IDENTIFICATION OF MASSACHUSETTS BAYS EMBAYMENTS AT RISK OF EUTROPHICATION

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EXECUTIVE SUMMARY

Introduction

This report provides a screening-level assessment of Massachusetts embayments at risk of eutrophication. It estimates the nitrogen loadings to the study embayments and their ability to eliminate nitrogen. For each embayment, nitrogen loading was estimated from non-point sources (*i.e.*, surface run-off, groundwater, and atmospheric deposition) and wastewater treatment plants using methodologies consistent with prior studies in Massachusetts coastal areas (*e.g.*, Buzzards Bay Project, Cape Cod Commission). Non-point source contributions of nitrogen were estimated using a land use analysis similar to Costa (1994) and Valiela *et al.* (in press). The report assesses embayment sensitivity using the Cape Cod Commission nitrogen sensitivity index (Eichner *et al.*, 1995). Nitrogen loading and nitrogen sensitivity estimates were combined to rank the eutrophication potential of the study embayments. Based on these results, the authors provide recommendations for future study and management of the embayments.

Methodology to estimate nitrogen loading

River estimates

To prevent gross overestimates of nitrogen loading, Massachusetts Bays Program (MBP) staff requested that delineations of river watersheds end at the first upstream dam or impoundment (in the case of the Merrimack River, the delineation ended at its tidally-influenced reach). In lieu of modeling the various loss mechanisms, nitrogen loads into the marine system were estimated using river flow and nitrogen concentration data. Data for these calculations were obtained from Menzie-Cura & Associates, Inc. (1991).

Land use estimates

To estimate non-point source loadings of nitrogen, a land use analysis was performed for each embayment watershed. The analysis combines watershed land use with nitrogen loading coefficients. Land use data was obtained from MassGIS, a GIS system developed and maintained by the Massachusetts Executive Office of Environmental Affairs (EOEA). Nitrogen loading coefficients were derived for each MassGIS land use category using conservative assumptions and data from various nitrogen studies. The loading coefficients account for various non-point sources of nitrogen, such as fertilizer application and septic systems, and losses that attenuate nitrogen concentrations, such as denitrification. To obtain non-point source nitrogen loadings, the land use areas within a watershed (ha) were multiplied by their respective nitrogen

loading coefficients (kg ha^{-1} yr^{-1}). In addition, changes in land use and predicted future changes in nitrogen loadings were evaluated using the methodology of Costa (1994).

Atmospheric deposition estimates

Atmospheric nitrogen loads directly onto embayment surfaces were estimated using wet and dry depositional rates from Golomb *et al.* (1996).

Point source estimates

Effluent concentrations and flow were used to estimate nitrogen loadings from wastewater treatment plants (WWTPs). Data for these estimates were obtained directly from facilities, EPA National Pollutant Discharge Elimination System (NPDES) data, and Menzie-Cura & Associates, Inc. (1991). To ensure that nitrogen inputs were not double-counted, non-point source loading estimates (*i.e.*, those based on land use analysis) were corrected to reflect the percentage of homes that are publicly sewered.

Total loading estimates

To arrive at a total nitrogen loading for each embayment, the non-point and point source estimates described above were summed. Total nitrogen loadings were used as part of the evaluation process to rank embayments.

Ranking scheme

A ranking scheme was developed to evaluate the sensitivity of the study embayments to eutrophication. To rank nitrogen loadings, the loadings were normalized by embayment surface area (kg ha^{-1} yr^{-1}). Jaworski (1981) suggested a "permissible" nitrogen loading of 54 kg ha^{-1} yr^{-1} to minimize eutrophication of shallow (4 to 9 meters) nitrogen limited estuarine zones. In addition, he provides estimates of loadings for estuaries of varying trophic condition. Loadings as high as 128 kg ha^{-1} yr^{-1} were reported for nitrogen limited estuaries that were non-eutrophic. The normalized nitrogen loadings of the study embayments were ranked using this range of values. Nitrogen loading rates limits have also been derived by the Buzzards Bay Project (BBP). However, these limits are based on flushing (expressed as mass $volume^{-1}$ $time^{-1}$) and therefore cannot be directly applied to this analysis.

To judge an embayment's ability to eliminate nitrogen, the report uses the "nitrogen sensitivity index", developed by the Cape Cod Commission (CCC) to prioritize Cape Cod watersheds (Eichner *et al.*, 1995). This scheme evaluates several morphological parameters, including the

ratio of the area of the embayment to ocean inlet width, the ratio of the area of the embayment to area of salt water wetlands, and shoreline development. The CCC scheme assigns a score to each parameter, based on a comparison to benchmark values. The nitrogen sensitivity index is calculated by adding the parameter scores. This report categorizes nitrogen sensitivity as either "high", "moderate" or "low", relative to the other embayments based on a statistical classification.

Finally, the nitrogen loading ranks were compared to the nitrogen sensitivity ranks of each embayment within a matrix to identify embayments at greatest risk of eutrophication. The report plots the ranks such that the embayments with the high nitrogen loadings and greatest nitrogen sensitivity lie within the upper left corner of the matrix.

Results

Table E-1 illustrates the relationship between the nitrogen loading rank and embayment sensitivity rank for each embayment. The matrix indicates that the Ipswich River, Weymouth Fore River and Weymouth Back River have the highest potential for eutrophication of the study embayments[1]. Additionally, the matrix indicates that Merrimack River, North River (South Shore), Parker River, Sandwich Harbor, Green Harbor River, South River, Gloucester Harbor and Manchester Harbor may also be at some risk of eutrophication.

Note that the results should be interpreted with caution until field work can confirm these embayment classifications (see Recommendations). For example, data collected from the Weymouth Fore River (MWRA, 1995) suggests that this river suffers from poor water quality and high nutrient concentrations, which agrees with our ranking scheme. However, the Weymouth Back River, which also ranked high in this analysis, generally does not exhibit conditions associated with eutrophication.

Conclusions and Recommendations

The results of this study are intended to provide a screening-level assessment of the eutrophication potential of Massachusetts Bays embayments. The results should be used to

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[1] Because the embayment ranks are *relative*, they to do not necessarily indicate that particular embayments will experience eutrophication. However, the results are useful in prioritizing which embayments may require further study.

Table E-1. Comparison of nitrogen loading and nitrogen sensitivity ranks

Nitrogen sensitivity relative to other study embayments

← increasing risk of eutrophication

Nitrogen loading ↑ increasing risk of eutrophication

	High[4]	**Moderate**[5]	**Low**[6]
some potential for eutrophication[1]	Ipswich River Weymouth Fore River Weymouth Back River	Merrimack River North River (South) Parker River Sandwich Harbor Green Harbor River South River Gloucester Harbor Manchester Harbor	Lynn Harbor Scorton Harbor Sesuit Harbor North River (North) Rock Harbor
low potential for eutrophication[2]	Plum Island Sound Danvers River	Beverly Harbor Hingham Bay Plymouth Harbor Saugus River Bass River Rowley River	Cohassett Harbor Hull Bay Pamet River Scituate Harbor Kingston Bay
non-eutrophic[3]	Weir River Annisquam River Duxbury Bay Wellfleet Harbor	Essex Bay Pines River Barnstable Harbor Salem Harbor Hingham Harbor Eagle Hill River Nahant Bay Provincetown Harbor Marblehead Harbor	Sandy Bay Ipswich Bay

[1]Loadings in this range are above the general range of loadings reported for nitrogen limited estuaries that are eutrophic (Jaworski, 1981).

[2]Loadings in this range are above the "permissible" loading of 54 kg ha^{-1} yr^{-1} estimated by Jaworski (1981), but are below the upper range of loadings (128 kg ha^{-1} yr^{-1}) reported for non-eutrophic estuaries.

[3]Loadings in this range are below the "permissible" loading of 54 kg ha^{-1} yr^{-1} estimated by Jaworski (1981); empirical data from Jaworski also suggest loadings in this range would not result in eutrophication.

[4]High rank contains values greater than the 75th percentile

[5]Moderate rank contains values between the 25th to 75th percentile

[6]Low rank contains values less than the 25th percentile

identify embayments which may require further evaluation. In addition to the information provided in this study, the authors recommend that MBP:

- Obtain flushing data for the study embayments. Currently, the analysis relies upon a nitrogen sensitivity index to rank embayments. Use of flushing data and mixing characteristics would reduce the uncertainty associated with this assessment. The flushing data should be internally consistent to avoid potential uncertainty associated with different methodologies.

- Conduct a sampling program to verify the results of this study and provide insights into embayment water quality. To conserve resources, MBP could focus the field sampling effort on a subset of study embayments. For a short list of embayments, the authors recommend recording embayment conditions (*e.g.*, presence or absence of eel grass beds, fish kills, etc.) and measuring water quality parameters, such as temperature, dissolved oxygen concentrations, secchi depth, nutrient concentrations, phytoplankton stock and productivity, and chlorophyll-a.

- Contact communities near embayments to discuss local water quality conditions. Such discussions could be useful in identifying particular areas within an embayment that may require further study and management.

1.0 INTRODUCTION

This report provides a screening-level assessment of Massachusetts Bays embayments that may be at risk of eutrophication. The report ranks the study embayments based on their nitrogen loading and potential sensitivity to nutrients. Excessive nitrogen in coastal waters has been implicated as a cause of eutrophication resulting in declining shellfish and finfish productivity, loss of eelgrass beds, and increased algal growth leading to declining species diversity (NRC, 1993). Results of this study will be used by the Massachusetts Bays Program (MBP) to develop appropriate management plans.

The report evaluates a total of forty-four embayments along the North Shore, South Shore and Cape Cod areas (Table 1). Due to the difficulties in accurately delineating heavily urbanized watersheds from topographic maps, the report does not evaluate embayments in the Boston area, including the Charles River, Mystic River, Dorchester Bay, Quincy Bay, Broad Sound and Boston Harbor. The report provides embayment-scale analyses and assumes complete mixing within an embayment. This study is not intended to identify sensitive areas on smaller scales, such as tidal creeks or areas of restricted flow, which could exhibit signs of eutrophication in the absence of embayment-wide eutrophication. Results of this study should therefore not be extrapolated to smaller scales.

Applied Geographics, Inc. (AGI) provided GIS support to Menzie-Cura & Associates, Inc. for this project. AGI produced checkplots, digitized watershed delineations, and incorporated land use data into an ARC/INFO GIS system.

