to cooperate, so it was not possible to obtain information on all wells and on-site systems. However, the survey team was able to obtain a representative sample in all segments; information was obtained for approximately 60 percent of the residences in Segments 4, 12, 15, 16, 17, and 18, and on selected streams and springs. It should be noted that the majority of persons contacted cooperated fully in the study.

The large majority of on-site systems in the study area are septic systems with drain fields or seepage pits. Twelve percent of the systems have wet drainfields or surfacing effluent. About 26 percent of the systems have illegal greywater separation, where laundry and kitchen sink wastewaters are discharged untreated to a roadside ditch, backyard corner, or nearby woods. In most cases, residents with illegal greywater systems do not know that such systems are considered as violations of PA-DER's regulations. In cases where lots are too small, the wet drainfields and separate greywater systems may not be subject to on-site correction, except by use of holding tanks.

For individual segments, the number of on-site system malfunctions, as a percentage of the number of homes surveyed in the segment, decreases as follows: Segments 4, 16, 17, 12, 14, 15, 18, 6, 5, and 13. Segment 4 not only has the largest percent of malfunction but also has the largest number of malfunctions and the largest number of malfunctions on small lots. Thus, Segment 4 is the top ranking segment in terms of severity of on-site systems malfunctions; this result is consistent with the PA-DER's past concern with the segment. Therefore, it is believed that need for improvement is well demonstrated in Segment 4. Segment 17 has the smallest number of malfunctions.

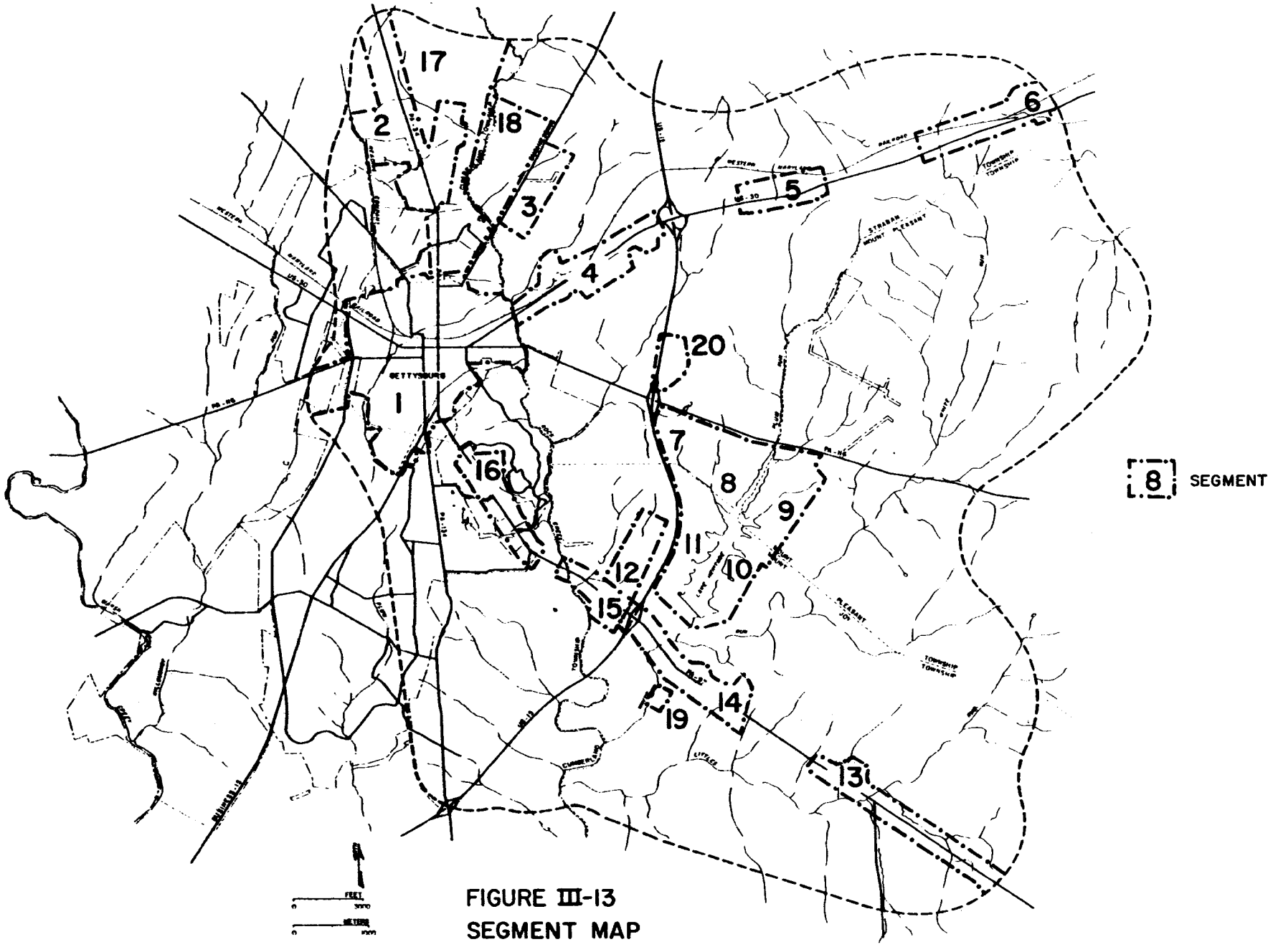


FIGURE III-13
SEGMENT MAP

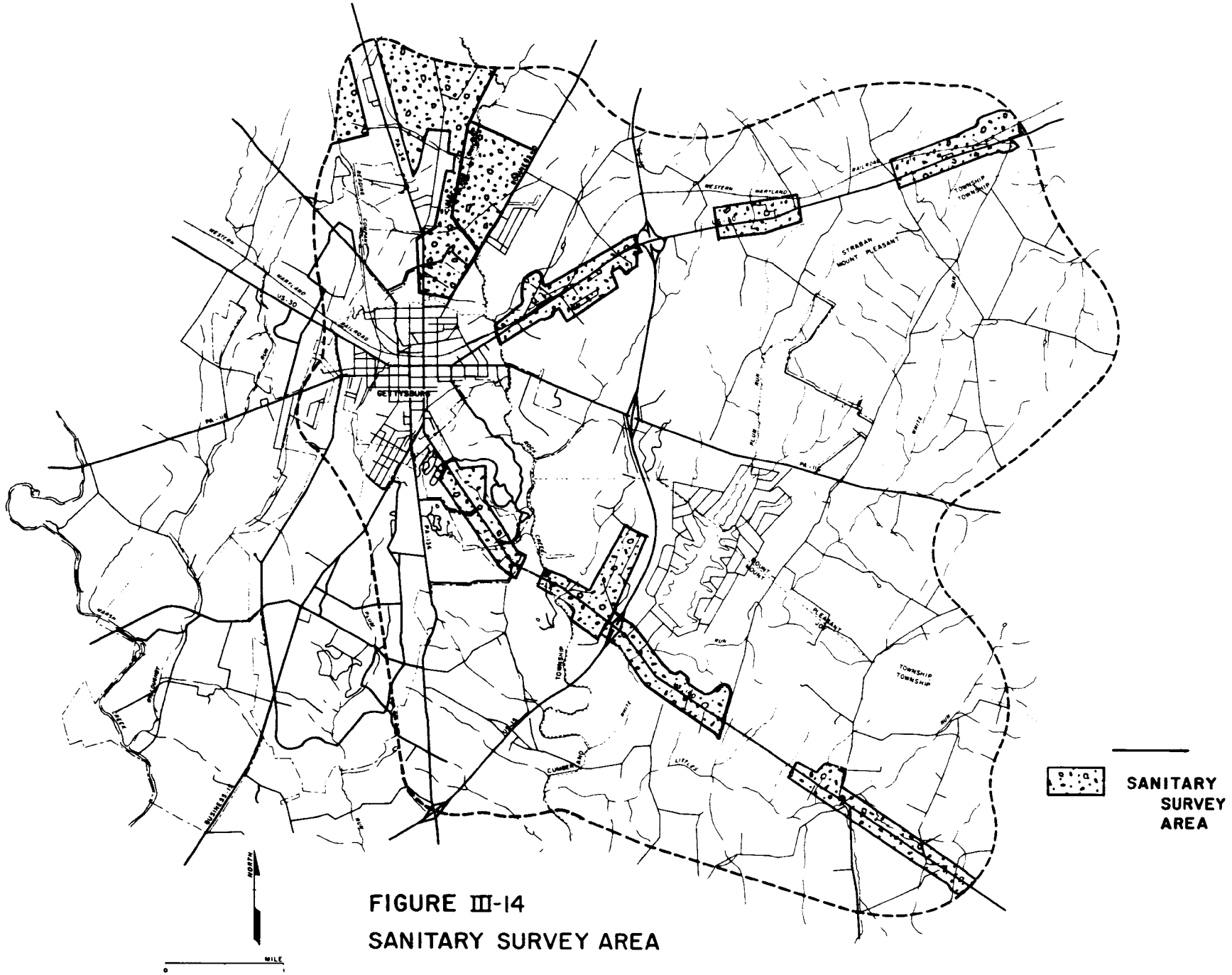


FIGURE III-14
SANITARY SURVEY AREA

Of the wells sampled, 45 percent exceed the total coliform standard for drinking water; 16 percent exceed the fecal coliform standard; and only 3 percent have nitrate concentrations in excess of 10 mg/l. None of these high nitrate levels is considered to be high enough to cause clinically significant health impacts. The existing evidence does not allow us to identify precisely the source(s) of the bacterial contamination (coliform levels) found in wells. The high bacterial levels may be due to either surface (or near surface) water contamination of wells or to poorly operating on-site sewage disposal systems.

CHAPTER IV

Alternatives for Wastewater Management

CHAPTER IV. ALTERNATIVES FOR WASTEWATER MANAGEMENT

Introduction

Much of the preparation for this EIS involved developing, screening, and costing a set of wastewater management alternatives for the Gettysburg area. These alternatives address (and where possible seek to eliminate) water pollution problems in the planning area. The alternatives also minimize the cost of wastewater management to residents and their communities and the impact on Gettysburg's cultural resources.

Development and Screening Process for Wastewater Management Alternatives

The method used to develop and examine these alternatives is outlined in Figure IV-1. The first step in developing the alternatives was to document the extent of need for improved wastewater management. To make this a more manageable task, the planning area was broken into 20 subareas or segments (see Figure III-13) shortly after the documentation began. Then three aspects of need were examined for each segment: the problems with existing wastewater systems (and wells), constraints upon the continued use of the systems, and the needs that were likely to arise during the planning period.

To identify the problems with existing systems, EPA used information presented in the Facilities Plan, searched local SEO files for records of malfunctioning septic systems and for records of lots that had been found unacceptable for on-site systems, conducted a sanitary survey of area wells and septic systems, and visited and evaluated the STP's in the planning area.

The constraints upon continued use of the existing systems were also identified. PA-DER has published effluent discharge limitations (see Table III-3) that area STP's must meet, as well as general regulations regarding wastewater treatment (Title 25, Part 1, Subpart C, Article II, Chapter 95). PA-DER has also published regulations regarding use of on-site systems (Title 25, Part 1, Subpart C, Article I, Chapter 73); the feasibility of on-site systems was evaluated, according to PA-DER regulations, by examining area soils, geology, topography, lot sizes, and population densities.

Finally, EPA examined the need for wastewater management that was likely to arise during the planning period by making estimates. How many existing systems might fail during the planning period was estimated, along with estimates of the community growth that was likely to occur in each segment during the period.

After the needs were documented, the EIS service area was determined by identifying the segments that should be addressed in the wastewater management alternatives for the planning area. Then wastewater management options for these segments were identified. To avoid an unmanageable number of alternatives, segments were grouped based on the logical locations for wastewater collection and treatment facilities. Finally, a set of alternatives was developed and screened to eliminate those alternatives that were not economically or environmentally acceptable.

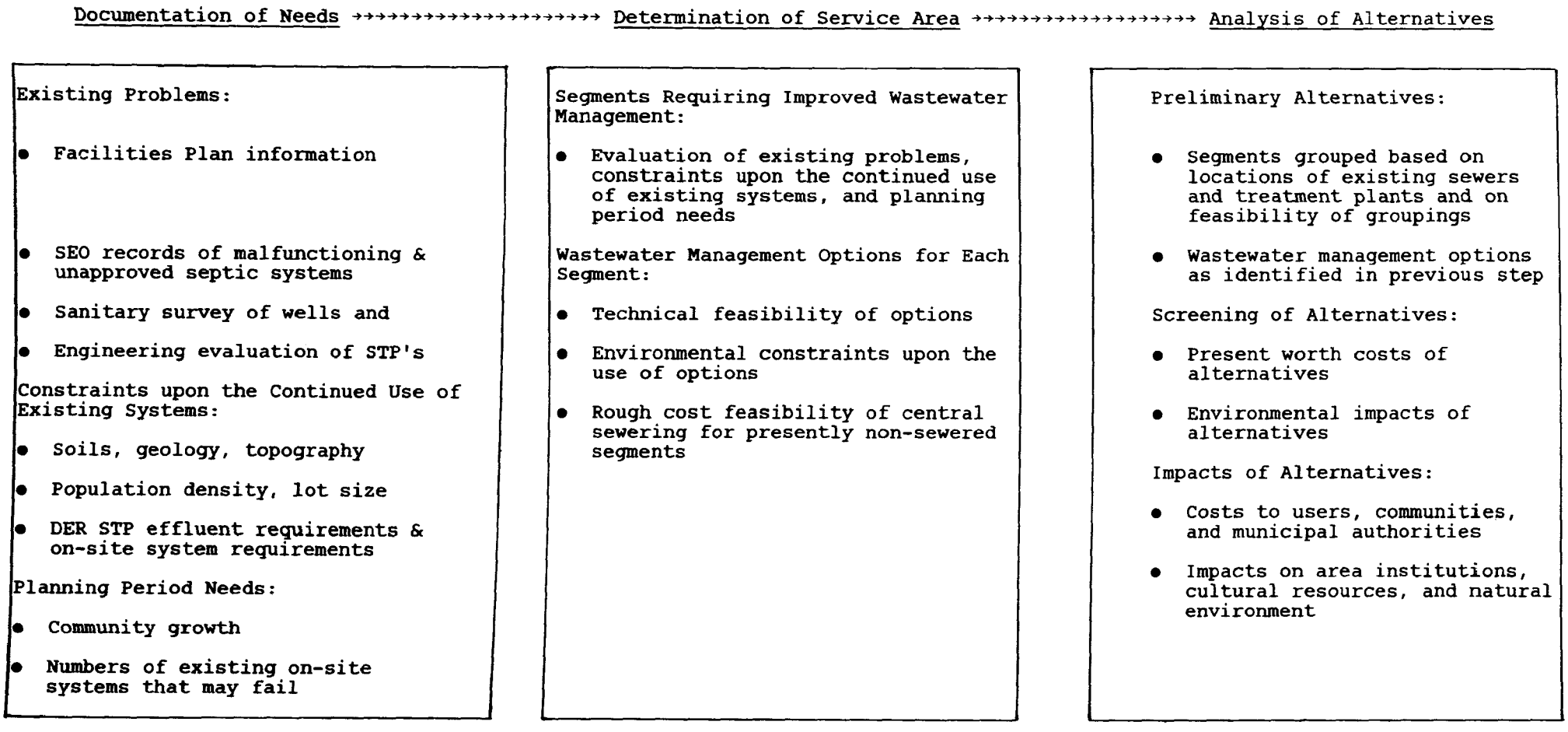


Figure IV-1. Method Used to Develop Wastewater Management Alternatives.

The remaining alternatives were defined as feasible planning area alternatives. A detailed analysis of costs and funding arrangements was performed for each of the feasible alternatives.

Wastewater Management Systems in the Study Area

For purposes of this analysis, a wastewater management system is defined as a combination of component parts to collect, treat, and dispose of wastewater effectively. The alternative waste management systems described in this EIS typically have six basic components (Table IV-1). Some of the options presented in Table IV-1 were more appropriate than others for use in the planning area.

I/I to the Gettysburg and Cumberland sewer systems should be reduced, to reduce wastewater and flow which is in line with GFCC and Buchart-Horn recommendations. Several businesses (e.g., the Gettysburg Times) already pretreat their wastes before sending them to the sewer systems, there is no indication that businesses that do not pretreat their wastes ought to. Although the use of in-house water conservation devices should be encouraged, no widespread use of such devices has been assumed in the wastewater alternatives because in the past, area municipalities were reluctant to require such devices. If such devices were required, we project that flow reduction inserts for showers and flow control for toilets are cost-effective, but composting toilets are not.

Gravity sewers (for wastewater collection) are expensive to install in the area because of shallow bedrock and rolling terrain. In some areas, such as Lake Heritage, pressure sewers (or holding tanks and tank trucks) are less expensive. Cluster sewer systems (where 20 to 30 homes on septic tanks are sewered to effluent disposal sites) were ruled out because sewering is too costly and because it is difficult to find suitable effluent disposal sites.

Tertiary treatment to provide nitrification, phosphorus removal, and dechlorination is necessary, in addition to primary treatment, secondary treatment, and disinfection. Only through such measures can area plants meet PA-DER's effluent requirements and avoid significant impacts on aquatic biota in Rock Creek.

Surface water discharge and land disposal are the two effluent disposal techniques examined in the alternatives. Four land disposal techniques were evaluated:

- overland flow, where treated effluent is renovated by flowing it over a mildly sloped, impermeable soil that is vegetated;
- marsh/pond, where treated effluent is passed through a shallow marsh that has aquatic growth to take up nutrients from the effluent and then is ponded prior to disposal;
- rapid infiltration, where effluent is sprayed or run onto a highly permeable sand/soil bed; and
- spray irrigation, where treated effluent is sprayed on cropland.

Only overland flow and marsh/pond treatment were considered feasible because area soils are too impermeable to permit rapid infiltration or a satisfactory rate for spray irrigation; and of the two chosen, overland flow is more feasible and less costly than marsh/pond.

Table IV-1. Components of a Waste Management System

COMPONENT	EXAMPLES
Wastewater and flow reduction measures	• Reduction of infiltration and inflow to collection system
	• Pretreatment of industrial wastes
	• Use of equalization facilities at treatment plants
	• In-house water conservation (use of water saving devices)
	• Use of holding or surge tanks at wastewater sources
	• Use of composting toilets
	• Ban on connection of garbage disposals
Wastewater collection	• Gravity sewers
	• Pressure sewers
	• Small flow sewers
	• Vacuum sewers
	• Tank trucks
Configuration of collection systems	• Regional sewer systems
	• Cluster sewer systems
	• On-site systems
Treatment plant processes	• Primary
	• Secondary
	• Tertiary
	• Disinfection
Effluent disposal	• Surface water discharge
	• Land disposal
	• Effluent recycling (use of wastewater for firefighting, industrial processes, cooling water, and lawn watering)
	• Holding
Sludge Disposal	• Sludge thickening
	• Sludge digestion
	• Sludge conditioning and dewatering
	• Thermal reduction
	• Sludge hauling and disposal

Finally, because farmland is available for the disposal of sludge from area treatment plants, the present practice of drying sludge on sand beds and disposing of it on farmland was assumed in all our alternatives.

Funding for Systems in the Study Area

Many facilities that are included in the wastewater management alternatives described in this section are eligible for Federal construction grants funds (Table IV-2). The level of Federal funding to be provided for these eligible items varies from 75 percent to 85 percent. Conventional treatment works are eligible for 75 percent of allowable construction costs, but innovative and alternative treatment works are eligible for 85 percent of allowable costs. This additional 10 percent acts as an incentive for grant applicants so that they employ new processes that have not been used widely but that offer promising results. Systems that reclaim and reuse water, recycle wastewater constituents in a productive manner, otherwise eliminate the discharge of pollutants, or recover energy, are considered innovative and alternative technologies.

Table IV-2. EPA Grant Eligibility Rules for the Construction of Municipal Wastewater Treatment Works, (EPA 1978)

System	Funding Considerations
Conventional treatment works	• Section 201 of the Federal Water Pollution Control Act Amendments of 1972 provides Federal grants for 75% of allowable construction costs of conventional treatment works.
Innovative and alternative treatment works	• Section 202(a)(2) of the Clean Water Act of 1977 provides Federal grants for 85% of allowable construction costs for treatment works that utilize innovative and alternative technologies. • Section 202(a)(3) of the Clean Water Act of 1977 provides Federal grants for 100% of costs to replace or modify treatment works that utilize innovative and alterntive technologies.*
Individual systems	• Section 14 of the Clean Water Act of 1977 provides Federal grants for 85% of allowable costs of publicly-owned and privately-owned individual systems serving one or more principal residences or small commerical establishments. Acquisition of land for such systems is not grant eligible

* Note that replacement funding is provided only if the treatment works fail within 2 years of construction and final inspection, and that it is necessary to go through construction grants procedure to obtain this funding.

The principal difference between "alternative" technologies and "innovative" technologies is the degree to which they have been developed and implemented. "Alternative" wastewater treatment processes and techniques are those that have been proven and used in actual practice; "innovative" processes and techniques are methods that have not been fully proven under the circumstances of their contemplated use.

Also eligible for 85 percent in Federal funding are the allowable costs for publicly-owned and privately-owned individual systems. An individual system serves "one or more principal residences, or small commercial establishments constructed prior to and inhabited on or before 27 December 1977". Individual systems are intended to abate existing water pollution or public health problems. A public body (municipality or municipal authority) must apply on behalf of a number of such units, and must certify that public ownership of such works is not feasible, and that the treatment works will be maintained and operated properly.

Individual systems are intended primarily for individual residences or clusters of residences. Among the alternatives for individual systems are: holding tanks, septic tanks and subsurface disposal systems, other on-site systems.

Analysis of Data (By Segment)

Needs Documentation

In order to evaluate the need for improved wastewater management in planning area segments, information was collected from the Facility Plan, local SEO files, a sanitary survey, visits to area treatment plants, PA-DER regulations, SCS and USGS maps. The information that was collected about existing sewer systems is summarized in Chapter III under the heading "Existing Facilities for Wastewater Management." Additional information about each segment is presented in Table IV-3.

Information about the degree of development for each segment (shown in Table IV-3) was obtained from several sources; the sanitary survey (Segments 4-6, 12-18), calls to local municipal authorities (Segments 2, 7-11), or current census information. The numbers of septic systems malfunctions and contaminated wells were obtained from the sanitary survey and from SEO records. Soil suitability for conventional on-site systems was determined by using PA-DER regulations, SCS maps, and from reports by local SEO's. Finally, population densities and community growth projections were estimated by using sanitary survey population counts and future growth projections prepared by socio-economists for the planning area.

Nature of Need for Improved Wastewater Management

Once it was collected, the data documenting the need for improved wastewater management in the planning area were analyzed in order to determine the nature of the need for improved wastewater management in each segment. This analysis emphasized septic system malfunctions and STP problems instead of well water contamination, soil suitability for septic systems, lot sizes, and community growth because malfunctioning septic systems and STP inadequacies show the need for improved wastewater management most directly. A complete report of the analysis can be found in Appendixes I-2 and I-3. The results and summary of those reports are presented in the following paragraphs.

Segments 4, 12, 14 through 17 have significant numbers and percentages of malfunctioning on-site systems. Soils within these segments, as classified by the PA-DER, are generally unsatisfactory for conventional septic tanks, but exhibit various degrees of acceptability for other types of on-site systems. Existing development and population density is fairly high in Segments 4 and 16. Future growth projections are relatively high for Segments 4, 17, and 18.

However, Segments 5, 6, and 13 showed minimal existing problems and low future growth projections. It is assumed that their needs can be accommodated with continued use of on-site treatment systems. Therefore, these segments will not be considered further during the EIS process.

Although many other considerations were involved as a result of this extensive analysis of environmental conditions, the areas determined to be in need of improved wastewater management are Segments 1-4, 7-12, 14-18, and 20. These areas will receive further discussion and evaluation throughout this EIS.

Selection of Alternatives

Although the need for improved wastewater management has been identified for Segments 12, 14, 15, 16, and 20, it appeared that population densities in these segments might be too low to make sewering economically feasible. Therefore, a cost comparison was conducted for these segments to determine what was less expensive: on-site treatment or sewering and treatment at a central facility. The results of the comparison are presented in Table IV-4.

The costs shown for on-site systems include the costs of systems to replace presently malfunctioning systems, the costs of new systems to accommodate future growth, and the costs for regular maintenance of all systems in each segment. We assumed that most of the replacement and new systems would be septic tank-sand mound systems, based on information given in the "Soil survey for Adams County" and on DER regulations regarding use of on-site systems; the remainder of these systems would be holding tanks. The sewer costs shown are for connections and laterals only and do not include the cost of any conveyance sewer that may be needed; also, sewer costs are shown with and without treatment costs included.

Table IV-4. Economic Analysis of Sewer* vs. On-Site Systems for Segments 12, 14, 15, 16, and 20 (Total Present Worth)

Segment	Alternate Item	Present Worth
12	On-site	$140,800
	Gravity sewer	$423,000
	Gravity sewer plus treatment**	$463,000
	Pressure sewer	$249,200
	Pressure sewer plus treatment	$289,400
14	On-site	$ 98,200
	Gravity sewer	$521,500
	Gravity sewer plus treatment	$555,800
	Presssure sewer	$245,500
	Pressure sewer plus treatment	$279,800
15	On-site	$178,000
	Gravity sewer	$502,100
	Gravity sewer plus treatment	$550,000
	Pressure sewer	$272,700
	Pressure sewer plus treatment	$320,700
16	On-site	$240,500
	Gravity sewer	$522,700
	Gravity sewer plus treatment	$571,800
	Pressure sewer	$820,500
	Pressure sewer plus treatment	$869,600
20	On-site	$ 64,700†
	Gravity sewer	$ 72,500
	Gravity sewer plus treatment	$ 92,200
	Pressure sewer	$ 51,000
	Pressure sewer plus treatment	$ 70,700

* Not including the cost of conveyance sewer if needed

† Assuming that pumping of holding tanks costs $30/2000 gallons (significantly more expensive than the LHMA's current charges)

** Typical per capita treatment costs have been used to estimate "sewer plus treatment" costs; these per capita costs are rough figures, so "sewer only" costs have been shown for reference.

As Table IV-4 shows, the on-site option is less costly than sewering for Segments 12, 14, 15, and 16. Consequently, these four segments were not included in the subsequent analysis of sewering alternatives. However, different means for addressing the problems identified in these segments are still considered in the remainder of the EIS. The on-site and sewer options are so close in cost for Segment 20 that the segment was included in subsequent analysis.

As the next step in the selection of alternatives process, potential wastewater management systems were developed for the individual segments in the planning area (Table IV-5). They include surface water discharge to STP's, land application (overland flow or marsh/pond system), and on-site systems. Each of these sys-

tems would function effectively in meeting current and future wastewater service needs. All the constraints and environmental factors that were described in the section titled "Nature of Need for Improved Wastewater Management" were considered in identifying potential systems; the only exception is that we did not consider the geographic locations of the segments with respect to existing sewer service areas.

Table IV-5. Potential Wastewater Management Systems

	Treatment at Central STP Surface Water Discharge						
Segment	Gettysburg STP	Cumberland STP	New Lake Heritage STP	New Schaff's Trailer Park STP	Overland flow	Marsh pond	On-site systems
1	X				X		
2	X	X			X		
3	X				X		
4	X			X			X
7	X		X		X	X	X
8	X		X		X	X	X
9	X		X		X	X	X
10	X		X		X	X	X
11	X		X		X	X	X
12							X
14							X
15							X
16							X
17	X	X			X		X
18	X	X			X		X
20			X		X	X	X

The next step, then, was to group segments to be addressed in this EIS into 32 possible geographical combinations. After this, the potential systems and the geographical combinations were combined selectively in order to form a reduced number of groupings.

