MIDSTATE
regional planning agency

report 3

survey of

SANITARY SEWAGE DISPOSAL and STORM WATER CONTROL

Conn P-43
The preparation of this report was financed by an urban planning grant from the Housing and Home Finance Agency under the provisions of section 701 of the Housing Act of 1954, as amended; by a regional planning grant from the Connecticut Development Commission; and by contributions from member municipalities.

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SANITARY SEWAGE DISPOSAL and STORM WATER CONTROL

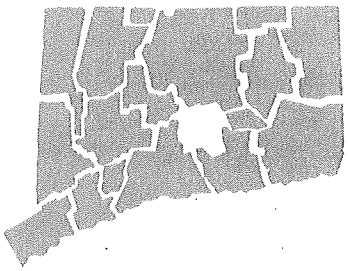
The survey of sanitary sewage disposal and storm water control was conducted under the supervision of Richard Newman and George Sinclair of Cahn Engineers, with staff assistance provided by the Midstate Regional Planning Agency.

Sincere appreciation is expressed for the cooperation and guidance of the numerous municipal and state officials whose valuable assistance is reflected throughout this report.

December, 1965.

MIDSTATE REGIONAL PLANNING AGENCY

CROMWELL DURHAM EAST HAMPTON HADDAM MIDDLEFIELD MIDDLETOWN PORTLAND



P.O. BOX 139 MIDDLETOWN, CONNECTICUT 06458 203 347-6180

February 1, 1966.

The Midstate Regional Planning Agency is pleased to submit to its member communities this Survey of Sanitary Sewage Disposal and Storm Water Control for the Midstate Planning Region.

The study is designed to bring into focus a specific aspect of the emerging problems and responsibilities which accompany the growth characteristic of this Region.

In order to meet these responsibilities, it is first necessary to evaluate the capacity of our resources as well as to appraise our willingness, to incorporate the changes dictated by urban pressures. The answers to these questions then form the basis for the long and short term decisions which guide the Region's future. The purpose of this report is to provide additional information upon which to base these decisions.

Much of the information contained herein deals with problems which require immediate attention. In other instances, proposals are discussed which are not yet urgently needed. These proposals merit serious consideration as well, since the nature of the technology is such that the ultimate design of disposal systems which may eventually be needed in the Region will undoubtedly resemble the preliminary layouts contained in this study.

Since these proposals are based upon a continuation of existing patterns of development, a community with this knowledge is better equipped to evaluate the consequences of its development policies. It may be better to alter a master plan or a zoning ordinance now, than to have to install a costly disposal system later.

In the final analysis, it is the determination of the communities themselves which channels patterns of development. In order to assist them, it is intended that this study be viewed in conjunction with local planning and zoning policies, since these elements cannot be divorced in planning for the future.

Very truly yours,

John Lyman, Jr.

John Lyman, Jr.
Chairman

IRWIN MOSS KAPLAN, DIRECTOR

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SURVEY OF SANITARY SEWAGE DISPOSAL FOR THE MIDSTATE PLANNING REGION

I. INTRODUCTION

It is the intent of this report to provide general information concerning the future sanitary sewer needs in the Midstate Region and to develop a preliminary plan to guide the Midstate Regional Planning Agency and its member communities in land use planning and the provision of sewage disposal facilities.

The disposal of sanitary sewage has become a major problem for all centers of population, regardless of size. With the more rigid Federal, State and Local regulation governing sewage disposal, the feasibility of industrial, commercial and residential development has become more dependent upon the availability of a satisfactory waste disposal system. In the near future, the presence of an adequate sanitary sewer system and sewage treatment facility will be as necessary for development as an effective water supply system was in past years.

While this study recognizes the need for retention and/or development of valuable open space and recreation areas as a companion process to urbanization, these open space uses do not stimulate the need for sewage facilities. Consequently, development as it will be referred to in the course of this study will mean those uses (e.g.residential,

commercial, industrial) which have a positive effect on sewage disposal needs.

Each community's sewage disposal problem requires individual attention and usually a unique solution. However, there have been instances where communities have planned and constructed common facilities to serve their needs. One of the prime purposes of this report will be to indicate to the member communities the comparative value of regional treatment versus municipal treatment versus private treatment in the future. Sewage disposal requirements are directly dependent on variables such as; population, commercial and industrial growth and distribution. Therefore, the recommendations of this report must be kept general and be based on knowledge of topography, soil and geological conditions, and estimates of trends of the growth variables.

II. SCOPE OF REPORT

The scope of this report is to initially provide a survey of the existing sewage disposal facilities, their extent, condition, and capacity with regard to future loads. For the area as a whole and for each specific town, the feasibility of public versus private, or a combination of the two systems is discussed. The study indicates the probable physical layout of the various future public sewer systems, the sequence of construction as might be dictated by the Region's

growth, and an outline of problems attendant to the development of a public system.

III. DATA

In compiling this report, the basic source materials used were United States Geological Survey topographic maps, various maps and information furnished by the individual communities, which were then supplemented with field inspections. The topographic maps noted above are at 1 inch=2,000 feet with contours at 10 foot intervals. Therefore, the recommendations made in this report concerning the physical location of trunk sewers, pumping stations and treatment plants must be general and need to be verified by subsequent, more detailed engineering studies.

IV. DESIGN CRITERIA

A. General

In general, the disposal of sanitary wastes may be accomplished on a cooperative basis, in which several towns combine to provide common facilities; or on a municipal basis, in which a single town provides facilities for its own use only; or on a private basis with disposal facilities installed and owned by individuals. The regional and municipal facilities would include a widespread network of small local sewers flowing to a trunk sewer system which

in turn carries the waste to a treatment plant. The system may also include pumping stations to overcome grade or location problems. On the other hand, a private system would include a relatively small length of pipe, possibly a small "package" treatment plant for ordinary sanitary wastes or perhaps a plant especially designed for a particular industrial waste; or as is more common a cesspool or septic tank/leaching field arrangement.

B. Design Flow

"Design Flow" is defined as the rate of sewage flow for which the proposed sewers and treatment plants can provide adequate capacity and treatment. One of the prime purposes of this study is to determine the feasibility of overcoming the sewage disposal problems in the Midstate Region through various alternative approaches. This is intended as a safeguard to communities within the Region which might otherwise construct separate sewage facilities, and then determine after it is too late that a more economical and efficient solution would have been to join with a neighboring community to resolve mutual problems.

To determine the design flow or quantity of sewage, it is first necessary to estimate the future population and land use which the system will serve. To obtain this estimate, past and present data is collected, summarized, and projected into the future. Then, such factors as proposed

highway construction, availability of rail and water transportation, availability of labor, existing tax structures, proposed land use plans, availability of local road systems and utilities, and the topographical-geological features of the land are taken into consideration to arrive at the final estimate.

As a corollary to the problem of estimating future land use and population, it must be decided whether to size the system to handle a given area as it will be when ultimately developed or at some intermediate stage of development. The most economical future year or design year for sizing a large trunk sewer varies with the size of the proposed conduit, and ranges from a forty to a fifty year period. For smaller local sewers, sizing for ultimate development has proven to be more economical. The reason for a greater time projection on smaller sewers is that the installation costs for the smaller lines comprises the major portion of total price. Therefore, the additional cost involved in increasing the size of the sewer from 8" to 10" or 10" to 12" is relatively small compared to the overall installation cost.

In a major trunk sewer however, an increase in capacity can appreciably affect overall costs, and cancel any long range savings which may originally have been intended.

In addition, the problem of forecasting future development in a specific area or section of a community is more difficult than forecasting development for the overall town. The reason for the greater latitude on a large size area is that estimated development may be low in one part of the area, high in another and the overall development will tend to balance out.

For this report, ultimate development will be assumed, as it is yet too early in the the planning and development stages of the region to estimate intermediate development for such a large scale study. The study also assumes a reasonably uniform rate of growth within individual watersheds, even though they frequently cross municipal boundaries. This is a necessary condition in order for regional treatment to be effective, since each of the communities affected must have the need for sewage facilities at approximately the same time. Local planning and zoning policies will undoubtedly alter rates and intensity of growth between neighboring communities, and any future detailed utilities studies will need to be planned accordingly.

With the estimate of future population and future total area of industrial and commercial acreage, the unit flow contribution of each of these sources can be derived. For this report, the figures of 75 gallons per capita per day from

residential, 5,000 gallons per acre per day from industrial and 2,000 gallons per acre per day from commercial land are used. These figures take into account an estimated future increase in water consumption.

Finally, an allowance is made for ground water which will infiltrate into the system. This infiltration is not desirable as it will increase treatment plant construction and operational costs. However, it cannot be eliminated unless the system is completely watertight which is not economically feasible with present day materials and workmanship.

The methods and criteria used to determine plant capacity are the same as those used for sewers. However, while the trunk sewers may be economically built for a 40 year design period, it could be very expensive to initially provide plant capacity to match the full capacity of the trunk system. Therefore, a design period of 20 years, is normally used for the plants. Additional land should be provided for future plant expansion to meet the trunk sewer design capacity.

C. Sewer and Plant Location

With regard to the location of the trunk and local sewers, the sewage is normally most economically transmitted by gravity. To accomplish gravity flow the pipes must follow

the natural slopes and valleys of the land. This is obviously the most efficient method as gravity provides the energy without cost. The exception to the rule is where a gravity system would require the pipe to be excessively deep in the ground or where the features of the terrain, such as a steep-sided ravine, large river or swamp, will make construction extremely expensive. In this case, a pumping station is used to pump sewage around the obstacle.

The treatment plant is best located at the lowest part of the trunk sewer system. In addition, the plant must be located near a river whose normal flow is large enough to receive the treated waste water from the plant. This is especially true where the plant is providing only "primary" treatment of sewage; that is, settling out and disposal of solids and chemical (chlorine) treatment of the outgoing waste water. Therefore, the larger the expected output of the plant, the larger the flow of the receiving river must be.

The size of the site necessary for a plant may dictate its location because of real estate values and available land. The treatment plant site should be so situated as to be above or protected from river floods.

The problems of location of trunk sewers and treatment plants are interrelated. The engineer must make such determinations as to the comparative economics of designing

a system consisting of one very large plant with a long trunk sewer flowing to it as opposed to two or more smaller plants serving several shorter and smaller trunk sewers.

In certain instances the most economical solution to the treatment plant trunk sewer layout problem is to cross town lines with trunk sewers and provide one plant to serve two or more towns. In the case of regional treatment, the final determination of the division of construction and operational costs of a proposed system between towns can only be made after the details have been fully explored. For the purpose of this report, only construction costs are considered and cost was assigned to each town in proportion to the estimated sewage flow from the town to the total estimated flow in a particular section of the system. Generally, operational and maintenance costs for one central plant would be more economical than two separate plants. The cost of rights-of-way and land acquisition and of the system are not included, however, but should be comparable for the alternates considered in this report.

Of course, in any such arrangement whereby towns are served on a regional basis, the governing body of the various towns would have to approve the method of apportioning costs of the system.

D. Related Problems

There are also other considerations concerning a waste disposal system which must be taken into account when planning a sewage system. One is the problem of storm water. Present day law often requires that new sanitary sewer systems and treatment plant handle "dirty" water only and the pipes and plant are sized accordingly. That is to say, a new sanitary system is designed on the assumption that no storm water flows are connected to the sanitary pipes.

If, because of poor control, such storm flows are connected to the sanitary pipes, the system could become overloaded long before its time, raw sewage will be passed untreated into the rivers during storms, and the authority in charge of the system will be confronted with the necessity of spending additional monies to correct the situation.

It therefore cannot be too highly stressed that the right of connection to a sanitary sewer system must be rigidly controlled, both by ordinance and effective field inspection.

Another problem is that of existing "combined"sewers. A combined sewer is one that is designed to carry both storm and sanitary flows, and is connected to a treatment plant. Many such sewers were installed at the turn of the century. The problem with these sewers is that during

periods of rain, the combined sanitary and storm flows overload the treatment plants so that they must be passed untreated into the river. At present, there is ever-increasing governmental pressure to replace these combined sewers with separate storm and sanitary systems.

E. Future Technology

The possibility of future technical improvements should be mentioned. At present, the most feasible item appears to be the so-called "packaged" treatment plant offered by several manufacturers. The term "packaged" means that the basic components of the plant are built in the factory, complete with all appurtenant machinery. At the site, these components are set in prepared foundations and connected by the necessary wiring and piping. Such a unit would only be suitable for low sewage flows. Their advantage is that they are prefabricated and thereby save on-site construction costs.