1.1 About the Massachusetts Bays Program

The Massachusetts Bays Program is a cooperative US Environmental Protection Agency and Massachusetts State effort to develop a management plan, known as the "Comprehensive Conservation and Management Plan (CCMP)", for Massachusetts Bays. The CCMP goals are to protect, maintain and, where necessary, restore the Massachusetts Bay and Cape Cod Bay ecosystems. The plan reviews the problems of the Massachusetts Bays, discusses planning efforts in the region, and recommends actions for improved water quality. Work carried out under the MBP is intended to:

- improve the habitats of living resources in Massachusetts Bay;
- protect public health by minimizing risk from environmental contaminants;
- protect and improve water and sediment quality;
- enhance the aesthetic quality of Massachusetts' coast and coastal waters;
- encourage pollution prevention and other environmentally and fiscally sound methods of treatment, clean-up and restoration; and,

- improve access, educational and appropriate recreational opportunities in and around the waters of Massachusetts and Cape Cod Bays.

The MBP has identified as a high priority the need to understand the fate, transport and effects of nutrients from point and non-point sources. This project supports the goals of the CCMP as they relate to the control of nutrients and the eutrophication of Massachusetts coastal waters.

1.2 General approach

To identify the Massachusetts Bays embayments at greatest risk of eutrophication, this study provides a screening-level analysis of nitrogen loading and embayment sensitivity. The approach is consistent with prior evaluations of nutrient loadings and impacts (*e.g.*, Buzzards Bay Project, Cape Cod Commission). The report estimates nitrogen loadings to each embayment originating from wastewater treatment plants and non-point sources (*i.e.*, surface run-off, groundwater, and atmospheric deposition). Non-point source contributions of nitrogen are estimated using a land use analysis similar to Costa (1994) and Valiela *et al.* (in press). This assessment also estimates the ability of an embayment to eliminate nitrogen using the "nitrogen sensitivity index" used by the Cape Cod Commission (CCC) to prioritize embayments in Cape Cod (Eichner, 1995).

To estimate non-point source loadings of nitrogen, a land use analysis was performed for each embayment watershed. The analysis paired land use data within the watershed with nitrogen loading coefficients. Atmospheric nitrogen loads directly onto embayment surfaces were estimated using wet and dry depositional rates from Golomb *et al.* (1996).

To estimate nitrogen loadings from wastewater treatment plants, measured or reported effluent concentrations and flow were used. To ensure that double-counting of nitrogen inputs would not occur, corrections were made to non-point source loading estimates (*i.e.*, those based on land use analysis) to reflect the percentage of homes that are sewered.

Based on the estimates of nitrogen loadings and nitrogen sensitivity, a ranking scheme was developed to evaluate an embayment's potential for eutrophication relative to the other study embayments. The ranking scheme pairs the physical and hydrologic characteristics of embayments with estimates of nitrogen loadings.

1.3 Limitations and uncertainty of approach

The general approach taken in this study has several limitations:

- The data and methodology will provide a *first-order* approximation of total nitrogen loading. The rankings are intended to be used with other data, such as water quality measurements, presence or absence of eelgrass, and evidence of hypoxia or anoxia, to develop plans or refine rankings. Caveats describing the limitations of the data and results are provided throughout the report.

- Total nitrogen loadings alone do not provide a complete indication of which embayments are at risk of eutrophication. For example, the land use analysis yields *total* nitrogen loadings, and does not differentiate among species (*e.g.*, nitrate, nitrite, ammonium, particulate and dissolved organic nitrogen, etc.). Some nitrogen species are more biologically available than others. In addition, nitrogen loadings may not be useful predictors of eutrophication in coastal systems when other nutrients or conditions are limiting.

- Surface geology influences nitrogen transport. In areas of till and bedrock (such as the North Shore), surface runoff is a significant transport mechanism. In unconsolidated sandy deposits (such as Cape Cod) groundwater dominates nitrogen transport. Therefore, nitrogen loading factors should differ for these regions due to the relative importance of various attenuation processes and loss mechanisms. However, most loading factors available in the literature have been developed for systems dominated by groundwater transport (*e.g.*, Valiela *et al.*, in press; Costa *et al.*, 1994), and for most land uses adequate data do not exist to develop nitrogen loadings factors for surface runoff. The same loadings factors were therefore used for all Massachusetts Bays embayments. This adds a source of uncertainty to estimates of nitrogen loadings, particularly those for embayments in the North and South Shores. Wherever possible, the report estimates the potential range of nitrogen loading coefficients.

- Where groundwater is the dominant transport medium for nitrogen, current land uses may not reflect current nitrogen loadings due to the slow movement of groundwater from inland regions to embayments. Depending upon the groundwater velocity, it may take several years to decades for nitrogen introduced into groundwater to reach an embayment.

2.0 DESCRIPTION OF METHODOLOGY

2.1 Estimates of nitrogen loading

In Massachusetts Bays, point sources of nitrogen are generally limited to wastewater treatment plants and combined sewer overflows. Non-point sources of nitrogen include atmospheric deposition, surface run-off, and groundwater. Surface run-off and groundwater loadings play greater or lesser roles in nitrogen loadings depending upon the local surficial geology. In areas of till and bedrock, such as the North Shore, surface run-off is typically more important than groundwater. In areas of sandy deposits, such as Cape Cod, groundwater is typically more important. In either case, these non-point sources of nitrogen are usually the result of fertilizer application, atmospheric deposition (both onto the watershed and the embayment surface), and septic systems. Less significant sources of nitrogen that are not considered in this report include nitrogen from animal wastes and industrial processes.

In addition to evaluating the loadings to embayments, the report combines the loadings of smaller embayments (subembayments) that contribute to larger systems. For example, the Ipswich River, Parker River and Eagle Hill River embayments were evaluated individually and also as subembayments of the Plum Island Sound embayment (*i.e.*, loadings from the Ipswich River, Parker River and Eagle Hill River embayments were added to those of the Plum Island Sound embayment). This approach allows the watersheds to be evaluated on an individual basis, and as part of a larger-scale analysis.

2.1.1 Atmospheric deposition

To estimate the loadings associated with atmospheric deposition directly onto embayment surfaces, the embayment surface area was multiplied by a nitrogen deposition coefficient (kg ha^{-1} yr^{-1}). Coastline information (based on mean high water) used to calculate embayment surface area were obtained from MassGIS, a GIS system developed and maintained by the Massachusetts Executive Office of Environmental Affairs (EOEA). Table 2 summarizes the loading coefficients for atmospheric deposition. The coefficients are based on data from Golomb *et al.* (1996), who summarize wet deposition rates in Massachusetts Bay over a seven year period and estimated dry deposition indirectly using airborne concentrations and depositional velocities. The study reports low-estimate, best-estimate, and high-estimate depositional rates of 3.7, 5.7 and 12.6 kg ha^{-1} yr^{-1}, respectively. This range of coefficients was used to estimate atmospheric loadings directly onto embayment surfaces. The assessment also used these data to estimate atmospheric deposition to embayment watersheds (Section 2.1.2).

2.1.2 Land use

Non-point source loadings of nitrogen were estimated using land use data within an embayment watershed. This analysis was similar to the evaluation completed as part of the Buzzards Bay Project (Costa, 1994). Land use and population data were obtained from MassGIS. MassGIS data were incorporated into an ARC/INFO database and for each land use category, a land use loading coefficient was developed.

2.1.2.1 Watershed delineation

To conduct the land use analysis, the authors delineated the watersheds of the study embayments. Watersheds were delineated using standard hydrographic procedures (see below). For some rivers, the complete watershed was not delineated (discussed in Section 2.1.4). In addition, Massachusetts Bays Program staff requested an analysis of nitrogen loadings using a 1,000 meter coastal boundary. The 1,000 meter boundary was selected as an estimate of the minimum coastal area that contributes nitrogen to an embayment. The report estimates nitrogen loading for both types of delineations.

Delineations from other studies

To conserve resources, MBP and Menzie-Cura & Associates, Inc. agreed to use watershed delineations that were available from other studies. The Cape Cod Commission (CCC) previously delineated watersheds for Cape Cod using composite water table maps for the six Cape Cod groundwater lenses (Eichner *et al.*, 1995). The CCC delineated the watersheds based on groundwater elevation and flow data. These delineations were incorporated into the ARC/INFO database for the Cape Cod embayments of interest.

Delineation of areas with sand deposits

For Cape Cod and the Plymouth/Carver area, where surficial geology consists primarily of unconsolidated sand deposits, the water table topography, rather than surface topography, generally defines the extent of the watersheds. A USGS water table map (1:50,000) was used to delineate the Plymouth/Carver watersheds. This map indicated the direction of groundwater flow as inferred from water table elevations and the location of groundwater divides.

Delineation of areas with till or bedrock

For the remainder of the Massachusetts coast, surface topography was used to delineate watersheds. Wherever possible, standard hydrologic procedures were followed for the delineation of embayment watersheds (*e.g.*, New Hampshire Water Resources Division, 1990).

Surface water flow was assumed to flow perpendicular to contour lines, and topographically flat areas such as swamps were divided equally between bisecting streams.

Checkplot production

Embayment watersheds were delineated on a series of paper checkplots (1:25,000 scale). The checkplots are paper plots of topographic data and other MassGIS data, including:

- coastline
- hydrography
- community boundaries
- USGS major basin boundaries
- USGS sub-basin boundaries
- contours

To facilitate accurate digitization of the watershed delineations, each checkplot contained lines corresponding to USGS quadrangle boundaries. The checkplots also contained the 1,000 meter coastal delineation. The 1,000 meter delineation was computer-generated using the ARC/INFO "buffer" command and the MassGIS 1:25,000 coastline.

Delineation review

After the embayment watersheds were delineated onto the checkplots, they were subject to a two-step review process. Massachusetts Department of Environmental Protection (MADEP) staff conducted an initial technical review of the watershed delineations, followed by a USGS review. The delineations were modified as necessary, based on MADEP and USGS recommendations.

Data processing

Upon final approval by MBP staff, watershed delineations were digitized and stored in an ARC/INFO format.

Quality control/quality assurance

The newly created data sets were checked for the correct ARC/INFO topology. A series of checkplots with the digitized delineations were then produced for each study embayment. These checkplots were compared with the original watershed manuscripts to assure accuracy. Errors were identified and corrected.

2.1.2.2 Land use data

MassGIS contains 21 land use categories. These categories are based on the land uses identified by MacConnell land maps (e.g., MacConnell *et al.*, 1984). To estimate nitrogen loading, the most recent land use data available (in most cases, 1990) was clipped to the watershed boundaries and the highest resolution shoreline data. In cases where 1990 land use data were not available from MassGIS, 1985 land use data was used and such instances were noted in the report tables.