After considering logical combinations of segments and available treatment sites, we selected six alternatives for further consideration in this EIS; in addition to those are the No-Action Alternative and GMA's previous proposal. The six alternatives are summarized in Table IV-6 and in Figures IV-2 to IV-7. The

alternatives are presented in order, from the most decentralized grouping to the most centralized grouping. On each of the following figures, the conveyance routing and treatment locations are presented in order to illustrate how and where each segment's flow will be treated.

Table IV-6. Gettysburg EIS Alternatives

Alternative A--Limited Action:

Upgrade Gettysburg STP - Segments 1, 3
Upgrade Cumberland STP - Segment 2
Build New Schaff's STP - Schaff's Trailer Park in Segment 4
Build New Lake Heritage STP - Segments 7-11 on holding tanks, etc.
Improve On-Site Systems - Remainder of Segment 4 and Segments 7-11, 17, 18

Alternative B:

Upgrade Gettysburg STP - Segments 1, 3, 4
Upgrade Cumberland STP - Segment 2
Build New Lake Heritage STP - Segments 7-11 on holding tanks, etc.
Improve On-Site Systems - Segments 7-11, 17, 18

Alternative C:

Upgrade Gettysburg STP - Segments 1, 3
Upgrade Cumberland STP - Segment 2
Build New Segment 4 Land Application Site - Segment 4
Build New Lake Heritage STP - Segments 7-11 on holding tanks, etc.
Improve On-Site Systems - Segments 7-11, 17, 18

Alternative D:

Upgrade Gettysburg STP - Segments 1, 3, 4, 18
Upgrade/Expand Cumberland STP - Segments 2, 17
Build New Lake Heritage STP - Segments 7-11 on sewers

Alternative E:

Upgrade Gettysburg STP - Segments 1-4, 17, 18
Build New Land Application Site - Segments 7-11 on sewers

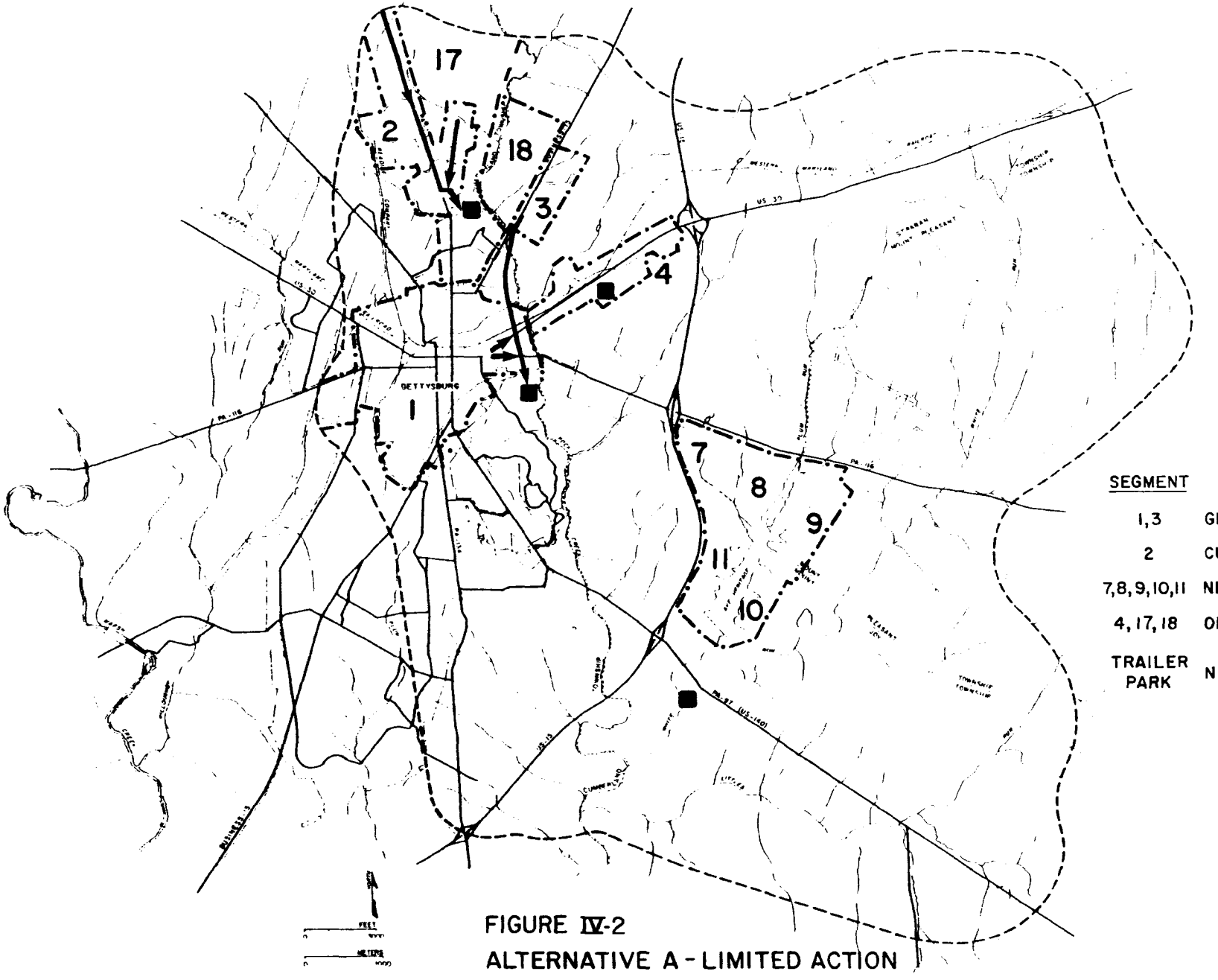
Alternative F:

Upgrade Gettysburg STP - Segments 1-4, 7-11, 17, 18

Design for Alternatives

Populations and Wastewater Flows

In order to determine numbers of on-site systems, sizes of sewer and pump stations, and sizes of treatment processes for each of the alternatives, design populations and wastewater flows were needed. Because of the amount of tourism in the area, both permanent and seasonal populations had to be estimated.



SEGMENT	SERVED BY
1, 3	GETTYSBURG STP
2	CUMBERLAND STP
7, 8, 9, 10, 11	NEW LAKE HERITAGE STP
4, 17, 18	ON-SITE SYSTEMS
TRAILER PARK	NEW SCHAFF STP

FIGURE IV-2
ALTERNATIVE A - LIMITED ACTION

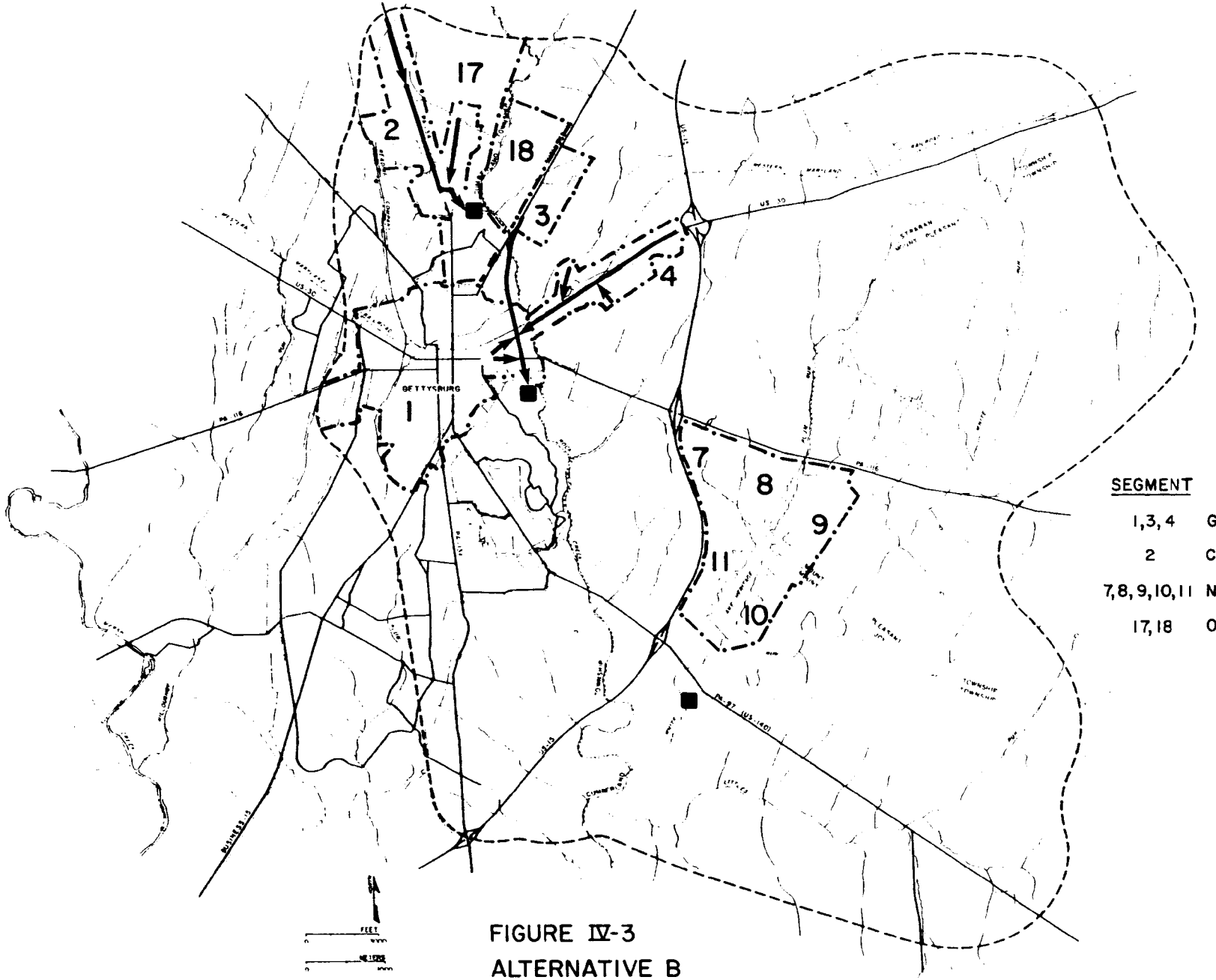
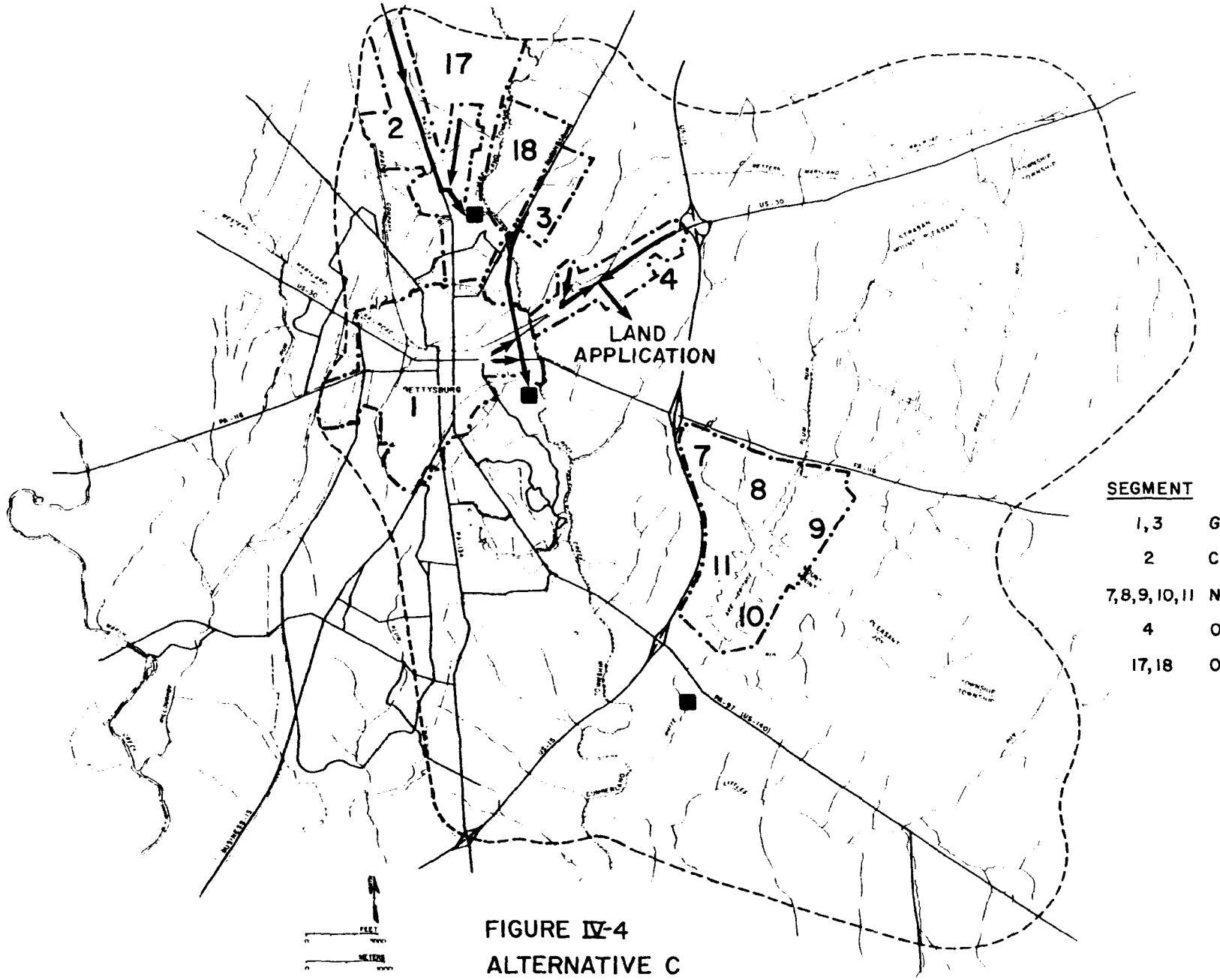
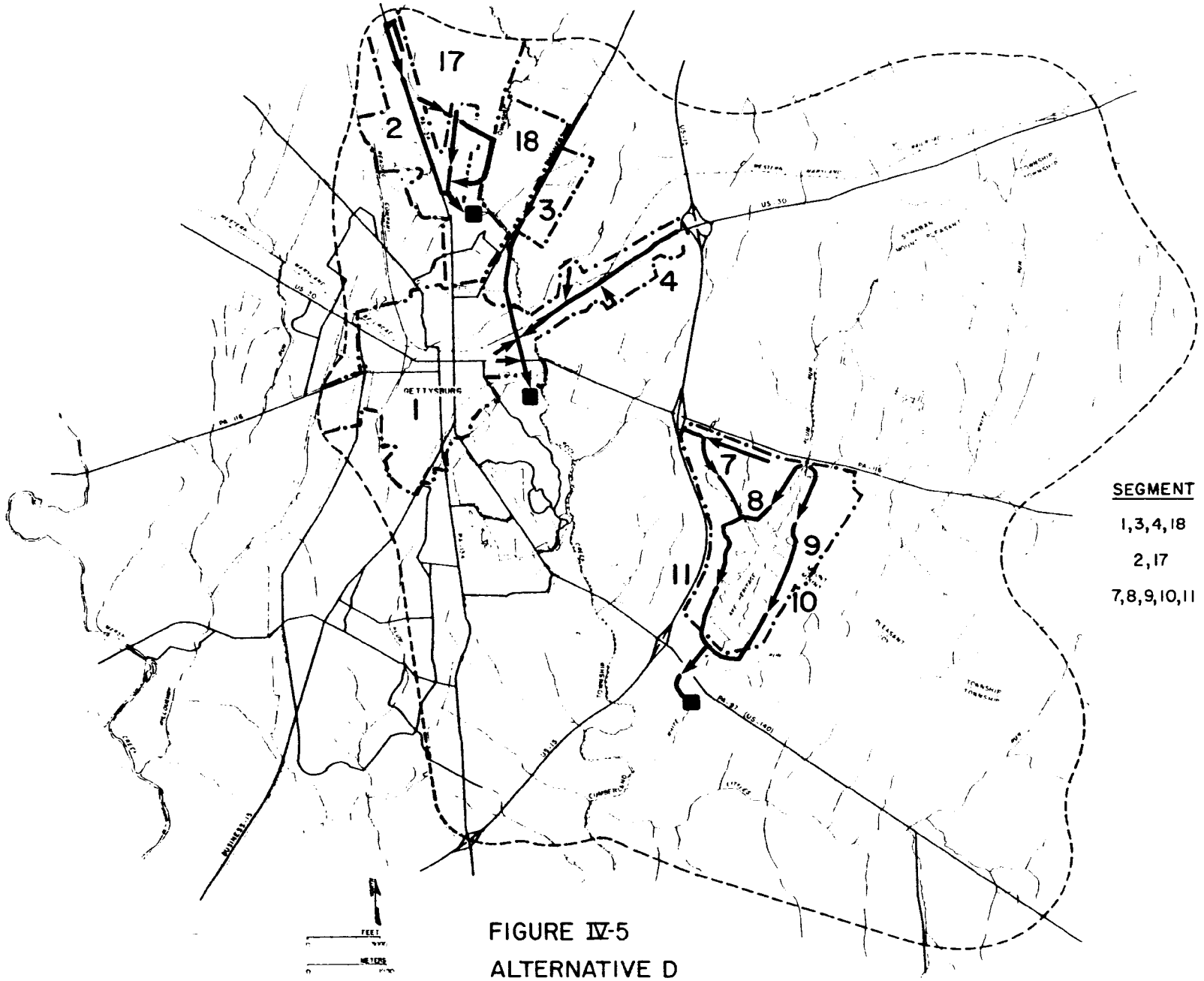


FIGURE IV-3
ALTERNATIVE B



SEGMENT	SERVED BY
1, 3	GETTYSBURG STP
2	CUMBERLAND STP
7, 8, 9, 10, 11	NEW LAKE HERITAGE STP
4	OVERLAND FLOW
17, 18	ON-SITE SYSTEMS

FIGURE IV-4
ALTERNATIVE C



SEGMENT	SERVED BY
1,3,4,18	GETTYSBURG STP
2,17	CUMBERLAND STP
7,8,9,10,11	NEW LAKE HERITAGE STP

FIGURE IV-5
ALTERNATIVE D

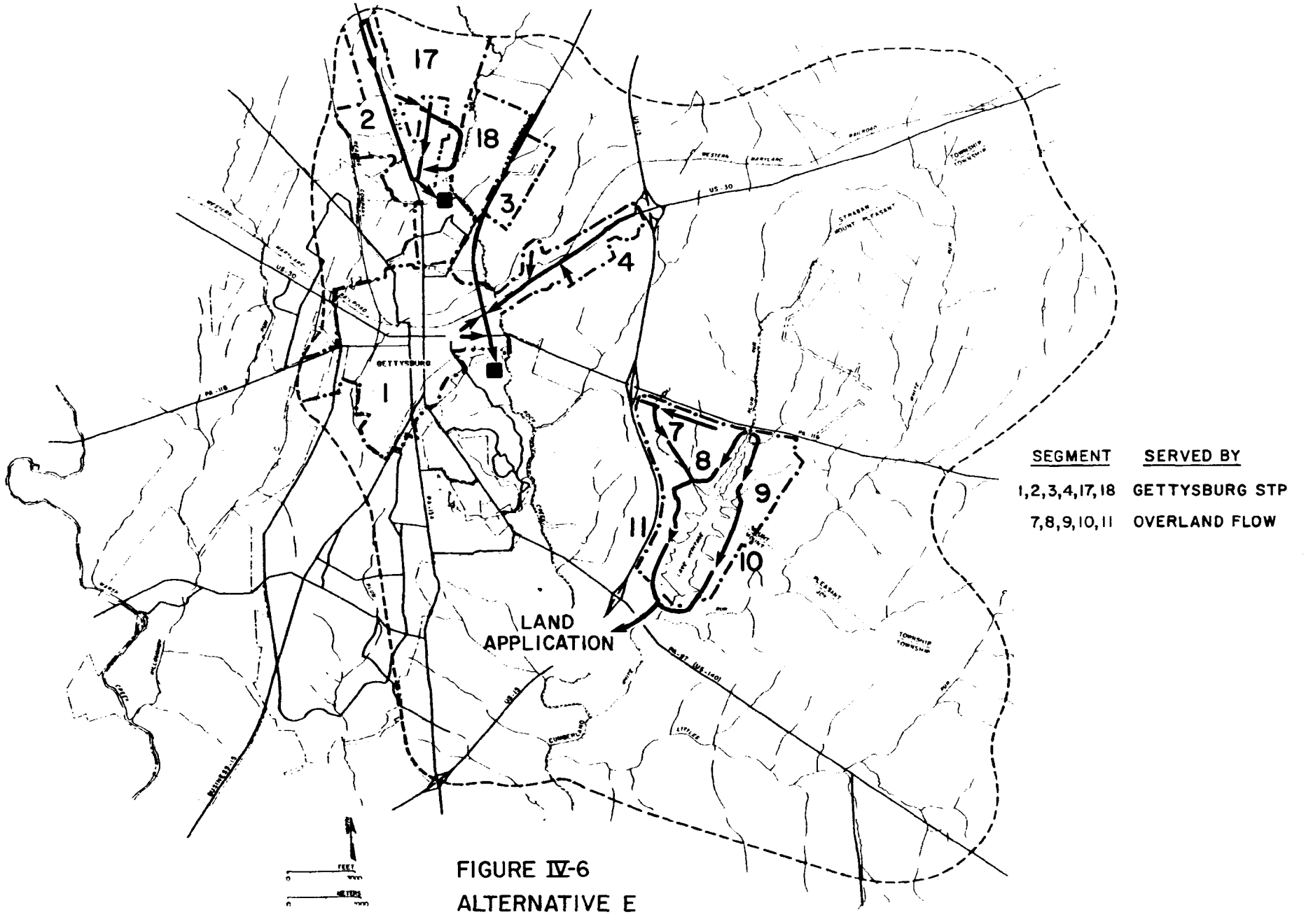


FIGURE IV-6
ALTERNATIVE E

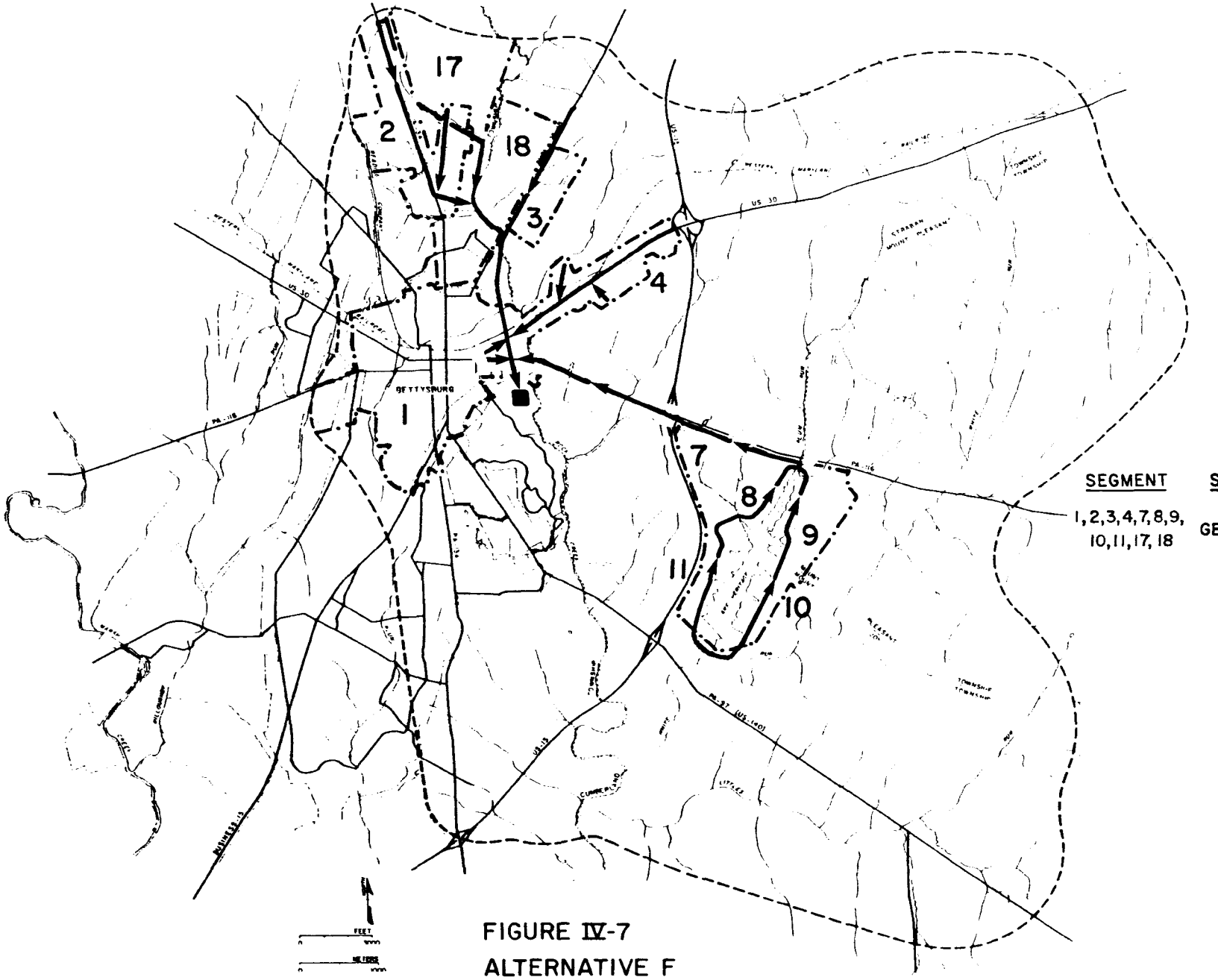


FIGURE IV-7
ALTERNATIVE F

The permanent populations to be served were estimated segment by segment. First, the number of existing dwelling units in each segment was determined. Then, we estimated the number of additional units likely to be built in each segment between the years 1980 and 2005. Finally, the number of permanent residents for each segment was calculated by multiplying existing and year 2005 dwelling units by the relevant municipality's 1980 and 2005 average household sizes. The results of this process are shown in Table IV-7.

Numbers of tourists to be served were estimated by using the number of motel rooms and campsites (obtained from the Gettysburg Travel Council) in each segment. It was assumed that motels are 90 percent occupied and campgrounds are 70 percent occupied (again, obtained from the Gettysburg Travel Council) during the peak tourist season. Also, it was assumed that wastewater facilities have to be sized to handle use at the peak of the tourist season, so the number of tourists for each segment was treated as equivalent to a like number of residents. The results of this process are also shown in Table IV-7. Note that the estimates

Table III-7. Populations Used for Analysis of Alternatives

		Year 1980	Year 2005
Gettysburg:			
Segment 1 -	Residents	4,769	4,856
	Students (approximate number)	2,450	2,450
	Motel room renters	1,542	1,542
Segment 3 -	Residents	530	595
	subtotal	9,291	9,443
Cumberland:			
Segment 2 -	Residents	614	561
Segment 16 -	Residents	111	125
	Motel/Campsite Renters	295	295
Segment 17 -	Residents	47	1,170
	subtotal	1,067	2,151
Straban:			
Segment 4 -	Schaff's Trailer Park	363	331
	Residents	97	246
	Motel Room Renters	108	108
Segment 18 -	Residents	105	951
	subtotal	673	1,636
Lake Heritage:			
Segment 7 -	Residents	161	248
Segment 8 -	Residents	100	315
Segment 9 -	Residents	228	432
Segment 10/11	Residents	609	914
Segment 20 -	Campsite Renters	429	429
	subtotal	1,527	2,338
Mount Joy:			
Segment 12 -	Residents	83	102
Segment 14 -	Residents	86	87
Segment 15 -	Residents	96	122
	subtotal	265	311

for tourists are about the same as the estimates that can be obtained by using NPS numbers of visitors to park facilities, and by using EPA's multiplier of 0.1-0.2 to convert day-use visitors to equivalent full-time residents.

