

TOWN OF NORTH STONINGTON

Sewer Authority Engineering Report

Prepared by North Stonington Sewer Authority

Paul E. Ames

David Birkbeck

Clarence W. Bradley

Maurice A. Browning

Edwin S. Budzik

William R. Kaehrle

Kenneth C. Main

Richard W. Marble

Richard W. Marble
Richard W. Marble
Chairman

April 29, 1972

TABLE OF CONTENTS

	<u>Page</u>
1.0 Introduction	1
2.0 Conclusion	2
3.0 Recommendations	3
4.0 Background Information	4
4.1 Order 84	4
4.2 North Stonington Sewerage Study Committee	5
4.3 North Stonington Sewer Authority	5
5.0 Sanitary Survey	6
5.1 Objective	6
5.2 Basic Approach	6
5.3 Existing Land Use	6
5.4 Existing Dwelling and Population Densities	6
5.5 Existing Sewerage Facilities	7
5.6 Visual Inspection of Sites	7
5.6.1 Village of North Stonington	7
5.6.2 Cedar Ridge Area	8
5.6.3 Kingswood/Meadowood	9
5.6.4 State Rest Area	10
5.7 Sampling and Testing	10
5.7.1 Specific Conductivity Sampling	11
5.7.2 E-Coli MPN Survey	11
5.7.3 Millipore Survey	12
5.8 Evaluation of Sanitary Survey	12
6.0 Long Range Planning	14
6.1 The Domestic Growth Predictions	14
6.1.1 Objective	14
6.1.2 Population Growth	14
6.1.3 Population Distribution	14
6.1.4 Land Use	14
6.1.5 Dwelling Units	14
6.1.6 Existing Public Facilities	15
6.1.7 Public Utilities Plan	15
6.2 Industrial Development	15
6.2.1 Objective	15
6.2.2 Assumptions & Relevant Data	15
6.2.3 Industrial Growth Projection	16
6.2.4 Conclusions	16

TABLE OF CONTENTS

	<u>Page</u>
Table 1 - Land Use	17
Table 2 - Listing of Sample Sites	18
Table 3 - Test Results	20
Figure 1 - Existing Land Use	22
Figure 2 - Dwelling Units	23
Figure 3 - New Dwelling Starts	24
Figure 4 - Sample Sites & Drainage Areas	25
Figure 4A - North Stonington Village	26
Figure 4B - Cedar Ridge	26
Figure 4C - Kingswood/Meadowood	27
Figure 4D - I-95 Rest Area	28
References	29
Appendix A - Background Documents	
Appendix B - Sample Sites, Drainage Areas & Test Results	
Appendix C - Planning and Zoning Commission Report	
Appendix D - Development and Industrial Commission Report	
Appendix E - Zoning Regulations, Town of North Stonington	
Appendix F - Subdivision Regulations, Town of North Stonington	

1.0 Introduction

This report presents the work of the North Stonington Sewer Authority in responding to the Water Resources Commission Order No. 84, Modified, Step A. Included herein are 1) background correspondence since issuance by the Water Resources Commission of Order No. 84, 2) a sanitary survey which considers the land use, population density, appearance and biological conditions of the waters of the Town, 3) a long range projection of domestic and industrial growth which together with the sanitary survey provides a basis for determining whether a municipal sewerage system will be required within the next 50 years.

2.0 Conclusion

It is the conclusion of the North Stonington Sewer Authority that municipal sewerage service will not be required before the year 2020.

The basis for this conclusion is developed in the succeeding sections of this report and is briefly summarized herein without regard to the order of importance:

1. Sanitary survey and sampling analysis show that existing problems are relatively few in number and correctable on site.
2. The population growth rates are following the "low" predictions of the 1967 Plan of Development (1).*
3. Growth patterns show no tendency to develop growth centers. The town is rural and is expected to remain so.
4. Zoning and sub-division regulations provide the mechanism to ensure and enforce orderly growth and the development of responsible and technically adequate on-site disposal systems and drainage.
5. Industrial growth is predicted to occur to a modest level within a designated area which has adequate soil conditions to allow safe on-site disposal of wastes.

*Numbers in parentheses () refer to references listed at the end of the report.

3.0 Recommendations

The North Stonington Sewer Authority assumes the responsibility of maintaining a continuous monitoring of those conditions and activities which might be expected to endanger the purity of our waters. To this end, the following recommended actions are offered:

1. A continuing program of sampling will be instituted which will provide early indications of impending sewage problems. This Authority will work closely with the EPA to establish a format and procedure for conducting this program which will meet our mutual goals.
2. A bi-annual report to the EPA will be prepared by this Authority, commencing 30 April 1974. This report will revise, as appropriate, the domestic growth projections and concentrations and the industrial and commercial growth projections thereby providing early indications of sewer needs if required earlier than the date predicted in this report.
3. This Authority shall review, for approval, sewerage system plans for all proposed subdivisions, commercial and industrial developments.
4. The EPA should take appropriate action to establish a monitoring and sampling program for the Department of Transportation Rest Area adjacent to I-95 and the Shunock River to establish that the on-site sewage disposal system is functioning properly.
5. With consideration for the findings and conclusion made by this Authority, it is our contention that Order No. 84, as modified on 15 June 1970, should be recinded.

4.0 Background Information

The purpose of this section of the report is to document the key events from the issuance of Order No. 84 to the Town of North Stonington in 1967 to the present time. Pertinent correspondence is included in Appendix A of this report. Materials and information gleaned from published reports and used in this document are referenced to the original source.

4.1 Order 84

Order No. 84 (3) (Appendix A, Exhibit 1), was issued to the Town of North Stonington on the 19th day of June 1967. This document orders the Town of North Stonington to construct necessary sewage collection system to serve present and future needs and to provide capacity for future industrial waste. A rigid timetable of events is specified in the order which goes from step A) which requires that an engineering report be submitted to the Water Resources Commission by April 30, 1970, to step G) which calls for placing constructed facilities in operation by December 31, 1972. Of special significance are the facts that the order calls for "... the discharge of all sewers to the Pawcatuck system in the Town of Stonington" and that the issuance of the order appears to be based on "Having found that the Town of North Stonington is a municipality within which a community pollution problem can reasonably be anticipated in the future ..."

In September of 1969 the Town of North Stonington engaged the engineering firm of Metcalf and Eddy of Boston, Massachusetts (Appendix A, Exhibit 2 & 3) to perform the engineering study required by Step (A) of Order No. 84. For record it is noted that the firm of Metcalf and Eddy was well acquainted with the Town as it had developed a comprehensive plan for the Town of North Stonington in 1967 (1). In addition, this same firm was concurrently engaged in performing a regional sewerage study (2) for the Southeastern Connecticut Regional Planning Authority (SCRPA). Though the time allocated for an engineering study may be regarded as minimal, there was considerable groundwork done during the 1967 to 1969 period which would be of extreme value to any sewerage study.