Because a portion of the Merrimack River watershed includes land in New Hampshire, New Hampshire GIS (NHGIS) data was also included in the analysis. However, NHGIS categorizes land use differently than the MassGIS system. To incorporate these data into the analysis, the NHGIS categories were assigned MassGIS categories. Since, in some cases, NHGIS categories are more general than the MassGIS categories, the NHGIS data were divided among several MassGIS categories. For example, it was assumed that the NHGIS urban land use is equal to residential, commercial, industrial, urban open, transportation, and waste disposal MassGIS land uses. These assumptions are summarized below:

NHGIS category	MassGIS categories selected to represent the NHGIS category
active agriculture	cropland and pasture (area divided equally between these categories)
urban	commercial, industrial, urban open, transportation, waste disposal, residential-multifamily, residential - less than 1/4 acre lot, residential - 1/4 to 1/2 acre lot, and residential greater than 1/2 acre lot (area divided equally among these categories)
water	open water
disturbed	mining
wetland	non-forested wetland
cleared and clear-cut	open land
forest	forest

2.1.2.3 Land use loading coefficients

Currently, a variety of nitrogen loading coefficients are available in the published literature (*e.g.*, Frink, 1991; Costa, 1994; Valiela *et al.*, in press). The wide range in magnitude of these coefficients reflects the assumptions and uncertainty associated with their derivation and the types of land uses which they intend to model. To address this uncertainty, a *range* of land use loading coefficients (kg ha^{-1} yr^{-1}) were developed for each MassGIS land use category. The coefficients account for various sources of nitrogen, such as septic systems and fertilizer application, and nitrogen losses, such as denitrification. To estimate nitrogen loading rates (*e.g.*, fertilizer application rates, atmospheric deposition, *etc.*), data from Costa (1994), Frimpter *et al.*

(1988), Golomb *et al.* (1996), and Valiela *et al.* (in press) were used. Each nitrogen loading rate was adjusted to account for losses using data reported by Valiela *et al.* (in press). The magnitude of losses varies, depending upon the assumed fate and transport of the nitrogen. For example, nitrogen passing through an aquifer is assumed to be reduced by 35%, while nitrogen passing through both the vadose zone and an aquifer is assumed to be reduced by 75% (Valiela *et al.*, in press). Tables 3 to 7 present the derivation for the loading coefficients. Table 8 summarizes the coefficients.

Note that the land use methodology, while suitable for rural and suburban areas, is less applicable for urbanized zones. As noted by Costa (1994), urban and industrialized areas do not lend themselves to such a loading analysis because wastewater and stormwater are collected in sewer systems and discharged through outfalls. Heavily urbanized areas (*e.g.*, Boston area) were therefore not included in the analysis.

Commercial and Industrial Land Use

Table 3 presents the derivation of the commercial and industrial land use coefficients. These coefficients model atmospheric deposition based on data from Golomb *et al.* (1996). For these values, the report assumes nitrogen losses of 75% associated with the vadose zone and aquifer (Valiela *et al.*, in press). The resulting commercial and industrial coefficients range from 0.9 to 3.2 kg ha^{-1} yr^{-1}. These coefficients do not account for nitrogen loads from septic sewage. Instead, the residential land use coefficients (see below) account for the annual nitrogen loading generated per capita (This approach does not account for residents that work outside of their own watershed).

Residential Land Use

MassGIS has four categories of residential land use: residential-multifamily, residential-less than 1/4 acre lot, residential-1/4 to 1/2 acre lot, and residential-greater than 1/2 acre lot. Table 4 illustrates the derivation of the nitrogen loading coefficients for each residential category[2]. The coefficients account for the nitrogen loadings due to fertilizer application, atmospheric deposition, and septic sewage. The equation used to calculate residential loading coefficient is:

$$\text{loading coefficient}_{\text{residential}} = \text{atmospheric coefficient} + \text{fertilizer coefficient} + \text{septic system coefficient}$$

[2] The values in Table 4 are for illustrative purpose only. As discussed later in this section, residential loading coefficients are watershed-specific since they are calculated from the watershed's mean occupancy rate and the percent of homes that are publicly sewered.

Coefficients for atmospheric deposition are based on the data from Golomb *et al.* (1996). These values were adjusted by assuming losses of 90% due to uptake, and losses in the vadose zone and aquifer (Valiela *et al.*, in press).

The equation used to calculate the fertilizer coefficient is:

fertilizer coefficient = fertilizer application rate * fertilizer use * lawn:lot area * fraction not lost

To estimate a range of fertilizer coefficients, fertilizer application rates (kg ha^{-1} yr^{-1}) reported by Valiela *et al.* (in press) were used. Additionally, it was assumed that 59% percent of residences use fertilizer[3] and that the ratio of lawn area to lot area ranges from 10 to 30%. The analysis also assumes losses of 85% due to gas losses and losses in the vadose zone and groundwater (Valiela *et al.*, in press).

The equation used to calculate the septic system coefficient is:

septic system coefficient = nitrogen produced per person * fraction not lost * watershed-specific occupancy rate * unit density * fraction of residences not publicly sewered

To estimate the septic system coefficient, data from Valiela *et al.* (in press) and Costa (1994) were used. Valiela *et al.* (in press) estimated nitrogen production ranges from 1.8 to 5.4 kg $person^{-1}$ yr^{-1}. They also assumed losses of 74% in septic tanks, leaching fields and groundwater. Because nitrogen loadings associated with septic systems are expressed on a per capita basis, these values were converted to an equivalent loading coefficient (kg ha^{-1} yr^{-1}) using occupancy rate (persons $unit^{-1}$) and unit density (units ha^{-1}) data. Occupancy rates were estimated from US Census Topologically Integrated Geographic Encoding and Referencing (TIGER) files, which provide population and housing unit data. For a given watershed, the occupancy rate is calculated as:

occupancy rate = watershed population / number of housing units within watershed

Because the TIGER files include data for permanent residents only, the Cape Cod watershed occupancy rates were adjusted to reflect seasonal increases in population. Data from Menzie-Cura & Associates, Inc. (1991) and the Cape Cod Commission (1994) were used to estimate seasonal population increases, which ranged from three-fold to six-fold increases, depending upon the watershed. These increases were assumed to occur three months of the year, and the

[3] This an average of reported fertilizer useage by Valiela et al, in press and Costa, 1994.

occupancy rates were adjusted accordingly. For residential-multifamily, residential- less than 1/4 acre, residential- 1/4 to 1/2 acre, and residential- greater than 1/2 acre land uses, unit densities of 12.4, 9.2, 5.0, and 2.5 units ha^{-1}, respectively (Costa *et al.*, 1994) were assumed.

To avoid double-counting of nitrogen inputs, the authors adjusted the septic system coefficient to account for residences known to be sewered. This information was obtained from the US Census Summary Tape File (STF) CD-ROM.

Naturally-vegetated land use

Table 5 illustrates the derivation of the nitrogen loading coefficients for forested, open land, urban open, wetland and salt marsh land uses. These coefficients are based on atmospheric deposition data from Golomb *et al.* (1996). For forest, open land and urban open areas, nitrogen losses of 91% were assumed (Valiela *et al.*, in press). This results in a range of coefficients from 0.3 to 1.1 kg ha^{-1} yr^{-1}. For wetlands and salt marsh, a range of nitrogen losses of 100% to 14% was assumed, resulting in a range of coefficients from 0 to 10.8 kg ha^{-1} yr^{-1}.

Recreational land use

Table 6 presents the derivation of the nitrogen loading coefficients for participatory recreation (*e.g.*, golf courses) and spectator recreation (*e.g.*, baseball fields). For these land uses, it was assumed that nitrogen is introduced through fertilizer application and atmospheric deposition. The fertilizer application rates were estimated from data for several Cape Cod golf courses (Cape Cod Commission, 1990). These values were adjusted to account for nitrogen losses of 85% (Valiela *et al.*, in press). Atmospheric deposition were estimated using deposition rates reported by Golomb *et al.* (1996). As with the fertilizer rates, these values were adjusted to account for nitrogen losses. The fertilizer and atmospheric components were summed to estimate the total nitrogen coefficient for recreational land use. These values range from 17.9 to 22.2 kg ha^{-1} yr^{-1}.

Agricultural land use

Table 7 presents the derivation of the nitrogen loading coefficients for agricultural land uses. There are three MassGIS land use categories associated with agriculture: woody perennial (*e.g.*, cranberry bogs), cropland and pasture. For woody perennial land use, the report uses a range of reported nitrogen application rates for cranberry bogs (Frimpter *et al.*, 1988) and assumes nitrogen losses of 60% (Valiela *et al.*, in press). For cropland and pasture land use, the report assumes a range of nitrogen application rates from Costa (1994) and losses of 85% (Valiela *et al.*, in press). For each type of agricultural land use, this assessment also accounts for atmospheric deposition (Golomb *et al.*, 1996) and losses (Valiela *et al.*, in press). Based on these data, woody perennial, cropland and pasture loading coefficients were estimated to range from 5.4 to 21.0 kg ha^{-1} yr^{-1}, 11.2 to 21.3 kg ha^{-1} yr^{-1}, and 5.8 to 11.3 kg ha^{-1} yr^{-1}, respectively.

2.1.3 Coastal wastewater treatment plants

Wastewater effluent can be a major source of nitrogen to an embayment. To identify those wastewater treatment plants discharging to study embayments, this analysis used the EPA Permit Compliance System (PCS). PCS is a database management system used by EPA to track National Pollutant Discharge Elimination System (NPDES) dischargers nationwide. Among other data, PCS stores each facility's location by street address, town, latitude/longitude coordinates, and USGS basin. Several search queries were developed to identify wastewater treatment plants along the Massachusetts coast. From the search results, outfalls within each embayment watershed delineation were identified.

Nitrogen loadings of many of the wastewater treatment plants were previously estimated in *Sources and Loadings of Pollutants to Massachusetts Bays* (Menzie-Cura & Associates, Inc., 1991). These loadings were estimated from data sources such as NPDES permit applications, Discharge Monitoring Reports, 301(h) studies, Massachusetts Division of Water Pollution Control, and survey reports. Because the report did not provide loading estimates for NPDES minor dischargers, these loadings were estimated by contacting the facilities in question to obtain effluent flow and nitrogen concentration data. If the facility could not supply the relevant information, the facility data was obtained from PCS.