After these populations had been estimated, wastewater flows were calculated for each of the alternatives. These flows consist of sewage generated by the populations and of I/I of water into sewer systems. The sewage flows were calculated by multiplying the number of people in each segment by a per capita flow figure that ranges from 70 to 80 gpcd, depending on the level of commercial or municipal activity in the segment. I/I was determined by using I/I studies of the Gettysburg and Cumberland sewer systems and by assuming that I/I would be reduced. Infiltration for new systems was estimated using lengths of sewer to be constructed and 200 gpd per inch-mile of allowable I/I. The results are shown in Table IV-8.

For all alternatives except Alternative A, year 2005 populations and flows were used to size wastewater facilities. For Alternative A (the limited action alternative in which facilities are to handle existing flows only), year 1980 populations and flows were used, except that population growth that can occur by use of septic systems was assumed to occur.

Sewage Treatment Plants

There are four sewage treatment plants associated with the various alternatives. This section provides a brief discussion of the treatment processes that were designed for each plant.

Gettysburg STP--In the alternatives where this plant is used, the present Gettysburg STP would be upgraded and expanded to handle various flows (from 1.25 mgd for Alternative A to 1.71 mgd for Alternative F). The treatment processes included in the design are preliminary treatment, primary clarifier, trickling filter, intermediate clarifier, activated sludge unit, final clarifier, anaerobic digester, chlorination, dechlorination, denitrification, mineral addition, sludge drying, and sludge land application.

Cumberland STP--In Alternatives A, B, and C, the existing STP would be retained by adding dechlorination, nitrification, and land application of sludge. In Alternative D, the plant would be replaced with an oxidation ditch plant containing the following processes: preliminary treatment, aeration basin, clarifer, chlorination, dechlorination, mineral addition, and sludge land application.

Lake Heritage STP--In Alternative A, the existing Lake Heritage STP would be replaced by an extended aeration package plant containing preliminary treatment, aeration basin, clarifer, aerobic digester, filtration, mineral addition, chlorination, dechlorination and denitrification units. In Alternatives B, C, and D, the plant would be replaced by an oxidation ditch plant like the Alternative D Cumberland Plant.

Schaff's Trailer Park STP--In Alternative A, the existing plant would be replaced by an extended aeration package plant like the Alternative A Lake Heritage plant.

Overland Flow Systems

Overland flow systems were designed for different wastewater flows in the range from 0.15 mgd to 1.71 mgd. The key components of the overland flows systems are pre-application treatment

Table IV-8. Wastewater Flows used for Alternatives Analysis

	Design Flows (Million Gallons/Day)[U]		
	Sewage[O]	I/I*	Total
Alternative A			
Gettysburg STP:			1.248
Gettysburg (Segments 1, 3)	0.743	0.500	1.243
Cumberland (Segment 17)	0.001	-0-	0.001
Straban (Segments 4, 18)	0.004	-0-	0.004
Cumberland STP:			0.070
Cumberland (Segment 2)	0.055	0.015	0.070
Schaff's STP:			0.027
Straban (Schaff's Trailer Park)	0.024	0.003	0.027
Lake Heritage STP:			0.051
Lake Heritage (Segments 7-11, 20)	0.049●	-0-	0.049
Cumberland (Segment 16)	0.001	-0-	0.001
Mount Joy (Segments 12, 14, 15)	0.001	-0-	0.001
Alternative B			
Gettysburg STP:			1.363
Gettysburg (Segments 1, 3)	0.755	0.500	1.255
Cumberland (Segment 17)	0.025	-0-	0.025
Straban (Segments 4, 18)	0.075	0.008	0.083
Cumberland STP:			0.070
Cumberland (Segment 2)	0.055	0.015	0.070
Lake Heritage STP:			0.098
Lake Heritage (Segments 7-11, 20)	0.096●	-0-	0.096
Cumberland (Segment 16)	0.001	-0-	0.001
Mount Joy (Segments 12, 14, 15)	0.001	-0-	0.001
Alternative C			
Gettysburg STP:			1.304
Gettysburg (Segments 1, 3)	0.755	0.500	1.255
Cumberland (Segment 17)	0.025	-0-	0.025
Straban (Segment 18)	0.024	-0-	0.024
Cumberland STP:			0.070
Cumberland (Segment 2)	0.055	0.015	0.070
Segment 4 Land Application:			0.056
Straban (Segment 4)	0.051	0.005	0.056
Lake Heritage STP:			0.098
Lake Heritage (Segments 7-11, 20)	0.096●	-0-	0.096
Cumberland (Segments 12, 14, 15)	0.001	-0-	0.001
Mount Joy (Segments 12, 14, 15)	0.001	-0-	0.001

See footnotes at end of table.

Table IV-8. Wastewater Flows used for Alternatives Analysis--Continued

	Design Flows (Million Gallons/Day)°		
	Sewage°	I/I*	Total
Alternatives D and E			
Gettysburg STP:			1.397
Gettysburg (Segments 1, 3)	0.755	0.500	1.255
Straban (Segments 4, 18)	0.123	0.019	0.142
Cumberland STP:			0.167
Cumberland (Segments 2, 17)	0.139	0.028	0.167
Lake Heritage STP:			0.143
Lake Heritage (Segments 7-11, 20)	0.138•	0.003	0.141
Cumberland (Segment 16)	0.001	-0-	0.001
Mount Joy (Segments 12, 14, 15)	0.001	-0-	0.001
Alternatives F and G			
Gettysburg STP:			1.564
Gettysburg (Segments 1, 3)	0.755	0.500	1.255
Cumberland (Segments 2, 17)	0.139	0.028	0.167
Straban (Segments 4, 18)	0.123	0.019	0.142
Lake Heritage Land Application:			0.143
Lake Heritage (Segments 7-11, 20)	0.138•	0.003	0.141
Cumberland (Segment 16)	0.001	-0-	0.001
Mount Joy (Segments 12, 14, 15)	0.001	-0-	0.001
Alternatives H and I			
Gettysburg STP:			1.705
Gettysburg (Segments 1, 3)	0.755	0.500	1.255
Cumberland (Segments 2, 16, 17)	0.140	0.028	0.168
Straban (Segments 4, 18)	0.123	0.019	0.142
Lake Heritage (Segments 7-11, 20)	0.138•	0.001	0.139
Mount Joy (Segments 12, 14, 15)	0.001	-0-	0.001

o Based on 70-80 gallons/person/day, depending on degree of commerce.
• Includes flows from Drummer Boy Campground and S. W. Construction Company.
* Flows due to infiltration and inflow into sewers.

(including preliminary treatment, primary clarifier, alum addition, and aerobic digester), storage lagoon, field preparation, distribution, recovery, land application of sludge, and aerators for storage.

Storage lagoons were designed to hold wastewater for 10 weeks during the winter months and would have mechanical aerators and bentonite-clay linings. The overland flow application rate would be 4 inches per week. Both the 10-week storage time and the 4-inch/week application rate are based on EPA specifications (EPA 625/1-77-008, Process Design Manual for Land Treatment of Municipal Wastewater).

On-Site Wastewater Disposal Systems

Two types of on-site systems have been considered for use in the alternatives: septic tank-sand mound systems and holding tanks. Wherever soil conditions permit the use of septic tanks, we have assumed that closed sand mound systems would be used in order to provide conservatively high cost estimates for on-site systems. Where soils may not permit the use of septic tanks, we have assumed that holding tanks would be used and treatment capacity has been provided for holding tank wastes at area treatment plants. If site-by-site analyses are done, researchers may find it possible to correct malfunctions and to accommodate future growth with less expensive conventional or alternative on-site systems than those that are proposed. Also, when holding tanks have to be used, in-house water conservation devices can and should be used to reduce the operating costs of the systems.

Cost of Alternatives

Present Worth Analysis

There are two principal types of costs associated with each of the six wastewater management alternatives. One is the capital cost of wastewater facilities, which includes the costs of constructing or installing the facilities, as well as the costs of designing the facilities, of legal work, of materials, and of arranging financing. The other is the annual O & M costs associated with using the facilities.

In order to compare the costs of alternatives, both the capital and the O & M costs must be considered. In addition, the lifespans of the facilities must be taken into account because an alternative that costs more than another may be a better buy if the facility being paid for will last longer.

One way of taking into consideration capital costs, O & M costs, and lifespans is to compare the "present worth costs" of the alternatives. The "present worth cost" of an alternative is the amount of money that would have to be placed in an interest-earning account at the beginning of the design period to cover the capital costs and O & M costs of the alternative, if it is assumed that the wastewater facilities would be sold for their salvage value at the end of the period. The present worth of the cost to operate and maintain the facilities is for a specific number of years (typically 20). The salvage value is subtracted from the other two costs; this amount is the present worth of the value of the facilities at the end of the specific number of years.

The present worth costs for the six EIS alternatives and the Facility Plan proposed action are shown in Table IV-9. The costs are based on a 20 year period and 7-1/8% interest rate.

Table IV-9. Present Worth Cost of Alternatives (in thousands of dollars, 4th quarter 1979)

Alternative	On-site systems	Collection/ Conveyance sewer	I/I Reduction	STP's
A	5,109	510	1,007	8,488
B	7,484	2,573	1,007	8,705
C	7,484	2,470	1,007	8,514
D	657	13,972	1,007	9,403
E	657	14,187	1,007	7,412
F	657	14,365	1,007	16,596

Alternative	Overland flow Treatment	Existing debt	Total Present Worth
A	-0-	290	15,404
B	-0-	290	20,059
C	1,017	290	20,782
D	-0-	290	25,329
E	1,433	290	24,986
F	-0-	290	23,907

Alternatives A, B, and C have the lowest present worth costs of the six alternatives. This is because these alternatives propose extensive use of on-site systems in Segments 7-11, 17, and 18, whereas remaining alternatives propose use of sewers in these segments. The rocky soils, hilly terrain, and low population densities make sewers more expensive than on-site systems in these areas. Alternative A has the lowest present worth cost of all because it does not provide wastewater facilities for future population growth except that which can occur by use of septic systems. Alternatives B and C propose that substantial additional growth be allowed to occur on holding tanks in Segments 7-11, 17, and 18; holding tank wastes would be treated at the Gettysburg and Lake Heritage STP's.

Costs by Municipal Authority

At present, there are three municipal authorities in the study area that operate sewer systems or STP's: the Gettysburg Municipal Authority (GMA), the Cumberland Township Authority (CTA), and the Lake Heritage Municipal Authority (LHMA).

To suggest how each alternative would affect the sizes and costs of systems run by each authority, the capital costs (Table IV-10), and the operation and maintenance (O & M) costs (Table IV-11) of the alternatives have been split among the authorities.

These tables were prepared under two assumptions: that each authority would be responsible for any treatment plant (or over-

Table IV-10. Capital Costs of Alternatives by Municipal Authority (in thousands of dollars, 4th quarter 1979)

Alternative	Municipal Authority*	On-Site Systems	Sewer System•	Sewage Treatment	Total Capital°
A	GMA	-0-	968.8	3485.0	4453.8
	CTA	1570.4	38.2	382.0	1990.6
	LHMA	764.8	-0-	349.0	1113.8
	Straban	1436.3	84.1	282.0	1802.4
	Total				9360.6
B	GMA	-0-	3394.2	3640.0	7034.2
	CTA	1837.3	38.2	382.0	2257.5
	LHMA	1275.0	-0-	424.0	1699.0
	Straban	1265.7	-0-	-0-	1265.7
	Total				12256.4
C	GMA	-0-	2011.6	3579.0	5590.6
	CTA	1837.3	38.2	382.0	2257.5
	LHMA	1275.0	-0-	424.0	1699.0
	Straban	1265.7	1122.0	639.9	3027.6
	Total				12574.7
D	GMA	-0-	6335.7	3701.0	10036.7
	CTA	-0-	3206.7	614.0	3820.7
	LHMA	510.5	5430.5	497.0	6438.0
	Total				20295.4
E	GMA	-0-	9713.2	3844.0	13557.2
	LHMA	510.5	5430.5	859.4	6800.4
	Total				20357.6
F	GMA	510.5	15307.3	3922.0	19739.8

* GMA-Gettysburg Municipal Authority - Currently operates the Gettysburg/Woodcrest/Twin Oaks sewer system and treatment plant.

CTA-Cumberland Township Authority - Currently operates the Cumberland sewer system and treatment plant.

LHMA-Lake Heritage Municipal Authority - Currently operates the Lake Heritage Holding tank collection system and treatment plant.

Straban-New Authority - To oversee the Alternative A Schaff's STP, the Alternative C overland flow site, and Alternatives A-C on-site systems in Straban.

• Costs shown include costs of reducing infiltration/inflow in existing systems.

o Capital costs shown do not include existing debts (see Table III-11).

Table IV-11. Annual O&M Costs of Alternatives by Municipal Authority (in thousands of dollars, 4th quarter 1979)

Alternative	Municipal Authority*	On-Site Systems	Sewer System	Sewage Treatment	Total O&M°
A	GMA	-0-	35.0	298.0	333.0
	CTA	15.0	3.1	52.0	70.1
	LHMA	117.2	-0-	31.0	148.2
	Straban	31.3	3.3	21.0	55.6
	Total				606.9
B	GMA	-0-	38.3	328.0	366.3
	CTA	65.7	3.1	52.0	120.8
	LHMA	214.1	-0-	49.0	263.1
	Straban	60.6	-0-	-0-	60.6
	Total				810.8
C	GMA	-0-	35.5	315.0	350.0
	CTA	65.7	3.1	52.0	120.8
	LHMA	214.1	-0-	49.0	263.1
	Straban	60.6	11.9	41.7	114.2
	Total				848.6
D	GMA	-0-	42.0	340.0	382.0
	CTA	-0-	7.1	65.0	72.1
	LHMA	18.9	79.2	57.0	155.1
	Total				609.2
E	GMA	-0-	54.3	359.0	413.3
	LHMA	18.9	79.2	62.8	160.9
	Total				574.2
F	GMA	18.9	136.3	369.0	524.2

o O&M - Operation and maintenance

* GMA-Gettysburg Municipal Authority - Currently operates the Gettysburg/Woodcrest/Twin Oaks sewer system and treatment plant.

CTA-Cumberland Township Authority - Currently operates the Cumberland sewer system and treatment plant.

LHMA-Lake Heritage Municipal Authority - Currently operates the Lake Heritage holding tank collection system and treatment plant.

Straban-New Authority - To oversee the Alternative A Schaff's STP, the Alternative C overland flow site, and Alternative A-C on-site systems in Straban.

land flow site) located at or near where the authority's plant is now located, and that the authority would be responsible for all sewer systems (not on-site systems) feeding into the plant. Responsibility for on-site systems was divided as follows: Segment 17, CTA; Segments 4 and 18, Straban; Segments 7-11, 20, LHMA; and Segments 12, 14-16, LHMA except in Alternative 6 where responsibility is assigned to the only remaining authority, GMA.

As would be expected, the capital and O & M costs for the GMA system increase from Alternative A to Alternative F, as more service area segments feed into the GMA treatment plant. Similarly, the capital and O & M costs for the CTA system increase between Alternatives A through C and Alternative D because in Alternative D the CTA assumes responsibility for a sewer system to serve Segment 17. Finally, the capital and O & M costs for the LHMA increase from Alternative A (where no growth is to be accommodated in Segments 7-11), to Alternatives B and C (where growth is to be accommodated on holding tanks), to Alternative D (where Segments 7-11, 20 are sewered and wastewater is treated at a treatment plant) to Alternative E (where Segments 7-11, and 20 are sewered and wastewater is treated at an overland flow site). Because the number of residences served by the LHMA system does not increase between Alternatives B and C, and Alternatives D and E, Alternatives B and C appear to be better choices than Alternatives D and E for the LHMA Service Area.

Costs by Municipality

Regardless of the number of municipal authorities that will manage the wastewater facilities for the study area, five area municipalities will be involved in financing the facilities. These municipalities are: Gettysburg Borough, Cumberland Township, Straban Township, LHMA, and Mount Joy Township. Table IV-12 shows the portion of capital costs that each of these muncipalities will be likely to finance, i.e., the local share of capital costs.

Local Shares--The local shares of capital costs are the portions of capital costs that local municipalities will have to bear after the Federal and State governments have contributed their shares. The local shares shown in Table IV-12 are broken into pre-1985 and post-1985 costs to indicate that a substantial part of the local share is for the costs of those on-site systems, house-to-sewer connections, and laterals that are needed to serve future (post-1985) population growth. Many, if not all, of these items may be paid for by the future growth residents who require these facilities, and may not be paid for by present populations. However, note that the post-1985 local shares are substantial and may be difficult for future population growth, alone, to bear.

In order to determine these local shares, it was necessary to estimate Federal and State shares. The Federal share of capital costs depends on two things: the portion of capital costs that is eligible for funding, and the level (percentage) of funding to be provided for that portion. Capital costs for conveyance sewer and treatment are generally 100 percent eligible for grant funding, except that the cost of the land that is not needed for storage or land application at an overland flow site is not eligible, and the cost of excess treatment capacity is also not eligible. Capital costs for collection sewer are subject to the terms of EPA's Program Requirement Memoranda (PRM) 78-9 and 79-8. PRM 78-9 specifies that to be eligible for Federal funding, collection and conveyance sewers must be necessary, cost-effective when compared to alternative wastewater collection and

Table IV-12. Federal and Local Shares of Alternatives by Municipality (in thousands of dollars, 4th quarter 1979)

Alternative	Municipality	Capital Costs				
		Federal Share	Local Share*			Total Capital
			Pre '85	Post 85	Total	
A	Gettysburg	3350.1	1211.0	-0-	1211.0	4561.1
	Cumberland	440.6	276.1	1586.9	1863.0	2303.6
	Straban	431.8	119.3	1251.3	1370.6	1802.4
	Lake Heritage	478.0	157.5	-0-	157.5	635.5
	Mount Joy	184.1	32.5	131.7	164.2	348.3
						9650.9
B	Gettysburg	3365.5	1216.2	970.8	2187.0	5552.5
	Cumberland	489.9	292.3	1853.9	2146.2	2636.1
	Straban	1010.4	436.0	1342.6	1778.6	2789.0
	Lake Heritage	534.6	175.9	510.2	686.1	1220.7
	Mount Joy	184.1	32.5	131.7	164.2	348.3
						12546.6
C	Gettysburg	3378.2	1220.1	970.8	2190.9	5569.1
	Cumberland	489.2	292.0	1853.9	2145.9	2635.1
	Straban	1291.0	395.6	1404.5	1800.1	3092.0
	Lake Heritage	534.6	175.9	510.2	686.1	1220.7
	Mount Joy	184.1	32.5	131.7	164.2	348.3
						12865.2
D	Gettysburg	3369.2	1217.3	970.8	2188.1	5557.3
	Cumberland	590.3	329.5	3214.0	3543.5	4133.8
	Straban	1275.6	529.9	2781.2	3311.1	4586.7
	Lake Heritage	1248.4	3469.8	1241.5	4711.3	5959.7
	Mount Joy	184.1	32.5	131.7	164.2	348.3
						20585.8
E	Gettysburg	3177.3	1153.4	970.8	2124.2	5301.5
	Cumberland	724.1	375.1	3214.0	3589.1	4313.2
	Straban	1107.8	473.9	2781.2	3255.1	4362.9
	Lake Heritage	1571.5	3509.2	1241.5	4750.7	6322.2
	Mount Joy	184.1	32.5	131.7	164.2	348.3
						20648.1
F	Gettysburg	3033.0	1105.4	970.8	2076.2	5109.2
	Cumberland	703.9	368.2	3214.0	3582.2	4286.1
	Straban	1089.8	467.7	2781.1	3248.8	4338.6
	Lake Heritage	1327.7	3387.7	1232.4	4620.1	5947.8
	Mount Joy	184.1	32.5	131.7	164.2	348.3
						20030.0

* Pre-1985 local shares of capital costs include existing debts for all wastewater systems except the Schaff's Trailer Park system. Post-1985 costs are for those on-site systems, sewer connections, and laterals that will serve mainly future population growths; in this regard, it has been assumed that no growth will take place between 1980 and 1985.

treatment facilities, and designed to carry flows from residences when at least two-thirds of those residence were in existence as of October 18, 1972. PRM 79-8 appears to exempt certain types of sewers from the "two-thirds rule" portion of PRM 78-9; the exempted types are small gravity, pressure, and vacuum sewer serving clusters of households and small commercial establishments. The collection systems for Lake Heritage (including Hazelbrook Hills), and for Segments 17 and 18 appear to be ineligible under the terms of these memoranda. A final determination of eligibility will be made by EPA and PA-DER based on the detailed plans and specifications of the selected alternative. The final eligiblity determination may differ from the EIS eligibility determination.

The level of Federal funding of the eligible capital costs varies between 75 percent and 85 percent. Section 201 of the 1972 Federal Water Pollution Control Act Amendments and the Clean Water Act of 1977 enable EPA to fund 75 percent of the total eligible capital costs of conventional wastewater facilities and 85 percent of the eligible costs of innovative and alternative facilities. Of the facilities proposed in the alternatives, those that appear to qualify for 85 percent funding are:

- replacements for existing on-site systems,
- pressure sewer proposed for use in Segment 4 in Alternative C,
- overland flow treatment of wastewater (including pre-application treatment and storage), and
- land application of sludge (include pre-application drying).

As for the State share of capital costs, Pennsylvania does not contribute towards the capital costs of Section 201-funded wastewater facilities. However, PA-DER may fund up to 2 percent of the annual O & M costs of the facilities under Pennsylvania Act 339.

User Charges--The local shares of capital costs and O & M costs for wastewater facilities must be paid by residents within each municipality. "User charges" are the costs that are periodically billed to customers of a wastewater management system to cover local share and O & M costs. The charges consist of three parts: debt service (repayment of the principal and interest to cover the local share of capital costs), O & M costs, and a reserve fund that consists of 20 percent of the debt service to finance future capital improvements.

The estimated annual user charges for each municipality under each alternative are presented in Table IV-13. The debt service component was based on use of a 30-year bond at 7-1/8% interest. Note that the user charges were calculated using the local share and O & M costs for pre-1985 facilities only and calculations assume that no population growth will take place between 1980 and 1985.

Table IV-13. Estimated 1985 Annual User Charges* By Municipality (dollars per household, 4th quarter 1979)

Alternative	Gettysburg	Cumberland	Straban	Lake Heritage	Mount Joy
A	123	253	245	406	126
B	124	274	300	461	126
C	124	274	430	461	126
D	124	312	479	1,241	126
E	118	267	436	1,268	126
F	112	258	422	1,154	126

* These user charges cover only costs of items built by 1985; they do not cover capital and operation and maintenance costs for those on-site systems, sewer connections, and laterals that will serve mainly future population growth. Further, the user charges have been calculated under the assumption that there will be no growth in numbers of residences in the Service Area portions of the above municipalities between 1980 and 1985. Finally, the user charges include the costs for retiring all existing debts for wastewater systems except any debt for the Schaff Trailer Park sewer and treatment system.

The user charges for Gettysburg and Mount Joy are the lowest charges of those shown in Table IV-13 for all alternatives. Gettysburg's charges are low because the Borough already has a sewer system to serve its residents and has a large population to bear the costs of improving both the sewer system and the treatment plant. Gettysburg's user charges are lowest under Alternatives E and F because under these alternatives, the residents in Segments 2, 7-11, and 17 bear part of the costs of upgrading the treatment plant. The user charges for Mount Joy are low because they reflect only the replacement of malfunctioning on-site systems and the operation of on-site systems in Segments 12, 14, and 15.

The user charges for Cumberland are lowest under Alternative A (where the existing Cumberland sewer and treatment system is retained and future growth is accommodated only by septic systems) and Alternative F (where existing and future growth in Cumberland is sewered and connected to the Gettysburg treatment plant, which also treats Gettysburg, Straban, and Lake Heritage). Cumberland's user charges are somewhat higher under Alternatives B, C, and E. Alternative B and C user charges are higher than those in Alternative A because more future growth is accommodated through the use of holding tanks along with septic systems; the user charges reflect the Gettysburg treatment plant capacity that will be needed to treat holding tank wastes. Alternative E user charges are higher than those in Alternative F because in Alternative E Lake Heritage does not share the cost of the Gettysburg treatment plant. Finally, Cumberland's user charges are highest in Alternative D, where the Cumberland treatment plant is replaced with a plant large enough to serve both existing residences and future growth, which will be sewered.

Straban's user charges are lowest in Alternatives A and B. In Alternative A, residents in Segments 4 and 18 continue with on-site systems and future growth is accommodated only as it can occur through the use of septic systems. In Alternative B,

Segment 4 is connected to the Gettysburg treatment plant and additional future growth in Segment 18 is allowed to occur through the use of holding tanks, whose wastes are to be treated as the Gettysburg plant. Alternative C user charges for Straban are relatively high because an overland flow site is used for Segment 4. Alternative D, E, and F user charges are relatively high because these alternatives propose the use of sewers in Segment 18 and provide treatment capacity at the Gettysburg Plant for future growth in the segment.

Lake Heritage (including Hazelbrook Hills and the Drummer Boy campground) has the highest user charges of all the municipalities. The user charges are lowest in Alternatives A through C, where holding tanks would continue to be used and are very high in Alternatives D, E, F, where Segments 7-11 and 20 would be sewered. The use of sewers appears to be prohibitively expensive; although user charges for Alternatives D, E, and F might drop somewhat as more residents move into Lake Heritage and help bear the cost of the system. However, the addition of households to the sewer system would require additional grinder pumps, which are fairly expensive; this expense would offset reductions in user charges.

Small Waste Flows Districts

Regulation of on-lot sewage systems has evolved to the point where most new facilities are designed, permitted and inspected by local jurisdictions through their sewage enforcement officers (SEOs). But after installation, local government has no further responsibility for these systems until malfunctions become evident. At that time the SEO may inspect and issue permits for repair of the systems. In the past, the sole basis for a government in this activity has been its obligation to protect public health.

Rarely have the obligations of the government been interpreted to include monitoring and contol of other effects of on-lot system use or misuse. The general lack of knowledge about operation of on-site systems has been coupled with an absence of information concerning the impacts of septic systems on ground and surface water quality.

Now, methods of identifying and dealing with the adverse effects of on-lot systems are being developed. They include the wastewater treatment and disposal alternatives discussed in Chapter IV, improved monitoring of water quality, and new managerial methods. The latter are being applied in various communities whose waste flows are small.

As with centralized districts, the issues of legal and fiscal authority, agency management, project financing, and user charges must all be resolved by small waste flows districts.

Authority

Pennsylvania's Act 537 empowers individual municipalities jointly or singly to form authorities for centralized disposal of wastewater. The same Act sets up a system of Sewage Enforcement Officers appointed by each municipality to be responsible for oversight of on-site wastewater management systems.