A letter report by Metcalf and Eddy dated May 22, 1970 was submitted to the State of Connecticut, Water Resources Commission (Appendix A, Exhibit 4). The significant points of the letter report are that (1) no significant pollution problems exist in the Town of North Stonington, (2) the opinion that sewerage facilities, pending no unforeseen developments, would be unwarranted for some time (8 to 10 years is

mentioned in the letter), and (3) a request for a two year delay in the submission of a more comprehensive engineering report was requested. A subsequent letter to the Water Resources Commission dated May 28, 1970 (Appendix A, Exhibit 5) requested a two year extension, to April 30, 1972 for completion of Step (A) of Order No. 84.

Order No. 84 Modified (Appendix A, Exhibit 6) was issued to the Town of North Stonington on the 15th day of June 1970. Essentially the modified order is the same as the original order except that all dates are advanced by two years. A change in wording, though it is believed by this Authority to be unwarranted, was also made to the modified order and it now reads "Having found that the Town of North Stonington is a municipality causing pollution of the waters of the State of Connecticut . . ."

4.2 North Stonington Sewerage Study Committee

A North Stonington Sewerage Study Committee was appointed by the Board of Selectmen in June of 1971. It should be noted here that this Committee was not at this time instituted as a Commission or Board duly established by vote at a town meeting with specific, specified powers by law. Therefore, the initial Committee objectives were to formulate a response to Order No. 84 Modified. In its early deliberations the objectives were further delineated to:

1. Determine if a pollution problem did exist in the Town of North Stonington
2. Formulate and recommend initial steps to be taken by the Town for preservation of a pollution free environment within the Town of North Stonington
3. Formulate and recommend the necessary steps required for a long term program for maintaining a pollution free environment in the Town of North Stonington.

It is believed that the above objectives, pursued with diligence and perseverance will meet the spirit and intent of Order No. 84.

4.3 North Stonington Sewer Authority

At a town meeting held on January 31, 1972 a resolution which formally established a Sewer Authority, with the duties and powers specified in State Statutes, was adopted. This resolution became effective (15) fifteen days after it was passed by the Town Meeting. Members of the Authority were appointed on March 21, 1972 (Appendix A, Exhibit 7).

5.0 Sanitary Survey

5.1 Objective

The primary objectives of the sanitary survey were (1) to determine if a pollution problem does exist in the Town of North Stonington, (2) to establish a baseline against which future surveys may be compared and (3) to quantify the magnitude of any problem discovered.

5.2 Basic Approach

For purposes of this survey the Town was subdivided into thirteen (13) natural drainage districts. It was reasoned that areas of pollution, if they existed, could at least be initially identified by testing the water quality in the brooks and streams in their particular drainage district. Sampling sites were chosen within eleven (11) of the most populated districts. In addition to the water samples taken, a visual inspection was made in the vicinity of each sample site. Housing concentrations, existing land use and any special features were also considered in this study. Dye testing was not conducted.

5.3 Existing Land Use

Land use within the Town of North Stonington as of July 1966 is shown in Table 1 and Figure 1. Changes in land use between July 1966 and October 1971 are given in Table 1 and are minimal. From a pollution and sewage generation point of view the most striking figures given in Table 1 are that less than 1% of the Town can be classified as suburban while state preserves, woodland, wetlands, agricultural land, open spaces and water areas account for 93% of the land area. North Stonington is a rural community.

Of particular interest in this study are the residential areas. Again referring to Table 1 and Figure 1, the 1125 rural residential acres are scattered throughout the Town's 54.6 square miles, mostly along the existing highways and roads. The 195 acres of suburban low density are made up partly of the Village area and the Kingswood/Meadowood development. The 60 acres of suburban, high density consists of part of the Village area and the Cedar Ridge development. More detailed information will be given in other parts of this report relative to the suburban low and high density areas.

5.4 Existing Dwelling & Population Densities

The dwelling distribution as of March 1966 is shown in Figure 2. New dwelling starts from March 1966

to October 1971 are shown in Figure 3. In October of 1971 there were 1201 dwelling units, of which 146 were seasonal, and 89 were trailers. The dwelling distribution indicates that the only areas of relatively high population density are the Village, Kingswood/Meadowood and Cedar Ridge.

The population of North Stonington was 3,748 per the 1970 census. The average population density is therefore, 0.10 persons/acre, which ranks 147 of the 169 towns in the State of Connecticut.

5.5 Existing Sewerage Facilities

There are no public sewage collection or disposal facilities in the Town of North Stonington. The majority of housing units rely on septic tank or cesspool units for sewage treatment or disposal.

5.6 Visual Inspection of Sample Sites

A listing of sample sites is given in Table 2. Figures 4, 4A, 4B, 4C and 4D show the location of the sample sites and the natural drainage boundaries of each district. A more detailed description of each drainage district with some of the pertinent statistics and characteristics of the district are given in Appendix B.

A visual inspection of the streams, ponds and brooks was made in the vicinity of each sample site. There was no indication of pollution, such as fecal matter, debris, high turbidity or odor, in the vicinity of any sample site with the exception of (1) the North Stonington Village, (2) Cedar Ridge, (3) Kingswood/Meadowood, and (4) the I-95 State Rest Area. The above noted areas were judged to be possible problem areas from visual observations and a more detailed account of each area is given below.

5.6.1 Village of North Stonington

The Shunock River was visually inspected from Route 2/201 near Gallup Pond, sample site 9, to the Village area, sample site 14. Sample sites 9, 10, 29, 28, 27, 11, 11¹, 11², and 14 are located within this traverse of the Shunock River which is approximately one mile in extent. The general appearance of the river was clean, clear, free of debris and free of high turbidity except for the very local and specific areas described in this section.

Above sample site 10, the natural drainage

area is very sparsely populated and there appeared to be no reason to take samples upstream of this point. The pond at sample site 10 is used for swimming and fishing. Gallup Pond just above site 9 is a favorite trout fishing pond. Between sites 9 and 10 is located the shallow well which supplies water to the Kingswood/Meadowood development. From appearance and local usage, pollution above sample site 10 is not a serious consideration. From site 10 to within 400 ft. above sample site 29 there are no homes.

Sample sites 29, 28, 27, 11, 11¹, 11², and 14 are located in the Village area. In this area two pipes, believed to be sewer pipes, terminated or discharged into the Shunock River. At one of these locations a fluid discharge was observed entering the Shunock River. Samples for biological analysis were taken in the immediate area of the discharge by a Town Health Officer at the time of discharge. Aside from the above, the condition of the river appeared to be clean, clear and free of any evidence of sewage within 100 feet of the discharge noted above. A heavy concentration of sample sites was, however, chosen in this area due to the viewed discharge and the proximity and density of homes in the immediate area of the River.

5.6.2 Cedar Ridge Area

Cedar Ridge is a development of 123 homes located along Route 184. Lot sizes are 10,000 sq. ft. and each home is served by an on-site sewage disposal system consisting of a septic tank and drainage field. This area of North Stonington is officially classed as suburban, high density, 4 to 8 homes per acre. There is a well in the Cedar Ridge area which furnishes the domestic water needs of Cedar Ridge.