At this time, there is much to be desired in the operation of these units. However, future technical improvements may make these plants quite useful in providing sewage treatment for the smaller isolated watersheds where service is needed. Their advantage is that pump stations and/or long expensive runs of trunk sewer

necessary to reach a larger treatment plant would be eliminated.

V. CRITERIA OF NEED

"Public Health Hazard" are the key words that form the basis of any criteria which might determine whether or not a public disposal system should be installed. A health hazard might be leaching field effluent infiltrating into a brook or may range from an older residence whose sewage is piped directly to a brook to a factory which daily dumps tons of industrial wastes into a river. A more serious hazard would be leaching field effluent infiltrating into wells or simply rising up to the ground surface above the field for lack of any other outlet.

Existence of these hazards come to light from various sources. Usually the first to voice complaints will be the homeowner who notices the odors and swamp-like ground conditions in his backyard or the odor and deposits in the brook near his property. The community Health Officer will then probably make an over-all survey or perhaps merely add this information to his existing records. He may then run laboratory analyses on water samples from the brooks and wells in the area and find additional evidence of pollution. Finally

the State, working through its Department of Health, may generate pressure to alleviate particular instances of health hazards and river pollution within a community.

At what point these health hazards become critical and demand a solution can only be determined by the community itself working in conjunction with the State Department of Health and/or Water Resources Commission. It is always possible to institute corrective measures such as installing new or rebuilding existing septic tank systems or installing special treatment processes in individual industries. However, the cost of these measures should be compared to the cost of a public system which, in time, may have to be the ultimate solution. Consideration should also be given so that a solution does not prove to be temporary and only a partial safeguard to health.

If the general nature of the soil is one of poor absorptive qualities, a repetition of septic tank problems will probably occur as a town continues to expand. Further, existing conditions such as small lot size and the difficulty of locating pollution sources and enforcing corrective measures complicates and reduces the possibility for success of a solution based on rebuilding or installation of private systems.

A community should also be in a position to recognize and consider the opportunity, should it be presented, to combine with another town for a common solution. If the combination proves to be the most economical for all concerned, it might be wise to consider the creation of a system in anticipation of increasingly serious health problems.

Finally, planning the future development of a community is directly related to the availability of utilities including a sanitary waste disposal system. With the present day competition between municipalities for new and relocated industry, and with the rigid State and local regulations which often require very expensive private systems, the presence of a public disposal system can be a great asset to the successful and continuing development of a town.

VI. EXISTING CONDITIONS AND STUDY PLAN FOR FUTURE

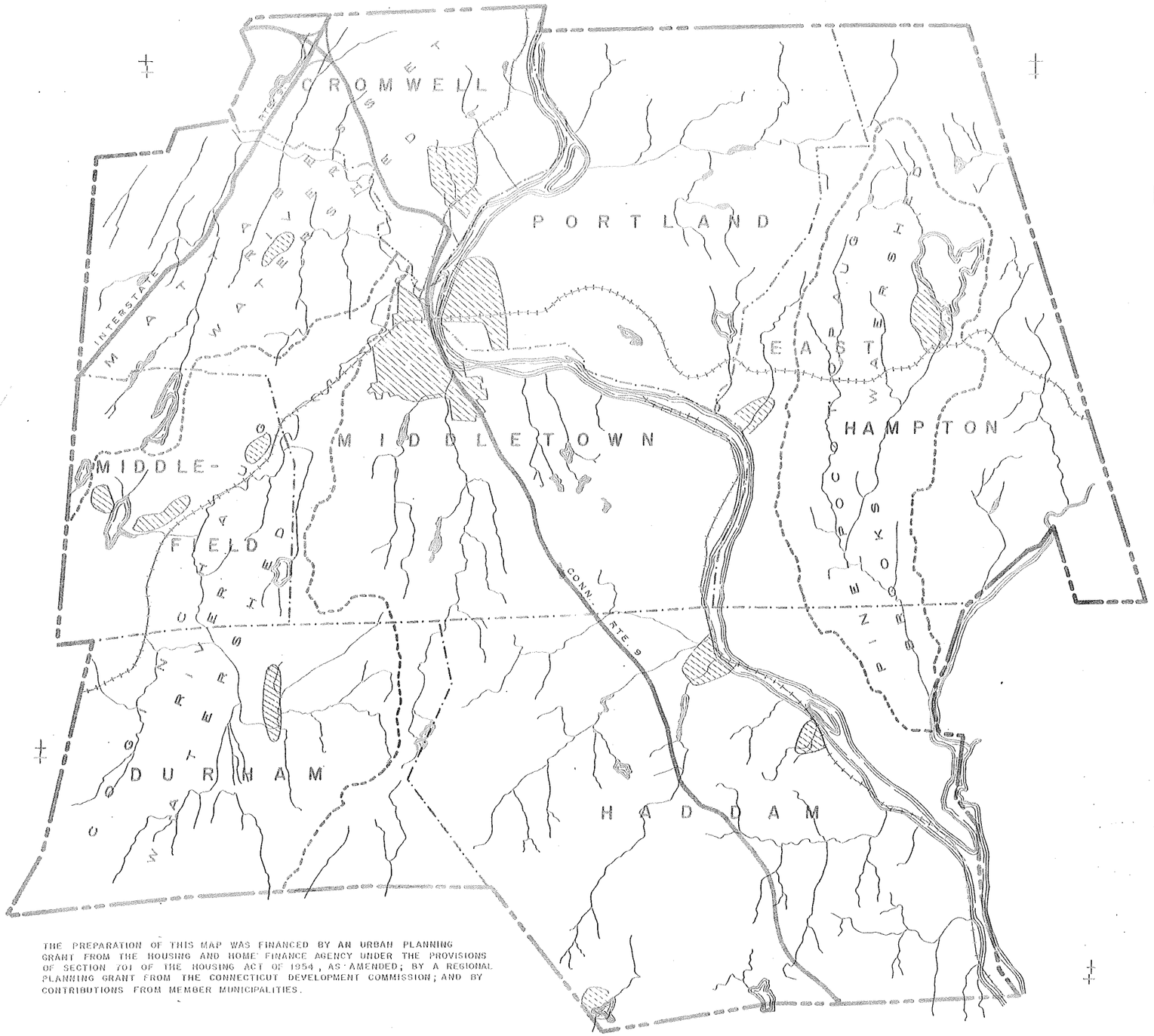
A. General Topography and Development

The seven communities comprising the Midstate Region cover an aggregate of 202 square miles of land area and are enclosed in a rectangle approximately 14 miles long on each side. The Connecticut River crosses the Region in a general north-south direction with about one-third of the region's land on its east bank, the

remainder to the west. Three major streams, the Mattabesset, Coginchaug and Salmon River, are tributary to the Connecticut within the limits of the Region and drain some 40% of its area. A great many smaller streams flowing directly to the Connecticut drain another 50% of the Region. The remaining 10% of the land is drained by streams flowing to outlets other than the Connecticut River, as shown on the accompanying maps showing the Region's drainage pattern.

With respect to present development, the main centers of population and business are in Middletown and Portland with lesser centers scattered throughout each of the other towns. Both Middletown and Portland already have sewage disposal systems while Cromwell is preparing to embark on its own construction program. The remaining communities rely on private septic tank/leaching field or cesspool arrangements for sewage disposal.

In the future, it appears that the Towns of Cromwell, Middletown, Middlefield and Durham will develop more intensively than the rest of the Region. Most of the prime land in the Region is located in these Towns with Durham being especially well endowed. Further, the presence of the existing railroad in all these Towns and the construction of Routes 91 and 72 through Middletown and Cromwell will aid and hasten development. The



SANITARY SEWAGE DISPOSAL STUDY

DRAINAGE PATTERNS OF THE MIDSTATE PLANNING REGION

LEGEND

- LIMITS OF MIDSTATE REGION
- TOWN LINES
- LIMITED ACCESS HIGHWAYS: EXISTING & UNDER CONSTRUCTION
- EXISTING RAILROADS
- CENTERS OF POPULATION
- RIVERS AND LAKES
- LIMITS OF MAJOR DRAINAGE AREA

MIDSTATE PLANNING REGION

0' 15,000'

THE PREPARATION OF THIS MAP WAS FINANCED BY AN URBAN PLANNING GRANT FROM THE HOUSING AND HOME FINANCE AGENCY UNDER THE PROVISIONS OF SECTION 701 OF THE HOUSING ACT OF 1954, AS AMENDED; BY A REGIONAL PLANNING GRANT FROM THE CONNECTICUT DEVELOPMENT COMMISSION; AND BY CONTRIBUTIONS FROM MEMBER MUNICIPALITIES.

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remaining towns of Portland, East Hampton and Haddam will probably develop to a lesser extent due to the roughness of their terrain and their somewhat less central transportation orientation with respect to the main centers of population and business activity.

B. Existing Conditions and Future Plans

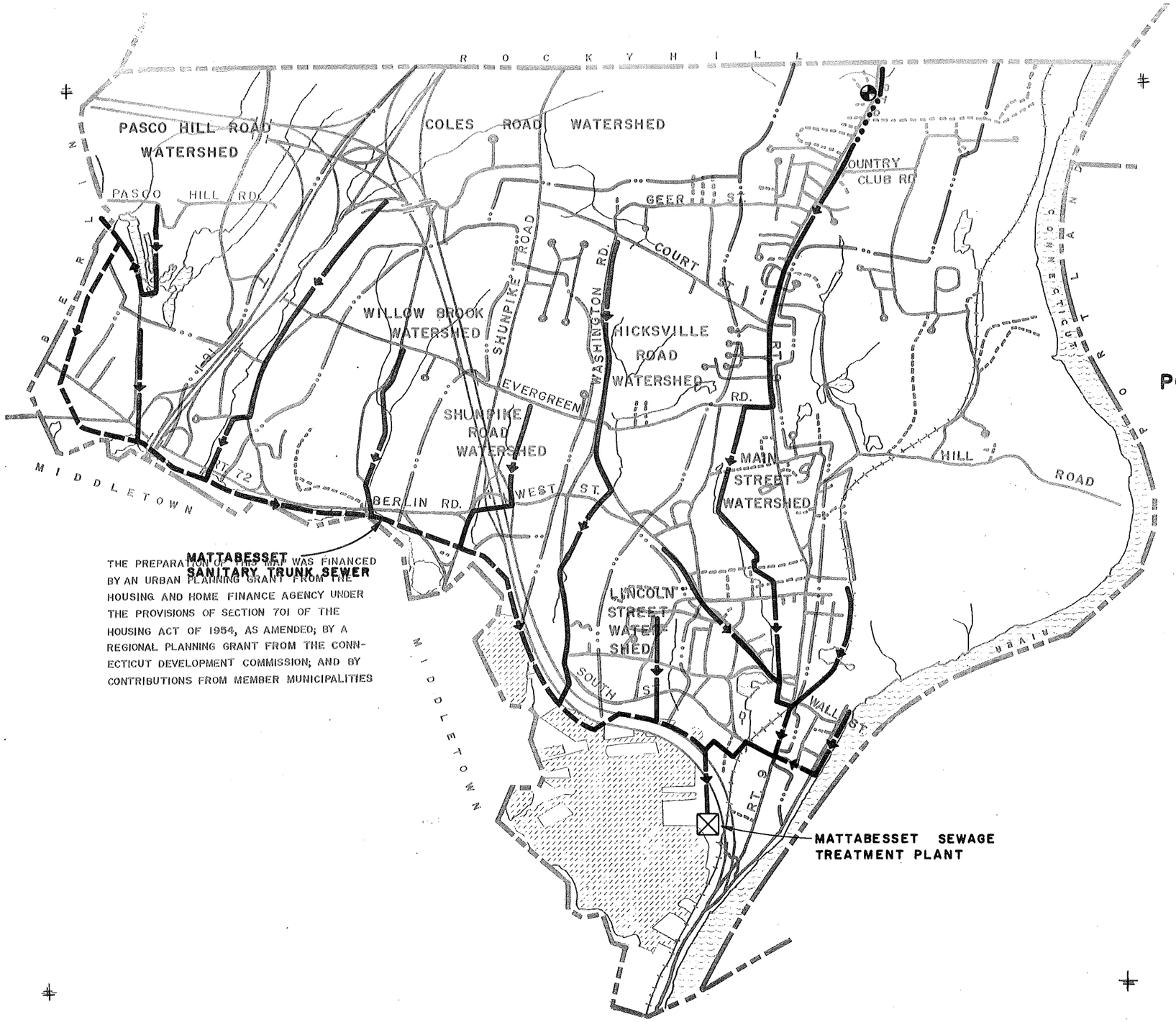
The following is a summary and evaluation for each of the seven communities of conditions that presently exist and an outline of a tentative plan which could effectively eliminate existing and potential problem areas.