In addition to the facilities identified above, it was estimated that 9% of the effluent from the Nut Island treatment plant mixes into the Weymouth Fore River (Massachusetts Water Resources Authority, 1995). This estimate is based on field studies and computer models by McDowell *et al.* (1991) and Signell (1992).

2.1.4 Rivers

Ingram *et al.* (1994) suggest that only a fraction of the nitrogen input several kilometers upstream of an embayment will reach an embayment. Processes such as uptake, immobilization, sedimentation and denitrification are believed to hinder nitrogen transport over such distances. To prevent gross overestimates of nitrogen loading, MBP staff requested that delineations of river watersheds end at the first upstream dam or impoundment (in the case of the Merrimack River and Weymouth Fore River, the delineation ended at their tidally-influenced reaches). In lieu of modeling various loss mechanisms, upstream nitrogen was estimated by multiplying the river flow at the watershed delineation by nitrogen concentration. This data was obtained from Menzie-Cura & Associates, Inc. (1991) and USGS (1984). To estimate the flow at the upstream reach of a delineation, the flow at a gauging station was adjusted by the flow per unit drainage area ($m^3\ sec^{-1}\ ha^{-1}$), where:

flow per unit drainage area = flow at gauging station / watershed of gauging station

Nitrogen concentrations are not available for some of the study rivers, including the Rowley River, Weymouth Fore River, Weymouth Back River, Weir River, and North River (South Shore). In such cases, a nitrogen concentration of 1.6 mg/L was used, based on the average of reported values for other Massachusetts Rivers (Menzie-Cura & Associates, Inc., 1991).

2.1.5 Off-shore loadings

Oceanic loadings were not quantified in this study. For coastal embayments, exchange with adjacent ocean waters can potentially supply large amounts of nitrogen when tidal inflows are high and/or tidally exchanged waters have high nitrogen concentrations. However, few studies have attempted to quantify tidal contributions due to difficulties in modeling such loadings. In the Recommendations (Section 3.0), the report suggests two approaches which could be implemented to estimate off-shore nitrogen loadings. Both models require data which are not readily available for many Massachusetts embayments, and these data limitations currently prevented even a cursory evaluation of oceanic loadings.

2.2 Statistics on changes in land use

2.2.1 Land use statistics

The report summarizes land use (ha) and land use rates of change (percent) for 1971, 1985 and 1990. For some towns, 1990 land use data is not available from MassGIS. In such cases, the report uses 1985 land use data in lieu of 1990 data. Because New Hampshire GIS does not contain land use data for 1971 and 1985, the report does not evaluate changes in land use for the Merrimack River estuary.

2.2.2 Prediction of changes in land use

This report predicts future changes in land use using the methodology of Costa (1994). This approach provides adequate conservative predictions of growth potential consistent with the goals of this study and the resolution of the available land use data. The methodology assumes that half of the current forested or undeveloped land will be transformed into residential and commercial/industrial land use classes. The report uses the existing ratio between residential and commercial/industrial categories to represent future buildout of forested and undeveloped lands. In addition, it is assumed that new residential development to be proportional to existing land use. This approach provides a simplified approximation of future growth potential. These buildout estimates are used to estimate future nitrogen loadings. Future nitrogen loading estimates do not account for buildout upstream of study delineations.

2.3 Ranking scheme

A ranking scheme was developed to evaluate the sensitivity of the study embayments to eutrophication. The ranking scheme pairs estimates of nitrogen loading with physical characteristics of the embayments.

The Buzzards Bay Project (BBP) has proposed nitrogen loading limits for Buzzards Bay embayments (Buzzards Bay Project, 1994). For embayments whose mean depth is greater than 2 meters, the nitrogen loading limits are expressed as mass per volume per Vollenweider flushing term (mg m^{-3} Vr^{-1}). The flushing term is calculated using the hydraulic turnover time of the receiving water (in years). Since such data do not exist for most of the study embayments, the BBP standards could not be utilized in this analysis.

In lieu of a nitrogen evaluation involving flushing rates, the loadings were normalized by embayment surface area (kg ha^{-1} yr^{-1}). Jaworski (1981) analyzed the scale of eutrophication of 13 temperate estuaries and freshwater ecosystems and examined the seasonal and long term trends for five estuarine systems in Chesapeake Bay. Jaworksi suggested a "permissible" nitrogen loading of 54 kg ha^{-1} yr^{-1} to minimize eutrophication of shallow (4 to 9 meters) nitrogen limited estuarine zones. This value was based on a "permissible" phosphorus loading of 7.5 kg ha^{-1} yr^{-1} and an assumed N/P ratio of 16. We therefore rank study embayments that have loadings below this value as non-eutrophic. Jaworski (1981) also reported the range of nitrogen loadings for estuaries of varying trophic condition. The highest nitrogen loading reported for a nitrogen-limited, non-eutrophic system was 128 kg ha^{-1} yr^{-1} for the Pamlico River estuary. We therefore ranked study embayments that were less than this value, but greater than the "permissible level", as having a low potential for eutrophication. Study embayments with loadings greater than 128 kg ha^{-1} yr^{-1} were judged to have some potential for eutrophication. These benchmark values are intended to provide a screening-level evaluation of the nitrogen loadings. Exceeding a benchmark value does not necessarily imply eutrophic conditions. Eutrophication potential is also dependent upon whether or not the embayment is nitrogen limited[4] (not evaluated in this report) and is capable of sufficiently eliminating nitrogen (see below).

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[4] Frequently in marine systems, phytoplankton growth is limited or controlled by the amount of nitrogen available (which is used as a nutrient by the phytoplankton). However, other nutrients, such as phosphorus, or other environmental parameters, such as available light, can also control or limit primary productivity. The ratio of nitrogen to phosphorus as developed by Redfield (1958) is often used to provide insights into which nutrient may limit phytoplankton growth. A nitrogen to phosphorus ratio below 16 is typically interpreted as indicative of nitrogen-limiting conditions.

To judge an embayment's ability to eliminate nitrogen, this assessment uses the "nitrogen sensitivity index", developed by the Cape Cod Commission to prioritize Cape Cod watersheds (Eichner *et al.*, 1995). This scheme evaluates several morphological parameters, including the ratio of the area of the embayment to ocean inlet width, the ratio of the area of the embayment to area of salt water wetlands, and shoreline development. Shoreline development (referred to as "branching" by the CCC) represents the ratio of the length of the shoreline to the circumference of a circle with the area of the embayment[5]. Embayments with shoreline development scores that are significantly greater than one will be more likely to have morphometries that include constricted areas with longer residence times and greater sensitivity to nitrogen loading. An additional CCC parameter, tidal range, was not included in this analysis, since the study embayments' tidal ranges are similar.

A major limitation of the CCC ranking scheme is that it does not incorporate flushing data (currently not available for all of the embayments). The flushing time, the time required for embayment water to exchange with ocean (tidal) water, controls the concentrations and distributions of nutrients in the water, which in turn control the nutrient bioavailability. If nutrients have a relatively short residence time in an embayment, the concentrations that are assimilated by biomass or accumulated by sediments are reduced, and so is the potential for eutrophication. Flushing time invariably affects the loading tolerance of an embayment and thus is a useful parameter in establishing a loading scale.

The CCC scheme assigns a score to each parameter, based on a comparison to benchmark values. Scores are calculated as follows:

score	10	20	30	40	60	80	100
embayment area (ft^2) : ocean inlet width (ft)	<5,000	5,000 to 9,999	10,000 to 19,000	20,000 to 39,999	40,000 to 79,999	80,000 to 120,000	>120,000
embayment area (ha) : salt water wetlands area (ha)	< 1.0		1.0 to 2.9	3.0 to 7.0		>7.0	
shoreline development (unitless)	<1.8		1.8 to 2.5	2.5 to 3.0			>3.0

[5] The equation to calculate shoreline development is:

$$shoreline\ development = \frac{length\ of\ embayment\ shoreline}{2\sqrt{\pi\ surface\ area\ of\ embayment}}$$

The nitrogen sensitivity index is calculated by adding the parameter scores.

Nitrogen sensitivity is categorized in this report as either "high", "moderate" or "low", relative to the other embayments. "High", "moderate" and "low" ranks correspond to nitrogen sensitivities that are above the 75th percentile, between the 75th and 25th percentiles, or below the 25th percentile, respectively. This classification scheme, otherwise known as quartile comparison, is commonly used in exploratory statistics (Devore and Peck, 1986). This ranking scheme was chosen over a more complex one, given the screening-level approach of the analysis.

Finally, this report compares the nitrogen loading ranks to the nitrogen sensitivity ranks for each embayment. A matrix is constructed of the two ranks to identify embayments at greatest risk of eutrophication. The ranks are plotted such that the embayments with the high nitrogen loadings and greatest nitrogen sensitivity lie within the upper left corner of the matrix. The matrix also identifies systems that have high nitrogen loading but have a low nitrogen sensitivity and vice-versa.

3.0 RESULTS AND RECOMMENDATIONS

3.1 Results

3.1.1 Land use and population data

Appendix A contains the land use data (by year), predicted buildout of land use, and rates of land use change for each embayment. Embayment watersheds that have experienced the greatest increase in residential, commercial and industrial development from 1985 to 1990 include Plum Island Sound, Beverly Harbor, North River (North Shore), North River (South Shore), Kingston Bay, Plymouth Harbor, Barnstable Harbor, Sandwich Harbor, and Wellfleet Harbor. Land use data indicate that cropland and forested areas account for the majority of land that recently has been developed. The analysis predicts large increases in buildout for many of the embayment watersheds in the South Shore, including Cohasset Harbor, South River, North River, Kingston Bay and Plymouth Harbor. The analysis also predicts significant buildout potential for several Cape Cod embayments, including Sandwich Harbor, Scorton Harbor, Barnstable Harbor and Wellfleet Harbor. Of the North Shore embayment watersheds, the analysis predicts large buildouts for the Merrimack River, Plum Island Sound, Ipswich Bay and Beverly Harbor.

Appendix A also contains information on the population, housing units, and sewerage within each delineation. As previously discussed in Section 2.0, the report uses this data to calculate watershed-specific nitrogen loading coefficients for residential land use categories. Embayment watersheds in the North Shore generally have the highest populations and highest percentage of sewered residences. South Shore embayment watersheds follow this trend to a lesser degree. Of the Cape Cod study embayments, only Plymouth Harbor and Green River Harbor River watersheds have high percentages of sewered residences. Year-round populations of embayment watersheds in the Cape Cod area are generally low, compared to other study embayment watersheds.