The Cedar Ridge storm drain system serves Cedar Ridge and a short stretch of Route 184 adjoining the development. These drains discharge into a swamp or pond which are the

extreme upper reaches of Anguilla Brook which eventually discharges into the Pawcatuck River. Sample sites 30 and 31 were chosen at the outfalls of the storm drainage system at Hickory Lane. It was reasoned that any pollution generated within the Cedar Ridge area would manifest itself at these sample sites.

From the appearance of sites 30 and 31, even though site 30 was dry during the September 25 and October 16 inspections, it was judged that direct connections between household drains and storm drains existed. Catch basins in the Cedar Ridge area were also inspected and gave further evidence of the above conclusion.

5.6.3 Kingswood/Meadowood

The Kingswood/Meadowood development consists of 177 homes on about 195 acres. Fifty nine homes have been built on lots of from 18,000 to 20,000 sq. ft., while 118 homes have been built on lot sizes of 20,000 sq. ft. or larger. In April of 1965, the minimum lot size was established at 20,000 sq. ft. by agreement of the Planning and Zoning Commission and the Kingswood/Meadowood developer. Existing zoning regulations now call for 1 acre lots in the area. Each home is served by an on-site sewage disposal system consisting of a septic tank and leaching field. The Kingswood/Meadowood area is classed as low density residential, 1 to 4 homes per acre.

Eight storm drain outfalls or culverts serve the Kingswood/Meadowood area. One storm drain serves about one half of Meadowood Drive and Kingswood Drive and discharges through a culvert into the swamp on the north side of Main Street, sample site 23. The swamp feeds the Shunock River. The balance of the developed area is served by a storm drainage system which empties into the Assekonk Swamp through 7 storm drain outfalls. Sample sites 32, 33, 34, 35, and 36 were located at five of the seven outfalls. The Assekonk Swamp discharges into the Assekonk Brook which joins the Shunock River in the center of the Village. An important feature of the storm drain system serving the Kingswood/Meadowood development is that individual footing drains are connected to the storm drain system.

The flow at sample site no. 23 appeared to be clear. However, due to the concentration of housing in the Kingswood/Meadowood area the storm drainage system was inspected. It was found that storm drains did not conform to plans on file and that there was evidence in the manholes of a direct connection between household drains and the storm drain system.

The appearance of the flow at sample sites 32, 33, 34, 35, and 36 varied considerably. At sites 32 and 33 the flow was full of algae and unsightly scum but there was no particular evidence of sewage in the discharge. Sample site no. 34 was dry. Sample sites 35 and 36 appeared to be clear.

5.6.4 State Rest Area

Sample sites 15, 15¹, 15², and 15³ were located on the Shunock River between the service road connecting Routes 2 and 49 and the Route I-95 Bridge over the Shunock River. A State operated rest area and welcome station is located on the south side of the River along I-95. The sewage disposal fields for the rest area are located on the north side of the service road and Shunock River. Due to local protests at the time of construction, the sewage disposal beds are used only for the sewage facilities at the rest area. The planned trailer sewage dumping station is closed and is not in use.

The Shunock River at this point appeared to be clean and clear except for areas adjacent to the River bank. Along the north bank there were numerous areas which showed a water level above that of the river and these areas were generally filled with algae. In this area the service road is built on fill approximately 20 feet high and the edge of this fill forms the River Bank.

5.7 Sampling and Testing

A tabulation of the results of all sampling accomplished to date is given in Table 3. Sampling and testing consisted of specific conductivity readings taken at 35 sites on September 25th and 26th, 1971; E. Coli, MPN and specific conductivity readings taken at 22 sites on October 16, 1971 and Millipore samples taken at 10 sites on December 18, 1971. (See Appendix B)

5.7.1 Specific Conductivity Sampling

The objective of sampling the specific conductivity was to help establish a baseline for the stream conditions in North Stonington and to assist in choosing sites for further sampling. It is significant to compare these specific conductivity data with that presented in the U.S.G.S. Report (Connecticut Water Resources Bulletin No. 15 Dated 1968) for those same sites and on comparable seasonal dates. A comparison of conductivity levels with those previously established would at least give some gross indication of changes in stream chemistry. Current reading versus reading taken on September 24, 1963 and September 22, 1964 compare as follows:

Site 1	lower/lower
Site 7	lower/lower
Site 22	lower/lower
Site 2	lower/lower
Site 21	lower
Site 19	lower
Site 11	lower
Site 20	lower
Site 12	higher
Site 17	same/lower

Current levels of specific conductivity were appreciably lower than those recorded in 1963 and 1964. It can at least be concluded that stream quality at the sites has not deteriorated from 1963 to 1971.

The survey also resulted in a listing of sites which were to be tested for E-Coli.

5.7.2 E-Coli MPN Survey

To give some measure of significance to the tabulated MPN values in Figure 3, the State of Connecticut Health Department uses an MPN value of 1000 as the dividing line between classification of waters safe and unsafe for swimming. Values of MPN over 1100 were considered suspect and worthy of further study. Of the 22 samples taken, 13 showed MPN values in excess of 1100; these were sites 2, 11, 14, 15³, 20, 21, 23, 28, 29, 31, 33, 35, and 36. The source of the high MPN values at sites 2, 20, and 21 were at least initially attributed to animal rather than human pollution due to the very sparse housing density in the area of the sites and due to the fact that cow

pastures are contiguous with the streams. Sites 28 and 29 are in the immediate vicinity of known septic violations which are now being acted upon by the Town Health Officer. Sites 11, and 14 are only a short distance, within 500 feet, of sites 28 and 29. Sites 23 and 31 represent outfalls from storm drainage systems where there are suspected interconnection between the storm drains and household drains. These sites were listed for further study and sampling. Sites 33, 35 and 36 are outfalls from storm drains in the Kingswood area while site 15³ is near the I-95 State Rest Area.

5.7.3 Millipore Survey

Millipore samples were taken at sites 2, 10, 11, 15¹, 15³, 20, 23, 31, 32, and 36. It was the purpose of these tests to discriminate between animal and human sources of waste so that the most probable cause of high E-Coli measurements could be established. A ratio of Fecal Coliform to Fecal Strep of 4 or greater indicates human waste while a ratio of less than 1 indicates animal waste. Intermediate ratio values of from 1 to 4 can be either and are not conclusive.

Site 31, where visual inspection indicated direct connection of sewage lines to storm drains, was the only site which showed that the high E-Coli count was due to human waste. All other sites were inconclusive or indicated sources other than human waste.