1. Cromwell

Almost the entire land area of Cromwell is naturally tributary to the Mattabesset River. At this time, Cromwell is a member of the Mattabassett Sewer District which will soon build an intercepting trunk sewer along the Mattabesset River Valley and a treatment plant near the Connecticut River.

This proposed trunk sewer is ideally positioned to serve Cromwell as it is located along its southern boundary and in the lowest part of the Town.

A Master Sewer Plan has already been prepared for the Town of Cromwell by Cahn Engineers. This plan summarizes the present needs of the Town, outlines the general plan



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SANITARY SEWAGE DISPOSAL STUDY

POSSIBLE FUTURE SYSTEM LAYOUT

LEGEND

- DRAINAGE LIMIT
- SANITARY TRUNK SEWER
- PUMPING STATION AND FORCE MAIN
- EXISTING STATE FISH AND GAME AREAS
- EXISTING STATE PARKS AND FORESTS
- PUBLIC ROADS, HIGHWAYS
- PRIVATE ROADS

TOWN OF

CROMWELL

0' 5000'

MIDSTATE
REGIONAL PLANNING AGENCY
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of the future sewer system and summarize the procedure which must be followed in developing municipal sewer service. Even if the Mattabassett District facilities were not constructed, Cromwell's best layout would be with their own system with a plant in the area of the proposed Mattabassett Plant.

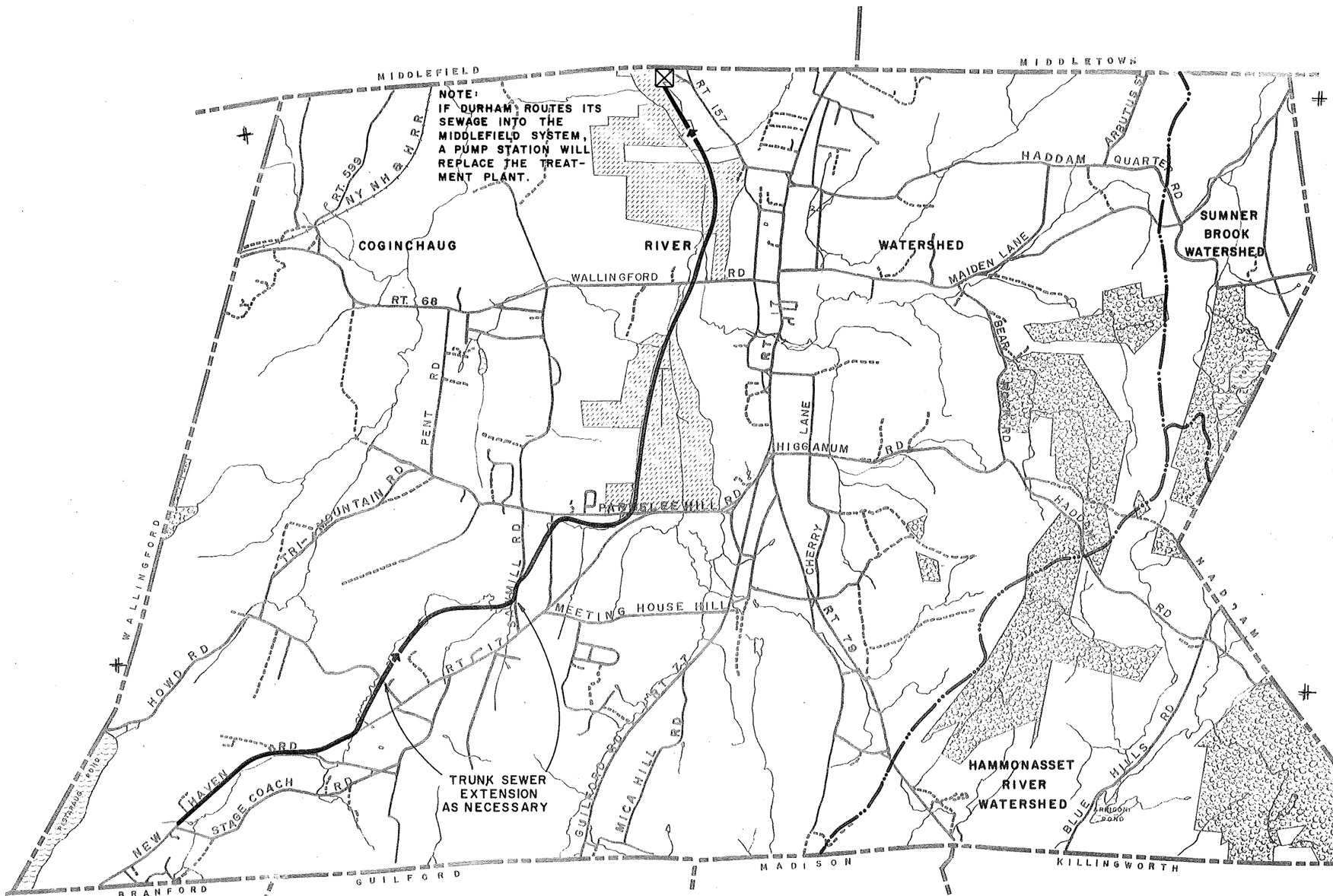
2. Durham

At present, Durham is served entirely by private means of disposal such as septic tanks with leaching fields and/or cess pools.

There are existing disposal nuisances and health hazards in that most of the Town's sub-soil is hardpan, which will not readily absorb the effluent from leaching fields. Effluent coming to the ground surfaces or infiltrating into brooks is evident along various roads in the town. These areas include portions of Route 17, Fowler Avenue, Hope Terrace, Tuttle Road, Side Hill Road, Edwards Road, Linmar Drive, and Durham Heights.

From a topographical standpoint, the Town of Durham is divided into three watersheds. These areas would probably involve separate means of sewage treatment. The following is a description of the Sumner Brook and Hammonasset River and Coginchaug River Watersheds.

(a) The Sumner Brook rises in Durham and flows northerly through Middletown into the Connecticut River. This



SANITARY SEWAGE DISPOSAL STUDY

POSSIBLE FUTURE SYSTEM LAYOUT

LEGEND

- DRAINAGE LIMIT
- SEWAGE TREATMENT PLANT
- SANITARY TRUNK SEWER
- EXISTING STATE FISH AND GAME AREAS
- EXISTING STATE PARKS AND FORESTS
- PUBLIC ROADS, HIGHWAYS
- PRIVATE ROADS

TOWN OF

DURHAM

0' 5000'

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watershed measures about 1.3 square miles in Durham of quite steep and broken land. Development of this land will probably not be on a large scale not take place for many years and sewage disposal will remain on a private basis.

(b) The Hammonasset River Watershed. This river originates in Durham and flows southeasterly into Madison draining about 3.1 square miles of Durham. This section of Durham is characterized by very steep and broken land and is therefore not likely to develop for many years, if at all. The State has already acquired about one-third of this area for forest preserve (Cockaponset State Forest). Therefore, the Hammonasset area, like the Sumner Brook area, will treat its sewage on a private basis for many years. In that the areas in the Sumner Brook and Hammonasset River Watersheds will probably be served for many years by private septic tank/leaching field arrangements, it is important that zoning ensure that adequate land be available for the private system in those areas where the soil has a poor percolation rating.

(c) The Coginchaug River rises in Guilford and flows northerly through Durham, Middlefield, and Middletown into the Mattabesset River. This area comprises about 19.2 aquare miles of the total Town area of 23.6 square miles and contains the land most suitable for development

within the Town because of its generally flat or gently rolling nature. The Coginchaug drainage basin contains the majority of Durham's population, and the sewage from this area may be treated in three possible ways. Final determination of treatment plant location will require additional study to ascertain which method of treatment would be economically advantageous to Durham and the other communities involved. Three possible arrangements are as follows:

(i) Construction of plant at the site of the former Middletown West Side Treatment Plant with facilities to serve parts of Middletown, Middlefield and Durham. This would involve about 2.0 miles of trunk sewer in Middletown, about 3.9 miles in Middlefield and about 1.2 miles of trunk sewer in Durham to reach the Wallingford Road. These sewers would be located in the Coginchaug River Valley. Such a system would provide service for some 80% of Durham's land, about 85% of Middlefield and about 10.5% or about 4.7 square miles of Middletown's area.

(ii) The second arrangement would call for a treatment plant at the Middlefield-Middletown boundary along the Coginchaug River. This scheme would eliminate Middletown sewage and would require 3.9 miles of sewer in Middlefield and 1.2 miles in Durham.

(iii) The third layout would serve Durham only with the treatment plant located at the Durham-Middlefield

town line along the Coginchaug. This would require the same 1.2 miles of trunk sewer from the plant to the Wallingford Road to serve the center of Durham.

To each of the three alternates for plant location the prime trunk sewer is common. The sewer would be built from the Durham-Middlefield boundary southerly through the Durham Hunting area and terminating at the Village of Durham. The sewer would be at a flat grade and would be approximately 36" in diameter. The 36" trunk line includes capacity for future development in the vicinity of the Durham Meadows and Hunting area and would be reduced accordingly as it was determined the extent to which this area would never be developed. Future extension of the main trunk sewer into adjacent lands would ultimately provide service for 80% of the Town's total area and most of the town's developable land.

Additional study may indicate the solutions of combining sewage from Durham, Middlefield area or Middletown to be more economical for each of the communities.

The major problems of these alternates is that of timing and motivation. For the joint plans to be effective, each of the communities should be in need of sewage disposal in the foreseeable future from the time the first community is ready.

The timing problem is magnified by two factors. First, it would be more costly for any one of the three communities to construct facilities in accordance with the joint plan, if the other two communities were not eventually to take part in the facility. Secondly, unless the need for the other two communities is evident at the time the first member is ready, it is difficult to plan an economical and efficient facility. The problem of phased construction is generally more critical for the communities (Durham in this case) which are furthest from the proposed plant.

In the case of the joint alternates, if Durham were ready to construct sewers prior to Middlefield and/or Middletown, then it would be necessary for the cooperating communities to construct a plant large enough for future flows or with capability for future expansion and a 3.9 mile trunk sewer through Middlefield sized for future Middlefield sewage; for the first alternative, an additional trunk sewer of 2.0 miles through Middletown would have to be sized and constructed for future Middlefield and Middletown sewage.

Therefore, if Durham were in need of sewers before Middletown could foresee its own need, alternate one does not appear reasonable. The same would hold true for alternate one and two if Middlefield's need was not

apparent at the time Durham's need arose.

To create an inter-municipal authority for treating Durham, Middlefield and/or Middletown sewage, a great deal of work must be accomplished well in advance. The results of this study, plus careful coordination and education will doubtless be required to stimulate the necessary interest to explore and determine the advantage of coordinated treatment and the creation of an organization to fulfill the sewage needs of Durham, Middlefield and/or Middletown.

3. East Hampton

At the present time, the Town of East Hampton is served by private disposal systems only. Some of these systems are not working properly in that nuisances and health hazards have been reported at various points adjacent to and along the shore line of Lake Pocotopaug. The situation in the center of the Town at the south end of the Lake is especially serious in that solids have been noted in the brook draining the Lake. The State Water Resources Commission has record of four to five small industries discharging their waste into the Pocotopaug Brook thereby creating pollution.