3.1.2 Nitrogen loading

Tables 9 through 52 summarize the nitrogen loadings for each of the forty-four study embayments. The tables include the estimates for both the 1,000 meter coastal boundary and watershed delineations and for both present and future nitrogen loadings. Future nitrogen loadings are based on the buildout projections. Each table also contains pie charts which summarize the percent contribution of nitrogen from wastewater treatment plants, land use, atmospheric deposition, and river to an embayment. Appendix B contains the data that were used to arrive at the information in the summary tables. Appendix B tables include the area and percent area of each MassGIS land use category, nitrogen loading coefficients and nitrogen loadings by land use.

3.1.2.1 Watershed estimates

Table 53 illustrates the nitrogen loadings expressed as both kg yr^{-1} and kg ha^{-1} yr^{-1} for the forty-four study embayments (based on the watershed delineations). The table also indicates which embayments are above and below the benchmark loading levels of 54 and 128 kg ha^{-1} yr^{-1}. Embayments which exceeded both benchmark loading levels and therefore exhibit some potential for eutrophication include: Scorton Harbor, Merrimack River, Ipswich River, Lynn Harbor, North River (South Shore), Green Harbor River, Weymouth Fore River, Parker River, Sesuit Harbor, Sandwich Harbor, North River (North Shore), Weymouth Back River, Rock Harbor, Manchester Harbor, Gloucester Harbor and South River.

Study embayments at "permissible" levels that are unlikely to result in eutrophication include: Sandy Bay, Pines River, Essex Bay, Barnstable Harbor, Weir River, Annisquam River, Hingham Harbor, Salem Harbor, Ipswich Bay, Eagle Hill River, Duxbury Bay, Wellfleet Harbor, Provincetown Harbor, Marblehead Harbor and Nahant Bay.

3.1.2.2 Comparison of watershed estimates to 1000 m boundary estimates

For most embayments, the 1,000 m boundary nitrogen loading estimates were 2 to 4 times less than their respective watershed loading estimates. These results reflect the fact that the study embayments' watersheds were generally much larger than the area captured by the 1,000 m boundary. Most of the study embayments that are ranked above the "permissible" level of 54 kg ha^{-1} yr^{-1} but below 128 kg ha^{-1} yr^{-1} using watershed delineations, would fall within the "permissible" level using 1,000 m boundary delineations. These embayments include the Danvers River, Beverly Harbor, Saugus River, Bass River, Rowley River, Cohassett Harbor, Pamet River, Scituate Harbor, and Kingston Bay. In addition, the North River (North Shore) lies above the 128 kg ha^{-1} yr^{-1} benchmark using a watershed delineation, but within the "permissible" level using the 1,000 m boundary delineation. These results highlight the importance of using a reliable watershed delineations for land-use analyses.

3.1.2.3 Comparison of loading estimates to other studies

Only a few studies have previously estimated nitrogen loading to the study embayments. Eichner (1994) estimated nitrogen loadings to Wellfleet Harbor as part of the Wellfleet Harbor Mini-Bays Project (Heufelder, in progress). Using a land use analysis similar to this study, Eichner estimated total nitrogen loadings (adjusted for seasonal fluctuations in populations) of 2.6×10^4 kg yr^{-1}, compared our estimate of 2.8×10^4 kg yr^{-1}. While these estimates agree well with each other, if broken down by source, the loading estimates are significantly different. For example, Eichner estimates that land use and atmospheric contributions are 2.5×10^4 kg yr^{-1} and

Table 53. Nitrogen loading ranks

	Nitrogen loading[1] (kg yr^{-1})	Surface area (ha)	Nitrogen loading[1] (kg ha^{-1} yr^{-1})	Rank
Scorton Harbor	1.4E+04	4.4E-01	3.2E+04	some potential for eutrophication[2]
Merrimack River	1.1E+07	8.9E+02	1.3E+04	
Ipswich River	3.1E+05	1.5E+02	2.0E+03	
Lynn Harbor	6.9E+05	4.8E+02	1.4E+03	
North River (South Shore)	1.5E+05	1.1E+02	1.3E+03	
Green Harbor River	1.0E+04	1.9E+01	5.4E+02	
Weymouth Fore River	2.5E+05	5.2E+02	4.8E+02	
Parker River	9.7E+04	2.0E+02	4.8E+02	
Sesuit Harbor	5.6E+03	1.2E+01	4.7E+02	
Sandwich Harbor	1.1E+04	2.6E+01	4.0E+02	
North River (North Shore)	8.2E+03	3.7E+01	2.2E+02	
Weymouth Back River	4.2E+04	2.3E+02	1.9E+02	
Rock Harbor	1.0E+03	5.7E+00	1.8E+02	
Manchester Harbor	1.5E+04	8.5E+01	1.8E+02	
Gloucester Harbor	9.7E+04	6.3E+02	1.6E+02	
South River	2.6E+04	1.7E+02	1.5E+02	
Saugus River	8.0E+03	7.0E+01	1.2E+02	low potential for eutrophication[3]
Rowley River	1.5E+04	1.3E+02	1.1E+02	
Hull Bay	4.7E+04	4.4E+02	1.1E+02	
Plymouth Harbor	6.1E+04	5.7E+02	1.1E+02	
Hingham Bay	3.6E+05	3.5E+03	1.0E+02	
Bass River	2.8E+03	3.2E+01	8.8E+01	
Plum Island Sound	1.3E+05	1.6E+03	8.0E+01	
Pamet River	2.3E+03	3.2E+01	7.2E+01	
Danvers River	1.4E+04	2.0E+02	6.8E+01	
Scituate Harbor	5.9E+03	9.0E+01	6.6E+01	
Cohasset Harbor	1.5E+04	2.3E+02	6.3E+01	
Kingston Bay	2.0E+04	3.6E+02	5.6E+01	
Beverly Harbor	2.8E+04	5.0E+02	5.5E+01	
Sandy Bay	1.8E+04	3.8E+02	4.6E+01	non-eutrophic[4]
Pines River	7.4E+03	1.7E+02	4.3E+01	
Essex Bay	2.5E+04	8.3E+02	3.0E+01	
Barnstable Harbor	4.0E+04	1.3E+03	3.0E+01	
Weir River	5.9E+03	2.2E+02	2.7E+01	
Annisquam River	8.7E+03	3.6E+02	2.4E+01	
Hingham Harbor	5.8E+03	2.9E+02	2.0E+01	
Salem Harbor	6.4E+03	3.8E+02	1.7E+01	
Ipswich Bay	4.7E+04	3.0E+03	1.6E+01	
Eagle Hill River	3.0E+03	1.9E+02	1.6E+01	
Duxbury Bay	2.2E+04	2.0E+03	1.1E+01	
Wellfleet Harbor	2.8E+04	2.5E+03	1.1E+01	
Provincetown Harbor	1.2E+04	1.3E+03	9.0E+00	
Marblehead Harbor	1.3E+03	1.4E+02	8.8E+00	
Nahant Bay	9.9E+03	1.3E+03	7.5E+00	

[1]Values are the average nitrogen loadings for watershed delineations

[2]Loadings in this range are above the general range of loadings reported for nitrogen limited estuaries that are eutrophic (Jaworski, 1981).

[3]Loadings in this range are above the "permissible" loading of 54 kg ha^{-1} yr^{-1} estimated by Jaworski (1981), but are below the upper range of loadings (128 kg ha^{-1} yr^{-1}) reported for non-eutrophic estuaries.

[4]Loadings in this range are below the "permissible" loading of 54 kg ha^{-1} yr^{-1} estimated by Jaworski (1981); empirical data from Jaworski also suggest loadings in this range would not result in eutrophication.

1.0×10^3 kg yr^{-1}, compared to estimates of 1.3×10^4 kg yr^{-1} and 1.4×10^4 kg yr^{-1} by this report. Some of these differences are explained by the selection of input parameters. For example, Eichner assumes an atmospheric depositional rate of 0.2 kg ha^{-1} yr^{-1} for wet deposition. This is over an order of magnitude less than this report's estimated range of 3.7 to 12.6 kg ha^{-1} yr^{-1} (Golomb, 1991). It is likely that the value of 0.2 kg ha^{-1} yr^{-1} underestimates atmospheric deposition since it does not account for dry deposition and may underestimate total annual precipitation. These differences highlight the importance of input parameters and the uncertainty of the methodology.

As part of their *The State of Boston Harbor* report, The Massachusetts Water Resources Authority (MWRA) estimated 3.6×10^5 kg nitrogen yr^{-1} enters the Weymouth Fore and Back Rivers (MWRA, 1995), compared to our estimate of 3.0×10^5 kg yr^{-1}. This agreement is not surprising, since this report uses the same assumption regarding Nut Island treatment plant effluent as in the MWRA report and effluent accounts for the majority of the nitrogen entering the system.

3.1.3 Nitrogen sensitivity

Table 54 summarizes the nitrogen sensitivity ranks for the study embayments. The embayments with the highest nitrogen indices (*i.e.*, most sensitive) were Danvers River, Duxbury Bay, Ipswich River, Plum Island Sound, Weir River, Weymouth Fore River, Annisquam River, Wellfleet Harbor and the Weymouth Back River.

3.1.4 Comparison of ranks

Table 55 illustrates the relationship between the nitrogen loading rank and embayment sensitivity rank for each embayment. The matrix indicates that the Ipswich River, Weymouth Fore River and Weymouth Back River have the highest potential for eutrophication of the study embayments[6]. Additionally, the matrix indicates that the Merrimack River, North River (South Shore), Parker River, Sandwich Harbor, Green Harbor River, South River, Gloucester Harbor and Manchester Harbor may also be at some risk of eutrophication. Although the nitrogen loadings for Lynn Harbor, Scorton Harbor, Sesuit Harbor, North River (North Shore) and Rock Harbor also resulted in ranks of "some potential for eutrophication", these embayments scored low on nitrogen sensitivity. The risk to these embayments is therefore less certain. This report judges the embayments at least risk of eutrophication to be those embayments less than the

[6] Because the embayment ranks are *relative*, they to do not necessarily indicate that particular embayments will experience eutrophication. However, the results are useful in prioritizing which embayments may require further study.