The SEOs issue building permits, oversee construction and inspect completed installations of on-site systems. They also issue repair permits for failing systems. There is, however, no struc-

ture for management of small waste flows on a district-wide basis. Maintenance remains the responsibility of the homeowner, and no inspection and monitoring program exists.

If a small waste flows management district were set up in the EIS study area, resolution of the roles of agency and SEO would be an important issue. The SEO could, for example, head the agency, be employed by it, continue his present role and work outside it, or serve as an advisor. It is probable that amendents to Act 537 would be necessary.

Management

The purpose of a small waste flows district is to balance the costs of management with the needs of public health and environmental quality. Management of such a district implies formation of a management agency and formulation of policies for the agency. The concept of such an agency is relatively new. The range of functions a management agency may provide for adequate control of decentralized systems is presented in Table IV-14. Because the level of funding for these functions could become an economic burden, their costs and benefits should be considered in the development of the management agency. Major decisions which have to be made in the development of this agency relate to the following questions.

- Should engineering and operations functions be provided by the agency or by private organizations under contract?
- Would off-site facilities require acquisition of property and right-of-way?
- Would public or private ownership of on-site wastewater facilities be more likely to provide cost savings and improved control of facilities operation?
- Are there environmental, land use, or economic characteristics of the area that would be sensitive to operation and construction of decentralized technologies? If so, would special planning, education and permitting steps be appropriate?

Five steps are recommended to implement an efficient, effective program for the management of wastewater in unsewered areas:

- Development of a site-specific environmental and engineering data base;
- Design of the managment organization;
- Agency start-up;
- Construction and rehabilitation of facilities; and
- Operation of facilities.

Site Specific Environmental and Engineering Data Base - The data base should include groundwater monitoring, a house-to-house investigation (sanitary survey), soils and engineering studies, and a survey of available technologies likely to function adequately in the area. This baseline information will provide the framework for the systems and technologies appropriate to the district.

A program for monitoring groundwater should include sampling of existing wells and possibly additional testing of the aquifer.

Such monitoring should be instituted early enough to provide data useful in selecting and designing wastewater disposal systems.

Table IV-14. Small Waste Flow Management Functions by Operational Component and by Basic and Supplemental Usage

Component	Basic Usage	Supplemental Usage
Administrative	User charge system Staffing Enforcement	Grants administration Service contracts supervision Occupancy/operating permits Interagency coordination Property and right-of-way acquisition Performance bonding requirements
Engineering	Adopt design standards* Review and approval of plans* Evaluate Existing system/design rehabilitation measures Installation inspection* On-site soils investigation* Acceptance for public management of privately installed facilities	Design and install facilities Contractor training Special designs for alternative technologies Pilot studies of alternative technologies Implementing flow reduction techniques
Operations	Routine inspection and maintenance Septage collection and disposal Groundwater monitoring	Emergency inspection and maintenanct Surface water monitoring
Planning		Land use planning Public education Designate areas sensitive to soil-dependent systems Establish environmental, land use and economic criteria for issuance or non-issuance of permits

*Usage normally provided by local governments at present.

The sanitary survey which included interviews with residents and inspections of existing systems was conducted during the course of this EIS. Information such as lot size and location; age and

use of dwelling; location, age, and type of sewage disposal system; adequacy of the maintenance of the existing system; water-using fixtures; and problems with the existing system was recorded.

Detailed site analysis may be required to evaluate operation of the effluent disposal fields and to determine the impacts of effluent disposal upon local groundwater. These studies may include probing the disposal area, boring soil samples, and the installation of shallow groundwater observation shafts. Sampling of the water table downhill from drains fields aids in evaluating the potential for transport of nutrients and pathogens through the soil. Classifications of soil near selected leach fields may facilitate improved correlations between soils and leach field failures. An examination of the reasons for inadequate functioning of existing wastewater systems may prevent such problems with the rehabilitation or construction of new systems.

Determination of the basic and supplementary management functions to be provided will be influeced by the technologies appropriate to the Service Area. In this respect, the questions raised earlier regarding formulation of management policies must be resolved.

The product of these analyses should be an organizational design in which staffing requirements, functions, interagency agreements, user charge systems and procedural guidelines are defined.

Agency Start-Up - Once the structure and responsibilities of the management agency have been defined, public review is advisable. Additional personnel required for construction and/or operation should be provided. If necessary, contractual arrangement with private organizations should be developed. Acquisition of property should also be initiated.

Construction and Rehabilitation of Facilities - Site data collected for the environmental and engineering data base should support selection and design of appropriate technologies for individual residences. Once construction and rehabilitation begin, site conditions may be revealed that suggest technology or design changes. Since decentralized technologies generally must be designed to operate within site limitations instead of overcoming them, flexibility should be provided. Personnel authorized to revise designs in the field would provide this flexibility.

Operation of Facilities - The administrative planning, engineering, and operations functions listed in Table IV-14 are primarily applicable to this phase. The role of the management agency would have been determined in the organizational phase. Experience gained during agency start-up and facilities construction may indicate that some lower or higher level of effort will be necessary to insure that the decentralized facilities will be reliable over the long term.

CHAPTER V

Environmental Impacts and Mitigative Measures

Air Quality

No adverse effect on air quality is expected to result from the operations of any of the new and/or upgraded wastewater facilities associated with this project. In addition, the creation, expansion, or upgrading of wastewater treatment facilities in the study area is not expected to result in more frequent or more objectionable odors than those that may already occur, as long as these facilities are maintained properly.

Because the total population and all vehicular travel throughout the study area are projected to be the same for both the No-Action and each of the other alternatives, no induced growth is anticipated from the implementation of any alternative. Because any secondary air quality impacts would be the result of induced population growth, no adverse secondary impacts to air quality are expected to occur as a result of this project.

The addition of an activated sludge process at the Gettysburg STP for all alternatives, which (with the exception of Alternative A) would include increased flows, should not result in any adverse odor because the closest residences are about one-third of a mile from the plant. The Lake Heritage and Cumberland STP's presently operate on an extended aeration system. For those alternatives with increased flows (B through D for the Lake Heritage STP, and D for the Cumberland STP), oxidation ditches will replace the existing systems. No odor problem is expected to occur at either of these facilities, although the Lake Heritage STP has some residences within 500 feet of the facility. Finally, no adverse odor is expected to occur from either the new Lake Heritage plant (under Alternative A) or from a new extended aeration system behind the Schaff's Trailer Park (also Alternative A).

The primary noise impacts, for each of the project alternatives, will be a result of the construction of new STP's and the upgrading of existing plants. There will be an increase in noise levels because of on-site construction activities, however the impacts will be localized to land uses that are noise sensitive (residences, parks, hospitals, etc.) and within 1,000 feet of the construction site.

Secondary noise impacts are generated by induced residential, commercial, and industrial growth in the planning area. Induced growth is measured by the change in population density. A doubling of the population density will increase the day/night sound level (L_{dn}) of the planning areas by 3 dB (EPA 1974). The population projections, for each of the townships in the planning area, predict a small increase in population for the year 2005. The maximum population increase, 64 percent for Mount Joy Township, will result in an increase in sound levels in the range of 2 dB to 3 dB, which is considered subjectively to be barely noticeable (Beranek 1971).

Earth Resources

The impacts of proposed alternatives on earth resources are discussed in terms of erosion and sedimentation because of surface disturbance; they also discussed in terms of the conversion

of open land (including from prime agricultural land to other irretrievable uses), and the groundwater supply/recharge that these alternatives cause.

Erosion and Sedimentation

The wastewater management alternatives that were developed would result in the temporary disturbance of land for the construction of new facilities and pipelines. The extent of disturbance that would result from sewer construction was estimated, under the assumption that a right-of-way 10 feet wide would be disturbed, regardless of pipe size.

Erosion and sedimentation that results from construction may cause severe temporary impacts to the streams. These impacts include increased turbidity, stagnation, and/or increase in temperature, and decrease in dissolved oxygen level. These impacts may be minimized through the use of standard engineering control measures for sedimentation and erosion. A more detailed discussion of mitigative measures is presented in a later section.

Conversion of Open Land

The conversion of open land to use as a municipal facility would not create a substantial impact under any of these alternatives. For example, the maximum expansion anticipated at the Gettysburg STP would affect no more than two acres, in addition to that presently in use. Disturbance at the Schaff's Trailer Park STP would affect less than one acre of open space. The overland flow site designed to serve the Schaff's Trailer Park would require approximately 15 acres of open space. The Lake Heritage STP options would take less than one acre of new space, except for the overland flow site of 25 acres.

Groundwater Supply/ Recharge

The water table aquifer is recharged locally in the study area. Any development of the land surface would replace permeable natural surface materials with roofs, driveways, and other impermeable surfaces. This replacement results in an increase in surface runoff and an associated decrease in recharge to the groundwater system.

We evaluated the projected development in the Gettysburg study area by considering the number of acres that were developed on each of the major geologic bedrock types. This evaluation was performed to determine how much future development would occur on each bedrock type, equating generalized bedrock type with aquifer characteristics. The results of this analysis show consistency of development on the New Oxford Formation. Only one unit difference can be expected, regardless of the alternative selected.

The Gettysburg Formation would have the most developed land, with 411 to 426 acres affected. The Gettysburg Formation is not generally a high yielding aquifer, but it is used extensively for individual supplies. Primary permeability is low, with groundwater migration predominantly along bedding places, fractures, and other zones of secondary permeability. The small range of acreage that is effected indicates that any of the other alternatives would create slight, beneficial impacts to groundwater supply.

From 58 to 81 acres on the Heidlersburg Member of the Gettysburg formation are projected for development under the various alter-

natives. Of all the bedrock types in this area, this bedrock has the highest potential to provide large quantities of groundwater to wells. Although the acres on this bedrock represent a range of 40 percent above the development with the lowest acreage, it is the No-Action Alternative, Alternative A, and Alternative C that would cause the greatest projected development. The other alternatives would cause an impact slightly more beneficial than these three alternatives.

Development on the diabase bedrock is not a significant factor in this area because diabase is not utilized commonly as an aquifer in this area. Thus, the alternatives would have a minimal, slightly beneficial impact to groundwater supply by reducing the amount of impermeable core and allowing the natural infiltration of precipitation.

Mitigation

The PA-DER Rules and Regulations, Chapter 102, "Erosion Control," govern the State program for the control of erosion and sedimentation. These regulations require that a permit for interceptor construction be secured prior to earth-moving activities on 25 acres or more. The permit applicant is required to demonstrate that an erosion and sedimentation control plan will prevent siltation and pollution of surface waters as they are defined under the Pennsylvania Clean Streams Law. The control plan must be designed to prevent accelerated erosion and sedimentation by limiting grading and grading along contour lines, by conserving the existing vegetation, by mulching, and by promptly revegetating the disturbed sites. Plans are to be submitted to the County Soil and Water Conservation District for their review and approval.

Additional measures include minimizing areas disturbed by construction, designing an environmentally sound sewer alignment, avoiding steep slopes, removing excess material, backfilling trenches continuously, diverting runoff from disturbed areas, revegetating disturbed areas with grasses for stabilization and sediment filtering in a timely manner, and using detention or retention basins in critical areas. Measures included in the EIS Alternatives are:

- Placing excavated fill on the uphill side of the trench
- Hauling away soil displaced by the sewer pipe itself
- Leveling off backfilled trenches
- Applying liberal amounts of straw mulch and seeding the backfilled trenches immediately.

Significant adverse impacts associated with the disruption of stream bank areas that is caused by stream crossings (under any EIS wastewater management plan), can be minimized by jacking the sewer pipe beneath the stream bottom itself. This strategy involves excavating pits on each side of the stream and driving the pipe through stream bottom sediments under stream grade.

The establishment of a permanent, vegetated buffer zone along the banks of Rock Creek would minimize the potential for adverse effects on stream conditions (temperature, transparency, etc.). This buffer zone, which would be at least 200 feet wide, should retain both trees and understory vegetation or promote successional revegetation. The zone should be wider than 200 feet where the floodplain exceeds a 200-foot width.

There are several mitigative measures to limit the loss of aquifer recharge. Within the townships and county, officials should consider performance standards that require lower density residential uses, and cluster developments that reduce the impermeable surface coverage in aquifer recharge areas. "Incentive zoning" is a successful tool, where a developer may be granted density increases by providing measures to insure the same amount of recharge as existed before construction.

Measures that can be implemented to promote infiltration include: gravel-filled ditches or "dutch" drains, instead of impervious storm drains; porous asphalt in parking lots and other paved areas; precast concrete lattice blocks and bricks, in place of sidewalks; seepage or recharge basins; and dry wells. These measures have been successfully implemented in a number of areas where groundwater has been identified as a critical resource. It should be stressed that it is considerably less expensive to enact these measures before development takes place.

As development takes place, additional sources of groundwater contamination will occur. To prevent or mitigate these impacts, a number of measures can be taken. Pennsylvania State "Regulations Governing Individual Sewerage Systems" should be strictly enforced. Runoff from streets and parking areas can be mitigated by periodic street cleaning. On a localized scale, stormwater runoff should be controlled, whenever possible, in order to prevent the accumulation of pollutant loads. Close coordination is necessary, among farmers, soil conservation officers, and agricultural extension agents to insure that fertilizer loads are applied as close as possible to crop needs.

Water Resources

Surface Water Quality

This section presents the surface water quality impacts, as well as the associated mitigative measures in terms of various wastewater management alternatives developed in this EIS. Most of the impact assessment and quantification is based on results of the water quality modeling that is presented in Appendix D-1.

Water quality impact was assessed mainly in terms of the DO and total phosphorus concentrations because of their critical conditions in Rock Creek. Implementation of all EIS alternatives requires the effluent quality of all STP's to meet the State effluent limitations in terms of BOD_5 and ammonia concentrations. These effleunt concentrations are much lower than the concentrations presently in the effluents of Gettysburg and Cumberland STP's (see Table III-3). Thus, improvement of dissolved oxygen levels in Rock Creek can be expected. The modeling calculations provide quantitative assessment of the improvement in Rock Creek. Detailed analysis of the calculations for dissolved oxygen profiles can be found in Appendix D-1. Only the salient features of the modeling results are presented in this section.

The results of BOD/DO model projection are summarized in Figure V-1, where the DO profiles under the 7Q10 conditions are compared. The 7Q10 low flow is defined as the lowest average flow that occurs for a consecutive 7-day period at a recurrence interval of 10 years (see Table III-2). The DO sag in Rock Creek under the 7Q10 flow condition and the present BOD loading condition is about 1.0 mg/l, well below the state water quality criteria (5 mg/l). A portion of the stream (approximately 3.5 miles downstream from the Gettysburg STP) exhibits DO levels below the criteria.

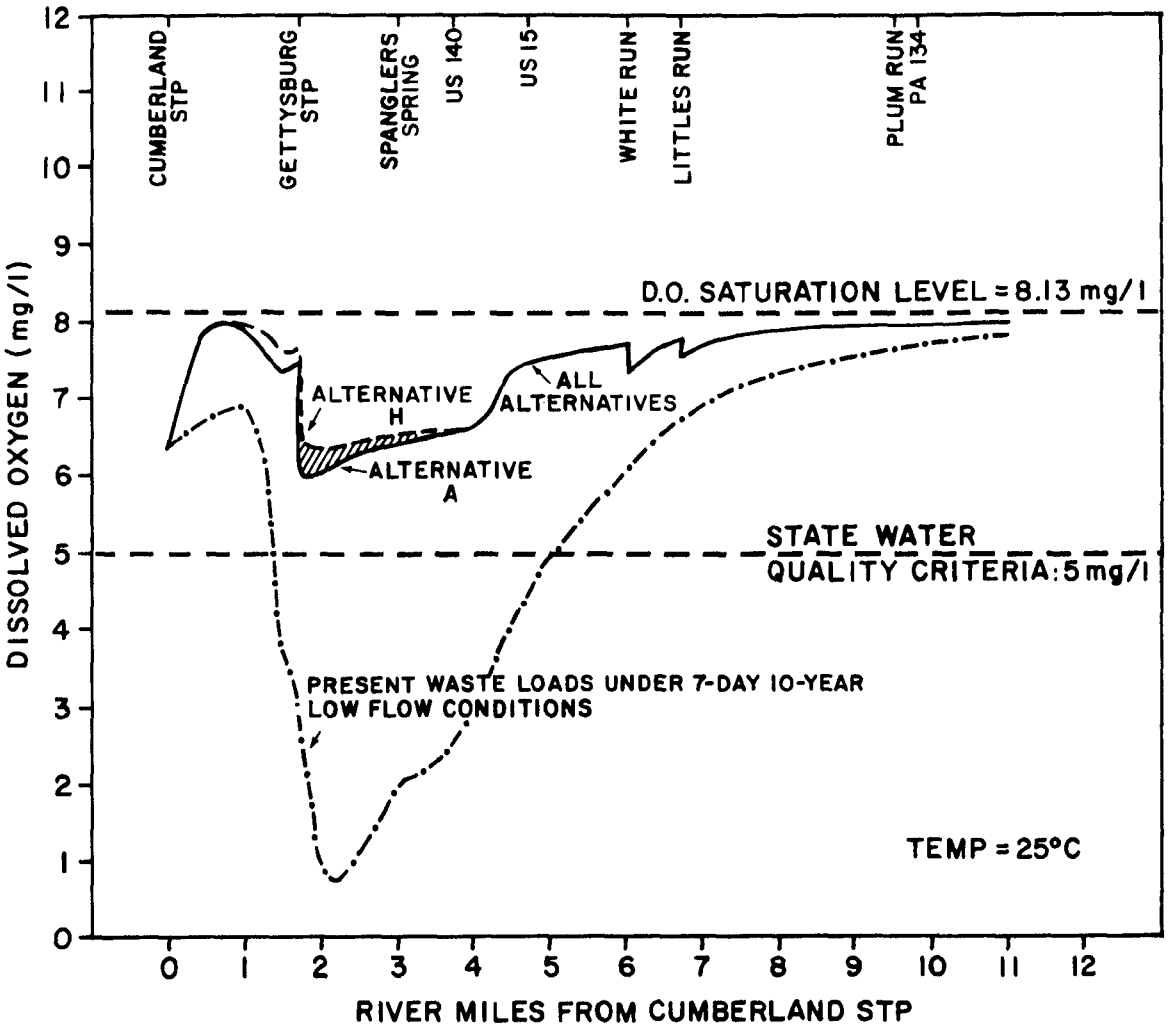


FIGURE V-1 PROJECTED DISSOLVED OXYGEN PROFILES UNDER 7-DAY 10-YEAR LOW FLOW CONDITIONS

All the wastewater management alternatives are expected to raise the DO level in Rock Creek significantly, such that the minimum dissolved oxygen concentration in the stream will be 6.0 mg/l. The results show little difference in the projected dissolved oxygen profiles among all the alternatives.

The calculation of total phosphorus concentration in Rock Creek indicate that the effluent requirement of 1.0 mg/l total phosphorus will maintain the phosphorus level in Rock Creek below 1.0 mg/l, under the 7Q10 condition (Figure V-2). This in-stream phosphorus concentration is acceptable in the free-flowing water, from an eutrophication point of view.

Because of the nitrification process designed in the STP's for various alternatives, future ammonia levels in the effluent will be substantially lower than the present levels. As a result, ammonia toxicity in Rock Creek should not be a problem.

A dechlorination process was designed for the STP's in all the EIS alternatives. The residual chlorine level in the effluent will be below the detection limit, or practically zero. Thus, the residual chlorine effect on aquatic life in Rock Creek should be minimal.

In general, the wastewater management alternatives developed in this EIS would generate no adverse impact on the water quality of Rock Creek. In addition, all the alternatives requiring continuous use of holding tanks or sewering in the Lake Heritage area would not generate any significant adverse impact on the water quality of Lake Heritage.

There is no significant secondary impact to surface water quality because induced growth in the study area has been projected to minimal.

Groundwater Quality

The beneficial impact connected with implementing any of the proposed alternatives would serve to improve the groundwater quality. It is certainly the first step toward reducing groundwater contamination (nitrate, fecal coliform) that is present in the area currently. Obviously those alternatives that serve more existing households would prevent more future contamination than those that serve fewer houses.

Direct impact to groundwater supply could occur if large volumes of groundwater withdrawn over the study area were to be collected, treated, and discharged at only one or two places. This would result in a net deficit of recharge in the study area, and a general leveling of the water table. With the present on-lot systems, drainwater is induced to recharge the groundwater table in the drainfields. The centralization of treatment works removes this water from the sites and, after treatment, discharges it to a surface water body. The efficiency of recharge from such a water body does not begin to approach the efficiency from individual on-lot systems.

Secondary impact on groundwater quality will be insignificant because induced growth will be minimal.

Biological Resources

Aquatic Biota

Several assumptions were made in assessing the impacts of the various wastewater management alternatives. It was assumed that (1) the effluent from any new or upgraded STP's will meet the

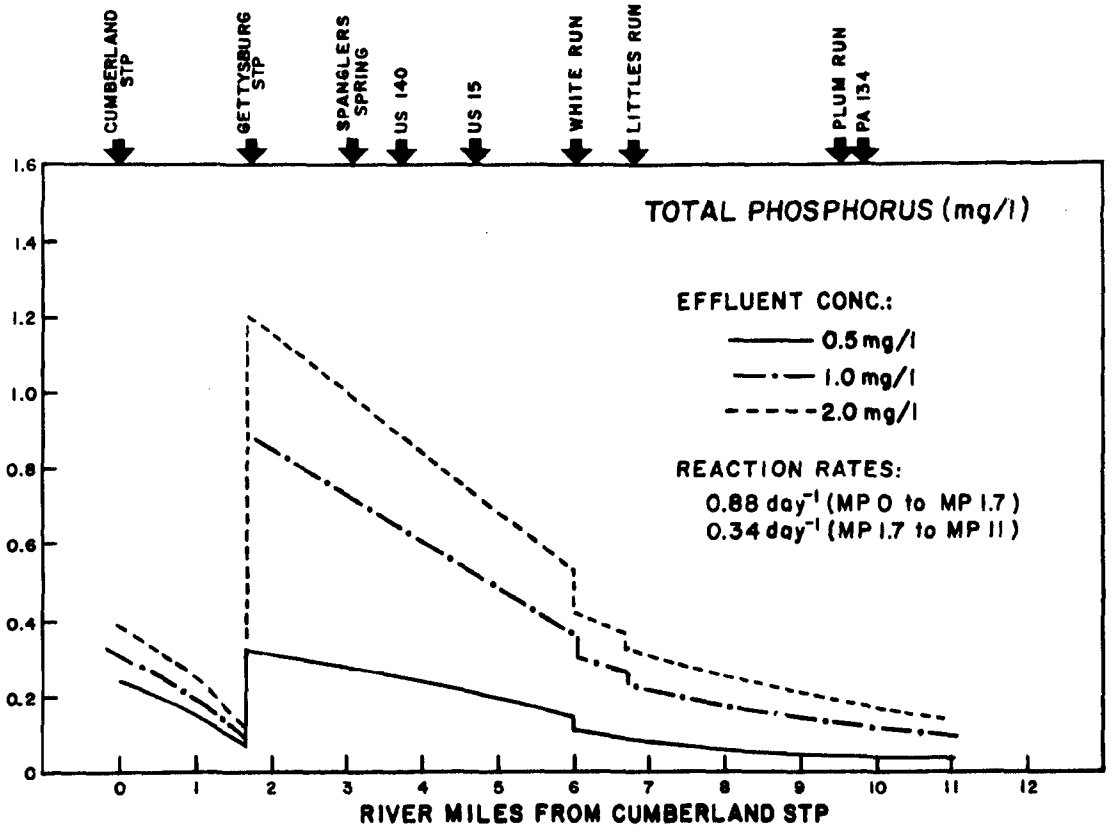


FIGURE V-2 PROJECTED TOTAL PHOSPHORUS CONCENTRATIONS UNDER 7-DAY 10-YEAR LOW FLOW CONDITION

NPDES effluent limitations shown in Table III-3, and (2) that all upgraded or new STP's will dechlorinate their effluent. A ranking of all the alternatives is given in Table V-1.

All alternatives require some use of STP's. The alternatives are discussed below, arranged from the most to the least acceptable. These rankings are based solely on aquatic considerations. However, in terms of impact to the aquatic environment, differences between the alternatives will be small.

Two general opinions were used to rank the alternatives. One was that on-site or overland flow systems were superior to STP's; the second was that, because of the low base flows of the streams in the study area, several smaller STP's would be better than one large STP.

Alternative A--This alternative is more desirable than those listed below because the size of the Gettysburg STP would be small. The very small size of the other three STP's should make their impacts on the aquatic biota negligible.

Alternatives B, C, and D--These alternatives are very similar and the impacts associated with each should be similar. Alternative C is slightly better than Alternative B because it calls for a slightly smaller Gettysburg STP. Similarly, Alternative B is considered superior to Alternative D because the Cumberland and Lake Heritage STP's are smaller in size.

Table V-1. Relative Ranking of the Gettysburg Alternatives.*

Alternative	Amount of Sewage Treated: Land Application	Amount of Sewage Treated: STP	% of 7Q10 low flow that will be STP effluent
A	on-site	1.25--Gettysburg	65
		0.07--Cumberland	10
		0.03--Schaffs Trailer Park	--
		0.03--Lake Heritage	6
C	0.06	1.32--Gettysburg	66
		0.07--Cumberland	10
		0.10--Lake Heritage	18
B	on-site	1.40--Gettysburg	67
		0.07--Cumberland	10
		0.10--Lake Heritage	18
D	None	1.40--Gettysburg	67
		0.17--Cumberland	20
		0.15--Lake Heritage	24
E	0.15	1.57--Gettysburg	70
F	None	1.71--Gettysburg	72

* Rankings based soley on aquatic biology considerations.

Alternative E--Although this plan does call for some overland flow operation, it was rated less desirable than the above alternatives because the Gettysburg STP would be large in size. Under this alternative, approximately 70 percent of the stream flow would be plant effluent, which makes it imperative for the plant to operate properly.

Alternative F--This alternative is viewed as less desirable than "E" because it includes no land application treatment and results in routing all wastewater (1.71 mgd) to the Gettysburg STP. Because 72 percent of the stream flow would be plant effluent, there would be little room for error during plant operation.

No-Action Alternative--This alternative is decidedly inferior compared to any of the others. If the Gettysburg plant continues to operate as it has been, the environmental damage that is already documented in the existing aquatic conditions will continue.

Secondary impact to aquatic biota is practically zero because no induced growth is expected to occur.

Terrestrial Biota

The various alternative plans will have three major types of impacts upon terrestrial vegetation:

- Direct loss of forested land through interceptor pipeline construction
- Direct loss of forested land through treatment plant expansion or new construction, including forest cutting for overland flow treatment sites
- Indirect loss of forested land through induced residential development that is projected as a result of the availability of sewer connections.

Presently, forested land covers less than 20 percent of the study area. So, reduction in the amount of forest represents a greater impact on the study area than it would if forest were a major component of the land cover.

A significant impact presented under Alternatives E and F is the new pipeline, which is proposed through approximately 6,000 feet of stream corridor forest. The forest is presently a narrow strip along Rock Creek, between US 30 and the northern boundary of the study area. Sewer pipeline construction in this corridor will have a significant impact on the narrow remaining tract of forest. Construction on creek banks is likely to produce considerable erosion and to make revegetation on the area more difficult.

In the Gettysburg Study Area, wildlife habitat is concentrated in the forest areas and forest loss is nearly equal to habitat loss.