Topographically, the town is characterized by long, narrow watersheds running north to south. The following

SANITARY SEWAGE DISPOSAL STUDY

POSSIBLE FUTURE SYSTEM LAYOUT

TOWN OF
EAST
HAMPTON

0' 5000'

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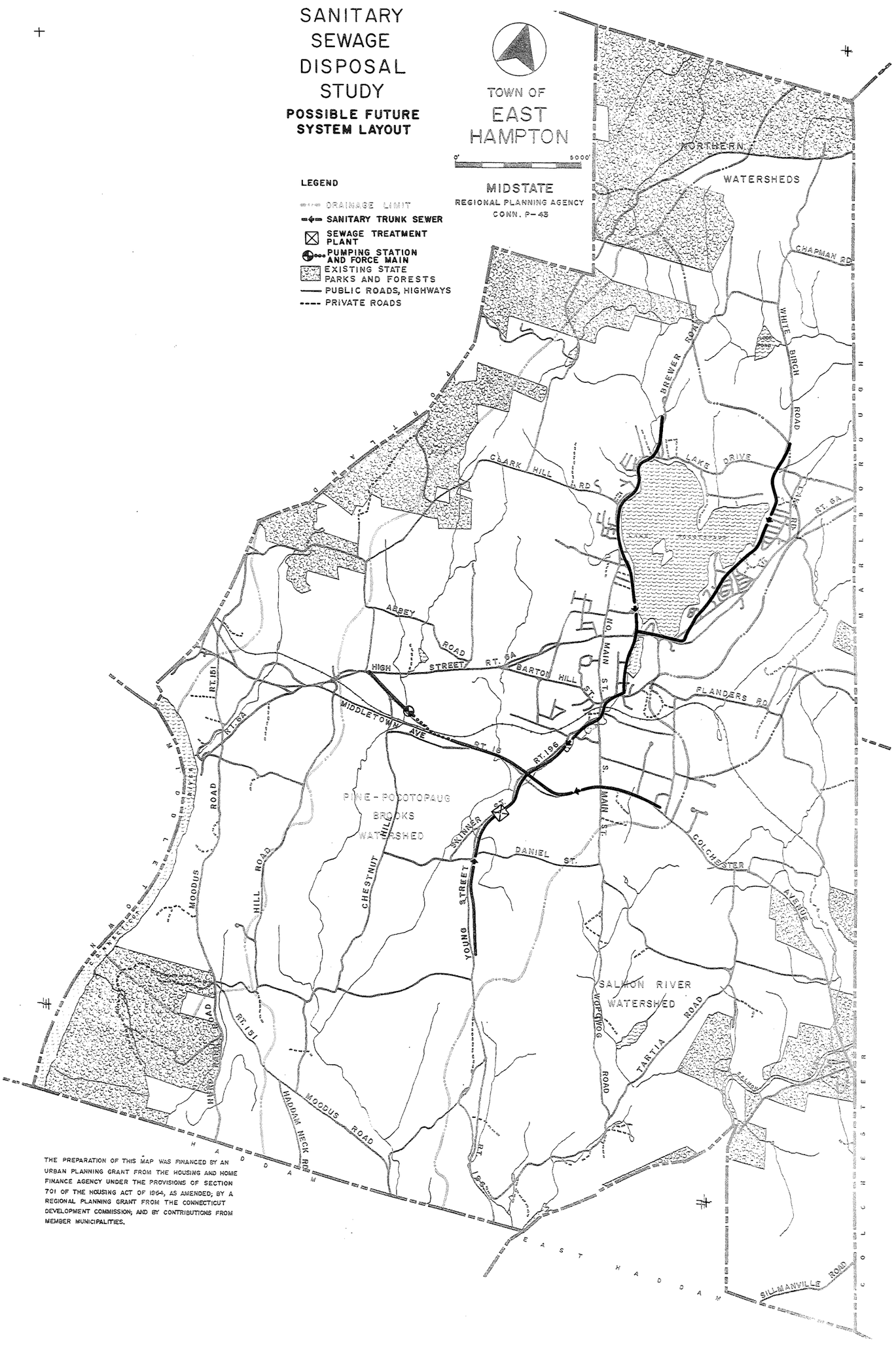
LEGEND

- DRAINAGE LIMIT
- **SANITARY TRUNK SEWER**
- **SEWAGE TREATMENT PLANT**
- **PUMPING STATION AND FORCE MAIN**
- EXISTING STATE PARKS AND FORESTS
- PUBLIC ROADS, HIGHWAYS
- PRIVATE ROADS



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four watershed areas will probably coincide with future sewage drainage areas:

(a) The Pine-Pocotopaug Brooks Watershed area includes about 14.8 square miles of the total Town area of 36.8 square miles. The Village of East Hampton and Lake Pocotopaug is located within this area. The watershed is generally steep and broken except in the central portion adjacent to the Lake and Village where flatter grades make the land more suitable for development. It appears likely that future development of the Town will occur first in these areas.

The first phase in developing a waste disposal system would be alleviate the existing nuisances located adjacent to the Lake and in the Town proper. The most practical means to accomplish this would be to build a treatment plant in the Pocotopaug Creek Valley south of Route 16. A trunk sewer would then be extended northerly along the valley into the Town and along the shores of the Lake. Such a system would provide service to the presently developed areas and would provide an outlet for most of the Town's better undeveloped land.

(b) The Salmon River Watershed. The area of this watershed is 9.4 square miles. The topography may be described as quite steep and hilly, and therefore this section will probably be among the last to develop

within the Town. A portion of the Salmon River State Forest lies within this watershed. For the foreseeable future private treatment with proper regulations appears most practicable.

(c) The Connecticut Shore Watershed area is composed of various small watersheds located along the east edge of the Connecticut River and drains directly to the River via various small streams. Due to the steep and broken nature of the terrain, no major development will take place for many years, if at all. The size of these combined watersheds is 5.8 square miles. Private treatment appears reasonable for the foreseeable future.

(d) The Northern Watersheds area is 6.8 square miles in size and is drained by streams flowing east, north and west into adjacent towns. The land again is hilly and steep and therefore unlikely to be intensely developed. As it becomes developed, private sewage disposal will be used.

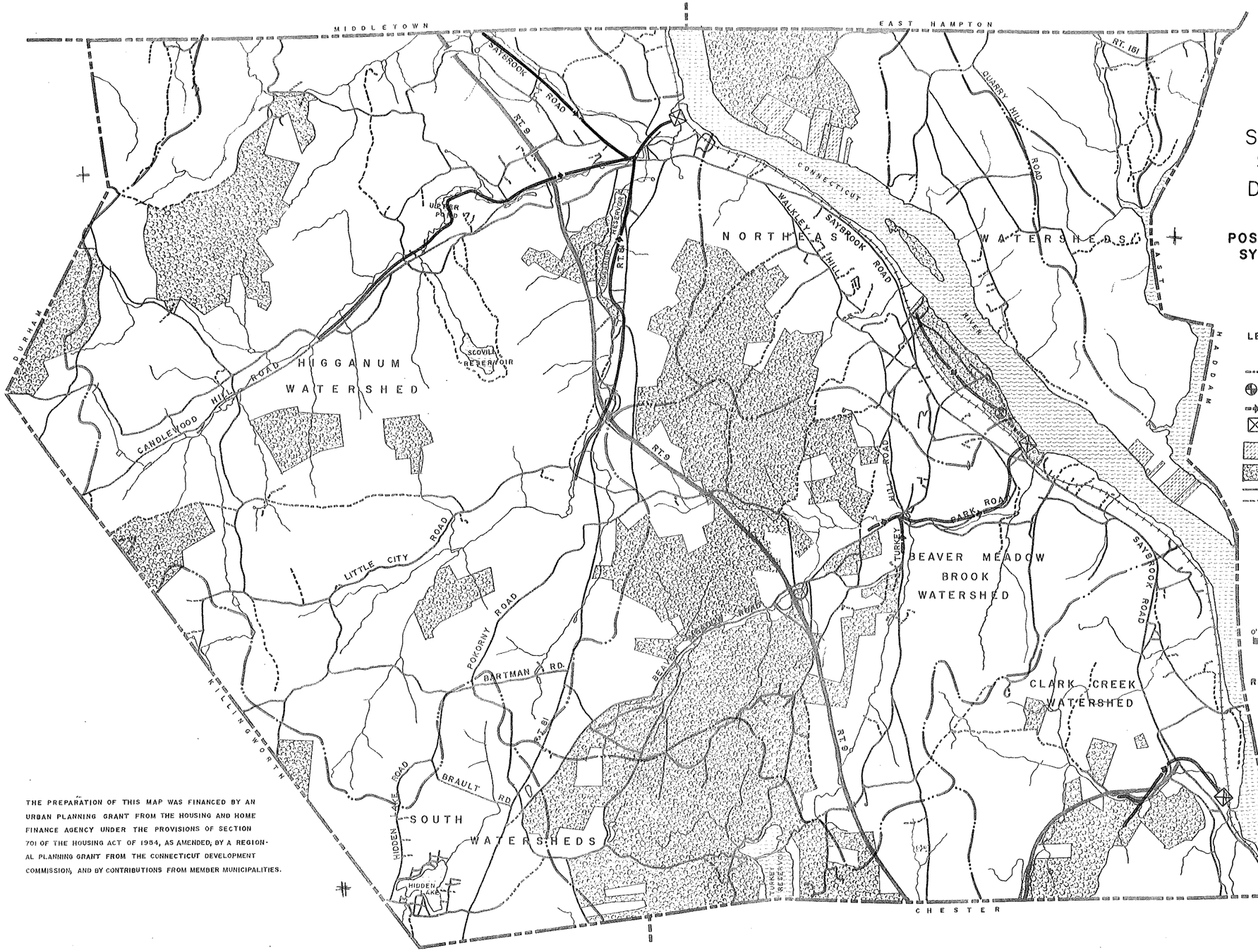
4. Haddam

At the present time, the Town of Haddam is served by private disposal systems only.

There are minor nuisances and health hazards in that it was reported that septic tank effluent from a few homes on Thayer Road were overflowing onto the ground surface and that the private disposal systems in the

SANITARY SEWAGE DISPOSAL STUDY

POSSIBLE FUTURE SYSTEM LAYOUT



LEGEND

- DRAINAGE LIMIT
- PUMPING STATION AND FORCE MAIN
- SANITARY TRUNK SEWER
- SEWAGE TREATMENT PLANT
- EXISTING STATE FISH AND GAME AREAS
- EXISTING STATE PARKS AND FORESTS
- PUBLIC ROADS, HIGHWAYS
- PRIVATE ROADS

TOWN OF
HADDAM

0' 5000'

MIDSTATE
REGIONAL PLANNING AGENCY
CONN. P-43

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vicinity of Hidden Lake were not operating properly.

Topographically, the Town is generally quite steep and hilly. The Connecticut River crosses the northeast corner of the Town leaving about one eighth of the Town on the East Side of the River. The main drainage areas are:

(a) Higganum Watershed. This is the major watershed in the town. It includes about 18.4 of the total town's total area of 45.2 square miles. It is drained by various brooks, which empty into the Connecticut River near the north boundary of the Town of Higganum, the main population center of the Town. Large tracts of land in this area are reserved as State Forest.

(b) Beaver Meadow Brook Watershed. This watershed, 8.0 square miles in size, drains the central portion of the town into the Connecticut River and includes a secondary center of population, Shailerville. Large tracts in this area are reserved as State Forest.

(c) The South Watersheds. This area, encompassing 4.4 square miles, is located along the southern edge of the Town. It is drained by numerous small streams flowing southerly into Chester. With the exception of the Hidden Lake area, the land encompassed by this area has relatively little development potential.

(d) Clark Creek Watershed. This watershed is situated in the southeastern corner of the Town and drains to the Connecticut River. It is 4.1 square miles in area and includes the area known as Tylerville.

(e) The Northeast Watersheds. This area is composed of numerous small watersheds on both sides of, and draining to the Connecticut River. It encompasses the northeast corner of the Town which,for the most part, is separated from the Town proper by the Connecticut River. Its topography alternates from river meadows to steep, hilly terrain. The area of this watershed is 9.6 square miles and includes the new Connecticut Yankee Atomic Power Plant as well as 6.7 square miles of State Park and Forest.

Finally, about 0.7 square miles in the northwesterly corner of the town is drained by streams flowing westerly and northerly into Durham and Middletown. This area is extremely steep and hilly and not very suitable for development.

In general, the topography of Haddam is characterized by steep and broken terrain. Therefore, little intense development may be expected except in relatively small isolated areas where the grades are relatively flat, and perhaps along the River.

To date, the State forests and parks, rivers and lakes account for about 27% of the Town's area. Therefore, the sewage disposal throughout the Town can probably be provided for by private systems for many years to come.