Table 54. Nitrogen sensitivity ranks

	Embayment surface area:saltwater wetlands score	Embayment surface area:inlet width score	Shoreline development	Total score	Rank
Danvers River	40	60	100	200	High[1]
Duxbury Bay	40	40	100	180	
Ipswich River	10	60	100	170	
Plum Island Sound	10	60	100	170	
Weir River	40	30	100	170	
Weymouth Fore River	40	30	100	170	
Annisquam River	30	30	100	160	
Wellfleet Harbor	80	40	40	160	
Weymouth Back River	40	20	100	160	
Barnstable Harbor	10	40	100	150	Moderate[2]
Essex Bay	10	40	100	150	
Merrimack River	10	40	100	150	
Pines River	10	40	100	150	
Sandwich Harbor	10	40	100	150	
South River	10	40	100	150	
Gloucester Harbor	80	30	30	140	
Parker River	10	30	100	140	
Rowley River	10	30	100	140	
Salem Harbor	80	30	30	140	
Saugus River	30	10	100	140	
Green Harbor River	10	20	100	130	
Manchester Harbor	80	10	40	130	
North River (South Shore)	10	20	100	130	
Provincetown Harbor	80	40	10	130	
Bass River	80	10	30	120	
Beverly Harbor	80	30	10	120	
Eagle Hill River	10	10	100	120	
Hingham Bay	80	30	10	120	
Hingham Harbor	80	20	10	110	
Marblehead Harbor	80	20	10	110	
Nahant Bay	80	20	10	110	
Plymouth Harbor	80	20	10	110	
Hull Bay	80	10	10	100	Low[3]
North River (North Shore)	80	10	10	100	
Sandy Bay	80	10	10	100	
Kingston Bay	40	20	30	90	
Scituate Harbor	30	20	40	90	
Lynn Harbor	30	20	30	80	
Pamet River	10	30	40	80	
Ipswich Bay	30	30	10	70	
Cohasset Harbor	10	20	30	60	
Rock Harbor	10	10	30	50	
Sesuit Harbor	10	20	10	40	
Scorton Harbor	10	10	10	30	

[1]High rank contains values greater than the 75th percentile
[2]Moderate rank contains values between the 25th to 75th percentile
[3]Low rank contains values less than the 25th percentile

Table 55. Comparison of nitrogen loading and nitrogen sensitivity ranks

Nitrogen sensitivity relative to other study embayments

← increasing risk of eutrophication

↑ **Nitrogen loading** (increasing risk of eutrophication)

	High[4]	**Moderate**[5]	**Low**[6]
some potential for eutrophication[1]	Ipswich River Weymouth Fore River Weymouth Back River	Merrimack River North River (South) Parker River Sandwich Harbor Green Harbor River South River Gloucester Harbor Manchester Harbor	Lynn Harbor Scorton Harbor Sesuit Harbor North River (North) Rock Harbor
low potential for eutrophication[2]	Plum Island Sound Danvers River	Beverly Harbor Hingham Bay Plymouth Harbor Saugus River Bass River Rowley River	Cohassett Harbor Hull Bay Pamet River Scituate Harbor Kingston Bay
non-eutrophic[3]	Weir River Annisquam River Duxbury Bay Wellfleet Harbor	Essex Bay Pines River Barnstable Harbor Salem Harbor Hingham Harbor Eagle Hill River Nahant Bay Provincetown Harbor Marblehead Harbor	Sandy Bay Ipswich Bay

[1]Loadings in this range are above the general range of loadings reported for nitrogen limited estuaries that are eutrophic (Jaworski, 1981).
[2]Loadings in this range are above the "permissible" loading of 54 kg ha^{-1} yr^{-1} estimated by Jaworski (1981), but are below the upper range of loadings (128 kg ha^{-1} yr^{-1}) reported for non-eutrophic estuaries.
[3]Loadings in this range are below the "permissible" loading of 54 kg ha^{-1} yr^{-1} estimated by Jaworski (1981); empirical data from Jaworski also suggest loadings in this range would not result in eutrophication.
[4]High rank contains values greater than the 75th percentile
[5]Moderate rank contains values between the 25th to 75th percentile
[6]Low rank contains values less than the 25th percentile

Jaworski "permissible" loading of 54 kg ha^{-1} yr^{-1}, regardless of their respective nitrogen sensitivity ranks.

Note that the results should be interpreted with caution until field work can confirm these embayment classifications (see Recommendations). For example, data collected from the Weymouth Fore River (MWRA, 1995) suggests that this river suffers from poor water quality and high nutrient concentrations, which agrees with this report's ranking scheme. However, the Weymouth Back River, which also ranked high in this analysis, generally does not exhibit conditions associated with eutrophication (MWRA, 1995).

3.2 Deliverables

In addition to this report, Menzie-Cura & Associates, Inc. has provided MBP with an electronic copy of all tables and appendices in the form of a Microsoft Excel workbook. The workbook was constructed so that individual input terms (*i.e.*, nitrogen loading coefficients, land use areas, etc.) can easily be adjusted, allowing for the revision of nitrogen loadings estimates as additional information becomes available. The workbook includes the following information:

- land use areas within each watershed;
- land use rates of change within each watershed;
- estimates of populations within each watershed;
- housing and sewerage statistics within each watershed; and,
- nitrogen loading estimates for each watershed.

Menzie-Cura & Associates, Inc. also provided MBP with the delineations and land use data (color plots and ARC/INFO files) for each of the study embayments, which can be obtained by contacting the MBP office at (617) 727-9530 ext. 406.

3.3 Recommendations – Title

The results of this study are intended to provide a screening-level assessment of the eutrophication potential of Massachusetts Bays embayments. The results should be used to identify embayments which may require further evaluation. In addition to the information provided in this study, the authors recommend that MBP:

- *Obtain flushing data for the study embayments.* Currently, the report relies upon a nitrogen sensitivity index to rank embayments. The authors recommend the use of flushing data over a sensitivity index. Once such data has been collected, it can be incorporated into a variety of models to estimate trophic condition. For example, Biggs *et al.* (1989) adapted the Vollenweider approach to describe estuarine susceptibility to nutrients and eutrophication. Their approach

involved developing a classification scheme based on physical and hydrologic data and pairing it with watershed classification based on anthropogenic activity and physical characteristics of the watershed.

2 *Conduct a sampling program to verify the results of this study and provide insights into embayment water quality.* To conserve resources, MBP should focus on a subset of the study embayments. This subset should include embayments representative of each nitrogen loading rank to substantiate the findings of this report. A recommended short list includes:

<u>Short list of study embayments for field verification</u>

Some potential for eutrophication:

Ipswich River, Gloucester Harbor, Sesuit Harbor, Lynn Harbor, South River

Low potential for eutrophication:

Danvers River, Plymouth Harbor, Scituate Harbor

Eutrophication unlikely:

Weir River, Salem Harbor, Sandy Bay

These embayments represent a wide-range of land uses, surficial geologies and population sizes.

For such a short list, the authors recommend recording embayment conditions and measuring water quality parameters. Indicators of eutrophication include presence or absence of eelgrass, hypoxic or anoxic conditions, sediment organic content and macroalgae blooms. Water quality parameters which could be measured include temperature, dissolved oxygen levels, secchi depth, nutrient concentrations (e.g., nitrate, nitrite, total kjeldahl nitrogen, total phosphorus), phytoplankton stock and productivity, and chlorophyll-a. Results of field verification may also provide a better understanding of the uncertainty associated with land-use analyses.

3 *Contact communities near embayments to discuss local water quality conditions.* Such discussions could be useful in identifying particular areas within an embayment that may require further study and management.

4 *Develop nitrogen loading coefficients for surface runoff.* If future nitrogen loading estimates are undertaken, the authors recommend developing nitrogen loading coefficients for areas whose nitrogen transport is primarily controlled by surface runoff (i.e., the North Shore). Because the nitrogen loading coefficients play a significant role in a land-use analysis, surface runoff coefficients for the North Shore will likely provide some refinement on the estimates provided in this report.

5 *Obtain the necessary data to estimate off-shore contributions of nitrogen.* For coastal embayments, exchange with adjacent ocean waters can potentially supply large amounts of nitrogen. Tidal contributions of nitrogen can be significant when tidal inflows are high and/or tidally exchanged waters have high nitrogen concentrations. However, few studies have attempted to quantify tidal contributions due to difficulties in modeling such loadings. Oceanic nitrogen loadings may not represent available nitrogen in coastal systems because nitrogen in ocean waters will enter coastal embayments at depth due the presence of a picnocline. If the bay or estuary is not well-mixed, this nitrogen may remain at depths below the photic zone and thus may not enhance algae growth. In addition, a significant fraction of the nitrogen that enters coastal embayments on the ingoing tides may be the same nitrogen that has previously left the embayment on the outgoing tides. Tidal inputs may thus be offset by tidal losses, and in some cases oceanic loadings may not represent available nitrogen in coastal systems. In other areas, such as upwelling areas, off-shore inputs may be very important.

A variety of physically-based exchange models can be used to estimate hydraulic loadings to coastal embayments, such as harbors and estuaries. The authors discuss two such approaches, the tidal prism model and the salinity balance model, below. Both models require data which are not readily available for many Massachusetts embayments, and these data limitations prevented even a cursory evaluation of oceanic loadings. Both models can only provide a first-order approximation of offshore loadings because coastal systems are highly dynamic in nature and may not be adequately represented by simple models incorporating limited data sets.

Tidal Prism Model

This model assumes that the volumetric in-flow of tidal waters can be computed based on the geometry of a coastal embayment and the tidal height of the embayment. The volumetric in-flow can then be multiplied by the annual average concentration of nitrogen at the open-ocean boundary to determine the annual oceanic nitrogen loading to an embayment of interest. The informational requirements of this approach thus include: tidal heights of coastal embayments, geometry of embayments (e.g., surface area and average depth), and the average concentration of total nitrogen (TN) at the open-ocean boundary.

For an embayment, the following formula could be used to determine the annual off-shore nitrogen loading:

Annual N loading of tidal inflow = tidal prism volume * annual average TN concentration
* 2 tides/day * 365 days/year

where, tidal prism volume = embayment surface area * tidal height

Extensive monitoring data are necessary to obtain a useful average annual TN concentration. TN concentrations are seasonally-dependent, and monthly monitoring data should be used to calculate a representative average. The authors recommend that parties interested in such data collection should review the monitoring plan developed and implemented as part of the Wellfleet Harbor Mini-Bays Project.

Salinity Balance Model

This model assumes that the volumetric in-flow of tidal waters can be estimated by constructing a salinity balance for a coastal embayment and requires: annual average freshwater volumetric flow, annual average salinity at the open-ocean boundary, annual average salinity inside the embayment, and the annual average concentration of total nitrogen (TN) at the open-ocean boundary.