5.8 Evaluation of Sanitary Survey

From the sanitary survey conducted to date several conclusions can be reached:

- 1) In the Cedar Ridge area it has been conclusively shown that a pollution problem exists by virtue of interconnection of house sewage disposal system or systems and the storm drains. This conclusion is substantiated by visual inspection, E-Coli and Millipore testing. This condition is regarded as serious and has been brought to the attention of the Town Health Officer for proper action.
- 2) The North Stonington Village area along the Shunock River has been shown to be an area of pollution. There are known septic violations where household sewage is discharged into the river. (These specific violations are being acted upon by the Town Health Officer). Biological samples sub-

- stantiate visual observations of pollution. However, the general appearance of the Shunock River in the Village area is clean. Elimination of specific violations may very well reduce biological readings to acceptable levels.
- 3) The result of the sanitary survey in the Kingswood and Meadowood area is considered to be sporadic and inconclusive. For example, site 23 shows a low total Coliform on the Millipore test sample while other indicators including visual observations would lead one to anticipate much higher readings. Perhaps the additional dilution of the heavier flow during December was adequate to reduce reading to acceptable levels. In the Kingswood area, site 32 which was expected to be one of the worst sites from visual observations, tested well within acceptable levels. Sites 35 and 36 appeared to be clear but showed higher E-Coli MPN values. It is significant that sample sites 25, 26, and 12 which are downstream of sample sites 32, 33, 34, 35 and 36 tested well within acceptable limits of E-Coli concentrations. From the above observations it is concluded that the Kingswood/Meadowood area is a low level polluter which could be corrected principally by the elimination of household drain connections to foundation drainage systems.
 - 4) The Shunock River State Rest Area also showed sporadic results. Biological samples taken within very short distances of each other (200 to 500 ft.) showed significant difference in biological test results, sites 15¹, 15², 15³. The river appeared to be very clean except as noted in the section on visual observations. These results indicate that the problem is very local and may be due to leaching from the highway fill or drainage field of the State Rest Area sewage disposal system. Further tests are required to determine the exact cause of pollution.
 - 5) High E-Coli counts at sample sites No. 2 and 20 are not regarded as a problem due to the very low density of dwellings in the area. The most probable cause is animal but if it should be due to nearby dwellings there should be no difficulty in taking corrective action. The same reasoning applies to site 21 with regard to dwellings within North Stonington and contiguous with the Pawcatuck River or its tributaries within North Stonington.

6.0 Long Range Planning

6.1 The Domestic Growth Predictions (See Appendix C)

6.1.1 The Objective of this section is to re-evaluate the population growth pattern as last projected in the Comprehensive Plan of Development for the Town of North Stonington, dated 1967. (1)

6.1.2 Population Growth:

The town's adopted subdivision and zoning regulations are expected to result in a population growth that will lie between the low forecast in the comprehensive plan of development and the forecast of the South-eastern Regional Planning Agency. These figures project to 11,000 and 15,500 respectively by the year 2020. (See revised Zoning Regulations (Appendix E); Town Revised Subdivision Regulations (Appendix F); attached report of SCRPA, (Appendix C); and the Comprehensive Plan of Development (1), page 50-52).

6.1.3 Population Distribution:

The population distribution patterns are expected to continue the present trend of scattered development with no new concentration centers appearing. See Figure 2 which shows the dwelling units in 1966, and Figure 3 for the dwelling additions from 1966 to 1971.

6.1.4 Land Use:

Future land use for residential development will occur at a density 0.5, to 1.1 family per acre with the minimum lot size of 40,000 square feet to 80,000 square feet per dwelling unit in the zoning regulations (Section VI, Table of Area Regulations, and attached zoning map, Appendix E).

6.1.5 Dwelling Units:

Single family dwelling units are expected to continue the present scattered growth pattern throughout the town. (See Figure 3 for housing units built 1966 through 1971).

6.1.6 Existing Public Facilities:

Water utilities continue to serve the town's two existing major subdivisions where population density exceeds the 1.1 family per acre density. (See Town Comprehensive plan of development page 119-120).

6.1.7 Public Utilities Plan:

Based on the foregoing items the ultimate utility service area as shown on Figure 26 of the Comprehensive Plan of Development is now considered obsolete under the adopted zoning and subdivision regulations. The initial utility service area shown on Figure 26 of the Comprehensive Plan of Development is changed to be the ultimate for water service utility. Sewerage service utility is not planned in this area before the year 2020. (See attached copy of zoning map; Section VI Table of area regulations in Revised Zoning Regulations; and Comprehensive Plan of Development Figure 26).

6.2 Industrial Development (See Appendix D)

6.2.1 The Objective of this section is to make a conservative prediction of the industrial growth over the next 50 years.

6.2.2 Assumptions & Relevant Data

- Town of North Stonington in 50 years - 2020
Note: Present population growth patterns are following the low forecast in the Town's Comprehensive plan of development. This projects to a population of 11,000 in 2020. The Southeastern Regional Planning agency forecast projects to 15,500 by 2020 and was used as a high figure.
- Present population 3,784, projected population 11,000 to 15,500
- Number of Acres available for development 400+
- Number of Acres to be developed 200+
- Number of Acres to be set aside 200+ (Buffers, open space, etc.)
- Any industry requiring any significant discharging of waste would be required (Code enforcements) to neutralize sufficiently to discharge as ground water and/or self contain for subsequent self disposal.
- Each plant employee uses (Discharges) 25 gals/day. (Commission decided to use figure

- of 50 gals/day for safety margin).
- Over 50% of available acreage in Industrial Zone has slight to moderate limitation for on-site sewerage disposal drainage. (Reference Town soil map report by U.S. Dept. of Agriculture, April, 1968).
- Safe disposal rate in average soil; 1 gallon/day for each 5 square foot of land or 8,000 gallons/day per acre.

6.2.3 Industrial Growth Projection

It was projected that 5 light industry, 10 office/commercial, 1 pure research facility, 10 service support facilities (motels, gas, restaurants, etc.) might reasonably be expected to locate within the established zone in the next 50 years. These 26 facilities would employ perhaps 600. Note that it is not anticipated that heavy industry would be attracted to this area.

6.2.4 Conclusions

On the basis of these projections it was conservatively estimated that by the year 2020 less than 250,000 gallons per day of plant wastes would require disposal; and that this volume could safely be disposed of in less than 40 acres of the more than 200 acres now planned for these industries. It should be noted here that any industry which might require excessive and peculiar waste discharging would be required to neutralize to the point where waste could be discharged normally to a ground absorption system or would have to contain for subsequent self disposal. Also note should be made of the fact that in the region of interest over 50% (200 acres) of the available acreage has slight to moderate limitations for on-site sewerage disposal drainage as reported in the town soil report, U.S.D.A., April 1968.