The Hidden Lake area however, may require separate consideration for its sewage disposal needs, depending upon the severity of the problem. Should this be the case, there are various alternative, the most suitable of which would depend upon an evaluation to be made at the time the facilities are to be provided.

(i) One possibility would be the installation of a packaged treatment plant to serve the area at such time as these units are approved for use in the area.

(ii) Another alternative and the most likely at the present time if adequate land for a leaching field were available, is the provision of an interim system such as currently serves the Mile Lane section in Middletown. This in essence is a community septic tank and leaching field which provides for chlorination of the effluent. This system requires continual maintenance to insure that the tanks are pumped out, filters cleaned, and the chlorination equipment kept in proper working order.

(iii) The third possibility, which in all likelihood would be inordinately expensive, would be to pump the

effluent back into the Higganum watershed toward Higganum, where treatment could be provided in conjunction with sewage from Higganum. This would require a pump and approximately a mile of force main, which would then continue as a gravity system through Higganum. This would be quite expensive, since much of this trunk line would traverse areas of limited buildability, so as to be of little value to much of the countryside through which it would pass.

Were the whole Town to develop to the point where a public system was required, some seven individual networks of gravity sewers would be necessary, all draining to the Connecticut River. Two of these systems would be located to the east of the River, the remainder to the west. The problem of locating treatment plants to serve these systems must be solved by future studies as the need arises. On a per-capita basis, these systems would be quite expensive due to their length as compared to the small amount of land fit for development.

Due to the topographical isolation of the Town, any sewage disposal systems which may become necessary would probably be administered on a municipal basis.

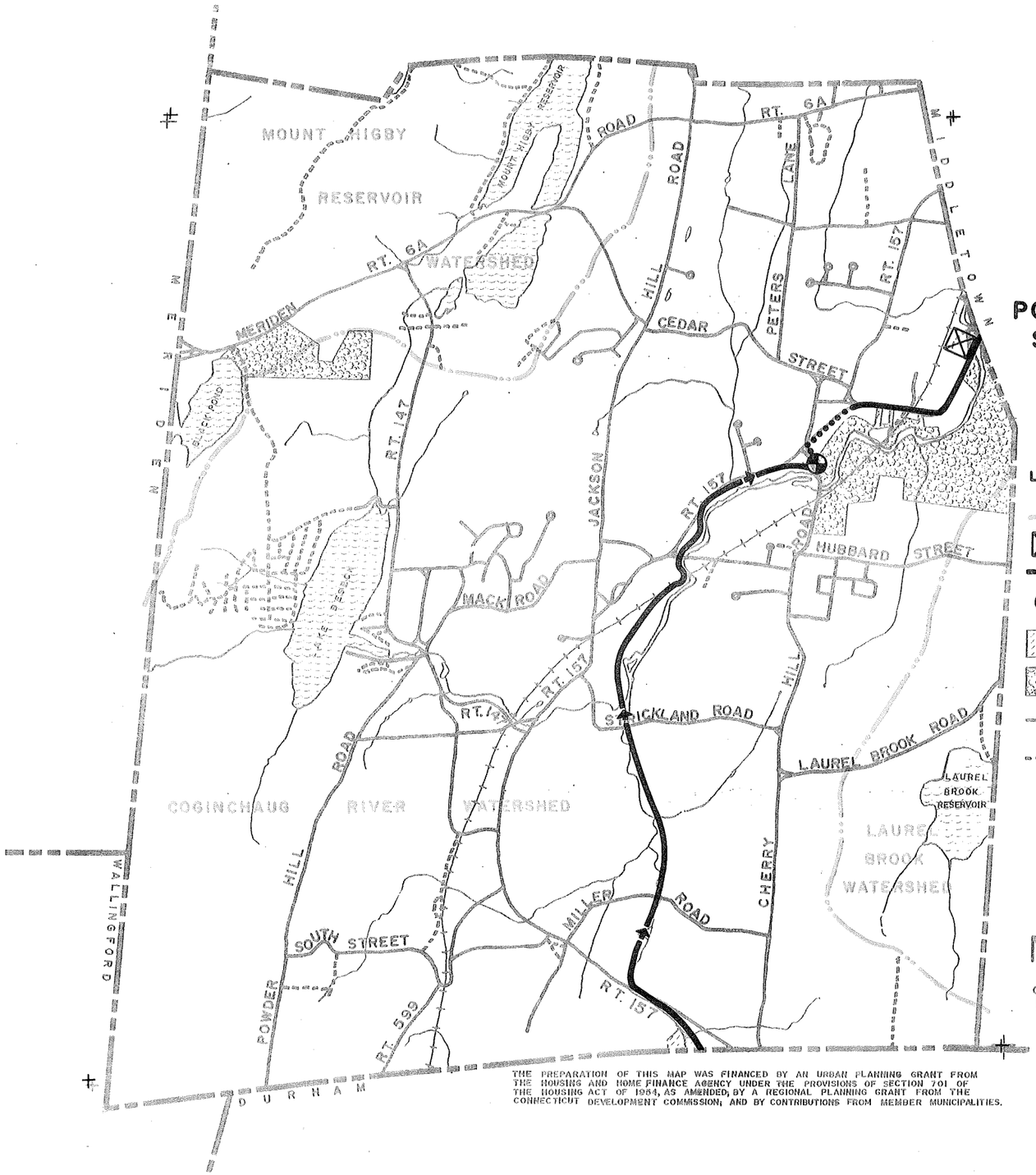
5. Middlefield

At present, Middlefield is served entirely by private disposal systems which include septic tanks with leaching fields and cess pools.

There are existing health hazards and nuisances in that it has been reported that leaching field effluent has been infiltrating into wells in the densely settled area to the west of Beseck Lake. The State Water Resources Commission notes one industrial discharge into the Coginchaug River.

From a topographical standpoint, the Town of Middlefield is naturally divided into the following three watersheds which will probably constitute future sanitary drainage areas.

(a) The Coginchaug River Watershed area comprises about 10.3 square miles of the Town's total area of 13.2 square miles. Most of the land within the watershed is quite suitable for development. The logical location for the main trunk sewer would be in the valley of the Coginchaug for the entire length of the Town and this would provide an outlet for 78% of the Town's land. However, field inspection reveals that, from the Wadsworth Falls northerly for approximately 4,000 feet, the River winds through a narrow, steep-sided, rock-lined gorge. Building a sewer along this



SEWAGE DISPOSAL STUDY

POSSIBLE FUTURE SYSTEM LAYOUT SCHEME I

LEGEND

- DRAINAGE LIMIT
- SEWAGE TREATMENT PLANT
- SANITARY TRUNK SEWER
- PUMPING STATION AND FORCE MAIN
- EXISTING STATE FISH AND GAME AREAS
- EXISTING STATE PARKS AND FORESTS
- PUBLIC ROADS, HIGHWAYS
- PRIVATE ROADS

TOWN OF

MIDDLEFIELD

0' 5000'

MIDSTATE

REGIONAL PLANNING AGENCY

CONN. P-43

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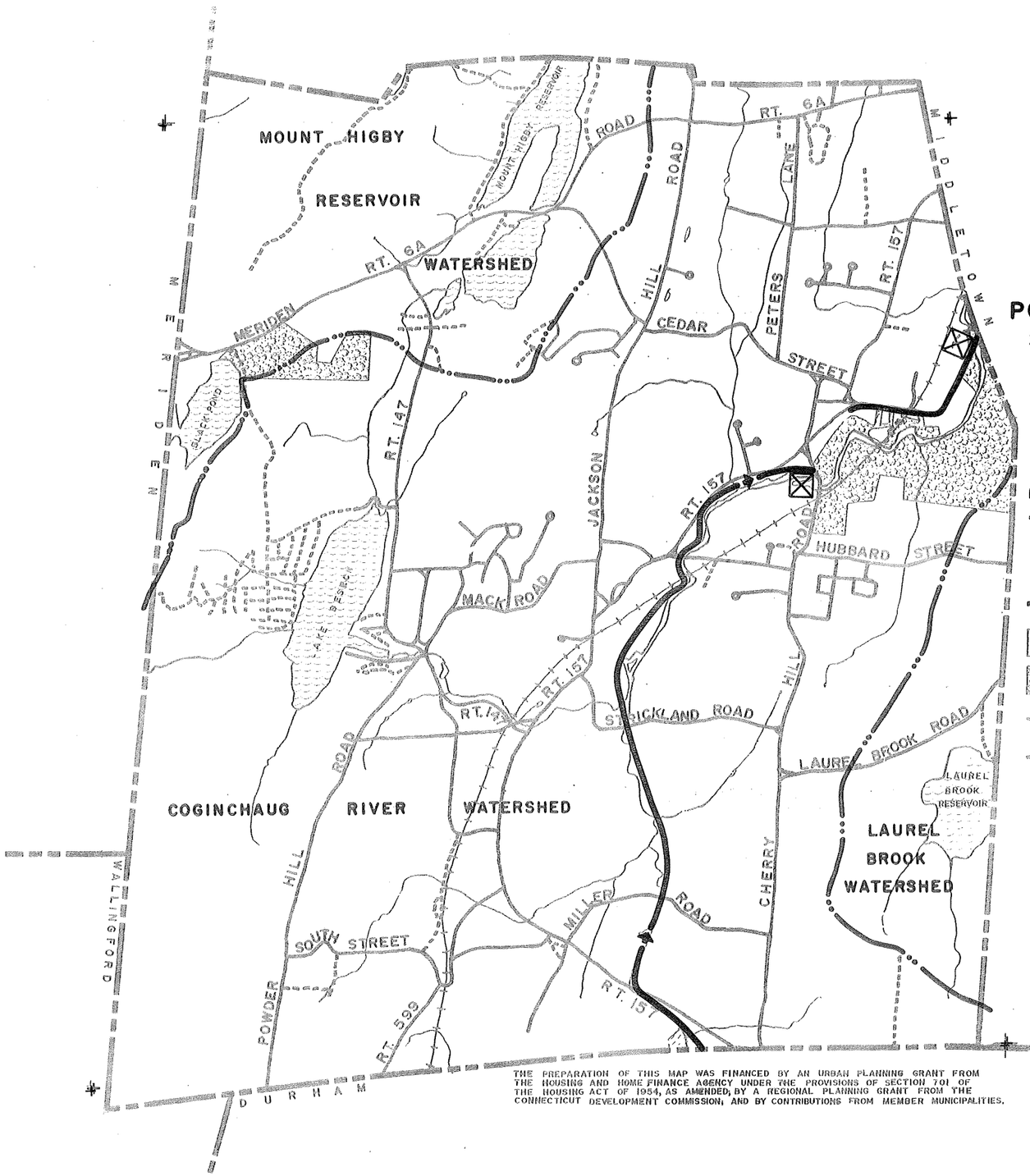
stretch of River would be extremely expensive in that a tremendous amount of rock excavation would be required just to provide a somewhat level area wide enough to maneuver construction equipment and lay the pipe.

One solution (scheme 1) to this problem would be to pump around the gorge. This would require a large pumping station (4500 GPM capacity for Middlefield alone, 10,000 GPM for Middlefield and Durham combined) to be located just upstream from the Falls. Sewage would be pumped northwesterly along Cherry Hill Road and northeasterly some 1000 feet along Route 157, at which point it would continue northerly by gravity. Such a pumping facility would be expensive to build and operate, but it probably is more economical than the gravity alternate.

(ii) Another possible solution (scheme 2) would be to locate a treatment plant in the open land just upstream of Cherry Hill Road. Such a plant would provide an outlet for some 70% of the Town's area and would have the advantage of being nearer to the problem area around Beseck Lake and the upstream undeveloped industrially zoned areas. To provide service for the Rockfall area and adjacent industries, a smaller plant could be located at the Middletown boundary, or the sewage might be piped into



SEWAGE DISPOSAL STUDY

POSSIBLE FUTURE SYSTEM LAYOUT SCHEME 2

LEGEND

- DRAINAGE LIMIT
- SEWAGE TREATMENT PLANT
- SANITARY TRUNK SEWER
- EXISTING STATE FISH AND GAME AREAS
- EXISTING STATE PARKS AND FORESTS
- PUBLIC ROADS, HIGHWAYS
- PRIVATE ROADS

TOWN OF

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the Middletown system. In either case, as was discussed in the previous section for Durham, flow from the Town of Durham may be carried and treated in Middlefield facilities.