The volumetric in-flow of tidal waters (T_i) is calculated in the following manner:

$$T_i = [S_o / (S_i - S_o)] * R$$

where, S_i = annual average salinity at the open-ocean boundary;

S_o = annual average salinity inside the embayment; and

R = annual average volumetric inflow of freshwater into the embayment.

The volumetric in-flow of tidal waters can then be multiplied by the annual average concentration of nitrogen at the open-ocean boundary to determine the annual oceanic nitrogen loading to an embayment of interest. Extensive monitoring data are necessary to obtain useful annual average TN concentrations and annual average salinities.

The annual average volumetric inflow of freshwater into an embayment can be estimated by using annual river flows for embayments served by major river systems. For embayments not served by major river systems, annual average freshwater flows can be estimated by multiplying annual average precipitation rates for the embayment watershed by appropriate runoff or recharge coefficients. For embayment watersheds having predominantly bedrock geologies (*i.e.*, embayments on the North and South Shores), a runoff coefficient of 0.35 may be appropriate. This coefficient was proposed by Nationwide Urban Runoff Program (NURP) and is an average for residential, commercial, and open land uses (USEPA, 1983). For embayment watersheds where sand and till materials predominate and groundwater is the principal transport medium for freshwater into coastal embayments (*i.e.*, Cape Cod), an annual recharge rate of 16 inches per year may be appropriate. This value is an assumed value for groundwater lenses of Cape Cod (Ed Eichner, Cape Cod Commission, personal communication).

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Table 1. Summary of study embayments

Region	Embayments/subembayments
Cape Ann	
	Merrimack River
	Plum Island Sound/
	Parker River
	Rowley River
	Eagle Hill River
	Ipswich River
	Ipswich Bay/
	Annisquam River
	Essex Bay
	Sandy Bay
	Gloucester Harbor
Boston Harbor	
	Hingham Bay/
	Weymouth Fore River
	Weymouth Back River
	Hingham Harbor
	Weir River
	Hull Bay
Massachusetts Bay	
	Beverly Harbor/
	Bass River
	North River
	Danvers River
	Salem Harbor
	Manchester Harbor
	Marblehead Harbor
	Nahant Bay
	Lynn Harbor/
	Saugus River
	Pines River
	Cohasset Harbor
	Scituate Harbor
	South River
	North River

Table 1. Summary of study embayments, continued

Region	Embayments/subembayments
Cape Cod Bay	
	Green Harbor River
	Duxbury Bay
	Kingston Bay
	Plymouth Harbor
	Sandwich Harbor
	Scorton Harbor
	Barnstable Harbor
	Sesuit Harbor
	Rock Harbor
	Pamet River
	Wellfleet Harbor
	Provincetown Harbor

Table 2. Nitrogen loading coefficients for open water

Embayment surface

	Atmospheric deposition[a] ($kg\ ha^{-1}\ yr^{-1}$)		
	low	mean	high
Wet deposition	3.1	3.8	6.9
Dry deposition	0.6	1.9	5.7
Total deposition	3.7	5.7	12.6

Open water within watershed

	Atmospheric deposition[a] ($kg\ ha^{-1}\ yr^{-1}$)	Nitrogen losses[b,c] (%)	Nitrogen loading coefficient ($kg\ ha^{-1}\ yr^{-1}$)
low	3.7	100	0.0
mean	5.7	56	2.5
high	12.6	14	10.8

Source:
[a]Golomb et al. 1996. Atmospheric deposition of contaminants onto Massachusetts and Cape Cod Bays. Massachusetts Bays Program. Boston, MA.

[b]Valiela et al. In press. Nitrogen loading from coastal watersheds to receiving waters: review of methods and calculation of loading to Waquoit Bay.

[c]Mean nitrogen losses = 100% - (44% not retained within the pond or lake).
Low and high nitrogen losses represent reported range.

Table 3. Nitrogen loading coefficients for commercial and industrial land uses

Commerce, industry, transportation, mining and waste disposal

	Atmospheric deposition[a] (kg ha^{-1} yr^{-1})	Nitrogen losses[b,c] (%)	Nitrogen loading coefficient (kg ha^{-1} yr^{-1})
low	3.7	75	0.9
mean	5.7	75	1.4
high	12.6	75	3.2

Source:

[a]Golomb et al. 1996. Atmospheric deposition of contaminants onto Massachusetts and Cape Cod Bays Massachusetts Bays Program. Boston, MA.

[b]Valiela et al. In press. Nitrogen loading from coastal watersheds to receiving waters: review of methods and calculation of loading to Waquoit Bay.

[c]Nitrogen losses = 100% - (39% not lost in vadose zone x 65% not lost in aquifer).

Table 4. Nitrogen loading coefficients for residential land use

Residential, multifamily

	Nitrogen application rate[a,b] (kg ha^{-1} yr^{-1})	Associated N losses[a,c] (%)	Lawn:lot area[d] (%)	Fertilizer component (kg ha^{-1} yr^{-1})	Atmospheric deposition[e] (kg ha^{-1} yr^{-1})	Associated N losses[a,f] (%)	Atmospheric component (kg ha^{-1} yr^{-1})	Nitrogen in sewage[a] (kg person^{-1})	Associated N losses[a] (%)	Occupancy rate[g] (persons unit^{-1})	Unit density[h] (units ha^{-1})	Sewage component (kg ha^{-1} yr^{-1})	Nitrogen loading coefficient (kg ha^{-1} yr^{-1})
low	29	85	10	0.4	3.7	90	0.4	1.8	74	3	12.4	17.2	18.0
mean	72	85	20	2.2	5.7	90	0.5	4.8	74	3	12.4	45.9	48.6
high	101	85	30	4.7	12.6	90	1.2	5.4	74	3	12.4	51.6	57.5

Residential, < ¼ acre lot

	Nitrogen application rate[a,b] (kg ha^{-1} yr^{-1})	Associated N losses[a,c] (%)	Lawn:lot area[d] (%)	Fertilizer component (kg ha^{-1} yr^{-1})	Atmospheric deposition[e] (kg ha^{-1} yr^{-1})	Associated N losses[a,f] (%)	Atmospheric component (kg ha^{-1} yr^{-1})	Nitrogen in sewage[a] (kg person^{-1})	Associated N losses[a] (%)	Occupancy rate[g] (persons unit^{-1})	Unit density[h] (units ha^{-1})	Sewage component (kg ha^{-1} yr^{-1})	Nitrogen loading coefficient (kg ha^{-1} yr^{-1})
low	29	85	10	0.4	3.7	90	0.4	1.8	74	3	9.2	12.7	13.5
mean	72	85	20	2.2	5.7	90	0.5	4.8	74	3	9.2	33.9	36.7
high	101	85	30	4.7	12.6	90	1.2	5.4	74	3	9.2	38.2	44.1

Residential, ¼ to ½ acre lot

	Nitrogen application rate[a,b] (kg ha^{-1} yr^{-1})	Associated N losses[a,c] (%)	Lawn:lot area[d] (%)	Fertilizer component (kg ha^{-1} yr^{-1})	Atmospheric deposition[e] (kg ha^{-1} yr^{-1})	Associated N losses[a,f] (%)	Atmospheric component (kg ha^{-1} yr^{-1})	Nitrogen in sewage[a] (kg person^{-1})	Associated N losses[a] (%)	Occupancy rate[g] (persons unit^{-1})	Unit density[h] (units ha^{-1})	Sewage component (kg ha^{-1} yr^{-1})	Nitrogen loading coefficient (kg ha^{-1} yr^{-1})
low	29	85	10	0.4	3.7	90	0.4	1.8	74	3	5.0	6.9	7.7
mean	72	85	20	2.2	5.7	90	0.5	4.8	74	3	5.0	18.3	21.1
high	101	85	30	4.7	12.6	90	1.2	5.4	74	3	5.0	20.6	26.5

Residential, > ½ acre lot

	Nitrogen application rate[a,b] (kg ha^{-1} yr^{-1})	Associated N losses[a,c] (%)	Lawn:lot area[d] (%)	Fertilizer component (kg ha^{-1} yr^{-1})	Atmospheric deposition[e] (kg ha^{-1} yr^{-1})	Associated N losses[a,f] (%)	Atmospheric component (kg ha^{-1} yr^{-1})	Nitrogen in sewage[a] (kg person^{-1})	Associated N losses[a] (%)	Occupancy rate[g] (persons unit^{-1})	Unit density[h] (units ha^{-1})	Sewage component (kg ha^{-1} yr^{-1})	Nitrogen loading coefficient (kg ha^{-1} yr^{-1})
low	29	85	10	0.4	3.7	90	0.4	1.8	74	3	2.5	3.4	4.2
mean	72	85	20	2.2	5.7	90	0.5	4.8	74	3	2.5	9.2	11.9
high	101	85	30	4.7	12.6	90	1.2	5.4	74	3	2.5	10.3	16.2

[a]Valiela et al. In press. Nitrogen loading from coastal watersheds to receiving waters: review of methods and calculation of loading to Waquoit Bay.

[b]Range of reported application rates (Valiela et al.) x 59% fertilizer useage (mean of reported values by Valiela et al. and Costa).

[c]Fertilizer nitrogen losses for lawns = 100% - (61% not lost as gasses x 39% not lost in vadose zone x 65% not lost in aquifer).

[d]Assumed range.

[e]Golomb et al. 1996. Atmospheric deposition of pollutants onto Massachusetts and Cape Cod Bays. Massachusetts Bays Program. Boston, MA.

[f]Atmospheric nitrogen losses for lawns = 100% - (38% not retained in plants and soil x 39% not lost in vadose zone x 65% not lost in aquifer).

[g]This occupany rate is for illustration only. Actual occupancy rates used to derive residential loading coefficients are obtained from US Census data by watershed.

[h]Costa et al. 1994. Use of a Geographic Information System to estimate nitrogen loading to coastal watersheds (draft). Buzzards Bay Project technical report.

Table 5. Nitrogen loading coefficients for naturally-vegetated land uses

Forest, open land and urban open areas

	Atmospheric deposition[a] ($kg\ ha^{-1}\ yr^{-1}$)	Nitrogen losses[b,c] (%)	Nitrogen loading coefficient ($kg\ ha^{-1}\ yr^{-1}$)
low	3.7	91	0.3
mean	5.7	91	0.5
high	12.6	91	1.1

Wetland and salt marsh

	Atmospheric deposition[a] ($kg\ ha^{-1}\ yr^{-1}$)	Nitrogen losses[b,d] (%)	Nitrogen loading coefficient ($kg\ ha^{-1}\ yr^{-1}$)
low	3.7	100	0.0
mean	5.7	77	1.3
high	12.6	14	10.8

Source:
[a]Golomb et al. 1996. Atmospheric deposition of pollutants onto Massachusetts and Cape Cod Bays. Massachusetts Bays Program. Boston, MA.