Table 1 - Land Use

Class	July 1966		October 1971	
	No. of Acres	Percent of Total Area	No. of Acres	Percent of Total Area
DEVELOPED LAND				
<u>Residential</u>				
Rural	1,050	2.9	1,125	3.2
Suburban-low density	195	0.5	195	0.5
Suburban-high density	60	0.2	60	0.2
Seasonal	35	0.1	35	0.1
<u>Commercial</u>	35	0.1	40	0.1
<u>Industrial</u>	60	0.2	79**	0.2
<u>Institutional and Governmental</u>	220	0.6	220	0.6
<u>Utilities and Transportation</u>	665	1.9	700	2.0
Subtotal - developed	2,320	6.5	2,454	6.9
PUBLIC OPEN SPACE				
<u>State Preserves*</u>	1,355	3.8	1,355	3.8
<u>Intensive Recreation</u>	90	0.3	90	0.3
UNDEVELOPED LAND				
<u>Woodlands</u>	21,100	59.3	21,100	59.3
<u>Wetlands</u>	2,745	7.7	2,745	7.7
<u>Agricultural Land</u>	4,620	13.0	4,620	13.0
<u>Open Land</u>	2,735	7.7	2,601	7.3
<u>Water Area</u>	615	1.7	615	1.7
Subtotal - undeveloped	31,815	89.4	31,681	89.0
GRAND TOTAL	35,580	100.0	35,580	100.0

*Does not include 2,000 acres of state preserve land which is classified as wetlands.

**Includes 55 acres of gravel banks which revert to Open Land after being worked.

Source: Existing Land Use Map, July 1966, (Ref. 1)
October 1971 Tax Assessor's Abstract

Table 2 - Listing of Sample Sites

1	Green Fall Br. at Putker Rd.
2	Green Fall Br. at Rt. 216
3	Clarks Falls at Grist Mill Dam
4	Green Fall Br. at Old 184 Crossing (Hopkinton)
5	Pendleton Hill Br. at Browning's Corner
6	Wyassup Br. at Rt. 49
7	Wyassup Br. at Dam
8	Pendleton Hill Br. at Old Cemetery Rd.
9	Gallup Pond at Rt. 2 Crossing (Shunock R.)
10	Shunock R. at Hewitt Pond
11	Shunock R. at West Main St. Bridge - N.S. Center
11 ¹	Shunock R./Assekonk B. - at Parking lot, N.S.
11 ²	Shunock R./Assekonk Br. - at East Main St. Bridge N.S. Center
12	Assekonk Br. at Corner Parking lot, N.S. Center
13	Assekonk Swamp at Pine Grove
14	Shunock R. at Store
15	Shunock R. at I-95 Service Road Culvert
15 ¹	Shunock R. at I-95
15 ²	Shunock R. at I-95 - 100 ft. up from I-95 Bridge
15 ³	Shunock R. at I-95
15 ⁴	I-95 Service Road - Catchbasin
16	Pawcatuck River at State Line
17	Shunock R. at Rt. 49 (Voluntown Road)
18	Lantern Hill Brook
19	Yawbux Br. at Ryder Road
20	Assekonk Br. at Jeremy Hill

Table 2 - Listing of Sample Sites (Cont.)

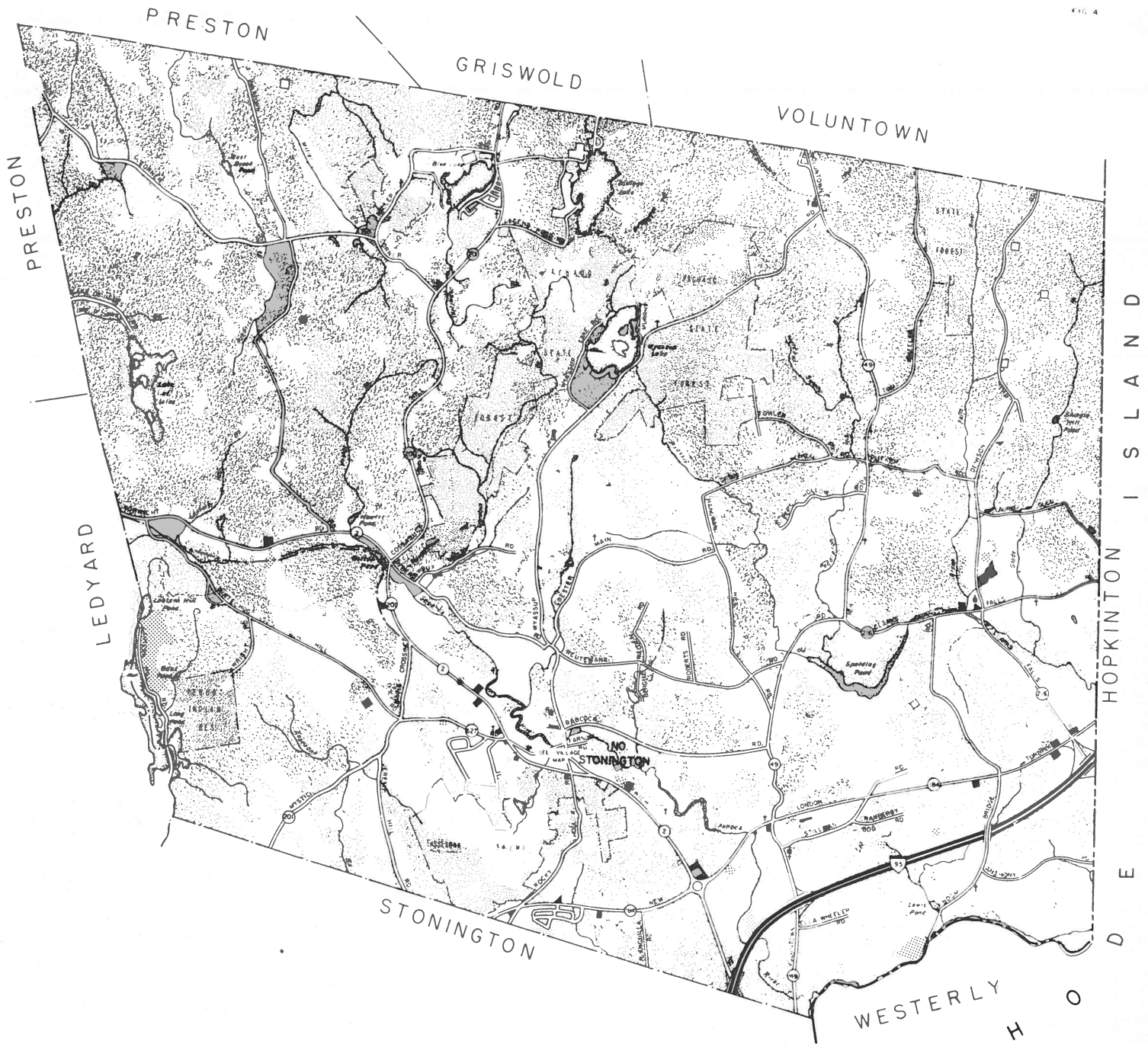
21	Boom Bridge - Pawcatuck R.
22	Pendleton Hill Br. (at gaging station)
23	Culvert corner Rt. 2 and West Main St.
24	Assekonk Br. at Dam
25	Assekonk Br. at Rt. 2 crossing
26	Assekonk Br.
27	Shunock R.
28	Shunock R.
29	Shunock R.
30 Culvert	Cedar Ridge - Hickory Lane at Pond Drive
31 Culvert	Cedar Ridge - Hickory Lane at Oak Drive
32 Culvert	Kingswood at extension of Old Colony Road
33 Culvert	Kingswood at Pinecrest - East
34 Culvert	Kingswood at Pinecrest - West
35 Culvert	Kingswood at Laurel Wood Rd.
36 Culvert	Kingswood at Old Colony Rd. - West

Table 3 - Test Results (cont.)