Population and Land Use

Population

From an overall study area perspective, the effects on population as a result of each of the six EIS alternatives do not differ significantly from the effects anticipated under baseline conditions. "Baseline" future population refers to the total level of population that is expected to reside in the study area through

the year 2005, if present conditions and trends continue. Furthermore, "Baseline" assumes no major public sewerage investments or additions to the existing system, although it does allow for small or moderate size package treatment facilities. The No-Action Alternative essentially is equivalent to "baseline", so the effects of the continuation of existing conditions also can be assessed. Each EIS alternative will generate approximately the same total number of dwelling units and populations in the study area under baseline conditions (see Table III-5). This lack of significant variation in population from the baseline is explained by the fact that, for each EIS alternative, the sewage capacity at the site (or sites) of treatment has been carefully designed to accommodate sewage flows that are adequate for the existing dwelling units (residences) and most of the units in the baseline projections. Thus, through careful engineering design and evaluation of the various proposed sewage treatment facilities, the potential for additional population growth beyond baseline growth has been avoided for the study area. For individual municipalities, some alternatives induce a change from the total projected baseline population as well as the arrangement of that population, by the year 2005. These differences are listed by alternative in Table V-2. Alternatives B, D, E, and F each will result in a different total year 2005 population for one or more of the municipalities. The significance of a change in population relates to the manner in which development patterns, community service systems, and other community services are affected. These effects constitute the important human resource and low use impacts to be considered in evaluating the various EIS alternatives.

Although the absolute amount of growth in the study area for each of the EIS Alternatives parallels projections for baseline growth, the rate of future growth can differ among the alternatives. Absolute growth can also differ from the baseline rate. The projected growth rate in baseline population for the study area averages 1.16 percent per year over the 25 year planning period. This rate of growth is assumed to be reasonable given recent trends and pressures for development both in the study area and throughout Adams County. Table III-5 indicates study area growth by five-year period, when the baseline rate is applied.

However, if the conveyance or treatment facilities proposed in the alternatives are completed by 1985, it is possible that development could occur at an accelerated rate, such that the total design capacity of proposed treatment facilities would be fully utilized earlier than year 2005. For example, if growth pressures increased, total design capacity could be absorbed by accelerated development during the 1985 to 1990 period. However, the probability of such an accelerated growth rate is not likely, given the current trends in housing market, economic conditions, and development pressures.

Beyond this EIS study area, there are at least seven other municipalities involved in similar sewage facility projects in Adams County. It is apparent that neither sewer capacity availabity nor development pressures are concentrated in the Gettysburg area or in any one particular area of Adams County. The rate of housing development in the Gettysburg Study Area most probably will be maintained through the year 2005 (Chapter III, Future Land Use). A temporary increase in development immediately following the construction of new or expanded facilities can be expected; however, this moderate rate increase, reflecting a

Table V-2. Effects of the EIS Alternatives on the Human Environment. Abbreviations: C = Cumberland Township, G = Gettysburg Borough, MT = Mt. Joy Township, MP = Mt. Pleasant Township, S = Straban Township, T = Study Area Total, NPS = National Park Service.

Alternative	Additional Population Associated with Future Development 1980-2005 (by municipality)	Additional Land (in areas) Absorbed by Future Development[2] 1980-2005 (by municipality)	Compatability of Future Development Patterns with Local Plans, Goals, and Objectives	Change[2] in Local Traffic Volumes	Change[2] in Demand on Service Systems resulting from Future Development
A	C 1,206 G 87 MJ 625 MP 379 S 1,402 T 3,699	C 257 G - MJ 124 MP 36 S 184 T 611	Incompatible: C,S,NPS Compatible: G, MJ,MP	Major increase: C,G,S Minor increase: MJ,MP	Minor increase: C,G, MJ,MP,S
B	C 857 G 87 MJ 625 MP 379 S 1,747 T 3,695	C 219 G - MJ 124 MP 36 S 222 T 601	Compatible: C,G,MJ,MP,S,NPS	Major increase: G Minor increase: C,MJ,MP,S	Minor increase: C,G, MJ,MP,S
C	C 1,206 G 87 MJ 625 MP 379 S 1,402 T 3,699	C 267 G - MJ 124 MP 36 S 169 T 596	Incompatible: C,S,NPS Compatible: G,MJ,MP	Major increase: C,G,S Minor increase: MJ,MP	Minor increase: C,G, MJ,MP,S
D	C 1,206 G 87 MJ 640 MP 317 S 1,448	C 253 G - MJ 140 MP 36 S 164	Incompatible: C Compatible: G,MJ,MP,S,NPS	Major increase: C,G,S Minor increase: MJ,MP	Minor increase: C,G, MJ,MP,S

See footnotes at end of table.

Table V-2. Effects of the EIS Alternatives on the Human Environment. Abbreviations: C = Cumberland Township, G = Gettysburg Borough, MT = Mt. Joy Township, MP = Mt. Pleasant Township, S = Straban Township, T = Study Area Total, NPS = National Park Service--Continued

Alternative	Additional Population Associated with Future Development 1980-2005 (by municipality)	Additional Land (in areas) Absorbed by Future Development[2] 1980-2005 (by municipality)	Compatability of Future Development Patterns with Local Plans, Goals, and Objectives	Change[2] in Local Traffic Volumes	Change[2] in Demand on Service Systems resulting from Future Development
E	C 878 G 87 MJ 640 MP 317 S 1,773 T 3,695	C 207 G - MJ 140 MP 36 S 203 T 586	Compatible: C,G,MJ,MP,S,NPS	Major increase: G Minor increase: C,MJ,MP,S	Minor increase: C,G, MJ,MP,S
F	C 878 G 87 MJ 519 MP 317 S 1,814 T 3,615	C 207 G - MJ 124 MP 36 S 216 T 583	Compatible: C,G,MJ,MP,S,NPS	Major increase: G Minor increase: C,MJ,MP,S	Minor increase: C,G, MJ,MP,S
No Action (Baseline)	C 1,206 G 87 MJ 625 MP 379 S 1,402 T 3,699	C 267 G - MJ 124 MP 36 S 184 T 611	Incompatible: C,S,NPS Compatible: G,MJ,MP	Major increase: C,G,S Minor increase: MJ,MP	Minor increase: C,G, MJ,MP,S

[1] Neither Gettysburg Borough nor the Lake Heritage subdivision of Mt. Joy, Mt. Pleasant, and Straban Townships are included in the respective totals. See text for complete explanation.

[2] Parameters of change: Major increase
Minor increase
No change
Minor decrease
Major decrease

pent-up demand that is accumulating during the current period, should average out through the year 2005.

Land Use

The total amount of acreage required to accomodate future development under each alternative was calculated for each municipality (Table V-2). The Lake Heritage subdivision and Gettysburg Borough, however, are not included in these calculations. From a land use perspective, both are essentially developed. The Borough already is almost completely built-out, such that all future development will be accomodated both by infill development on the few remaining vacant parcels and by redevelopment of already developed parcels at higher densities. In the formally approved Lake Heritage subdivision, existing homes are scattered throughout, interspersed with undeveloped lots. Future construction in Lake Heritage is assumed to occur on these lots in an evenly distributed manner. Determination of the exact lots and acreages utilized in Lake Heritage has not been undertaken in this EIS because of its parcel-specific nature.

Typically, land use effects are closely related to population effects. For each of the EIS alternatives, future growth has generally been equated with residential development. As in the baseline projections, no additional, significant industrial land uses are projected under the EIS alternatives, (according to economic trends discussed in the Future Land Use section of Chapter III), although some older industrial uses may be replaced by new industry in other locations. No great pressures for industrial development exist in the Gettysburg Study Area, but if an industry chooses to locate in the study area as a result of sewering in any of the EIS alternatives (e.g., along US 30, east of Gettysburg Borough) the effects essentially would be beneficial for the local economic structure.

Similarly, no additional significant, population-serving land uses, including commercial uses, are projected for any of the EIS alternatives. Considerable population-serving acreage currently exists in the study area, much of which functions seasonally and is tourism-related. This acreage could accommodate an increased year-round demand. Therefore, it is reasonable to assume that no additional commercial uses will be generated during the planning period as the result of the EIS alternatives. Nevertheless, moderate redistribution of existing population-serving uses may occur in response to the sewering configurations that are proposed in the alternatives as well as unanticipated changes in economic conditions.

For the overall study area the absolute amount of growth generated by each of the EIS alternatives does not differ significantly from that projected under baseline conditions. The induced patterns of growth, however, may differ both in the location and in the amount of land required to accommodate that growth. One critical issue here is that densities for sewered development (as allowed by municipal subdivision regulations) are generally higher than densities for nonsewered development. Consequently, less land is required to accommodate the same number of dwelling units when they are on sewered land. Due to the absence of zoning in the study area townships, variation in density between different parts of a township, except for that which is attributable to the provision of public sewer systems, is not expected to be significant.

The total amount of acreage that is absorbed by future development varies, depending upon the alternative, from baseline pro-

jections. The variation ranges from Alternative A, and No-Actions which absorb the same total amount of land as baseline, to Alternative F, which absorbs about 5 percent less land study area-wide. With the exception of Alternative A and No-Action, all EIS alternatives are projected to require less land for future development in the study area than would be required under baseline conditions (which also varies by municipality, as presented in Table V-2).

This decrease in required acreage is related directly to the amount of growth that is publicly sewered and that, therefore, can be accommodated at higher densities than the projections under baseline (usually unsewered) conditions. (Table B in Appendix F-10 lists the acreage absorbed by future development by segment and by alternative.) In Segment 4, for example, 25 non-sewered single family units were projected (in baseline) to occur on 22 acres of land. However, in the EIS alternatives that propose sewers in that area (all except Alternatives A and No-Action), the same 25 units can be developed on only 7 acres, at the maximum allowable sewered density of 3.63 units per acre. Similar concentration of land development occurs in other segments of the study area, resulting in a reduced total number of acres developed.

It is important to note that this potential land reduction is not very significant study area-wide in any case. The smallest potential land absorption (Alternative F) amounts to 28 acres (4.58 percent) less than that projected for the study area under baseline conditions. This rather marginal difference is because of the fact that a certain amount of privately-provided sewage capacity was assumed to occur under baseline conditions (see Chapter III, Future Land Use and Appendix F-1).

The pattern of future development also varies from baseline among the EIS alternatives. The baseline pattern of future development is one in which most of the development is concentrated in areas of Cumberland and Straban Townships north of Gettysburg Borough. This baseline pattern (again, defined as the continuation of current trends) is not necessarily the most beneficial or ideal baseline future; in fact, the baseline pattern or No-Action Alternative is associated with various adverse impacts (Table V-2). Alternative patterns of future growth differ from baseline and from one another generally when a new or supplemental conveyance line is introduced. Such an occurrence usually creates, in effect, a competing attraction between two or more areas--one sewered and another non-sewered. This competition is based on the assumption that a new sewer line in a formerly non-sewered area will provide an attractive force, which "pulls" some potential development away from another area. Similarly, if two or more sewer lines convey flows to a single treatment site, the areas through which each sewer line passes can be assumed to be in competition for the ultimate sewage capacity of the treatment site (all other factors being equal).

The effect of this competition is that different patterns of some study area portions of the municipalities will have more (or less) acres of land developed under one or more of the EIS alternatives than was projected to occur under Baseline conditions (see Table V-2). Within the Straban Township portion of the study area, considerable redistribution of development from the baseline pattern will occur as a result of the implementation of Alternatives B, D, F, and H. Under each of these alterntives, approximately 35 percent of the baseline development projected to

occur north of the Borough (in Segment 18 - see Table B, Appendix F-10) can be expected to be redistributed to areas east of the Borough (Segment 4) along US 30).

The proposed new sewer line introduced along US 30 east of the Borough also provides the incentive for development to be induced (redistributed) there from Cumberland Township (Segment 17) under Alternative B, F, and H. Between 141 (Alternatives F and H) and 150 (Alternative B) additional units will be induced into this area from areas of Cumberland Township north of the Borough. This redistribution results in additional total development in Straban Township with commensurately less development in Cumberland Township. Under Alternatives A, C, and No-Action, the future land use distribution will be identical to that under baseline conditions (i.e., considerable development north of Gettysburg Borough).

Compatibility with Local Plans and Policies

The EIS alternatives, each of which reflects varying patterns and levels of projected future development, can be grouped according to how they conform with local land use plans, policies, and current land management controls. Here again, it must be emphasized that future land use patterns for each EIS alternative, as is the case in the future land use patterns for baseline conditions, is to be interpreted as a representation, or scenario, of future land development only under certain conditions.

The analyses of alternative sewage systems (see Appendix F-10) are presented in generalized form and are not the result of specific ownership boundary considerations, parcel-specific analyses, and the like. As such, none of the future land use analyses for EIS alternatives should be viewed as a "future land use plan." Rather, the alternative analyses or scenarios represent the most probable configurations of future development if baseline conditions are met or alternatives are constructed. These scenarios are most useful for the purpose of comparison, as an aid in the decision-making process. The scenarios are intended to be tests of different alternatives and should not be construed as EPA's or anyone else's plan for the future.

In Cumberland Township, EIS Alternatives B, E, and F represent levels and patterns of development that closely conform with the township's adopted comprehensive plan (PA-DCA 1979) and the current policy recommendations of its governing body (Weikert 1980). These alternatives represent a level of growth north of Gettysburg Borough that is not as large as the baseline projection. However, this area north of the borough remains the focal point for the majority of future growth in the EIS study area portion of Cumberland Township. EIS Alternatives A, C, D, and No-Action are not as compatible with township policies. All of the latter alternatives reflect a greater degree of development in this area than is considered desirable by the Township.

In Gettysburg Borough all of the EIS alternatives conform to a reasonable, although gradual, rate of development. This rate of growth is also compatible with the borough's unadopted Draft Comprehensive Plan (PA-DCA 1979).

The Straban Township Act 537 Plan (Gettysburg Engineering Company 1974) and the policy recommendations of the local governing body (Weaner 1980) indicate that the patterns of development associated with EIS Alternatives B, D, E, and F closely conform with

township policies. However, baseline projected growth, as well as EIS Alternatives A, C, and No-Action are incompatible with Straban's policies because these alternatives all represent greater levels of growth in areas north of the borough and commensurately lesser levels of growth immediately east of the borough (see Table V-2).

In Mount Joy and Mount Pleasant Townships, there are no formal land use plans, comprehensive plans, zoning ordinances, or explicit policy recommendations. Consequently, a proper assessment of conformance with local policy is extremely difficult. In these two municipalities, each EIS alternative reflects patterns and levels of growth that are quite similar to the projections for baseline growth, and none is unreasonable in light of recent trends in development.

The "Draft General Management Plan for the Gettysburg National Military Park" (USNPS 1979) proposes that development should be prohibited within the Park and restricted in adjacent areas, particularly in areas that, if developed, would have potential visual impact on the park. None of the EIS alternatives promotes development on Federally-owned park land. EIS Alternatives B, D, E, and F, in which some of the development that is projected to be concentrated in areas north of the borough is redistributed to areas east of the borough, may conform more closely to the intent of the General Management Plan. The aesthetic impacts of the EIS alternatives are discussed in detail in the later section, on Aesthetic Resources.

Traffic Patterns

Current traffic volumes on study area highways appear to be moderate, although serious problems often develop during periods of peak tourism activity, particularly within Gettysburg Borough. No major new highway additions or modifications are assumed to be forthcoming during this planning period. Alternatives A, C, D, and No Action, would exacerbate existing traffic problems, and potentially could creat additional problems through the development of between 646 and 751 new residential units in areas north of Gettysburg Borough (along PA 34 and Business Route US 15). Traffic volumes would be increased to a lesser extent in those areas of Cumberland and Straban Townships north of the Borough under Alternatives B, F, and H. Minor traffic increases can be expected on most of the other study area roadways during the planning period as the population increases. Since Gettysburg Borough is the local point for governmental, tourism, commercial, and institutional activities in the study area, unavoidable increases in traffic through the center of the Borough can be expected to occur under every Alternative including No-Action (Table V-2).

Community Services

Community service systems (such as schools, police and fire protection, health care, and the like) are provided on a regional, rather than a local, basis in the Gettysburg area. Health care services, for example, are available to all study area residents by either of two regional hospitals (Annie M. Warner in Gettysburg, and, to a lesser extent, Hanover General in Hanover), rather than by separate, municipal facilities. This regionalization of services makes the operation of the systems generally more efficient. In addition, the service areas are large, and encompass the entire study area, so that existing and

future residents will be served no matter where they reside within the study area. Therefore, since all of the EIS alternatives are virtually identical with respect to total population generated within the study area (with only the patterns being different) no major adverse effects are anticipated under any of the alternatives. In some cases, notably schools and health care, an increase in demand would provide a beneficial effect by increasing operational efficiency through greater use of the facility. Effects on the community service systems are described separately below and are summarized in Table V-2.

Schools

Increases in population suggest that there will be an associated increase in the number of children who will require public schooling. All of the study area municipalities, with the exception of Mount Pleasant Township, are within the GASD; Mount Pleasant Township is within the LASD. Both school districts have recorded declining enrollments in recent years (see Chapter III, Community Services). In addition to the public schools, there currently are six non-public schools located within the EIS study area.

Current enrollments in the GASD total 3,688 students, or 73 percent of the district's rated capacity for 5,016 students. None of the EIS alternatives would add more than 1,000 new students to the school district even under the assumption that all new students would enroll in public schools. This projected increase in enrollments can be accommodated easily by the GASD, and might even provide a beneficial effect should the increase prevent the closure of school facilities or reduce teacher layoffs that otherwise might be necessary.

The same situation exists in the LASD, where current enrollments represent only 73 percent of the district's rated capacity of 2,711 students. None of the EIS alternatives would add more than 160 new students to this district, an increase that is significantly lower than the approximately 750 additional students that could be accommodated in the district schools.

Public Safety

As discussed in Chapter III (Community Services) the protection afforded to study area residents for both police and fire services appears to be adequate for the present and the near future. The projections of 3,699 additional persons, at maximum, by the year 2005 would translate into a need for 4.4 additional Gettysburg and Cumberland policemen (according to a standard of 1.2 officers per 1,000 residents in the population, as adopted in the Cumberland Township Comprehensive Plan). The Lake Heritage community is protected by a private security force of its own. Fire protection and ambulance service is provided to study area residents largely by volunteer forces, and it can be assumed that the number of volunteers will increase as the population increases.

Health Services

The additional populations generated by any of the EIS alternatives will have a net beneficial effect on the provision of health care services in the study area. Presently, both hospitals serving study area residents (Annie M. Warner and Hanover General) are underutilized. All additional residential development in the study area will contribute to a more efficient utilization of local health care facilities.

Solid Waste Disposal

The solid waste disposal needs of study area residents are served by two private contractors. None of the EIS alternatives is expected to create significantly different demands for disposal service.

Energy Supplies

Based upon utility company data, regional electric and gas needs for the Gettysburg area will be met during the planning period for each of the EIS alternatives.

Water Supply

The GMA supplies public water to all of Gettysburg Borough and parts of Straban and Cumberland Townships. Given current demand, considerable capacity is available to serve all projected populations under each of the EIS alternatives. In 1977, GMA completed a study to plan for improvments to its water sysem. This plan (GFCC 1977) will guide GMA in its attempt to serve an additional 5,700 persons by the year 2010.

Lake Heritage Utilities, Inc. (LHU) supplies public water to residents of the Lake Heritage community. Presently, LHU has ample supplies to serve all projected residents in Lake Heritage. None of the EIS alternatives will create an unusual demand for public water service during the course of the planning period.

Archaeological Sites/ Historic Sites/Aesthetic Resources

Archaeological Sites

Primary Impacts--"Primary" impacts on archaeological sites are those that may result from construction or operation of the proposed wastewater treatment facilities. Ground disturbances related to the construction of pump stations, force mains, collection and conveyance systems, and new treatment plants (or expansion of existing treatment facilities) may result in disturbance to or destruction of buried prehistoric and historic archaeological resources. Except for areas adjacent to Rock Creek, which were surveyed by a professional archaeologist during 1979, no professional reconnaissance has been conducted in the project area. Therefore, only an assessment of potential direct impacts can be discussed for each alternative. It is expected that a full archaeological survey will be conducted following selection of an alternative and prior to beginning construction.

As proposed, Alternative A could result in ground disturbance related to expansion of the Cumberland and Gettysburg STP's. During 1979, Dr. Fred Kinsey conducted an archaeological survey of Rock Creek in the designated primary impact area of the GMA proposed action (for construction of the Gettysburg Regional Wastewater Treatment Facility).

Kinsey determined that there was very low archaeological potential in the low areas adjacent to the existing treatment plants and, consequently, no further archaeological research would be required prior to expansion of the facilities. Alternative A requires relocation of a treatment plant at a trailer park south of US 30, and relocation of the Lake Heritage STP. Should construction of either of these facilities involve disturbance to stream benches or high dry ground adjacent to streams, an archaeological survey to identify potential archaeological resources may be required before construction of these facilities is approved. The direct impact area for construction of the proposed pump station and force main at the trailer park may also require a survey for both prehistoric and historic archaeological sites.

Implementation of Alternative B has the potential for similar direct impacts on unknown archaeological resources. A difference is that at the Schaff's Trailer Park, wastewater will be conveyed

by a collection and conveyance system to be constructed adjacent to the park along US 30 and along the Cumberland Township--Straban Township border between the Gettysburg STP and US 30. Sections of the collection and conveyance pipeline corridor that were previously undisturbed may require an archaeological survey to locate unrecorded, buried historic or prehistoric sites which may be disturbed or destroyed. The right-of-way of the proposed collection system between the Gettysburg STP and US 30, for example, may pass by Ewell's Civil War Headquarters on US 30 and the W. H. Montfort Civil War hospital near Zinkand Pond. The collection system passes Historic Site No. 130 (Figure III-8, "r"). Buried archaeological material related to these historic sites may be disturbed. In addition, the Zinkand Pond area was determined by Dr. Kinsey to have moderate archaeological potential, and an archaeological survey to locate any unrecorded prehistoric material was recommended by Dr. Kinsey.

Alternative C would result in impacts similar to those of Alternative B, with the addition of force main and conveyance and collection system construction southeast of the Trailer Park. This area, and a proposed overland flow site on a branch of Rock Creek may require an archaeological reconnaissance survey.

The potential direct impacts of Alterantives D and E on historic and prehistoric archaeological resources are similar to each other. Patterns of ground disturbance and potential impacts along US 30 and near Zinkand Pond are the same as those for Alternative B, and similar archaeological surveys will be required. In addition, reconnaissance archaeological surveys may be undertaken in the corridors of proposed collection and conveyance systems between Business Route 15 and PA 34 north of Gettysburg Borough, and West of PA 34, northwest of Gettysburg Borough (only if such surveys are funded by EPA). Ground in low marshy areas adjacent to Rock Creek that would be disturbed by construction of force mains and collection facilities (Figure III-10) was surveyed for prehistoric archaeological resources by Kinsey (1979). This ground was determined to have low archaeological potential, and to require no further archaeological reconnaissance.

Ground to be disturbed by construction of a pump station and force main and by construction of a treatment plant or land disposal site south of Lake Heritage may require an archaeological survey in order to locate unknown archeological resources. The D. Schaffer Civil War Hospital site is in this vicinity, and higher ground adjacent to Rock Creek may also contain historic and prehistoric archaeological sites. Similarly, undisturbed ground to be effected by the construction of pump stations, force mains, and collection and conveyance systems around Lake Heritage and to the northwest of Lake Heritage may require archaeological reconnaissance to determine whether direct impacts will occur to unknown archaeological sites that are eligible for the National Register. Intrusion of wastewater facilities into the Gettysburg Battlefield National Historic District will constitute an adverse impact on the district. Adequate professional survey and applicable mitigation would be required to satisfy requirements of Section 106 of the National Historic Preservation Act of 1966 (PL 665, as amended).

Direct impacts of Alternative F are similar to those of Alternatives D and E, except that additional force mains and collector systems would be installed along PA 116 between Rock Creek and Plum Run. Archaeological surveys would be required of undis-

turbed sections of these direct impact areas wherever there was a likelihood of discovering historic or prehistoric archaeological resources.

In summary, the greatest amount of ground disturbance and, consequently, the greatest potential for direct adverse impacts to archaeological resources would result from the construction of Alternatives D, E, or F. Land within the Gettysburg Battlefield National Historic District would be disturbed by the construction of any of these three alternatives, and compliance with Section 106 procedures would be required for any direct impact areas that were not previously surveyed by an archaeologist. During a 1979 preliminary archaeological survey, it was recommended that a more intensive reconnaissance be conducted of any lands in the Zinkand Pond area that may be disturbed by the project. All areas adjacent to known Civil War and other historic sites should also be surveyed by an archaeologist.

A minimum amount of ground disturbance would result from the implementation of Alternative A. However, whichever alternative is selected, archaeological surveys of direct impact areas that are undisturbed and previously unsurveyed may be required in order to determine their archaeological potential. Surveys and tests will be required in the vicinity of known historic archaeological sites, within the boundaries of the National Register District, and in areas of moderate to high archaeological potential, where Kinsey recommended surveys.

Secondary Impacts--"Secondary" impacts are those that may occur from induced growth and future property development as a result of the implementation of a proposed project. The amount of growth and development for the years 1980-2005 that will occur if any of Alternatives A-F is implemented will not exceed that expected if none of the alternatives were to be implemented. Therefore, indirect impacts on archaeological resources cannot be directly attributed to construction of any project.

Mitigative Measures--Presently, potential impacts on archaeological resources that may result from construction of any of the alternatives are unknown. Prior to construction of any alternative proposed for the project, a Phase I archaeological survey probably will be required. Alternatives where surveys may be required include Alternatives D, E, and F.

Historic Sites

Primary Impacts--"Primary" impacts are those that would result from constructing or operating any of the proposed alternatives, and would constitute either beneficial or adverse effects to historic sites, properties, structures, or objects that are listed on or determined eligible for, the National Register of Historic Places. In this section, we discuss primary impacts to known historic properties presently listed on the National Register of Historic Places and the Pennsylvania Inventory of Historic Sites and Landmarks, and those historic structures determined to be potentially eligible for the National Register by the HGAC Historic Sites Survey.

"Beneficial effects" of alternatives generally consists of improvement to the aesthetic setting of historic sites and structures; such an improvement would result from the removal of present septic tank failures that cause unpleasant odors and damp depressions on the ground of structures, or cause the pollution of streams on and adjacent to such properties. "Adverse effects" consist of one or more of the following (36 CFR VIII 800, as amended):

- Destruction or alteration of all or part of property;
- Isolation from or alteration of surrounding environment;
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
- Transfer or sale of Federally-owned property without adequate conditions or restrictions regarding preservation, maintenance, or use; and
- Neglect of property resulting in its deterioration or destruction.

Upgrading the existing Gettysburg Treatment Plant under Alternative A should have adverse visual effect that is only minor on the Gettysburg National Military Park; and in general, upgrading should enhance the overall ambience of the Gettysburg Borough Historic District by alleviating existing septic problems. No other direct adverse effects on historic sites listed on or eligible for the National Register of Historic Places should result from the construction of Alternative A.

Construction of Alternatives B and C would require installation of collector pipes adjacent to Historic Site Number 130 on US 30. If proper care is taken during construction, no adverse impact should occur to this structure.

Upgrading the Cumberland Treatment Plant north of the Gettysburg Historic District under Alternative D should have only minor visual affect on the Gettysburg National Military Park and the Battlefield Historic District. Erection of a pump station on PA 116 west of the Battlefield Historic District at the East Cavalry Battlefield Site should have minimal adverse visual affect on the site.