The discussion of regional treatment as applied to Durham also applies to Middlefield. In fact, since Middlefield is physically located closer to the possible treatment plant sites, the advantage of an intertown solution appears even more justified for Middlefield than Durham.

The remaining portions of the Town are comprised of the Mount Higby Reservoir and Laurel Brook Watersheds.

(b) The Laurel Brook Watershed is about 0.9 square miles in area and is drained by Laurel Brook flowing north through Middletown to the Coginchaug. Laurel Brook Reservoir is located within its limits as well as much land which appears quite suitable for development.

(c) The Mount Higby Reservoir Watershed area is drained by various small streams flowing north into the Mattabesset River. The Mount Higby Reservoir is located within this area. The land, 2.0 square miles in area, is not likely to develop appreciably as it is either very steep or within the permanently protected watershed for two reservoirs.

These two areas may be served in the foreseeable future by private systems. Should the need arise, sewage from the Laurel Brook area could be pumped into Middlefield sewers if available, or piped to the Middletown system.

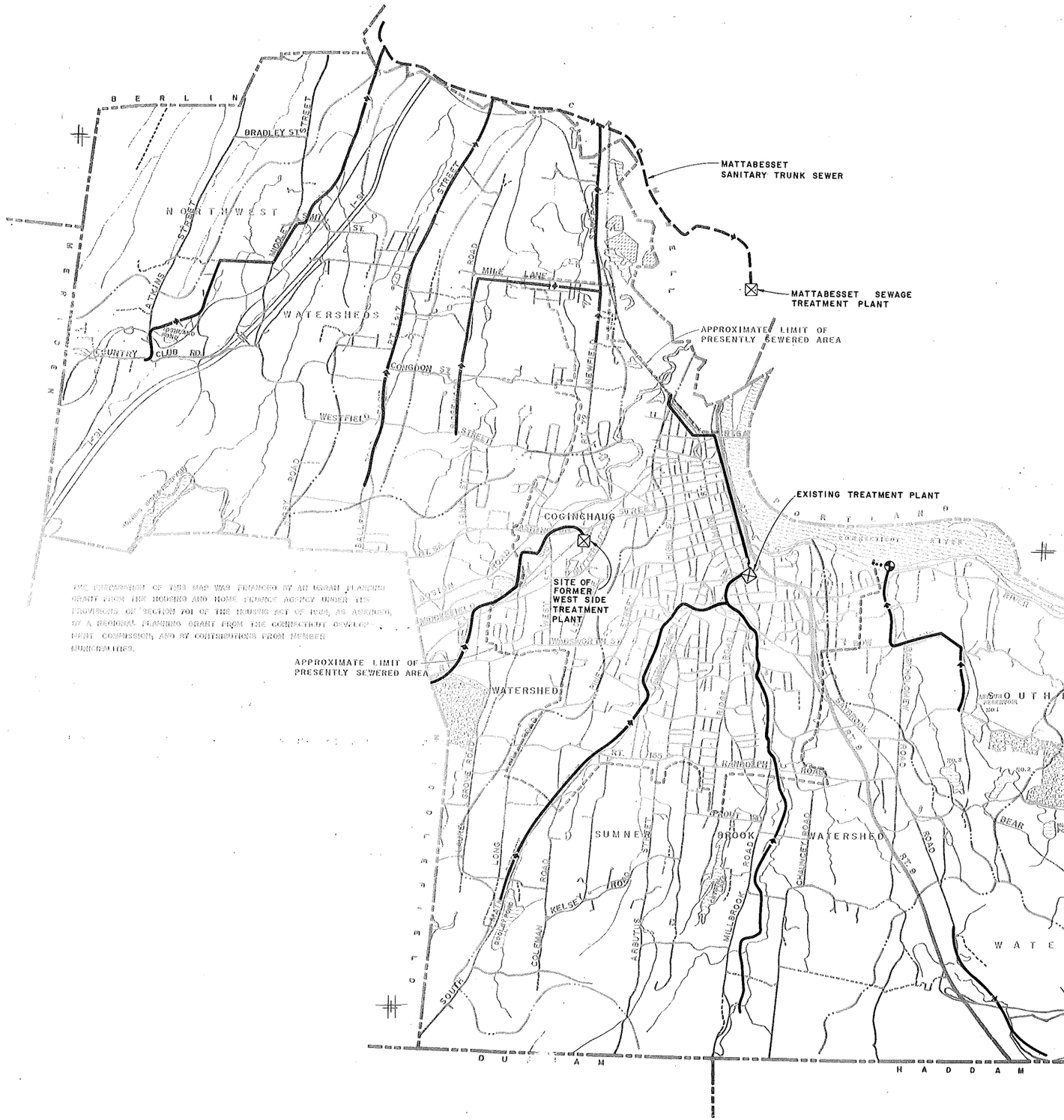
To propose a definite schedule of construction at this time appears impractical. Presumably, the only problem area in the Town is adjacent to Beseck Lake. This therefore, requires a treatment plant at Wadsworth Falls with trunk and local sewers extended southerly to the Lake. If the problem at Beseck Lake were to warrant construction of facilities in the near future, the possibility of treating Durham sewage in this plant must be considered during design, and the needs of Durham taken into account. On the other hand, if there were an acute problem in the Rockfall area, Middlefield would be in a position to consider the possibility of combining with Middletown as well as Durham.

6. Middletown

At present, Middletown is served by both private disposal systems and a public sewer system with a treatment plant. The public sewers are both sanitary and combined sewers and provide service to about 5.6 square miles of the City with a potential future

SANITARY SEWAGE DISPOSAL STUDY

EXISTING AND POSSIBLE FUTURE SYSTEM LAYOUT



DRAINAGE LIMIT

SEWAGE TREATMENT PLANT

SANITARY TRUNK SEWER

PUMPING STATION AND FORCE MAIN

EXISTING STATE FISH AND GAME AREAS

EXISTING STATE PARKS AND FORESTS

PUBLIC ROADS, HIGHWAYS

PRIVATE ROADS

TOWN OF MIDDLETOWN

0 5000'

MIDSTATE REGIONAL PLANNING AGENCY CONN. P-43

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addition of another 11.6 square miles. Total area of the City is 45.0 square miles.

The existing treatment plant provides primary treatment for the sewage. The capacity is adequate for the present needs of the City at times of no rain. The plant will have to be increased to handle the load which will be generated by future development. Expansion of the existing plant with respect to capacity or provision of secondary treatment facilities may prove difficult due to the limited amount of land available. The existing combined system should be separated to eliminate present overflow into the Connecticut River during periods of rain. The State Water Resources Commission also has records of several industries discharging waste directly to the River. It has also been reported there are areas in the suburban parts of the City where private disposal systems are not functioning properly.

Topography has divided the City of Middletown into the following four main watersheds which have separate sewage disposal problems:

(a) The Northwest Watersheds contains 14.3 square miles in the northwestern section of the City. It is drained by several small streams flowing northerly to the Mattabesset River.

This area is well suited for development because of

the rolling nature of its terrain, Interstate Route #91 which crosses through the area, and the imminent construction of the Mattabassett Trunk Sewer along its north edge to serve as an outlet for sanitary sewage. The area is zoned industrial in its northerly sections, residential in the southerly portions.

(b) The Coginchaug River Watershed area contains 5.8 square miles and is characterized by a rolling, hilly landscape quite suitable for development. A great part of the presently developed City lies within this area and is partially served by the existing sewers.

(c) The Sumner Brook Watershed area is 11.4 square miles and is similar to the Coginchaug Watershed in that a large part of the presently developed City lies within its limits and that the existing sewers serve a portion of its area. Much of its land is suitable for future development.

(d) The Southeast Watershed areas are 13.5 square miles in size, and are located in the most easterly portion of the City. They are drained by numerous small streams flowing easterly and northerly into the Connecticut River. The topography is generally steep and broken and therefore this land is the least suitable for widespread development within the City. This area includes Maromas and the recently discontinued CANEL operation.

In providing for future sewer service in the unsewered portions of the City, extension of the existing sewers in the Coginchaug and Sumner Brook Watersheds will completely sewer almost half the City. The Northwest Watershed may be sewered to the Mattabassett Trunk sewer soon to be built in the Mattabesset River valley as needs dictate.

Contained within this area is the packaged-type treatment plant serving approximately one hundred homes in the Mile Lane area. The heart of this system are a common septic tank and leaching field, with provision for chlorination of the effluent. This system was initially provided as an interim measure, and at such time as circumstances warrant, may be modified in accordance with several alternatives.

(i) One possibility is to tie it directly into the existing City system which runs along the Coginchaug River to the southeast.

(ii) A second alternative which appears preferable to the first, would be to tie service from this area into the proposed Mattabassett system. This, of course, is contingent upon construction of the system and Middletown's relation to it.

The physical limitations to the Southeast Watersheds will play a significant role in restricting the rate

and intensity of development which will take place in this area.

In the future, Middletown's program of separating the existing combined sewers into sanitary and storm systems must be continued. This work has already been initiated within the Redevelopment Area in which separate systems are proposed. Also, the sewers along a portion of Main Street were separated some years ago as part of a flood control project.

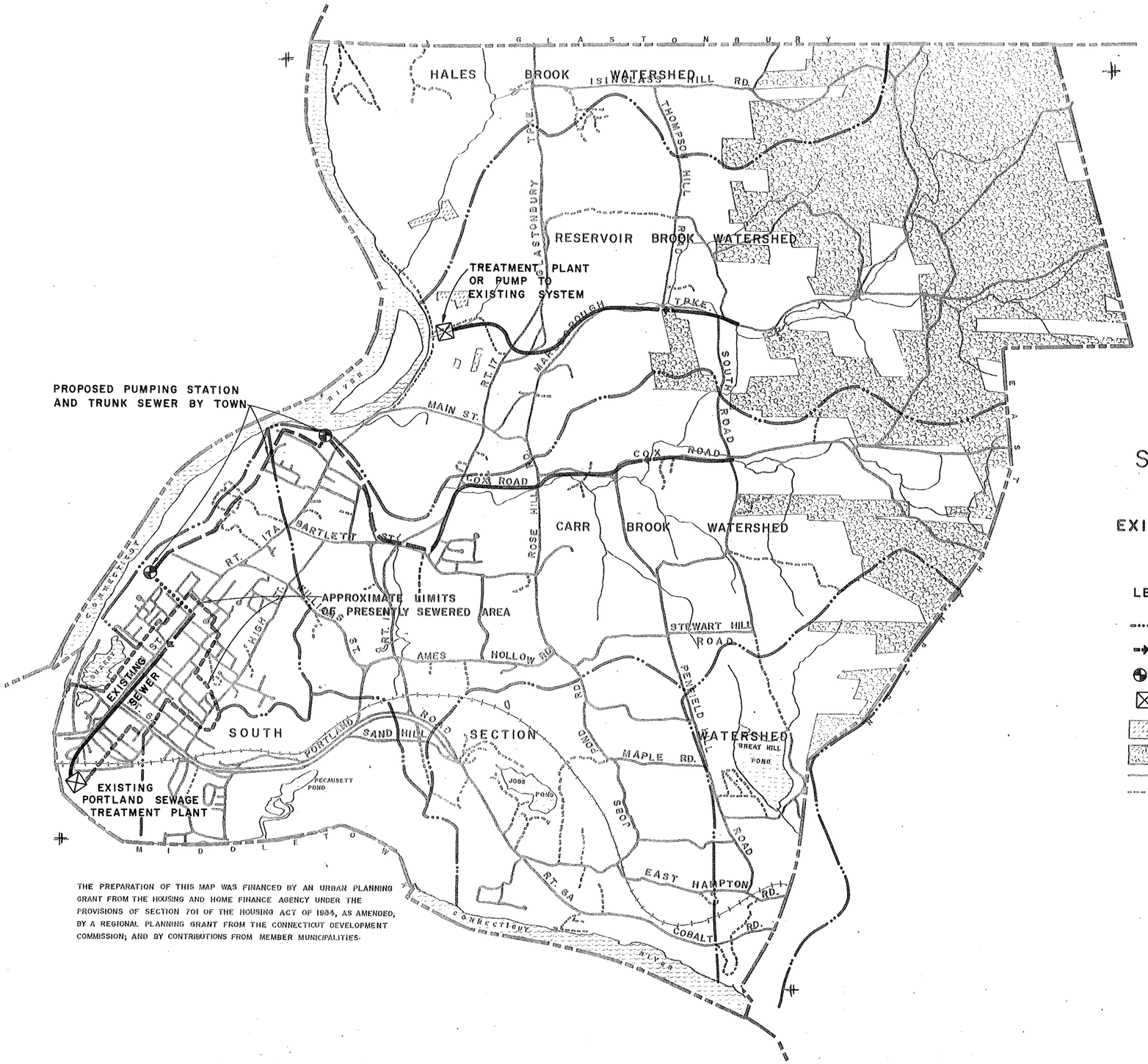
With respect to the problem of providing sewage treatment, the possibility of routing all Middletown flow into the proposed Mattabassett Treatment Plant was considered. To accomplish this, a minimum of 1.3 miles of existing sewer must be enlarged and separate systems built in City streets. Further, some 1.2 miles of trunk sewer must be built northerly across the swamp of the Mattabesset River valley or parallel to the railroad and Route 9 to reach the proposed plant. The rebuilding of sewers in City streets will be costly and the construction of the sewer across the swamp would be prohibitively expensive due to lack of access, poor foundation conditions and dewatering problems. Therefore, it appears that the more economical solution is to maintain and enlarge, as necessary, the existing plants in the City.