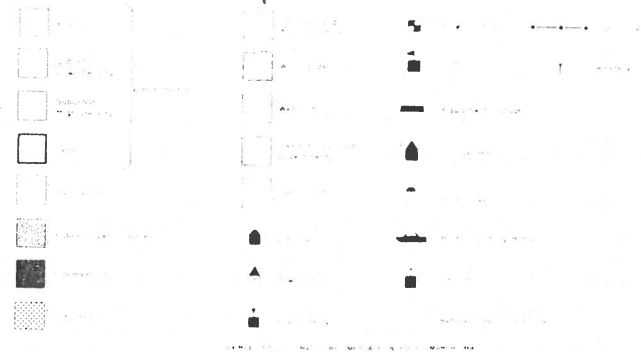
Station Number	Drainage Basin Number	Conductivity		Coliform Tests		Total Coliform	Millipore Tests		Fecal Coliform	Fecal Strep	Fecal Coliform	Fecal Strep
		9/25	26	10 - 16 - 71	Temp / Cond		MPN	Temp/Cond				
23	9	57/245		>1100	58/245	70	0	0				
24	9	59/78										
25	9	54/150		210	60/85							
26	9	53/160		2.2	60/86							
27	9	59/90										
28	9	58/550		>1100	58/110							
29	9	63/120		>1100	70/1100							
30	13			dry								
31	13			>1100	60/440	57,000	130	7				18.6
32	9			240	60/152	20	0	0				
33	9			>1100	60/131							
34	9			no flow								
35	9			>1100	62/198							
36	9			>1100	54/190	150	4	0				

Flow at site 22 on 9/26/71 was 0.23 ft³/sec at 12:45 EDT - Flow Duration 98%
 Flow at site 22 on 10/16/71 was 1.15 ft³/sec at 9 A.M. EDT - Flow Duration 81%
 Flow at site 22 on 12/18/71 was 7.0 ft³/sec at 8:30AM EST - Flow Duration 42%

Temperature - °F.
 Cond. - Conductivity Micro Mhos
 MPN - Most Probable Number



LEGEND



COMPREHENSIVE PLAN • TOWN OF NORTH STONINGTON, CONNECTICUT

EXISTING LAND USE

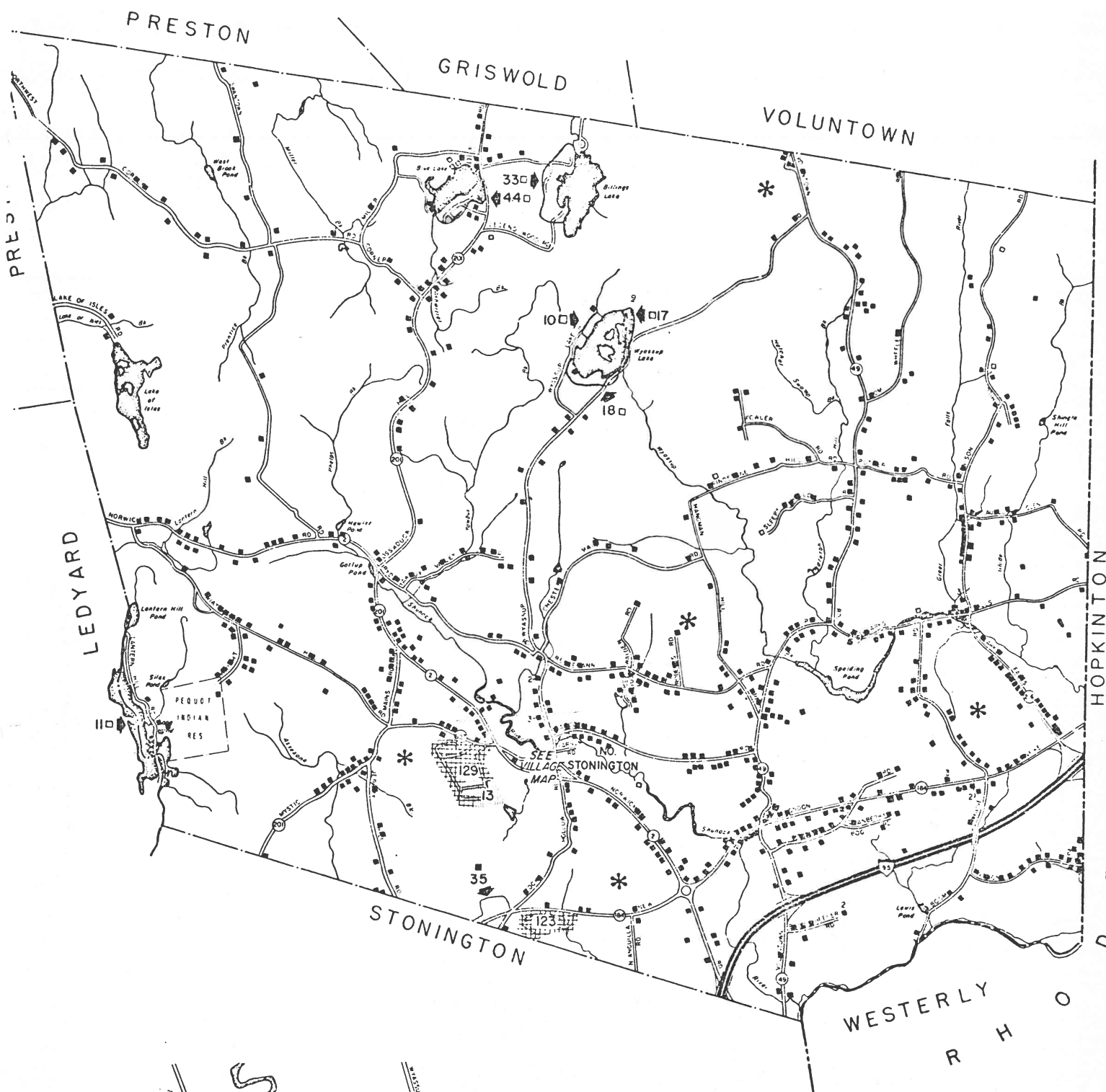
Scale: 1" = 1/4" (1:3600)

North Arrow

DATE: 1971

ENGINEERS & PLANNERS

NORTH STONINGTON VILLAGE



LEGEND

- Year-round Dwelling Structure
- Multi-family Structure (Numeral refers to dwelling units)
- Seasonal Dwelling Structure
- ◀ 00 Concentration of Dwelling Structures (Numeral refers to number of units)
- ▤ Recent Subdivision Activity (Numeral refers to completed dwellings)
- ▥ Approved Subdivision (Numeral refers to approved but unbuilt dwellings)
- * Possible Future Growth Areas