Primary impacts of Alternative E would be similar to those of Alternative D, with additional minor visual impact on the Gettysburg National Military Park and the Battlefield Historic District resulting from erection of a pump station on the Cumberland Township border northwest of Business Route 15. However, upgrading wastewater treatment facilities in this area should improve water quality in Rock Creek (see Surface Water Impact Section) and, in the absence of induced new growth or development, improve the ambient quality of these historic sites.

Construction of Alternative F would require erection of a pump station within the National Register District at the East Cavalry Battlefield Site, which may constitute an adverse visual impact on that historic site (in the vicinity of Plum run and PA 116). Other impacts north and northeast of Gettysburg Borough would be similar to those of Alternative E.

In general, direct adverse impacts on historic sites, structures, properties, and places will be minimal for all alternatives (A, B, C, D, E, and F). Alternative F would result in the greatest number of direct adverse impacts on sites listed on the National Register and on government-owned and administered historic properties. Upgrading wastewater treatment facilities should have a beneficial effect by relieving the existing septic problems that detract from the historic ambience of significant historic sites. In the absence of induced growth or development, which constitutes an adverse indirect effect on National Register pro-

perties, such upgrading should provide beneficial effects to offset the minor adverse visual effects of the proposed alternatives.

Secondary Impacts--Secondary, or "indirect," impacts are created by the development that may accompany improvement in wastewater treatment facilities; such impacts include: population growth and the conversion of undeveloped land to developed uses. These impacts are listed in the Criteria of Adverse Effect for structures eligible for the National Register as promulgated by the ACHP (36 CFR VIII 800.9). In this section, we discuss indirect impacts on historic structures and districts listed on, or eligible for, the National Register of Historic Places, as well as government-owned National historic sites.

Development of, or alteration to, the open space that surrounds many historic structures in the planning area presently and that constitutes an integral part of their historic setting may diminish the scenic quality and, hence, the historic integrity of such properties. Similarly, altering the character of potential historic districts by introducting structures, objects, or land uses that are incompatible with the historic setting and buildings of the district would constitute an adverse impact on the historic quality of the district.

Because altering the scenic quality of the area surrounding an historic site or district may alter the historic integrity of the area, indirect effects on historic resources are interrelated with effects on aesthetic resources. For this reason, historic preservation requirements for mitigation in the Gettysburg project area also apply to impacts on aesthestic integrity of the views from such historic sites as the Gettysburg National Military Park, the East Cavalry Battlefield Site, and the Gettysburg Historic District. Visual impacts on historic resources, resulting from growth and development related to each proposed alternative, are included among impacts on aesthetic resources, discussed in the section following.

Constructing any of the alternatives would not result in new growth or development beyond that projected for baseline growth between the years 1980-2005. The siting of facilities, configuration of proposed treatment and collection systems, and capacities of the respective facilities for each alternative, will determine where concentrations of baseline growth and development will occur. In addition, baseline growth will be exceeded within certain municipalities depending upon the alternative selected. It is appropriate, therefore, to consider concentration of development to be among the indirect effects of each alternative. Projected development is provided in number of acres developed and units per acre. The type of development that is presently permitted is unspecified and may become the subject of a Memorandum of Agreement in order to mitigate the adverse indirect impacts of the selected alternative for wastewater treatment facilities.

The National Park Service (n.d.) has designated certain "Critical Areas": lands that, if they are developed, would have visual impact on the Gettysburg National Military Park (Figure III-8) and preservation subzones (Figure III-8 or 9). Concentration of development in any of these areas as a result of implementating any alternatives will be considered an adverse impact.

Construction of Alternative A will result in baseline growth throughout the project area and secondary impacts would be similar to those for the "No-Action" Alternative. No indirect impacts to historic resources can be attributed to the construction of Alternative A.

Alternative B would result in the development of 48 acres fewer than baseline in Segment 17, and 60 more acres than baseline in Segment 4. In Segment 18, 22 fewer acres would be developed. In Segment 4, 330 units would be concentrated on 88 acres; however, Segment 4 is not considered to be a critical area by the National Park Service (nd: 99) and scenic views from the Battleground Historic District toward Segment 4 were not found to be of high quality during the 1979 aesthetic resources survey (Figure III-11). Views from Segments 8 and 10 toward Segment 4 are primarily agricultural and compatible; rated scenic. Therefore, there may be some adverse effect on these views, such an effect constitutes a secondary impact on the Gettysburg National Military Park and Battlefield Historic District.

Indirect impacts of Alternative C are similar to those of Alternative A, except that in Segment 4 (Figure III-14), the 59 units projected for baseline growth will be concentrated on 13 acres and, therefore, constitute higher density development. Development near the National Register district boundary will be no different from baseline, but higher density development may occur at a distance from the district. This should not constitute an adverse visual impact.

The potential indirect impacts of Alternatives D and E are similar. Concentrations of development above baseline projections would occur in Segments 4 and 7 and in "other" areas in Mount Joy Township. If Alternative E were selected, population densities would be the same as baseline in Segment 17, however, fewer acres would be developed. For both Alternatives D and E, baseline density would occur in Segment 18, but fewer acres would be developed. Potential indirect impacts on views from Gettysburg National Military Park and the Battlefield Historic District would be similar to those discussed for Alternative B.

If Alternative D were implemented, the visual impact in Segment 18 would be reduced slightly from the projected impact that is related to baseline development; while increased densities in and adjacent to the Battlefield Historic District in the vicinity of East Cavalry Battlefield Site may have an adverse effect upon views from access roads to the National Battlefield (Station 23, Figure III-11) and upon the Historic Distric itself. However, Segment 7, is not included among the critical areas, which if developed would have a visual impact on the Park (NPS h.d.: 99).

If Alternative E were selected, adverse visual impacts on views from Station 10 (Figure III-11) would be increased over adverse impacts under baseline conditions and under Alternative D, while visual impacts in Segment 17 would be additionally reduced.

Projected impacts on historic sites from the construction under Alternative F would be identical to the impacts under Alternative E, except that density in Segment 7 would be reduced from 3.9 to 3.8. In addition, the proposed development related to Alternative F would take place outside of the Gettysburg Historic District boundary in Segment 7, which reduces the adverse visual impacts within the district but increases potential adverse impact on views west from the district.

In general, adverse indirect impacts on historic resources from all alternatives will be minimal. Alternatives B, D, E, and F would create the greatest negative impact on views from the Gettysburg National Military Park (Stations 8 and 10, Figure III-11) and from the Battlefield Historic District.

Such impacts may be mitigated easily by the installation of adequate screening devices, such as stands of evergreen trees. In addition, mitigation could include controls on construction, controls that specify and/or restrict color, height, and style of the development that is permitted in areas where projected growth may result in an adverse effect on scenic historic integrity of National historic sites and historic sites that are eligible for the National Register of Historic Places. Mitigations are discussed in more detail in Appendix G-8.

Mitigative Measures--Minor adverse visual effects are anticipated on the historic district and military park during the construction of wastewater transmission lines and pump stations. Impacts of transmission lines may be mitigated by limiting bulldozing only to necessary construction areas, as well as by requiring prompt mulching and seeding after construction. Measures mentioned above should be applied to pump station construction, as well as measures like the planting of indigenous conifer and evergreen species to screen pump stations. Pump stations may also be constructed partially below grade to lessen visual intrusion. For additional measures see Appendix G-8.

Aesthetic Resources

Primary and Secondary Impacts--Potential impacts to aesthestic resources that may result from implementing any of the alternatives in the Gettysburg project area are an important consideration, primarily because these impacts are included among the potential impacts to historic resources. Consideration of these impacts is required under mandates from the National Historic Preservation Act of 1966, as amended, Executive Order 11593, and the Advisory Council Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800, as amended).

Beneficial impacts on the aesthetic quality of the Gettysburg area will result from the removal of septic problems that presently detract from the attractiveness of the Rock Creek stream channel, and the attractiveness of specific areas where odors and other problems occur. Such beneficial impacts will result from implementation of any of the alternatives.

Adverse impacts on the long-term aesthetic quality of the planning area are those that could result from secondary growth induced by construction of the alternative wastewater management systems. Many residents of the planning area appreciate the aesthetic quality of those areas that retain their historic, nineteenth-century rural character. Such appreciation results from a knowledge of local history and a familiarity with the architectural styles of the area, where families have lived for several generations. The appreciation is shared both by long-time residents and by tourists who visit the planning area because of its rural solitude and historic scenic beauty.

Because the aesthetic quality of the architecture throughout the countryside is an important aspect of the overall scenic quality of the landscape, any loss of the open space that surrounds the structures or historic districts diminishes their historic and aesthetic quality for visitors and local residents. Although a perception of what is aesthetically pleasing in a landscape is

subjective, the historic land uses are familiar to the inhabitants of an area and, therefore are, desirable. Any loss of aesthetically pleasing landscape would constitute a secondary adverse impact of the alternatives.

The primary concern in the Gettysburg area is to maintain the pastoral historic setting of the National Monuments Parks and historic districts. Development that may intrude upon the landscape or that may disrupt current aesthetically pleasing views from these historic resources would constitute a negative impact on the aethestic resources of the project area. The potential adverse impacts on aesthetic resources that would result from implementing the alternatives are the same as the potential impacts on historic resources that are discussed in previous section.

Because none of the alternatives would induce growth or development beyond what would occur without the proposed Federally-funded project, adverse impacts on aesthetic resources that can be attributed to construction of the proposed wastewater treatment facility alternatives are minimal. Implementation of one alternative as opposed to another may affect the distribution of development within the project area; to that extent, any adverse impacts to aesthetic resources that result may be considered attributable to the proposed project alternative. Adverse impacts to the aesthetic quality of the project area may result from the implementation of Alternatives B, D, E, or F, but as mentioned above, they are anticipated to be minimal.

Mitigative Measures--The requirements of the National Historic Preservation Act of 1966 (PL 89-665), the Archaeological and Historic Preservation Act of 1974 (PL 93-291), and Executive Order 11593 provide for consideration of primary effects on historic cultural resources that are listed on, or may be eligible for, the National Register of Historic Places. The requirements apply to Federally funded, licensed, or otherwise assisted undertakings.

However, such consideration would not be required for privately funded future development (secondary effects) in the planning area. It is therefore difficult for EPA to provide adequate mitigation for secondary adverse effects of land development on historic properties, although consideration of such effects is mandated by EPA guidelines for compliance with NEPA.

Alternatives B, D, E, and F are anticipated to have some impact on non-critical views within the Battlefield Historic District. These views were not considered high quality during the 1979 survey. In order to mitigate the impacts anticipated, however, a number of actions can be taken. Efforts should be redoubled to generate interest in conducting township planning and zoning that would conserve historic resources and landscapes. A conservation easement program could be initiated by the NPS to inform residents of the tax advantages that can be realized by deeding partial interest in their land to the service. The NPS should also reevaluate their resources to purchase critical lands in fee-simple or to buy conservation easements from local owners. Views that may be impacted could be enhanced by establishing and planting vegetation buffer screens.

Considerable effort has been expended to stimulate local township interest in conducting comprehensive planning and zoning that allows for orderly growth to occur while conserving historic

sites and structures. Municipalities are authorized, under Pennsylvania Act 167 of 1961, 53 P.S. Section 8001, to delineate and officially map historic districts and to appoint a Historic Architectural Review board. This board can advise the township commissioners on the appropriateness of design, height, color, and density of residential development in that district. Construction, demolition, or alteration cannot take place unless a certificate of appropriateness is issued by the governing body (Strong et al 1979). Additionally, through planning and zoning municipalities can direct higher density development into defined areas, and designate low density or open space zones into others.

Subdivision regulations may be written for each township to require design and buffer requirements in the land development process. For example, a developer could be required to retain a minimum width of land with fencing or trees to screen historic sites from buildings under construction. Additionally, these regulations may require underground installation of utilities, retention of a certain percentage of open space, and attention to the nature and extent of alterations to designated historic sites. The PA-DCA has developed the most experience in planning and zoning and should be consulted for their technical expertise.

NPS may wish to establish a conservation easement program and to act as recipient to deeds for partial interest in lands of high historic or scenic value. A "conservation easement" is a legal agreement between a property owner and an eligible recipient (a non-profit organization, such as HGAC; or a government entity, such as any municipality or NPS, in which the owner (donor) agrees to certain restrictions over his historic property and the recipient (donee) agrees to monitor the property and uphold the terms of the agreement (Strong et al. 1979).

The degree of protection to the site can vary with each easement document, but generally the easement restricts, in perpetuity, changes in the use of the land, and states that no construction or alteration of the subject property may occur without the concurrence of the donee. Under the Tax Reform Act of 1976, as amended by the Tax Reduction and Simplification Act of 1977, charitable contribution deductions on an individuals income tax are specifically permitted for gifts of less than the taxpayer's entire interest in property. These can include easements granted, in perpetuity, for conservation purposes, such as historically important land area or structures (Strong et al 1979). NPS should investigate the feasibility of 1) purchasing easements outright, 2) working with local interest groups to form an easement program, 3) setting up an easement program themselves and approaching property owners, or 4) working with local units of government in conducting such a program.

NPS could also work directly with local developers in planning and landscaping buffer areas to screen development from local historic resources. NPS could develop model landscape planting schemes and possibly develop a nursery for stock. This planning scheme should employ indigenous evergreen species that are readily available locally. The Park Service should consider working with local garden clubs, 4-H, or horticultural groups to develop local interest and educational demonstrations that would contribute to carrying this program out.

Local land development restrictions, conditions, and ordinances cannot be implemented by EPA. Therefore, EPA's responsible consideration of secondary growth impacts on historic cultural

resources may be limited to the selection of alternative plans that would reduce the potential for future development in certain sections of the planning area in order to retain their historic integrity while satisfying the need for improved wastewater management facilities. For further detail of mitigative measures see Appendix G-8.

Economic Conditions

Introduction

The economic impacts of all alternatives are evaluated in this section. The evaluation of economic impacts consists of an analysis of user charges, financial burden on users of the wastewater management facilities, and financial pressure that might cause lower income residents to move away from the service area (displacement pressure). The impacts are evaluated for each of the communities in the service area.

User Charges

User charges are the costs periodically billed to customers of a wastewater management system. The user charges for the systems proposed in the EIS alternatives have been calculated for each community in the service area (see Chapter IV, Costs of Alternatives) and are presented in Table IV-13.

Significant Financial Burden--High-cost wastewater management facilities may place an excessive financial burden on system users. Such burdens may cause families to alter their spending patterns substantially. The Federal government has developed criteria to identify high-cost wastewater projects (the White House Rural Development Initiatives 1978). A project is considered high-cost when the annual user charges are greater than:

- 1.5 percent of median household incomes less than $6,000;
- 2.0 percent of median household incomes between $6,000 and $10,000;
- 2.5 percent of median household incomes greater than $10,000.

The 1980 median household income estimates for each of the service area communities are presented in Table V-3. The median household incomes range from a low of $16,465 in Mount Joy to a high of $18,885 in Cumberland. According to the Federal criteria, any alternatives having annual user charges exceeding 2.5% of these median household figures are "high-cost" alternatives. Therefore, Alternatives C, D, and E are high-cost alternatives for Straban because under these Alternatives user charges exceed 2.5% of Straban's median annual income. Because income data for Lake Heritage are lacking, it is impossible to estimate the median income for Lake Heritage. However, given the relatively high user charges estimated for Lake Heritage, it is likely that Alternatives B, C, D, E, and F (especially D, E, and F) are high-cost alternatives for Lake Heritage.

Table V-3. Estimated 1980 Median Household Incomes

Municipality	Median Household Income	2.5% of Median
Gettysburg	18,255	456
Cumberland	18,885	472
Straban	16,900	422
Mount Pleasant	16,635	416
Mount Joy	16,465	412

Significant financial burden is determined by comparing annual user charges with the distribution of household incomes in each of the service area communities. Only households not facing a significant financial burden would be able to afford the annual user charges for proposed wastewater facilities. Table V-4 shows the percentage of households in service area communities, except Lake Heritage (and Hazelbrook Hills), estimated to face a significant financial burden under each of the alternatives. Significant financial burden ranges from a low of 5 to 10 percent under each of the alternatives for Mount Joy to a high of 60 to 65 percent under Alternative D for Straban. Despite the absence of income data for Lake Heritage, it is anticipated that a substantial number of households in Lake Heritage (and Hazelbrook Hills) would face significant financial burden under each of the alternatives, especially Alternatives D, E, and F.

Table V-4. Financial Burden (% of households)

	EIS Alternatives					
	A	B	C	D	E	F
Gettysburg Borough	10-15	10-15	10-15	10-15	10-15	10-15
Cumberland Township	15-20	15-20	15-20	20-25	15-20	15-20
Straban Township	25-30	30-35	50-55	60-65	50-55	50-55
Mount Joy Township	5-10	5-10	5-10	5-10	5-10	5-10

Displacement Pressure--"Displacement pressure" is the stress place upon families to move away from the service area as a result of costly user charges. Displacement pressure is measured by determining the percentage of households for which annual user charges exceed 5 percent of annual income. The displacement pressures induced by each alternative for the service area communities, except for Lake Heritage and Hazelbrook Hills, are listed in Table V-5. Within the service area, displacement pressure ranges from a low of 1 percent to 5 percent for Gettysburg and Mount Joy under each of the alternatives to a high of 20 percent to 25 percent for Straban under Alternative D. Because of the high user charges for Lake Heritage, displacement pressure in Lake Heritage would probably be severe under each of the alternatives, especially under Alternatives D, E, and F.

Table V-5. Displacement Pressure (% of households)

	EIS Alternatives					
	A	B	C	D	E	F
Gettysburg Borough	1-5	1-5	1-5	1-5	1-5	1-5
Cumberland Township	5-10	5-10	5-10	10-15	5-10	5-10
Straban Township	5-10	5-10	15-20	20-25	15-20	15-20
Mount Joy Township	1-5	1-5	1-5	1-5	1-5	1-5

Mitigation

The significant financial burden and displacement pressure attributed to user charges could be mitigated by a loan or grant from the Farmers Home Administration (FHA) of the USDA. The FHA assists communities facing high user charges for wastewater collection and treatment service. Other Federal agencies that provide financial assistance to communities constructing new wastewater facilities include the Economic Development Administration (EDA) of the US Department of Labor, and the US Department of Housing and Urban Development (HUD) through its Community Development Block Grant program.

Summary

The impacts of each wastewater management alternative on the natural environments, population, land use, archaeological and historic resources, and the local economy are described in the preceeding chapter. The impact discussion considers both primary and secondary effects of the alternatives. "Primary" impacts are those directly related to the construction and operation of sewage collection, transmission, and treatment facilities. "Secondary" impacts are project-induced effects, such as residential development, in areas with soils unsuitable for on-site wastewater treatment as a result of introduction of centralized wastewater treatment facilities.

This EIS estimated that wastewater management alternatives will have only minimal adverse impacts on the existing natural environment (air quality, earth resources, water resouces, and aquatic biota). Some positive impacts will result from eliminating water pollution in Rock Creek; these will be achieved by implementing any alternative except the No-Action. For example, dissolved oxygen level in Rock Creek will increase substantially under all alternatives. Secondary impacts on the natural environment will be insignificant because of negligible induced growth over the projected baseline growth rate.

From a study area perspective, the effects on population created by each of the six EIS alternatives do not differ significantly from those that are anticipated under baseline conditions. This lack of significant variation from the baseline growth is explained by the fact that, for each EIS alternative, the sewage capacity of collection and conveyance facilities has been designed carefully to accommodate sewage flows of both existing and projected baseline population and dwelling units. As a result of this careful engineering design, the potential for adverse effects from induced growth has been avoided for the study area.

Impacts on archaeological sites, historic sites, and aesthetic resources will be limited to short-term effects resulting from construction of the proposed wastewater collection and treatment facilities. Earth-moving activities related to construction of

pump stations, force mains, collection and conveyance systems, and treatment plants may result in some limited disturbance to, or destruction of, buried historic or archaeological resources. Detailed assessment of potential adverse impacts can only be analyzed by a professional historical/archaeological reconnaissance.

The economic impacts of the EIS alternatives are also evaluated in the preceding chapter. This evaluation includes an analysis of user charges, financial burden on users of the wastewater management facilities, and displacement pressure on lower income residents to move away from the areas as a result of project costs.

CHAPTER VI

Comparison of Alternatives

Additional Screening/ Modified Alternatives

The project costs for each of six EIS alternatives (A,B,C,D,E,F) were presented in Chapter IV in terms of total present worth, local shares and user charges by municipality. The environmental, economic, and social impacts associated with each of these alternatives were discussed in Chapter V immediately following the cost calculations.

EPA presented detailed information about these six alternatives to local officials and the Public Advisory Group during this past summer. Many constructive comments were received and EPA used these comments along with the cost analysis and impact evaluations to further screen and revise the alternatives prior to completion of the Draft EIS.

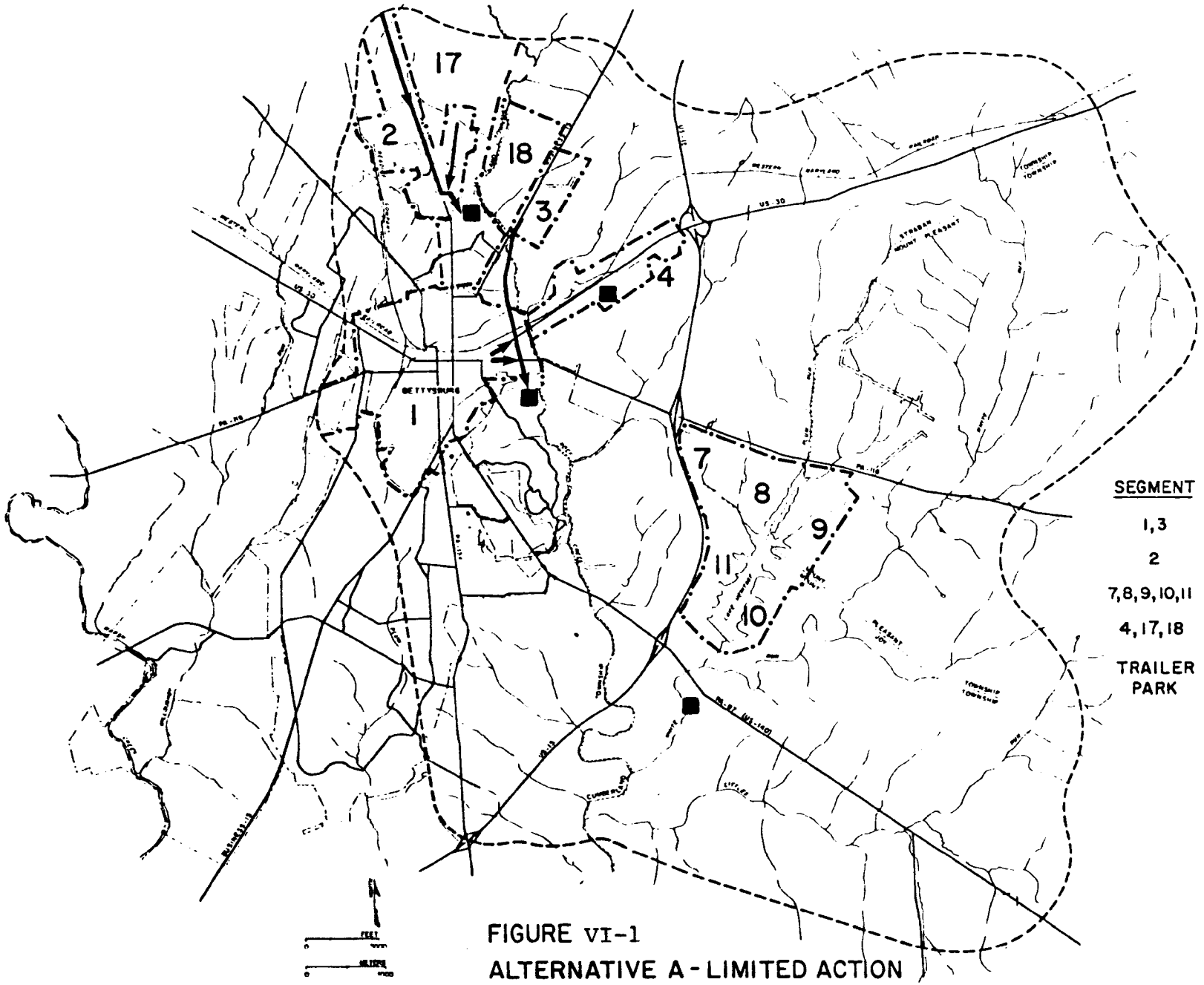
Alternative E, which called for expansion of the existing Gettysburg STP and construction of a new Lake Heritage land treatment system, was eliminated from further consideration due to high total cost plus uncertainties about suitable site acquisition for a land treatment system. Alternative F which consisted of a single regional STP at the existing Gettysburg STP site to handle all segments' flow (including Lake Heritage), was eliminated due to numerous adverse environmental impacts and questions about the availability of adequate acreage for STP expansion. Revised Alternatives D and E were developed in response to a PAG suggestion that certain components of existing alternatives be merged to form new alternatives, in hopes of arriving at the most acceptable combination.

Revised Alternative D is derived from parts of previous Alternatives C and D. The major change involves serving the Lake Heritage area segments by on-site systems rather than by sewering. Revised Alternative E is formed from parts of previous Alternatives D and E. It calls for sewering the Lake Heritage segments with treatment at a new STP and expanding the Gettysburg STP to accommodate the remaining segments.

The remaining five feasible alternatives are presented on the following pages, along with considerations concerning costs and environmental impacts. All five will provide for elimination of major existng sources of water pollution and are implementable through existing local government bodies.