An alternate solution might be to build a new plant at the site of the former West Side Treatment plant to serve this area of the City as well as upstream towns. This new plant, in combination with the replacement of existing combined sewers, would reduce the load on the existing plant and perhaps render its expansion more economical.

7. Portland

At present, Portland is served by both private disposal systems and a public sewer system with a disposal plant providing primary treatment of the sewage. Portions of the public system are combined sewers. About 0.4 square miles of the total Town area of 24.8 square miles has sewer service. A proposed trunk sewer-pumping station system will, in the near future, provide service to an additional 0.8 square miles and treatment plant capacity will be increased accordingly. Ultimate expansion of the proposed sewers will provide service to a total of 7.0 square miles.

There is presently a public septic tank which serves the Gildersleeve section of the Town. The above-mentioned trunk sewer-pumping station system will bring this flow into the treatment plant and eliminate the septic tank. The Town has also completed an engineering study as the first step in eliminating its combined sewers.



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SANITARY SEWAGE DISPOSAL STUDY

EXISTING AND POSSIBLE FUTURE SYSTEM LAYOUT

LEGEND

- DRAINAGE LIMITS
- SANITARY TRUNK SEWER
- PUMPING STATION AND FORCE MAIN
- SEWAGE TREATMENT PLANT
- EXISTING STATE FISH AND GAME AREAS
- EXISTING STATE PARKS AND FORESTS
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TOWN OF
PORTLAND

0' 5000'

MIDSTATE
REGIONAL PLANNING AGENCY
CONN. P-43

However, there are still existing problems with private disposal systems although not of a great extent. Problems have been reported in the Trout Acres development, in some areas east of the Gildersleeve section, in a development tract to the west of Main Street near the Post Office, and pollution has been noted in the brook to the east of Tuccitto Road.

Topographically, there are three main watersheds and numerous smaller watersheds within the Town. These areas which will generally constitute the sanitary drainage areas are as follows:

(a) Reservoir Brook Watershed is located in the northerly portion of the Town and is drained by Reservoir Brook which flows westerly into the Connecticut River. The area of this watershed is 6.9 square miles of the total Town area of 24.8 square miles. Much of the land is somewhat steep and suitable for limited development. Much of the easterly end of this area is State Forest and water supply watershed while the westerly end is flood plain. The area available for development will probably be sewered by private facilities.

(b) Carr Brook Watershed is 6.6 square miles in area and is located in the central part of Town. It is drained by Carr Brook which flows westerly into the Connecticut River. The land is somewhat steep and broken although there are some isolated areas suitable for

development. The easterly end of this area has already been designated as State Forest while the westerly end is flood plain. The proposed trunk sewer-pumping station system which will serve the Gildersleeve areas could also provide an outlet for the remainder of this watershed.

(c) The 8.7 square mile South Section Watershed is composed of four small watersheds drained by small streams flowing south into the Connecticut River. The developed portion of the Town is in the westerly end of this section, and is partially enclosed by a bend of the Connecticut River. The remaining portions of this watershed are composed of steep and somewhat broken land not very suitable for development.

(d) Hales Brook Watershed is located in the north end of the Town and is drained by Hales Brook which flows westerly into the Connecticut River. While this Brook drains a large portion of Glastonbury, it drains only about 2.6 square miles of the Town of Portland. Because of the river flood plain on the west, the steep and hilly nature of the higher ground and the existence of the State Forest in the east, little of this watershed is suitable for development.

At the present time, some 32% of Portland's land area is given over to State Forest, water supply watershed, lakes and flood plains. Of the remaining 68% or 16.8 square miles, existing or proposed sewers will provide

an outlet for some 7.4 square miles. Included in this 7.4 square miles is most of the developed portion of the Town as well as the most of the Town's prime undeveloped land. The remaining areas of the Town can probably be sewered by private disposal systems for many years to come.

The possibility of providing public sewer service to the developed area on either side of the railroad and east of Pecausett Pond should be considered as pollution has been noted in the brook there.

The possibility of routing Portland sewage across the River to either the proposed Mattabassett Treatment Plant or Middletown facilities was considered. However, construction costs for crossing the River and then piping the sewage to the treatment plant appears to be prohibitive.

C. Administration and Financing

Once the need for sewers has been established, the problem of creating and administering the system must be resolved. Of course, where the solution is private systems, each community must provide an adequate code for the construction and operation of such systems as well as proper field inspection to ensure the code is enforced. The code must be broad enough in scope to cover not only the

normal septic tank/leaching field arrangement but also to provide sufficient control for other types of disposal systems which an industry or developer may wish or be required to install. Examples of these systems might be a small package treatment plant or a special chemical process to treat industrial wastes.

If a community has determined the need for a public disposal system to handle sewage generated within its confines only, a municipal organization is required to plan, finance, build and maintain the system. Normally, a Commission of elected or appointed citizens from the town is designated as governing board to pass on all questions concerning the sewers, and to provide general supervision of the municipal departments or employees engaged in building and maintaining the physical plant. Engineering studies, construction plans and field inspection can be handled by the municipal engineering staff or by a private engineering consultant.

Financing must be done, of course, through town-wide taxation and local assessment as approved by the local government. Financial assistance is available to communities interested in alleviating existing sewage problems. The following is an outline of some of the programs available.

1) If the proposed project alleviates water pollution, federal aid may be available through the Department of Health, Education and Welfare as administered by the State Water Resources Commission.

2) If the sewers to be built are part of an urban renewal program, financial aid may be available through the Department of Housing and Urban Development.

3) The Community Facilities Administration (CFA) also provides interest-free loans for engineering studies and construction plans. As part of the application for the loan, a feasibility study needs to be submitted to the CFA.

The contents of this report coupled with the information developed in the course of this study may readily contain sufficient detail to serve as a feasibility study. The interest-free free loan is repaid only if and when a community commences construction.

4) The recent Housing and Urban Development Act of 1965 includes provisions for grants of up to 50% to communities for basic sewer facilities.

Once the treatment facility and main trunk sewer are in operation, it will be the Commission's duty to extend the sewers as need dictates, provide additional financing, levy assessments, and operate and maintain the existing system. The Commission should also be empowered to

negotiate with other towns or agencies on problems of common interest. As communities develop, it is not unusual for a town to desire to route a certain amount of its sewage into the system of an adjacent town because of favorable terrain or the proximity of the outlet. Before any decision can be made, an engineering check of the existing system must be made to determine if the necessary capacity is available, and the administrative problem of developing a mutually agreeable method of apportioning cost between the towns must then be worked out.

Some of the disadvantages of a municipally administered system is attributable to the fact that some towns are not large enough to support the staff and equipment necessary to plan and maintain a system. Secondly, it may be more economical to treat sewage from several towns in one plant rather than at local plants. Such an arrangement is less likely to come about if each town has either its own independent Commission or perhaps none at all.

Ideally, the most efficient and economical method to plan, build and maintain the sewer systems in whole or part of the Midstate Region would be on an intertown basis. That is, one organization, staffed by publicly paid employees and supervised by a Commission of appointed

or elected citizens from the various member communities, which would be responsible for all investigations and work incident to sewage disposal. Such an organization would provide the proper personnel, in terms of numbers, experience and knowledge, to serve all affected towns. Furthermore, such a staff could handle all but the most difficult of design and maintenance problems. Standard construction specifications and field inspection would result in lower construction and maintenance costs. Finally, such an organization would be in a better position to negotiate with surrounding communities or with state or federal agencies as the need arises.

An example of a successful organization of this type is the Metropolitan District of Hartford which provides sewage service to seven area towns, water service to nine towns and a mapping service to all towns. The District was formed in 1929 with Hartford as the core since this City was already highly developed and had an older existing sewer system (combined Sewers) with its attendant problems. Since then, other towns have joined, and the sewers have been extended to outlying towns to keep pace with development. New treatment plants have been built in Hartford, both upstream and downstream of Hartford and in East Hartford across the Connecticut River. In addition, the mapping section is developing 1"=200' scale maps with 2 foot contour

intervals for the region which are indispensible for all types of engineering and municipal planning.

The normal operations of maintenance, mapping, debt retirement and minor capital improvements are financed through a yearly tax on each member town based on their respective grand list. Major capital improvements are financed through bond issues approved by the electorate at the polls. Cost of local sewers is assessed completely against the benefiting properties. Federal aid is available on the same basis as for a municipally controlled system.

The topography and physical layout of the Midstate Region is somewhat similar to that of the Metropolitan District. The Connecticut River passes through both regions, but separates only East Hartford from the District while approximately one-third of the Midstate Region is cut off by the River. The City of Middletown and the Town of Portland are well developed with their own sewage facilities and form a core similar to Hartford. One point of dissimilarity is the large percentage of rugged, steep terrain within the Midstate Region which is unsuitable for any major development.

Another example of regional administration is the Mattabassett District which will soon begin construction

of a trunk sewer and treatment plant in Cromwell. Member towns of this District are New Britain, Berlin and Cromwell. Other communities are tributary to this trunk sewer and, in the future, may join the District or negotiate for use of its facilities. The Mattabassett District differs considerably from the Metropolitan District in that its sole responsibility is presently the construction, operation and maintenance of the primary trunk sewer and the treatment plant, leaving to the individual towns the problem of planning and extending the sub-trunk and local sewer networks.

While East Hampton is physically quite isolated and Haddam will probably not develop a significant portion of its land area, these Towns could still join at such time as the need for sewers may arise, and benefit from the services and experience provided by a properly staffed regional organization.

The basic problem in initiating a regional venture is in overcoming the inertia and generating the enthusiasm with which to draw the various communities together with the common purpose of forming a District. Initially, an immediate and pressing need for a solution to the sewage disposal problem must be apparent. Then, the communities involved must derive a mutually agreeable charter which designates the method of representation,

division of cost and taxation, basic procedures and scope of powers, all in accordance with State Statutes, and as enacted by the State Legislature.

D. Preparation for the Future:
Initiation of Plans and Programs

Only the central portions of Middletown and Portland are presently sewered by a municipal sewage disposal system. The rest of the Midstate Region handles its sewage disposal through private individual systems such as septic tanks with leaching field or cesspools. From knowledge gained through other communities' experiences, it is usually only a matter of time before it becomes more effective to dispose of sanitary wastes through a public system. Therefore, to facilitate the transition to a public system, it is important that proper planning be made in advance of the need becoming acute. This report is only the first step in this transition and each of the communities within the Region should continue its planning efforts toward the eventual development of a sewer system and sewage treatment facility where necessary.

The final layout of the various disposal systems which may eventually be built in the Region will undoubtedly be quite similar to those described in this report.

Before any systems are constructed however, many hurdles must be passed. The rate and intensity of development, and the seriousness of specific sewage disposal problems must justify earnest consideration for the construction of facilities. This would then lead to the necessary detailed engineering studies, careful financial planning, preparation of administrative detail, and public education programs which would follow.

The purpose of the overview portrayed in this report is to provide a perspective which encompasses the current status and future alternatives regarding sewage disposal practices.