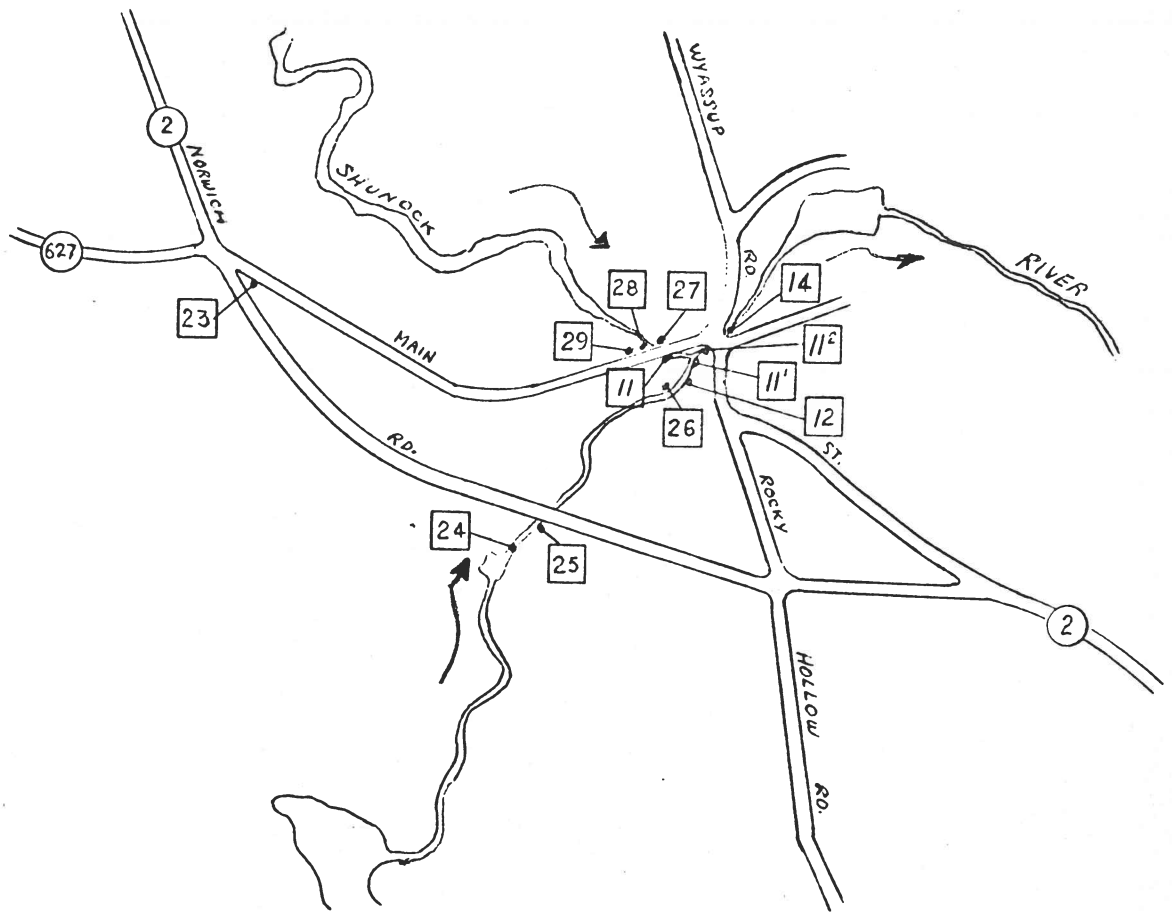
Source: Field Survey by Metcalf & Eddy, March, 1966