FEASIBLE ALTERNATIVES

Alternative	Major Components	Segements Served	Sewered?
A	Upgrade Gettysburg STP	1,3	Yes
	Upgrade Cumberland STP	2	Yes
	Construct New STP for Schaff's Trailer Park	Part of 4	Yes
	Construct NEW STP for Lake Heritage holding tanks	7-11	No
	Improve on-site systems as needed	4,7-12,14-17,18,20	No
B	Upgrade Gettysburg STP	1,3,4	Yes
	Upgrade Cumberland STP	2	Yes
	Construct New STP for Lake Heritage holding tanks	7-11	No
	Improve on-site systems as needed	7-12,14-17,18,20	No
C	Upgrade Gettysburg STP	1,3	Yes
	Upgrade Cumberland STP	2	Yes
	Construct Land Application system for Segment 4	4	Yes
	Construct New STP for Lake Heritage holding tanks	7-11	No
	Improve on-site systems	7-12,14-17,18,20	No
D	Upgrade Gettysburg STP	1,3,4,18	Yes
	Upgrade Cumberland STP	2,17	Yes
	Construct New STP for Lake Heritage	7-11	No
	Improve on-site systems	12,14-16,20	No
E	Upgrade Gettysburg STP	1-4,17-18	Yes
	Construct New Lake Heritage STP	7-11,20	Yes
	Improve on-site systems	12,14-16	No



SEGMENT	SERVED BY
1,3	GETTYSBURG STP
2	CUMBERLAND STP
7,8,9,10,11	NEW LAKE HERITAGE STP
4,17,18	ON-SITE SYSTEMS
TRAILER PARK	NEW SCHAFF STP

FIGURE VI-1
ALTERNATIVE A - LIMITED ACTION

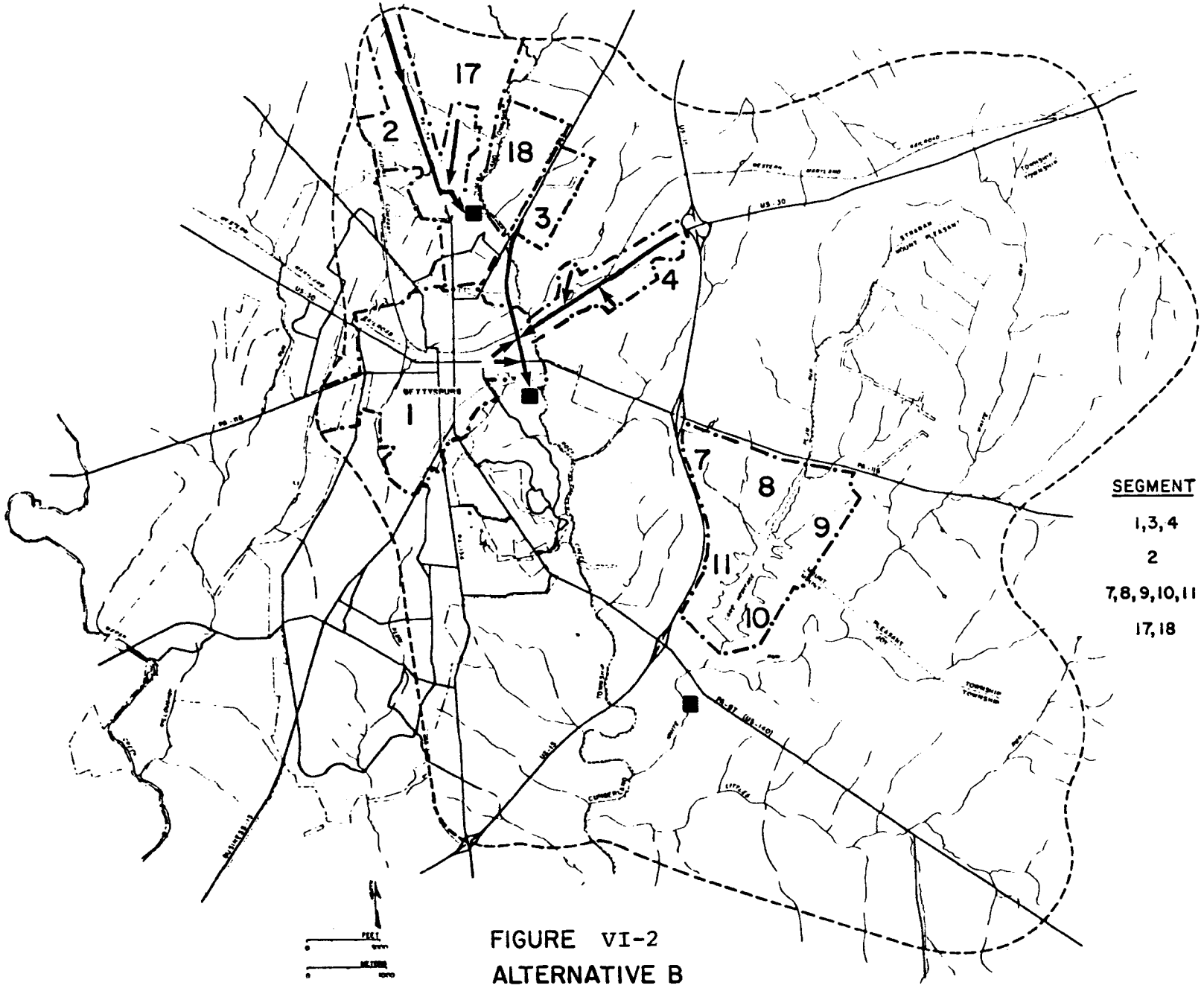


FIGURE VI-2
ALTERNATIVE B

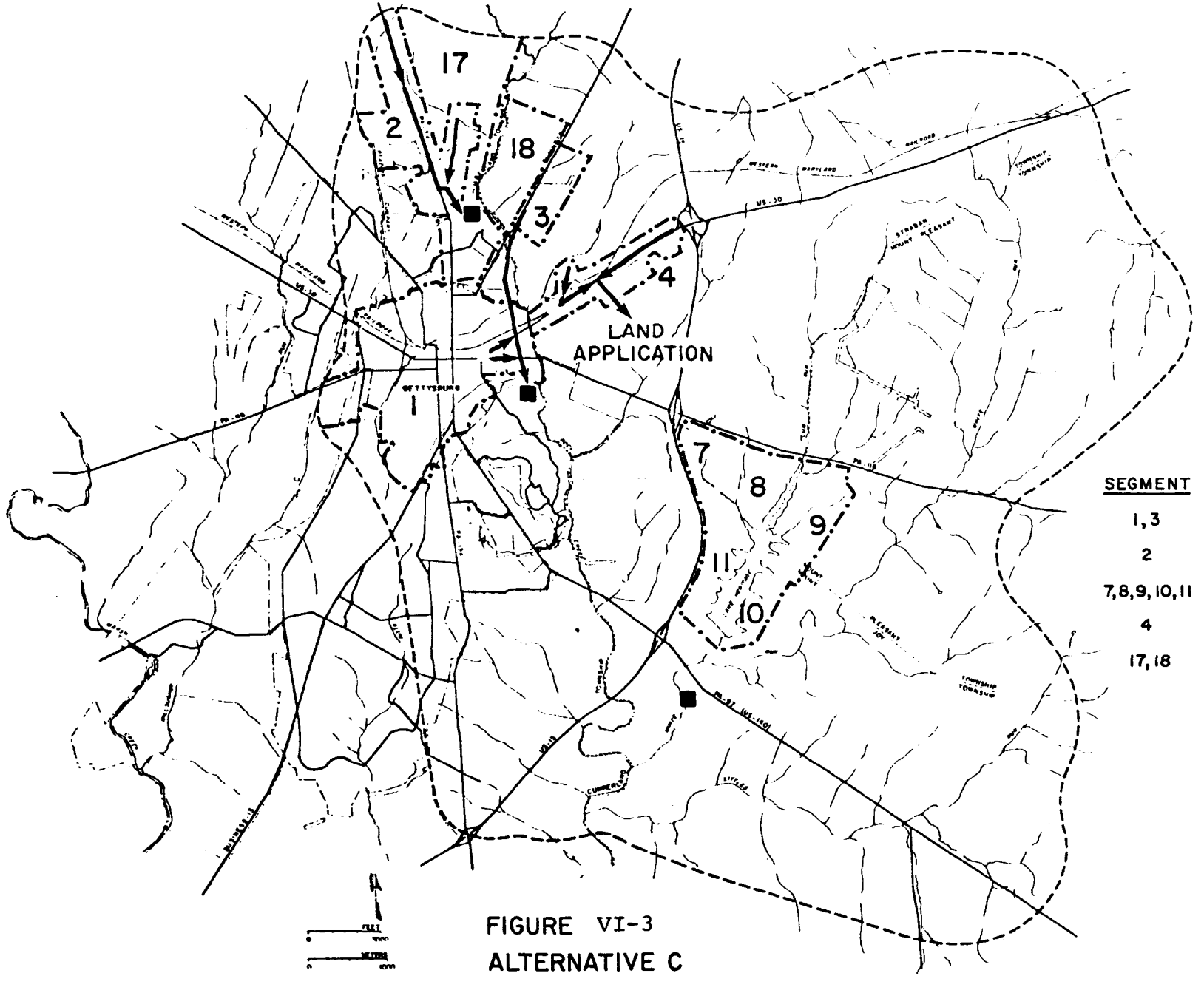


FIGURE VI-3
ALTERNATIVE C

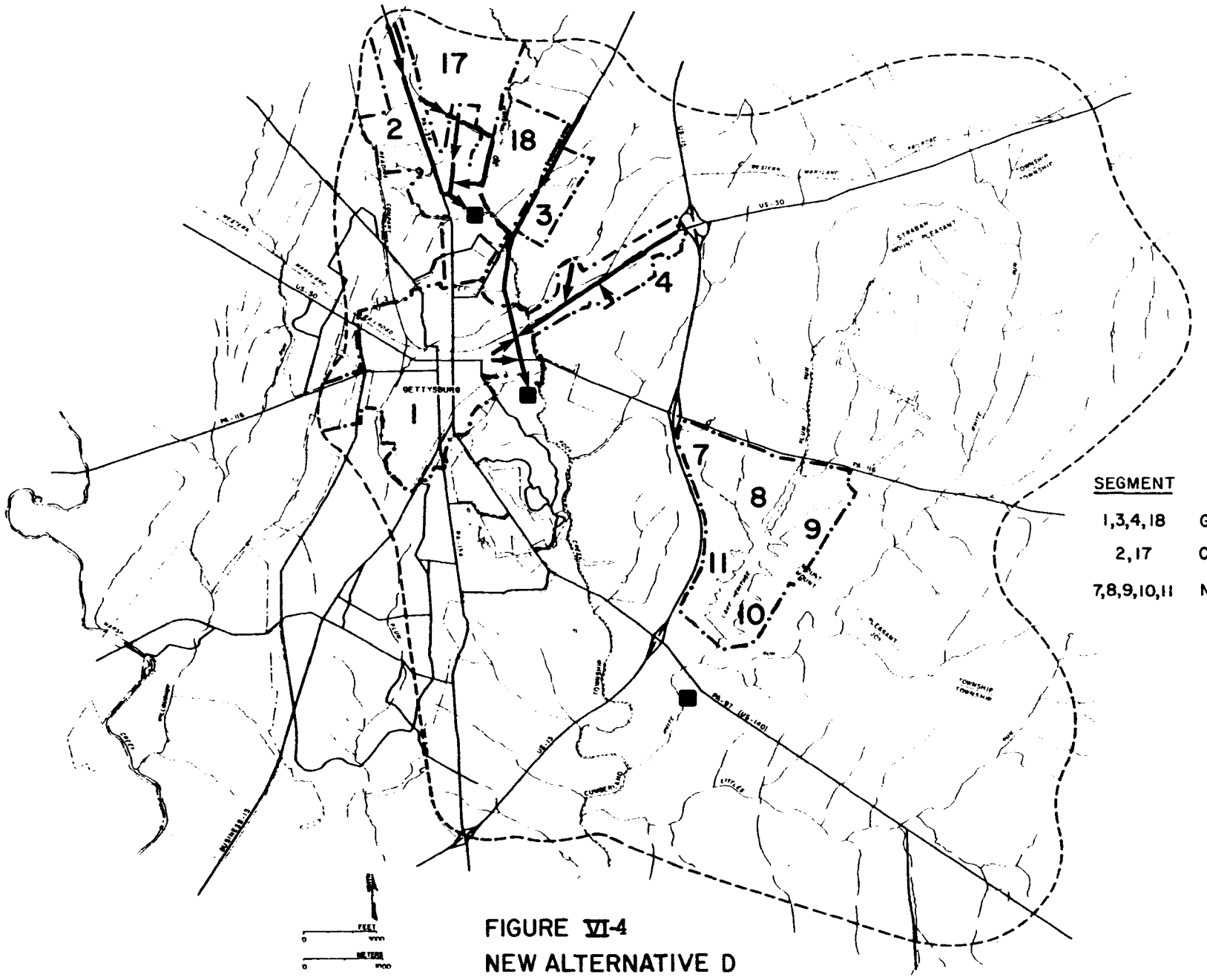


FIGURE VI-4
NEW ALTERNATIVE D

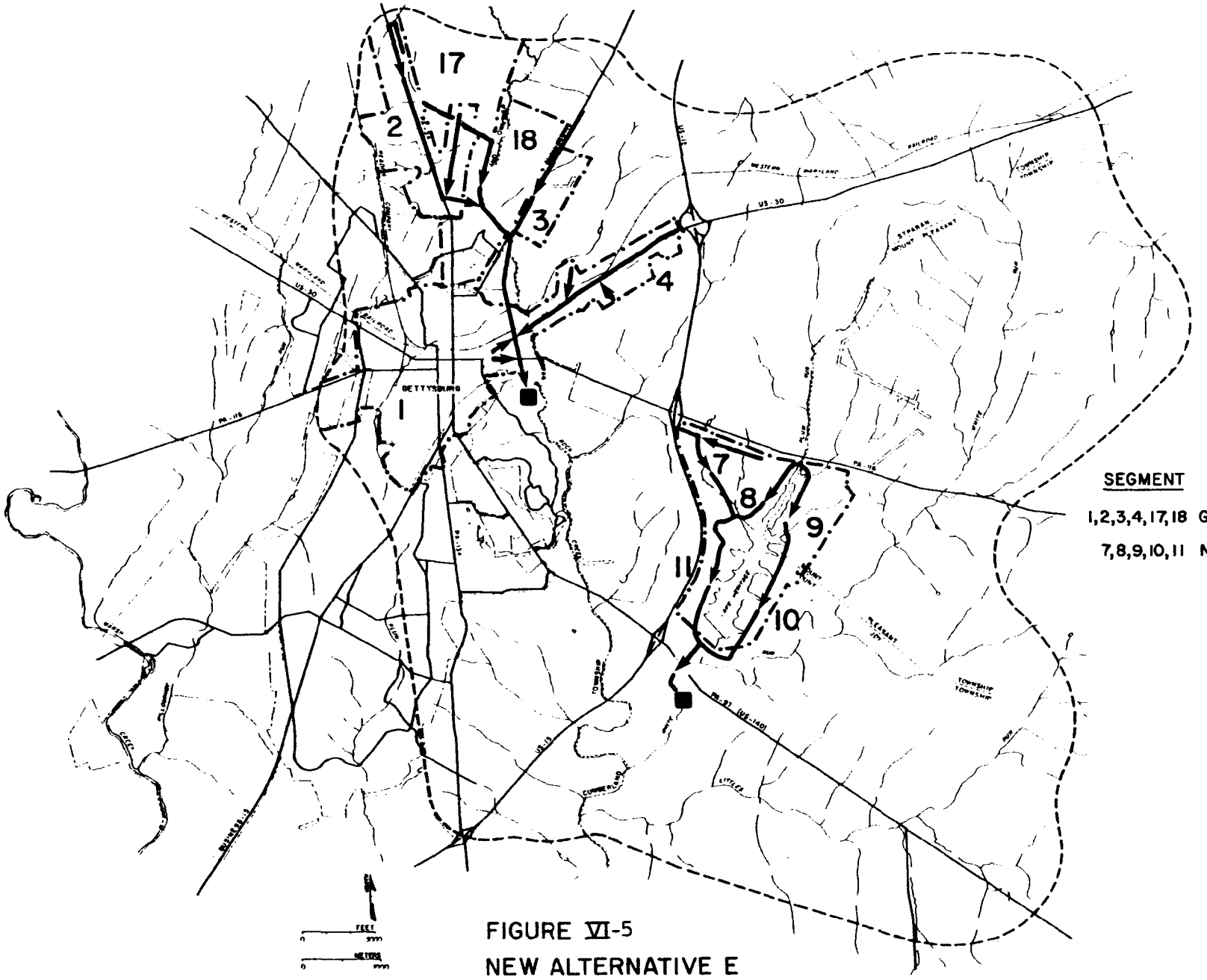


FIGURE VI-5
NEW ALTERNATIVE E

Impact Considerations

This section compares the impacts associated with each of the five alternatives. Impacts of revised Alternatives D and E are derived from the impact assessment related to previous Alternatives C, D, and E.

The impact evaluation indicates that all five alternatives will have minimum adverse impacts on the existing natural environment (e.g., air quality, earth resources, water resources, terrestrial biota, and aquatic biota). In addition, all five alternatives will have a favorable impact on water quality by eliminating water pollution problems in the study area. For example, dissolved oxygen levels in Rock Creek under summer critical flow conditions will increase significantly to meet the PA-DER water quality criterion. The only slight difference in impact among all alternatives may be in the operation of STP's and overland flow facilities. Operation of the overland flow system in Alternative C has a smaller probability of error that operation of STP's and therefore, is more fail-safe.

From an overall study are a perspective, the effects on population, land use, and community services due to each of the EIS alternatives do not differ significantly from those which are anticipated under the baseline condition. The baseline condition is defined as the total level and pattern of growth that is expected to occur in the study area through the year 2005, if present trends of growth continue.

Each EIS alternative will generate approximately the same total number of dwelling units and population in the study area as were projected in the baseline for future land use and population. This lack of significant variation from the baseline future land use is explained by the fact that, for each EIS alternative, the sewage capacity at the site (or sites) of treatment has been designed carefully to accommodate sewage flows adequate for existing and most baseline projected dwelling units.

Although the absolute amount of growth in the study area for each of the EIS alternatives parallels that for baseline projected growth, the rate of future growth and the pattern of future development can differ slightly among the alternatives as well as from the baseline rate and pattern. However, this slight difference among alternatives has been found to generate insignificant impact in the study area.

In terms of cultural resource impacts, the alternatives that generate more ground disturbance will have higher potential impact on archaeological and historic sites. For example, construction of collection and conveyance systems as well as pumping stations will have greater ground disturbance than construction of overland flow systems. Therefore, alternatives which call for centralized treatment, long distance conveyance systems and pumping stations for Lake Heritage area would be less desirable from environmental standpoint.

A primary concern in the Gettysburg area is for the maintenance of the pastoral historic setting of the National Monuments, Parks, and Historic District. Loss of aesthetically pleasing landscapes as a result of development stemming from the introduction of wastewater treatment facilities constitute a secondary adverse environmental impact. Although none of the alternatives will generate a significant influx of new growth within the study area, implementation of a particular alternative may affect the distribution of development and may result in minor adverse impact on the aesthetic values of the area. For example, Alternative B would result in development of 60 more acres in Segment 4 than under baseline conditions as a result of redistribution. This would result in some impact on an area defined as not having a high quality scenic view. Under other alternatives, development above baseline projections would occur in Segment 4. However, the impact again would be upon areas not having high quality views.

In order to mitigate the impacts anticipated, however, a number of actions can be taken. Efforts should be redoubled to generate interest in conducting township planning and zoning to conserve historic resources and landscapes. A conservation easement program could be inititated by the National Park Service (NPS), the townships, or historic Gettysburg-Adams County Inc., to inform residents of the tax advantages that can be realized in deeding over partial interest in their lands. NPS should also reevaluate their resources to purchase critical lands in fee simple or to buy conservation easements from local owners. Vistas that are anticipated to be impacted could be enhanced by establishing landscaped buffer screens.

Cost Comparison

The present worth analysis of the remaining feasible alternatives are presented in Table VI-1.

Table VI-1. Present Worth Costs of Alternatives (in millions of dollars, 4th quarter, 1979)

Alternative	On-Site systems	Collection conveyance Sewer	I/I	STP's
A	5.1	0.5	1.0	8.5
B	7.5	2.6	1.0	8.7
C	7.5	2.5	1.0	8.5
D	3.4	8.1	1.0	9.4
E	0.7	14.0	1.0	8.5

Alternative	Overland flow Treatment	Existing Debt	Total Present Worth
A	-	0.3	15.4
B	-	0.3	20.0
C	1.0	0.3	20.8
D	-	0.3	22.1
E	-	0.3	23.1

From a present worth standpoint, Alternative A, limited action is certainly the least expensive alternative. However, because of its limited scope of services compared with those provided by other alternatives, Alternative A should not be compared directly with other alternatives. Alternatives D and E are the most costly alternatives. Between them, Alternative E is more expensive because of the high cost to sewer the Lake Heritage area as well as to upgrade the Gettysburg and Cumberland STP's. Alternatives B and C are slightly less expensive than Alternatives D and E.

User charges for all municipalities under each alternative are shown in Table IV-2. There is little difference in user charges for each alternative except for the Lake Heritage sewered alternative (revised Alternative E). User charges for the Lake Heritage area under revised Alternative E is $548 per household per year. Compared with the user charge under previous Alternative D ($1,241), revised Alternative E offers a substantial reduction (over 50%) in user charge, mainly because of the 85% Federal funding considered in the calculation of user charge for revised Alternative E. As a result, the sewered alternative for the Lake Heritage area becomes very competitive compared with the on-site system alternatives.

Table VI-2. Estimated 1985 Annual User Charges by Municipality (dollars per household, 4th quarter 1979)

Alternative	Gettysburg	Cumberland	Straban	Lake Heritage	Mt. Joy
A	123	253	245	406	126
B	124	274	300	461	126
C	124	274	430	461	126
D	124	312	479	488	126
E	118	267	436	548	126

Alternative Selection Process

Through the EIS process, several alternatives for improved wastewater management have been developed and evaluated. Details about the five most feasible of these, in EPA's view, are presented for public consideration in the Draft EIS.

Both the costs and environmental impact information should be carefully reviewed by area residents and other interested parties to determine which of the alternatives, if any, is preferable. Reviewers should especially study the support information and methodology upon which the alternatives are based. Opinions about this information and the alternatives themselves should be formulated and comments provided to EPA.

Ample time will be available to study this matter and raise questions. Following public distribution of the Draft EIS, there will be a 45 day review and comment period during which time a public hearing will be held as described in the Draft EIS cover letter.

EPA will carefully evaluate any comments received and make any necessary changes to the alternatives analysis based on these comments. A response to substantive comments will be provided in the Final EIS, which will be completed following the end of the Draft EIS review period. Also in the Final EIS, EPA will identify a recommended alternative for implementation, with consideration given to public comments, local government positions, and the cost and impact evaluations described in the Draft EIS. EPA will also indicate whether other alternatives may also be accceptable and can be considered for Federal funding.

Following publication of the Final EIS, each local jurisdiction or municipal authority must decide which course of action they wish to pursue. If local decisions are consistent with the results of the EIS, applications for Federal funding to design and construct wastewater treatment facilities can then be processed.

REFERENCES AND GLOSSARY

REFERENCES

Adams County Planning Commission. 1968. Comprehensive County Plan for Water and Sewage Systems, Adams County. In conjunction with Clifton E. Rodgers and Associates, Harrisburg, PA. 147p.

Adams County Planning Commission. 1970. Adams County Comprehensive County Plan. In conjunction with Clifton E. Rodgers and Associates, Harrisburg, PA. Three technical reports and a summary report: Part 1, Background Information; Part 2, Planning Proposals; part 3, Implementation Program; Summary Report, variously paged.

Adams County Planning Commission. No date. Adams County Land Subdivision Regulations. Gettysburg, PA. 32p.

Adams County Planning Commission. No date. Adams County Proposed Subdivision and Land Development Regulations. Gettysburg, PA. 51p.

Adams County Planning Commission. No date. Housing Study: An Analysis of the 1970 Census Data. Gettysburg, PA. 52p.

Advisory Council on Historic Preservation. 1977. A Plan to Preserve the Historic Resources of the Gettysburg Area of the Commonwealth of Pennsylvania. US Government Printing Office, Washington, DC. 40p.

Air Quality Report. 1978. Commonwealth of Pennsylvania: Department of Environmental Resources - Bureau of Air Quality and Noise Control. Harrisburg, PA.

Beranek, L. L. 1971. Noise and Vibration Control. McGraw-Hill, Inc. 650pp.

Black, Terry. (oral communication). June 22, 1979. Conversation between Terry Black, Air Quality Engineer, PennDER, York, Pennsylvania and David L. Bush, Air Quality Scientist, WAPORA, Inc., NY, NY.

Borough of Gettysburg. 1977. The Gettysburg Borough Zoning Ordinance (Ordinance 902-75, October 13, 1975, Article 1, Section 100; Revised January 11, 1977). Gettysburg, PA. 252p.

Buchart-Horn, Inc. 1978. Cumberland Township Authority 201 Facilities Plan, Report on Program Requirements Memorandum 78-9, US Route 140 Area. York, PA. Variously paged.

Burchell, Robert W. and David Listokin. 1978. The Fiscal Impact Handbook. Center for Urban Polisy Research, New Brunswick, NJ. 480p.

Clean Air Act Amendments. 1977. Public Law 95-95. 95th Congress. August 7, 1977.

Climate of Gettysburg, Pennsylvania. June, 1977. National Oceanic and Atmospheric Administration. Environmental Data Service. National Climatic Center. Asheville, NC.

Commonwealth of Pennsylvania - Title 25. 1971-1972. Rules and Regulations. Part I. Department of Environmental Resources. Subpart C. Protection of Natural Resources. Article III - Air Resources. Chapter 131 - Ambient Air Quality Standards.

Cumberland Township Board of Supervisors. 1973. The Cumberland Township Subdivision and Land Development Ordinance (No. 28), Cumberland Township, PA. 47p. (includes Proposed Revisions of June 7, 1979)

EPA. 1974. Population Distribution of the United States As a Function of Outdoor Noise Level. 550la-74-009. Washington, DC.

Federal Register. 1971-79. National Ambient Air Quality Standards.

Federal Register. September 12, 1978. States Attainment Status.

Gannet Fleming Corddry and Carpenter, Inc. 1976. Wastewater Management Facilities Plan (201) 197b: Volumes 1 and 2. Prepared for the Gettysburg Municipal Authority, Harrisburg, PA. Vol.1, 125p; Vol. 2, 250p.

Gettysburg Area School District (GASD). 1973. A Long Range Development Plan (revised). Gettysburg, PA.

Gettysburg Area School District. 1978. Table of Grade Enrollments 1965-1966 Through 1977-1978, and Projected Enrollments 1977-1978 Through 1987-1988. Gettysburg, PA.

Gettysburg Area School District. 1979a. Budget Document 1979-1980. Gettysburg, PA. 42p.

Gettysburg Area School District. 1979b. Long Term Development Plan. Gettysburg, PA.

Gettysburg-Cumberland Demonstration Program: Technical Report #2, Ecological Studies. (In Conjunction with Wallace, McHarg, Roberts and Todd, and Gladstone Associates; Philadelphia, PA) Harrrisburg, PA. 60p.

Gettysburg Municipal Authority. 1977. Water Supply System Improvement Study. Harrisburg, PA. 80p.

Gettysburg Municipal Authority. 1978b. Report on Operation of Water System for the Period October 1, 1977 to September 30, 1978. Gettysburg, PA. 17p.

Health Resources Planning and Development, Inc. 1979. Acute Inpatient Care (Draft) Section of the Health System Plan. Camp Hill, PA. 312-414pp.

Holzworth, George C. January, 1972. Mixing Heights, Wind Speeds and Potential for Urban Air Pollution Throughout the Contiguous United States. EPA Publication AP-101. Research Triangle Park, NC.

Hughey, Ronald E. 1973. Aquatic Biology Investigation of the Gettysburg Sewage Treatment Plant on Rock Creek, Adams County. Pennsylvania Department of Environmental Resources, Stream File 5.11.2, 7p.

Hughey, Ronald E. 1978. Aquatic biological investigations of Rock Creek, Adams County. Pennsylvania Department of Environmental Resources, Stream File 5.11.2, 3p.

Lake Heritage Property Owner's Association, Inc. 1973. Revised Bylaws, Code of Regulations. Gettysburg, PA. 8p.

Littlestown Area School District (LASD). 1978a. Proposed budget 1978-1979. Littlestown, PA. 17p.

Littlestown Area School District. 1978b. Long range development plan. Section 8: School facilities (3p.), Section 4: Pupil enrollment projections (2p.) Littlestown, PA.

Mount Joy Board of Supervisors. 1979. Mount Joy Township subdivision and land development ordinance. Mount Joy, PA. 74p.

Mount Pleasant Township Board of Supervisors. 1972. The Mount Pleasant Township subdivision and land development regulation. Mount Pleasant, PA. 39p.

Pennsylvania Department of Agriculture, Crop Reporting Service. 1972. Pennsylvania Orchard and Vineyard Survey. Harrisburg, PA. 38p.