There are however, initial steps which either have been or should be considered to insure that each of the communities in the Region is prepared to satisfy its current needs and be in a position to meet future demands. Briefly,they are as follows:

1. Cromwell as Charter Member of the Mattabassett District, is undertaking the final design of the proposed Mattabassett Trunk Sewer and Treatment Plant in Cromwell. Cromwell during the course of this study, has also formed a Sewer Commission which is authorized to commence the final planning of the District #1, which includes approximately one million dollars worth of sewer construction in the south central part of Town. Cromwell's

foresight, which led them to commence planning for these improvements in 1958, has enabled them to become a part of the Mattabassett District and to be in a position to economically transform from private disposal to a public system.

2. Middletown, Middlefield and Durham should consider undertaking a more detailed study for the purpose of determining the feasibility of an intertown system at some future date. A study of a two-town combination is also warranted. Middletown should pursue the possibility of sewering its potential industrial area near I-91 into the Mattabassett Trunk Sewer. If Middletown chooses to tie into the Mattabassett, the earlier a decision can be made the easier it will make the physical connection.

3. East Hampton presently has the need for a public system in the central section of the Town and the Town should take advantage of the interest-free loan available under the Programs for Advances for Public Works Planning (702). It is also necessary to undertake the planning for the facility to enable the town to be in a position to request financial assistance through either the Water Pollution Act or the recent Housing and Urban Development Act of 1965.

4. Portland should continue its progressive sewer program which it presently has in final planning.

5. Haddam will probably be the last community in the Region to experience the need for a public system. The Town of Haddam, as well as the other communities, can prolong this need by effectively reviewing the plans and inspecting the installation of private systems. The need for a public sewer system is normally generated from a combination of an increase in development and the failure of private systems to operate efficiently. The ineffectiveness of private systems is generally due to improper installations in soils with poor absorptive capacity and to lack of maintenance of the system.

6. During the course of this study, the town officials were most cooperative in furnishing all available information to us. However, to aid future planning of sewage disposal in the Region, it would be most helpful if all sewage problems and complaints be systematically recorded in the future. Perhaps card files of complaints relative to sewage disposal could be established in each Town or at the Midstate Office. This additional data will assist in overcoming many future problems and will also facilitate in the determination of eventual need for a public system.

7. It is also recommended that each community review and update its present subdivision regulations to insure that they contain adequate design criteria and

minimum standards for the installation of private disposal fields, as well as adequate methods of enforcement.

STORM WATER CONTROL IN THE MIDSTATE PLANNING REGION

I. INTRODUCTION

The problems of storm water control, if not anticipated by adequate planning, can become as serious and as costly to remedy as the problems of sewage disposal. The effects of uncontrolled water can be quite disastrous, as witnessed by the 1955 floods.

The solution to the majority of storm water problems is usually made at the local level and with local financing. However, the best solution is to anticipate and avoid the creation of additional man-made problems. If the development of a local storm drainage system is not adequately planned and supervised, costly future repairs and new construction are inevitable.

In the case of major rivers such as the Connecticut where the problem is one of intermunicipal flood control, the solution requires a combination of local, state and federal resources.

Unlike many rapidly urbanizing areas in Connecticut, the Region's communities have not yet experienced major storm water problems. In this sense the Region is fortunate: on the other hand this situation perpetuates complacency, which in the overall picture is an expensive luxury. For this reason it is difficult to foster an

awareness and sense of urgency the problem deserves.

It is not uncommon to see the banks of a brook being filled in to make way for new construction. Urban development increases the storm water runoff while reducing the natural waterway area of the stream. After heavy rains, this combination can cause the water to rise above its original level and extensive flooding may result. If the downstream hydraulic characteristics do not contribute to the flooding, the obvious solution would be to enlarge the waterway area of the stream in the flooded section. This may involve purchase of construction rights of way, demolition of structures and the construction of facilities. Proper planning would have insured the protection of the natural waterway.

The irony of storm water problems is that they are largely the result of the urbanization process, which simultaneously creates the problem while diminishing the alternatives for quick and easy solutions.

II. EXISTING CONDITIONS

Aside from the problems of flooding along the banks of the Connecticut River, an inventory of the Midstate communities reveals no local storm drainage problems of major proportions. Flood control along the Connecticut River can be effectively planned only in the context of the entire river basin, and consequently requires

an overview which can only be achieved at the state and federal levels.

Within the individual communities, there are various types and degrees of activity concerning storm water control. Middletown and Portland have combined sewers (which carry both sanitary sewage and storm water) incorporated in their system. Both these communities are currently planning or undertaking construction to effect separation of the combined sewers.

All the Region's towns are engaged in the improvement of their drainage facilities either to accommodate new development or in conjunction with the State's Town Aid Program. For instance, the Town of East Hampton has, within the past few years, installed some 15,000 feet of storm drain toward a goal of 100,000 feet of pipe in addition to improving or enlarging some of its major road culverts.

Due to Middletown's rate and intensity of development, there are more local drainage problems than in the other Midstate towns. Fortunately, Middletown has the advantage of a permanent engineering and public works staff experienced in storm drainage to resolve their problems.

III. PREVIOUS WORK

There have not been a great deal of previous engineering studies done in relation to storm water control in the various communities. Work that has been done is listed below.

1. The State Water Resources Commission has made two studies of the Connecticut River within the Region entitled "Report on Stream Encroachment Lines, Connecticut River, Bodkin Rock to Massachusetts State Line" and "Connecticut River Local Protection Study, Middletown". These two reports deal with the flood control problem along the Connecticut River.
2. The Town of Portland has studied a portion of its public sewer system and has made recommendations for means of eliminating its combined sewers.

The United States Weather Bureau maintains two rain gages in or near the Region. One is in Middletown, the other at the Cockaponset Ranger Station, and neither incorporates automatic recording devices. There may be other gages in the Region maintained by local water companies for their own use.

It should also be noted here that there are various river gaging stations and rainfall gages located within

the Region. In particular, river gaging stations are located on the Salmon River adjacent to the Route 16 crossing, on the Mattabesset River in East Berlin, on the Coginchaug River at Rockfall in Middlefield, on Parmalee Brook in Durham, and on Ponset Brook in Haddam. The Salmon River gage records the depth of flow in the river continuously, while all other gages record only the peak depth.

There is additional information available from the Coast Guard Station in Portland, where the depth of the River is gaged periodically.

IV. CONCLUSIONS AND RECOMMENDATIONS

1. A realistic approach to storm water control is predicated upon its comprehensiveness. Each community must first anticipate and/or determine through the planning and zoning processes, the type and intensity of development which will take place within its boundaries. This combination of planning and policy is a major factor in diminishing future storm water problems. These guidelines may then be used to judge the future surface characteristics of the various watersheds, to estimate the future value of the property, to select an appropriate design

storm* and to size or conserve the necessary storm water structures to serve future needs. The engineering studies necessary for the provision of utilities can only be as sound as the comprehensive community plan of development upon which they are based.

2. All data used for rainfall intensity and duration are derived from the records of existing rain gages. This is one of the keys to proper design: the greater the number of gages used in compiling the data, the better the results will be.

The importance of gaging stations must not be overlooked. The data from these stations are extremely helpful when correlating the amount of runoff and corresponding rainfall. Their ultimate use is in determining peak rate of flow used in sizing channel widths, bridges and culverts spanning the larger streams as well as in the design of major storm conduits.

*Design storm is defined as the largest rainfall, in terms of intensity (inches per hour) and duration (length of time the rain falls) which will occur once in a given period of years. For example, a five-year storm is that storm which will produce the greatest intensity of rainfall for a given duration, and will happen on an average once every five years. The actual figures of intensity and duration are based on existing rainfall records.

Therefore, it is recommended that the existing private rain gages be inventoried, their past and future records centralized and new gages added to cover the complete region. The existing river gaging stations are all maintained by the United States Geological Survey and records are available in their publications or at their Hartford office. As necessary, the United State Geological Survey should be requested to add new gages, and all gages, both rainfall and runoff, should be of the continuously recording type.

Providing these instruments can be increased in number in the near future, excellent data upon which to base designs will be available when needed.

3. One of the most effective and inexpensive approaches to the problem is through utilization and integration of the programs and skills of planning, zoning and conservation commissions, to protect natural watercourses through the establishment and control of channel encroachment lines. The available and combined resources of these commissions are particularly well-suited to embark upon a precautionary program of storm water control. These encroachment lines, which should properly be determined by engineering studies, are theoretical limits on each side of a stream within which the natural topography cannot be altered (except by

excavation) thereby decreasing the capacity of the natural watercourse.

The State Water Resources Commission is in the process of establishing these lines for the Connecticut River, and they have already been completed for Cromwell, Middletown and Portland. While this program is ultimately to be extended to lesser watersheds as well, resource limitations of both the State Water Resources Commission and the United States Army Corps of Engineers restrict the possibility of such studies being performed along the Region's other rivers in the foreseeable future. In order to meet the problem before it is too late therefore, consideration should be given at the local level to the establishment of encroachment lines along watercourses which are most vulnerable to the effects of future development.

4. Problem areas and information concerning flooded areas should be filed systematically for future reference in the respective towns, and perhaps with the Midstate Regional Planning Agency as well, so as to facilitate the coordination of planning for intertown storm water problems as they arise.

5. In the final analysis a program which is geared to the control of storm water problems by anticipating and con-

taining them, is only as good as its enforcement. Adequate drainage criteria and standards which incorporate consideration of the areas upstream and downstream of the subject areas are necessary. These controls must also include provisions for the town to acquire adequate easements for the purpose of future maintenance, repair and/or reconstruction.

These controls should be included in the subdivision regulations, and it should be the responsibility of the town through its engineer or through other professional assistance to ascertain whether or not each proposal meets the required standards. Enforcement would then rest with the local building inspector and/or town engineer.

APPENDIX

A. References:

1) USGS Topographic Maps, Scale 1"=2000', 10' Contour Interval, dated 1952, 1953 and 1961, of the various communities in the Midstate Region;

2) Map of the "Sewage System, City of Middletown, Connecticut, Scale 1"=300', September, 1953";

3) ASCE Manual No. 37 "Design and Construction of Sanitary and Storm Sewers", 1960;

4) ASCE Manual No. 36 "Sewage Treatment Plant Design", 1960;

5) Steel, E.W., "Water Supply and Sewerage", McGraw-Hill Book Company, Inc., 1953;

B. Definitions

Sanitary Sewage - a normally gray, odorless flow of impure water containing wastes, organic and inorganic, produced by human beings in the course of their daily lives. It may also contain many chemicals from industrial processes and will contain groundwater which has infiltrated into the piping system.

Trunk Sewer - the primary sewer of a sewer network into which all sewage feeds and which carries all sewage to the location where it is treated.

Treatment Plant - a series of structures, piping and mechanical equipment whose purpose is to remove the impurities in the sewage before discharging it into a natural watercourse.

Septic Tank/Leaching Field - an arrangement whereby the solids in the sanitary sewage are allowed to settle out and the liquid is distributed to a large area of sub-soil to seep into the ground. The septic tank serves as a settling and storage chamber for the solids as well as a grease trap. Effluent from the tank is distributed to the leaching field by a number of small, perforated pipes bedded in crushed stone or coarse gravel. These systems are used mainly to serve private homes and are, therefore, privately owned and operated.

Commercial Land - that land which is mainly used for offices, retail and wholesale establishments, warehousing and similar activities whose sanitary sewage is approximately the same composition as that produced by a residential area.

Industrial Land - that land which is mainly used for light and heavy industry and whose sanitary sewage contains chemicals and other wastes from industrial processes.

Infiltration - ground water which seeps into the sewers via cracks in pipes or joints which are not watertight.

Primary Treatment - the system of treating sewage whereby the majority of the solid impurities are removed by settling out in large tanks, the solids disposed of, and the remaining sewage, in some cases, disinfected with chlorine, discharged into a natural watercourse.

Secondary Treatment - the system of treating sewage which, in addition to primary treatment, provides for additional biological treatment of the sewage after settling and before discharging into a nearby stream.

Storm Flows - the more or less intense but short duration flow of water in natural watercourses and pipe due to rainfall. This water is considered clean and need not be treated.

Watershed - that area in which, as defined by the high points and ridges of the land, all water flowing on the ground surface will flow to one point located within or on the edge of the area.