COMPREHENSIVE PLAN • PLAN OF NORTH STONINGTON, CONNECTICUT

4-10527-1

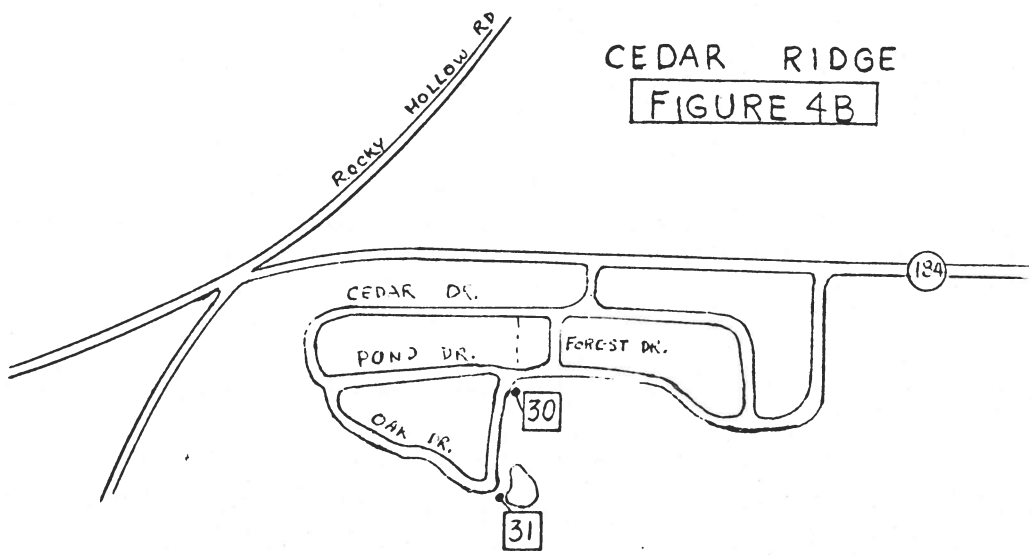
DWELLING UNITS

AUG. 1966



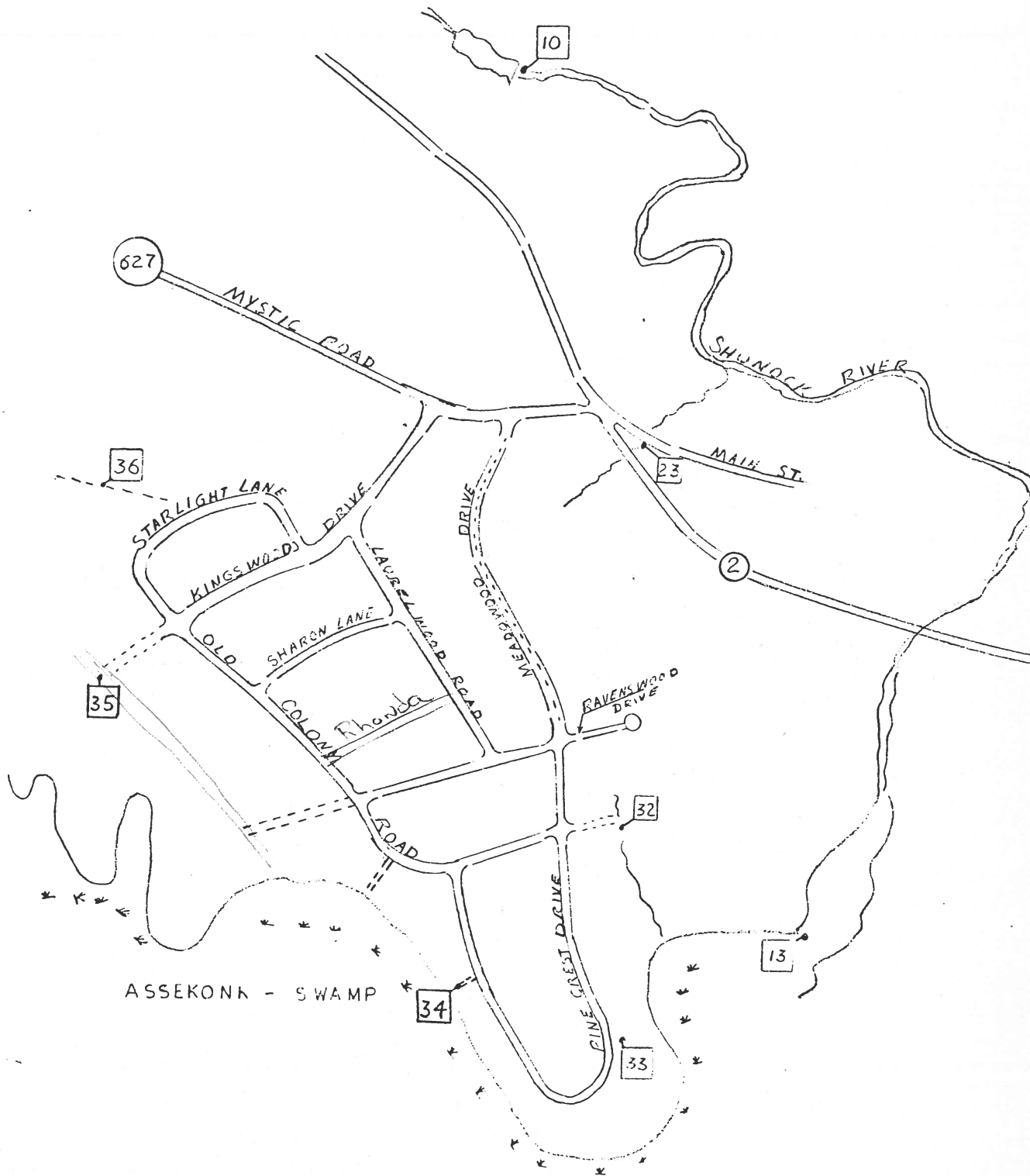
NORTH STONINGTON VILLAGE

FIGURE 4A



CEDAR RIDGE

FIGURE 4B

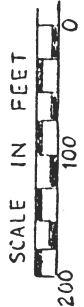
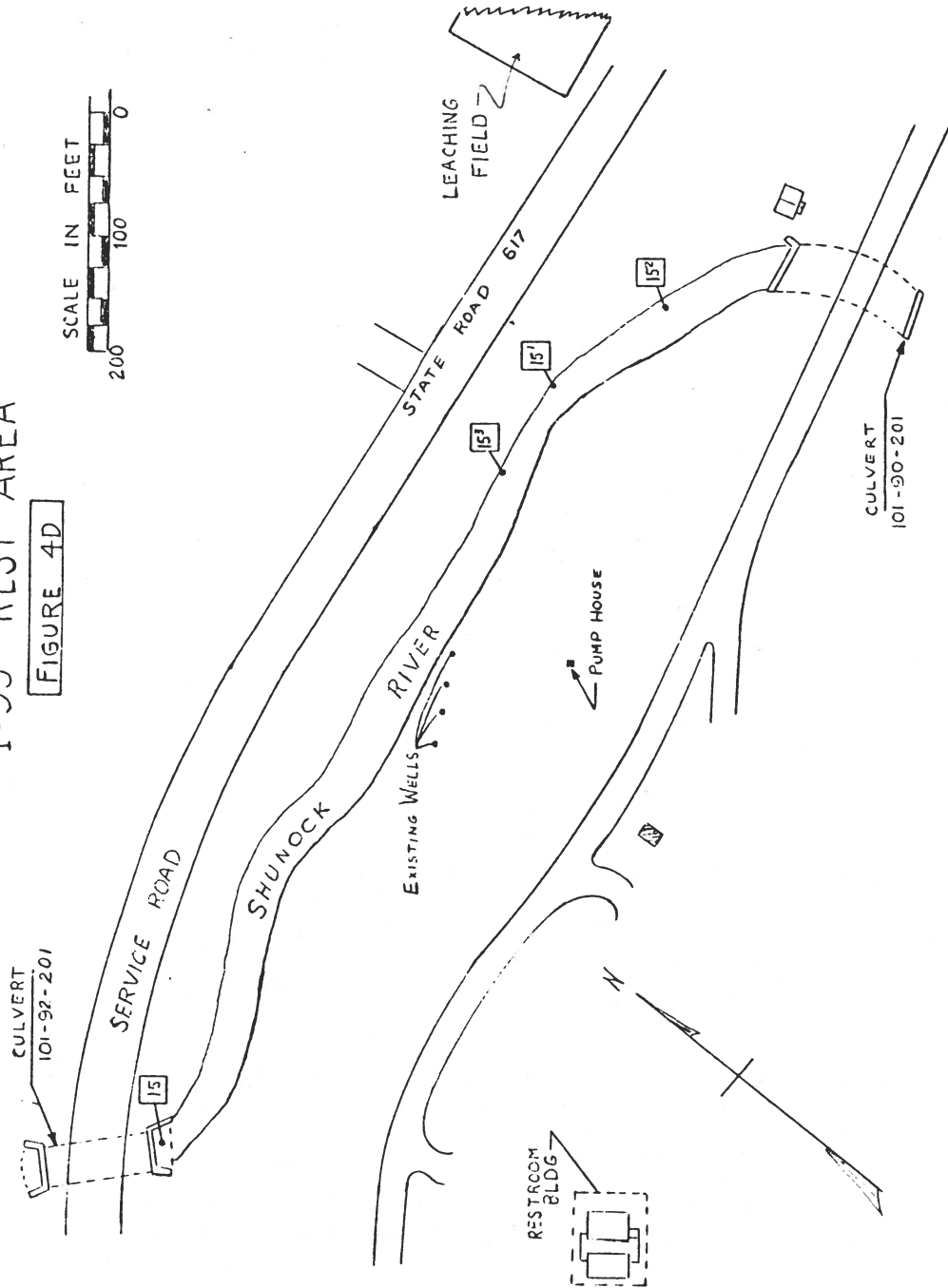


KINGSWOOD - MEADOWOOD

FIGURE-4C

I-95 REST AREA

FIGURE 4D



References

1. Comprehensive Plan of Development
Town of North Stonington, Connecticut
Prepared by Metcalf & Eddy
Engineers and Planners
October, 1967
2. Recommended Regional Sewerage Plan, 1969
Prepared for Southeastern Connecticut Regional Planning Agency
Prepared by Metcalf & Eddy
Engineers and Planners
February, 1969
3. Tax Assessor's Abstract of October 1971, Town of North
Stonington
4. Connecticut Water Resources Bulletin No. 15, dated 1968