Pennsylvania Department of Agriculture, Crop Reporting Service. 1977. 1976 Crop and Livestock Annual Summary, CRS-67. Harrisburg, PA.

Pennsylvania Department of Commerce, Bureau of Employment Security. 1979. Labor Market Analyst, Annual Planning Report: York Labor Market Area, Pennsylvania. York, PA. 52p.

Pennsylvania Department of Commerce, Bureau of Statistics. Research and Planning. 1978. Pennsylvania County Industry Report: Adams County. Harrisburg, PA. 27p.

Pennsylvania Department of Commerce. No Date. Adams County Industrial Report (Release No. M-5-70). Harrisburg, PA. 25p.

Pennsylvania Department of Community Affairs (DCA). 1970 Through 1977. Local Government Financial Statistics: Adams County. Harrisburg, PA. Variously paged.

Pennsylvania Department of Community Affairs. 1972a. Gettysburg-Cumberland Demonstration Program: Technical Report #1, Economic Studies. (In Conjunction with Wallace, McHarg, Roberts, and Todd, and Gladstone Associates; Philadelphia, PA) Harrisburg, PA. 70p.

Pennsylvania Department of Community Affairs. 1972b. Gettysburg-Cumberland Demonstration Program (In Conjunction with Wallace, McHarg, Roberts, and Todd, and Gladstone Associates; Philadelphia, PA). Harrisburg, PA. 155p.

Pennsylvania Department of Community Affairs. 1975. A Study of the Economic Impact of the Gettysburg National Military Park and Tourism on the Gettysburg Area. Harrisburg, PA. 155p.

Pennsylvania Department of Community Affairs. 1979a. Annual Budget of the Township of Cumberland for the Year 1979. Harrisburg, PA. 7p.

Pennsylvania Department of Community Affairs. 1979b. Draft Gettysburg Borough Comprehensive Plan (unadopted). Harrisburg, PA. (Unpaginated).

Pennsylvania Department Community Affairs. 1979c. Annual Budget Report and Guide for Mount Pleasant Township for the Year 1979. Harrisburg, PA. 26p.

Pennsylvania Department of Community Affairs. 1979d. Annual Budget for Adams County, PA for the Year 1979. Harrisburg, PA. 57p.

Pennsylvania Department of Community Affairs. 1979e. Cumberland Township Comprehensive Plan. Harrisburg, PA. Variously paged.

Pennsylvania Department of Education. 1971 Through 1979. Auditor's Reports (DECO-502) and Annual Financial Reports (DECO-500) for Gettysburg Area School District, and Littlestown Area School District. Harrisburg, PA. Variously paged.

Pennsylvania Department of Education. 1979a. A Listing of Pennsylvania Non-public Schools Having Elementary Enrollments 1978-1979. Harrisburg, PA. 172p.

Pennsylvania Department of Education. 1979b. A Listing of Pennsylvania Non-public Schools Having Secondary Enrollments 1978-1979. Harrisburg, PA.

Pennsylvania Department of Education. 1979C. Perpetual School Building Inventory Listing as of September 15, 1978. [Public] School Buildings in Operation 1978-1979. Harrisburg, PA. 287p.

Pennsylvania Department of Labor and Industry. 1970. Through 1979. York Labor Market Letter. Bureau of Employment Security, York, PA. Variously paged.

Pennsylvania Department of Labor and Industry. 1976. Pennsylvania Occupational Projections. Bureau of Employment Security, Labor Market Information Section, Research and Statistics Division. Harrisburg, PA. 586p.

Pennsylvania Department of Labor and Industry. 1979. Annual Planning Report, Fiscal Year 1980. Bureau of Employment Security, Labor Market Analyst for York, Pennsylvania. Harrisburg, PA. 50p.

Pennsylvania Department of Transportation. 1977. Pennsylvania Traffic Data Annual Report: 1977 (and 1975 Traffic Volume Map of Adams County). Bureau of Transportation Planning Statistics. Harrisburg, PA. 40p.

Pennsylvania Office of State Planning and Development. 1974a. Net Migration by Age, Sex, and Race in Selected Counties 1960-1970. Harrisburg, PA.

Pennsylvania Office of State Planning and Development. 1974b. Patterns of Commutation in Pennsylvania by County. Harrisburg, PA. 78p.

Pennsylvania Office of State Planning and Development. 1978. Pennsulvania Projection Series Summary Report (No. 78 PPS-1), State Economic and Social Research Data Center. Harrisburg, PA. Unpaginated.

Regional Science Research Institute. 1976. Housing Requirements and Needs in Pennsylvania: 1970-1990. (A Report to the PA-DCA). Philadelphia, PA. 151p.

State Industrial Directories, Inc. 1972. Pennsylvania State Industrial Directory. New York, NY. pp.G-13 Through G-16.

Straban Township Board of Supervisors. 1964. Land Subdivision Regulations. Straban, PA.

Straban Township Board of Supervisors. 1974. Buidlign Permit Ordinance. Straban, PA.

Straban Township Board of Supervisors. 1978. Annual [Budget] Report to the Treasurer. Straban, PA.

Straban Township Board of Supervisors. No Date. Development Potential - 1981 (Map). Straban, PA.

US Department of Commerce, Bureau of the Census (DOC). 1971. 1970 Census of Population, General Population Characteristics: Pennsylvania (PC (1) - B40). US Government Printing Office, Washington, DC. 287p.

US Department of Commerce, Bureau of the Census. 1972. 1970 Census of Population, Detailed Characteristics: Pennsylvania (PC(1) - D40). US Government Printing Office, Washington, DC.

US Department of Commerce, Bureau of the Census. 1973. 1970 Census of Population and Housing. York, PA, SMSA Census Tracts. US Government Printing Office, Washington, DC.

US Department of Commerce, Bureau of the Census. 1977. Projections of the Population of the United States, 1977 to 2050. Series P-25, No. 704. US Government Printing Office, Washington, DC. 87p.

US Department of Commerce, Bureau of the Census. 1978. Illustrative projections of State Populations: 1975 to 2000 (Advance Report). Series P-25, No. 735. US Government Printing Office, Washington, DC. 4p.

US Department of Commerce, Bureau of the Census. 1979a. Projections of the Number of Households and Families: 1979 to 1995. Series P-25, No. 805. US Government Printing Office, Washington, DC. 22p.

US Department of Commerce, Bureau of the Census. 1979b. 1976 Population Estimates and 1975 and Revised 1974 Per Capita Income Estimates for Counties, Incorporated Places, and Selected Minor Civil Divisions in Pennsylvania. Series P-25, No. 777. US Government Printing Office, Washington, DC. 42p.

US Department of Interior, National Park Service. 1979. Draft General Management Plan (for) Gettysburg National Military Park, Pennsylvania. 126p.

US Department of the Interior, National Park Service. Undated. Revised Draft General Management Plan for the Gettysburg National Military Park, Pennsylvania. 141p.

US Department of the Interior, National Park Service, Undated. Draft general management plan and draft environmental assessment for the Gettysburg National Cemetary. Pennsylvania. 117p.

US Water Resources Council. 1972. OBERS Projections, Regional Economic Activity in the United States. Series E. Washington, DC.

Van Orden, Dean. (oral communication). June 22, 1979. Conversation Between Dean Van Orden, Air Quality Engineer, PennDER, Harrisburg, Pennsylvania and David L. Bush, Air Quality Scientist, WAPORA, Inc., NY, NY.

WAPORA, Inc. 1979. Chlorine Toxicity Survey Data. Report Submitted to USEPA Region II.

ADSORPTION. Process by which one material is attached to another, such as an organic on activated carbon. It is a surface phenomenon.

ADVANCED WASTE TREATMENT. Wastewater treatment beyond the secondary or biological stage, whice includes removal of nutrients such as phosphorus and nitrogen and a high percentage of suspended solids. Advanced waste treatment, also known as tertiary treatment, is the "polishing stage" of wastewater treatment and produces a high quality of effluent.

AERATION. The process of being supplied or impregnated with air. Aeration is used in wastewater treatment to foster biological purification.

AEROBIC. Refers to life or processes that occur only in the presence of free oxygen.

ALLUVIAL. Pertaining to material that has been carried by a stream.

ALTERNATIVE TECHNOLOGY. Alternative waste treatment processes and techniques are proven methods to provide for the reclaiming and reuse of water, productively recycle wastewater consituents or otherwise eliminate the discharge of pollutants, or recover energy. Alternative technologies may not be variants of conventional biological or physical/chemical treatment.

AMBIENT AIR. The unconfined portion of the atmosphere; the outside air.

ANEROBIC. Refers to life of processes that occur in the absence of free oxygen.

AQUATIC PLANTS. Plants that grow in water, either floating on the surface, or rotted emergent or submergent.

AQUIFER. Water-bearing geologic stratum.

AQUILUDE. (Natural barrier) a water-bearing formation of relatively low permeability that will not yield usable quantities of water to wells.

BACK HOE. A piece of construction machinery used for scooping large pits so that soil can be examined for wastewater disposal suitability.

BACTERIA. Any of a large group of microscopic plants living in soil, water or organic matter, important to man because of their chemical effects as in nitrogen fixation, putrefaction or fermentation, or as pathogens.

BAR SCREEN. In wastewater treatment, a screen that removes large floating and suspended solids.

BASE FLOW. The rate of movement of water in a stream channel which occurs typically during rainless periods when stream flow is maintained largely or entirely by discharges of groundwater.

BEDROCK. The solid rock benath the soil and subsoil.

BIOCHEMICAL OXYGEN DEMAND (BOD). A measure of the amount of oxygen consumed in the biological processes that decompose organic matter in water. Large amounts of organic waste use up large amounts of dissolved oxygen; thus, the greater the degree of pollution, the greater the BOD.

BIOTA. The plants and animals of an area.

BOD_5. See "Biochemical Oxygen Demand." Standard measurement is made for 5 days at 20°C.

CAPITAL COSTS. All costs associated with installation (as opposed to operation) of a project.

CESSPOOL. A lined or partially lined underground pit into which raw household wastewater is discharges and from which the liquid seeps into the surrounding soil. Sometimes called leaching cesspool.

CHLORINATION. The application of chlorine to drinking water, sewage, or industrial waste for disinfection or oxidation of undesirable compounds.

CLARIFIER. A settling tank.

CLUSTER SYSTEM. Any syste,, whether publicly or privately owned, for the collection of sewage or industrial wastes of a liquid nature from two or more lots, and the treatment and/or disposal of the sewage or industrial waste on one or more of the lots or at any other site.

COLIFORM BACTERIA. Members of a large group of bacteris that flourish in the feces and/or intestines of warm-blooded animals, including man. Fecal coliform bacteria, particularly Escherichia coli (E. coli), enter water mostly in fecal matter, such as sewage or feedlot runoff. Coliform bacteria apprently do not cause serious human diseases, but these organisms are abundant in polluted waters and they are fairly easy to detect. The abundance of colifrom bacteria in water, therefore, indicates the probability of the occurrence of such disease-producing bodies (pathogens) as Salmonella, Shigella, and enteric viruses. These pathogens are relatively difficult to detect.

COLIFORM ORGANISM. Any of a number of organisms common to the intestinal tract of man and animals whose presence in wastewater is an indicator of pollution and of potentially dangerous bacterial contamination.

COMBINED SEWER. Carries sanitary wastes as well as stormwater.

COMMINUTOR. Grinds up large solids as a preparation for further wastewater treatment.

CONNECTION FEE. Fee charged by municipality to hook up house connection to lateral sewer.

CUBIC FEET PER SECOND (cfs). A measure of the amount of water passing a given point.

DECIBEL (db). Measure of sound intensity.

DIATOM. A member of a group of microscopic, single-celled plants found in both fresh and salt water. The limey or siliceous cell walls (shells) of diatoms may accumulate in enormous numbers in sediments.

DIGESTION. SEE Sludge Digestion.

DISSOLVED OXYGEN (DO). The oxygen gas (O_2) dissolved in water or sewage. Adequate oxygen is necessary for maintenance of fish and other aquatic organisms. Low DO concentrations sometimes are dut to the presence, in inadequately treated wastewater, of high levels of organics compounds.

DRAINAGE BASIN. (1) An area from which surface runoff is carried away by a single drainage system. Also called catchment area, watershed, drainage area. (2) The largest natural drainage area subdivision of a continent. The United States has been divided at one time or another, for various administrative purposed, into some 12 to 18 drainage basins.

DRYWELL. A device for small installations, comprising one or more pits extending into porous strata and lined with open-jointed stone, concrete block, precast concrete or similar walls, capped, and provided with a means of access, such as a manhold cover. It serves to introduce into the ground, by seepage, the partly treated effluent of a water-carriage wastewater disposal system.

EFFLUENT. Wastewater or other liquid, partially or completely treated, or in its natural state, flowing out of a reservior, basin, treatment plant, or industrial plant, or part thereof.

ELEVATED MOUND. A mound, generally constructed of sand, to which settled wastewater is applied. Usually used in areas where conventional on-site treatment is inadequate.

ENDANGERED SPECIES (FEDERAL CLASSIFICATION). Any species of animal or plant declared to be in known danger of extinction throughout all or a singificant part of its range. Protected under Public Law 93-205 as amended.

ENVIRONMENTAL IMPACT STATEMENT (EIS). A document required by the National Environmental Policy Act (PL 91-190, 1969) when a Federal action would significantly affect the quality of the human environment. Used in the decision-making process to evaluate the anticipated effects (impacts) of the proposed action on the human, biological and physical environment.

EROSIN. The process by which an object is eroded, or worn away, by the action of wind, water, glacial ice, or combinations of these agents. Sometimes used to refer to results of chemical actions or temperature changes. Erosion may be accelerated by human activities.

EVAPOTRANSPIRATION. A process by which water is evaporated and/or transpired from water, soil, and plant surfaces.

FECAL CLOIFORM BACTERIA. See Coliform Bacteria.

FORCE MAIN. Pipe designed to carry wastewater under pressure.

GLACILA DEPOSIT. A landform of rock, soil, and earth material deposited by a melting glacier. Such material was originally picked up by the glacier and carried along its path; it usually varies in texture from very fine rock flour to large boulders. Named according to their location and shape.

GRAVITY FLOW. Flow of wastewater through a sewer or wastewater treatment plant in which gravity provides the motivating force.

GRAVITY SYSTEM. A system of conduits (open or closed) in which no liquid pumping is required.

GROUNDWATER. Water that is below the water table.

GROUNDWATER RUNOFF. Groundwater that is discharged into a stream channel as spring or seepage water.

HABITAT. The specific place or the general kind of site in which a plant or animal normally lives during all or part of its life cycle. An area in which the requirements of a specific plant or animal are met.

HOLDING TANK. Enclosed tank, usually of fiberglass or concrete, for the storage of wastewater prior to removal or disposal at another location.

HOLDING TANK. A watertight receptacle which receives and retains sewage and is designed and constructed to facilitate ultimate disposal of the sewage at another site. Holding tanks include, but are not limited to, the following:

a. Chemical toilet - A toilet using chemical that discharge to a holding tank.

b. Retention tank - A holding tank to which sewage is conveyed by a water carrying system.

c. Privy - A holding tank designed to receive sewage water under pressure is not available.

IMHOFF TANK. Outmoded form of sewage treatment. Consists of a tank in which both primary clarification and sludge disgestion are carried out.

INFILTRATION. The flow of a fluid into a substance through pores or small openings. Commonly used in hydrology to denote the flow of water into soil material.

INFILTRATION/INFLOW (I/I). Total quantity of water entering a sewer system. Infiltration means entry through such sources as defective pipes, pipe joints, connections, or manhole walls. Inflow signifies discharge into the sewer system through service connections from such sources as area or foundation drainage, springs and swamps, storm water, street wash water, or sewers.

INNOVATIVE TECHNOLOGIES. Technologies whose use has not been widely documented by experience. They may not be variants of conventional biological or physical/chemical treatment but offer promise as methods for conservation of energy or wastewater constituents, or contribut to the elimination of discharge of pollutants.

INTERCEPTOR SEWERS. Sewers used to collect the flows from main and truck sewers and carry them to a central point for treatment and discharge. In a comined sewer system, where street runoff from rains is allowed to enter the system along with the sewage, interceptor sewers allow some of the sewage to flow untreated directly into the receiving stream to prevent the treatment plant from being overloaded.

LAGOON. In wastewager treatment, a shallow pond, usually man-made, in which sunlight, algal and bacterial action and oxygen interact to restore the wastewater to a reasonable state of purity.

LAND TREATMENT. A method of treatment in which soil, air, vegetation, bacteria, and/or fungi are employed to remove pollutants from wastewater. In its simplest form, the method includes three steps: (1) pretreatment to screen out large solids; (2) secondary treatment and chlorination; and (3) application to cropland, pasture, or natural vegetation to allow plants and soil microorganisms to remove additional pollutants. Some of the applied wastewater evaporates, and the remainder may be allowed to percolate to the water table, discharged through drain tiles, or reclaimed by wells.

LIMITING ZONE. Any soil horizen in the soil profile or underlying strata which shall include indication of seasonal water table, including perched water table, determined by direc-observation or by observation of soil mottling, or rock formation and impervious strata which shall include rock which is so slowly permeable that is prevents downward passage of effluent, rock with open joints or solution channels, and masses of shattered rock fragments with insufficient fine soil to fill the voids between the coarse fragments.

LOAM. The textural class name for soil having a moderate amount of sand, silt, and clay. Loam soils contain 7 to 27% of clay, 28 to 50% of silt, and less than 52% of sand.

MACROPHYTE. A large (not microscopic) plant, usually in an aquatic habitat.

MECHANICAL AERATION. Method of aerating the microorganisms in the aeration tank by beating and splashing the surface.

MILLIONS OF GALLONS PER DAY (mgd). Commonly used to express rate of flow.

MILLIGRAM PER LITER (mg/l). A concentration of 1/100 gram of a substance in 1 liter of water. Because 1 liter of pure water weights 1,000 grams, the concentration also can be stated as 1 ppm (part per million, by weight). Used to measure and report the concentrations of most substances that commonly occur in natural and polluted waters.

NON-POINT SOURCE. A general source of pollution. Surface water runoff is an example as it does not originate from a singel source and is not easily controlled.

NUTRIENTS. Elements or compounde essential as raw materials for the growth and development of organisms, especially carbon, oxygen, nitrogen and phosphorus.

OUTCROP. Places where the underlying rock protudes through the overlying soil and is exposed at the surface.

OVERBURDEN. The unconsolidated mantle of weathered rock and soil material on the earth's surface; loose rock material overlying a mineral deposit near the earth's surface.

OXIDATION POND. Method of wastewater treatment allowing biodegradation take place in a shallow pond.

PARAMETER. Any of a set of physical properties whoc values determine characteristics or behavior.

PERCOLATION. The downward movement of water through pore spaces or larger voids in soil or rock.

PERMEABILITY. The property or capacity of porous rock, sediment, or soil to transmit a fluid, usually water, or air, it is a measrue of the relative ease of flow under unequal pressures. Terms used to describe the permeability of soil are: slow, less than 0.2 inch per hour; moderately slow, 0.2 to 0.63 inch; moderate, 0.63 to 2.0 inches; moderately rapid, 2.0 to 6.3 inches; and rapid, more than 6.3 inches per hour. A very slow class and a very rapid class also may be recognized.

PHOTOSYNTHESIS. The process by which sugar is manufactured in plant cells, requiring carbon dioxide, water, light, and chlorophyll.

POINT SOURCE. A stationary source of a large individual emission. This is a general definition; point source is legally and precisely defined in Federal regulations.

POTABLE WATER. Safe and pleasing water.

PREHISTORIC. A term which describes the period of human development that occurred before the advent of written records. More generally, any period in geologic time before written history.

PRESENT WORTH. The sume of money that must be set aside at the beginning of the planning period in order to amortize the costs of a project over the planning period.

PRESSURE SEWER SYSTEM. A wastewater collection system in which household wastes are collected in the building drain and conveyed therein to the pretreatment and/or pressurization facility. The system consists of two major elements, the on-site or pressurization facility, and the primary conductor pressurized sewer main.

PRIME AGRICULTURAL LAND. Land which has the best combination of physical and chemical characteristics for producing high yields of fool, feed, forage, fiber, and oilseed crops. They are protected by existing local zoning ordinance or preferential assessments.

PUMP STATION. A structure used for pumping wastewater to a higher elevation.

RAPID INFILTRATION. A form of land treatment where wastewater is placed into spreading basins and applied to the land to percolate into the soil.

RAPID INFILTRATION BASIN. Unlined wastewater lagoons designed to that all or part of the wastewater percolates into the underlying soil

RARE SPECIES. A species not Endangered or Threatened but uncommon and deserving of further study and monitoring. Peripheral species, not listed as threatened, may be included in this category along with those species that were once "threatened" or "endangered" but now have increasing or protected, stable populations. Used as official classification by some states.

RAW SEWAGE. Untreated domestic or commercial wastewater.

RAW SLUDGE. Slurry from the bottom of the primary clarifer.

RECHARGE. The process by which water is added to an aquifer. Used also to indicate the water that is added. Natural recharge occurs when water from rainfall or a stream enters the ground and percolates to the water table. Artificial recharge by spreading water on absorptive ground over an aquifer or by injecting water through wells is used to store water and to protect groundwater against the intrusion of sea water.

RUNOFF. Surface runoff is the water from rainfall, melted snow or irrigation water that flows over the surface of the land. Groundwater runoff, or seepage flow from groundwater, is the water that enters the ground and reappears as surface water. Hydraulic runoff is groundwater runoff plus the surface runoff that flows to stream channels, and represents that part of the precipitation on a drainage basin that is discharged from the basin as streamflow. Runoff can pick up pollutants from the air or the land and carry them to the receiving waters.

SANITARY LANDFILL. Solid waste disposal in the ground using approved techniques.

SANITARY SEWERS. Sewers that transport only domestic or commercial sewage. storm water runoff is carried in a separate system. See sewer.

SECONDARY TREATMENT. The second stage in the treatment of wastewater in which bacteria are utilized to decompose the organic matter in sewage. This step is accomplished by using such processes as a trickling filter or activated sludge. Effective secondary treatment processes remove virtually all floating solids and settleable solids as well as 90% of BOD ans suspended solids. Disinfection of the effluent by chlorination customarily is the last step in this process.

SEDIMENTATION. Transportation of soil particles through stream channels caused by both environmental and human activities.

SEPTIC TANK. An underground tank used for the collection of domestic wastes. Bacteria in the wastes decompose the organic matter, and the sludge settles to the bottom. The effluent flows through drains into the ground. Sludge is pumped out at regular intervals.

SEPTIC TANK EFFLUENT PUMP (STEP). Pump designed to transfer settled wastewater from a septic tank to a sewer.

SEPTIC TANK SOIL ABSORPTION SYSTEM (ST/SAS). A system of wastewater disposal in which large solids are retained in a tank; fine solids and liquids are dispersed into the surrounding soil by a system of pipes.

SEWER, LATERAL. A sewer designed and installed to collect sewage from a limited number of individual properties and conduct is to a trunk sewer. Also known s a street sewer or collecting sewer.

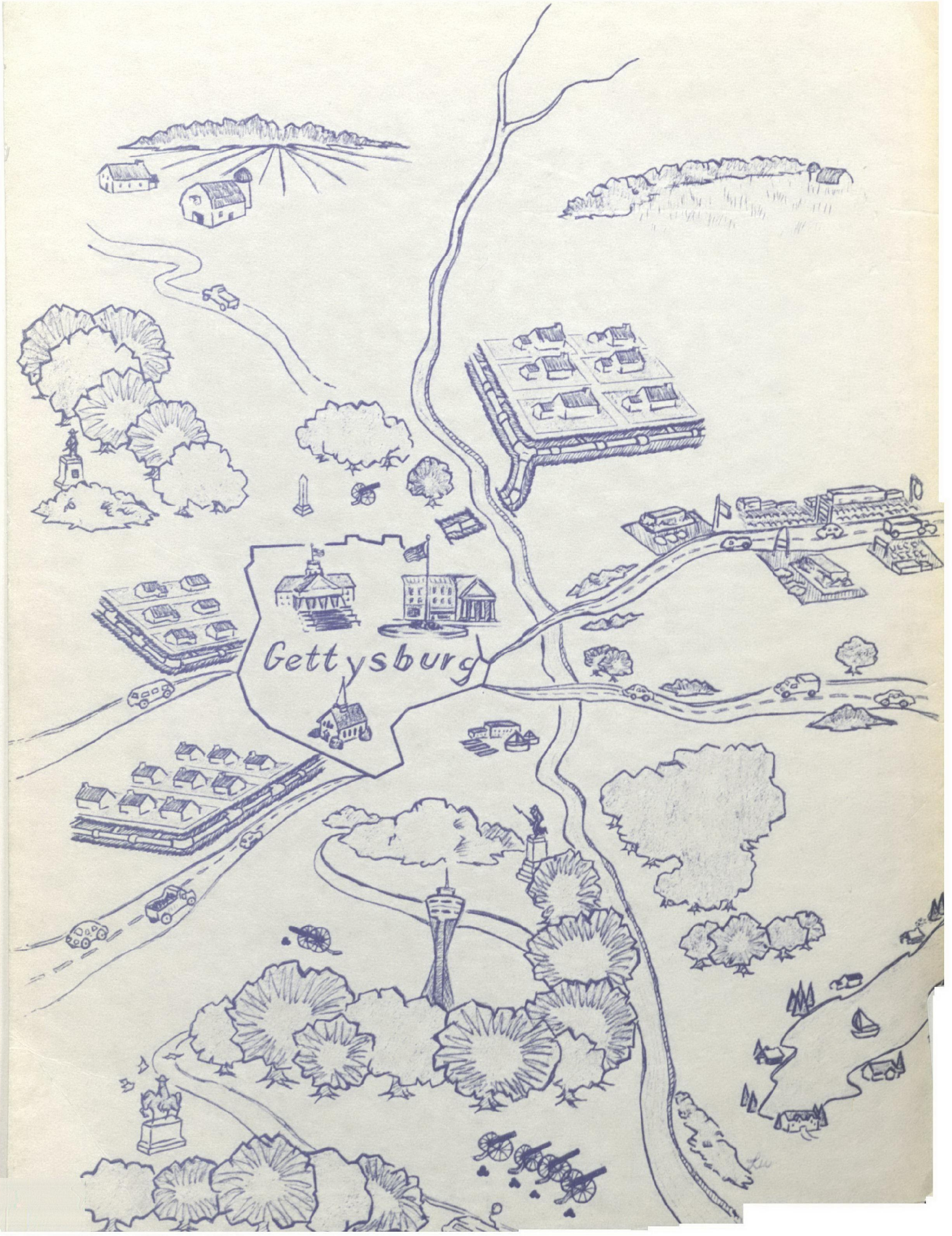
SEWAGE ENFORCEMENT OFFICER (SEO). The official of the local agency who issues and reviews permit applications and conducts such investigations and inspections as are necessary to implement that act and the rules and regulations thereunder.

SEWWR AUTHORITY. A municipal authority providing sewerage services. Sewer, combined. See combined sewer.

SEWER, STORM. A conduit that collects and transports stormwater runoff. I many sewerage system, storm sewers are separate from those carrying sanitary or industrial wastewater.

SEWER, TRUNK. A sewer designed and installed to collect sewage from a number of lateral sewers and conduct it to an interceptor sewer or, in some cases, to a sewage treatment plant.

SLOPE. The incline of the surface of the land. It is usaully expressed as a percent (%) of slope that equals the number of feet of fall per 100 feet in horizonal distance.


Gettysburg