[b]Valiela et al. In press. Nitrogen loading from coastal watersheds to receiving waters: review of methods and calculation of loading to Waquoit Bay.

[c]Nitrogen losses = 100% - (35% not retained in plants and soil x 39% not lost in vadose zone x 65% not lost in aquifer).

[d]Mean nitrogen losses = 100% - (23% not retained in plants and sediment).
Low and high nitrogen losses represent reported range.

Table 6. Nitrogen loading coefficients for fertilized turf

Participatory and spectator recreation

Data used to estimate loading coefficients[a]

Location	Associated land use	Nitrogen application rate ($kg\ ha^{-1}\ yr^{-1}$) Fairways/roughs	Tees	Greens	Area-weighted nitrogen application rate[b] ($kg\ ha^{-1}\ yr^{-1}$)
Bass River	Golf course	102	151	278	113.3
Eastward	Golf course	115	169	181	121.0
Hyannisport	Golf course	110	142	183	115.3
Falmouth	Golf course	122	98	423	135.9

	Area-weighted nitrogen application rate[b] ($kg\ ha^{-1}\ yr^{-1}$)	Associated N losses[c,d] (%)	Fertilizer component ($kg\ ha^{-1}\ yr^{-1}$)
low	113.3	85	17.5
mean	121.3	85	18.8
high	135.9	85	21.0

	Atmospheric deposition[e] ($kg\ ha^{-1}\ yr^{-1}$)	Associated N losses[c,f] (%)	Atmospheric component ($kg\ ha^{-1}\ yr^{-1}$)
low	3.7	90	0.4
mean	5.7	90	0.5
high	12.6	90	1.2

	Fertilizer component ($kg\ ha^{-1}\ yr^{-1}$)	Atmospheric component ($kg\ ha^{-1}\ yr^{-1}$)	Nitrogen loading coefficient ($kg\ ha^{-1}\ yr^{-1}$)
low	17.5	0.4	17.9
mean	18.8	0.5	19.3
high	21.0	1.2	22.2

Source:

[a]Cape Cod Commission. June, 1990. The Cape Cod Golf Course Monitoring Project.

[b]Assumes fairway/roughs are 90% of golf course area, tees are 5% of area, and greens are 5% of area (Frimpter et al., 1988).

[c]Valiela et al. In press. Nitrogen loading from coastal watersheds to receiving waters: review of methods and calculation of loading to Waquoit Bay.

[d]Fertilizer nitrogen losses = 100% - (61% not lost as gasses x 39% not lost in vadose zone x 65% not lost in aquifer).

[e]Golomb et al. 1996. Atmospheric deposition of pollutants onto Massachusetts and Cape Cod Bays. Massachusetts Bays Program. Boston, MA.

[f]Atmospheric nitrogen losses in turf = 100% - (38% not retained in plants and soil x 39% not lost in vadose zone x 65% not lost in aquifer).

Table 7. Nitrogen loading coefficients for agriculture

Woody perennials

	Nitrogen application rate[a] (kg ha^{-1} yr^{-1})	Associated land use[a]	Associated N losses[b,c] (%)	Fertilizer component (kg ha^{-1} yr^{-1})	Atmospheric deposition[d] (kg ha^{-1} yr^{-1})	Associated N losses[b,e] (%)	Atmospheric component (kg ha^{-1} yr^{-1})	Nitrogen loading coefficient (kg ha^{-1} yr^{-1})
low	11	Cranberry bog	60	4.5	3.7	75	0.9	5.4
mean	34	Cranberry bog	60	13.4	5.7	75	1.4	14.8
high	45	Cranberry bog	60	17.8	12.6	75	3.1	21.0

Cropland

	Nitrogen application rate[f] (kg ha^{-1} yr^{-1})	Associated land use[f]	Associated N losses[b,g] (%)	Fertilizer component (kg ha^{-1} yr^{-1})	Atmospheric deposition[d] (kg ha^{-1} yr^{-1})	Associated N losses[b,h] (%)	Atmospheric component (kg ha^{-1} yr^{-1})	Nitrogen loading coefficient (kg ha^{-1} yr^{-1})
low	70	Corn	85	10.8	3.7	90	0.4	11.2
mean	100	Corn	85	15.5	5.7	90	0.5	16.0
high	130	Corn	85	20.1	12.6	90	1.2	21.3

Pasture

	Nitrogen application rate[f] (kg ha^{-1} yr^{-1})	Associated land use[f]	Associated N losses[b,g] (%)	Fertilizer component (kg ha^{-1} yr^{-1})	Atmospheric deposition[d] (kg ha^{-1} yr^{-1})	Associated N losses[b,h] (%)	Atmospheric component (kg ha^{-1} yr^{-1})	Nitrogen loading coefficient (kg ha^{-1} yr^{-1})
low	35	Pasture	85	5.4	3.7	90	0.4	5.8
mean	50	Pasture	85	7.7	5.7	90	0.5	8.3
high	65	Pasture	85	10.1	12.6	90	1.2	11.3

Source:

[a]Frimpter et al. 1988. Mass-balance nitrate model for predicting the effects of land use on groundwater quality in municipal wellhead protection areas. Boston, MA.

[b]Valiela et al. In press. Nitrogen loading from coastal watersheds to receiving waters: review of methods and calculation of loading to Waquoit Bay.

[c]Fertilizer nitrogen losses for bogs = 100% - (61% not lost as gasses x 65% not lost in aquifer).

[d]Golomb et al. 1996. Atmospheric deposition of pollutants onto Massachusetts and Cape Cod Bays. Massachusetts Bays Program. Boston, MA.

[e]Atmospheric nitrogen losses for bogs = 100% - (38% not retained in plants and sediment x 65% not lost in aquifer).

[f]Mean from Costa et al. 1994. Use of a Geographic Information System to estimate nitrogen loading to coastal watersheds (draft). Buzzards Bay Project technical report. Low and high application rates are assumed.

[g]Fertilizer nitrogen losses for cropland and pasture = 100% - (61% not lost as gasses x 39% not lost in vadose zone x 65% not lost in aquifer).

[h]Atmospheric nitrogen losses for cropland and pasture = 100% - (38% not retained in plants and soil x 39% not lost in vadose zone x 65% not lost in aquifer).

Table 8. Summary of nitrogen loading coefficients

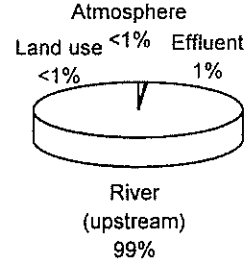
MassGIS code	MassGIS category	Description	Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$) low	mean	high
C1	Cropland	intensive agriculture (e.g., corn)	11.2	16.0	21.3
C2	Pasture	extensive agriculture (e.g., hay, dairy)	5.8	8.3	11.3
C3	Forest	forest	0.3	0.5	1.1
C4	Wetland	non-forested freshwater wetland	0.0	1.3	10.8
C5	Mining	sand, gravel and rock pits	0.9	1.4	3.2
C6	Open land	abandoned agriculture, power lines, areas of no vegetation	0.3	0.5	1.1
C7	Participatory recreation	golf courses, tennis, playgrounds, skiing	17.9	19.3	22.2
C8	Spectator recreation	stadiums, racetracks, fairgrounds, drive-ins	17.9	19.3	22.2
C9	Water-based recreation	beaches, marinas, swimming pools	3.7	5.7	12.6
C10	Residential[a]	multi-family	18.0	48.6	57.5
C11	Residential[a]	< ¼ acre lots	13.5	36.7	44.1
C12	Residential[a]	¼ to ½ acre lots	7.7	21.1	26.5
C13	Residential[a]	> ½ acre lots	4.2	11.9	16.2
C14	Salt marsh	salt marsh	0.0	1.3	10.8
C15	Commercial	general urban, shopping centers	0.9	1.4	3.2
C16	Industrial	light and heavy industry	0.9	1.4	3.2
C17	Urban open	parks, cemetaries, public and institutional greenspace	0.3	0.5	1.1
C18	Transportation	airports, docks, divided highways	0.9	1.4	3.2
C19	Waste disposal	landfills, sewage lagoons	0.9	1.4	3.2
C20	Open water	freshwater ponds and rivers	0.0	2.5	10.8
C21	Woody perennial	cranberry bogs, orchards	5.4	14.8	21.0
	Embayment surface	atmospheric deposition	3.7	5.7	12.6

[a]The residential loading coefficients used in the analysis vary based upon the watershed's occupancy rate. The values presented in this table reflect an occupancy rate of 3 persons $unit^{-1}$.

Table 9. Comparison of nitrogen loadings by source for Merrimack River

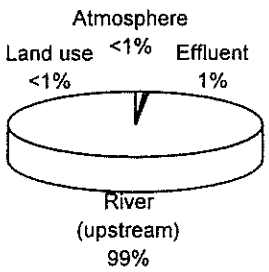
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high		Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources							
Effluent	1.1E+05	1.4E+05	2.4E+05		1.1E+05	1.4E+05	2.4E+05
Non-point sources							
Land use	1.1E+04	2.3E+04	4.9E+04		9.4E+03	2.3E+04	5.0E+04
Atmosphere	3.3E+03	5.1E+03	1.1E+04		3.3E+03	5.1E+03	1.1E+04
River (upstream)	6.7E+06	1.1E+07	1.6E+07		6.7E+06	1.1E+07	1.6E+07
1000 m delineation total	**6.8E+06**	**1.1E+07**	**1.6E+07**		**6.8E+06**	**1.1E+07**	**1.6E+07**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high		Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources							
Effluent	1.1E+05	1.4E+05	2.4E+05		1.1E+05	1.4E+05	2.4E+05
Non-point sources							
Land use	2.5E+04	4.7E+04	8.5E+04		2.1E+04	4.6E+04	8.7E+04
Atmosphere	3.3E+03	5.1E+03	1.1E+04		3.3E+03	5.1E+03	1.1E+04
River (upstream)	6.6E+06	1.1E+07	1.5E+07		6.6E+06	1.1E+07	1.5E+07
Watershed total	**6.8E+06**	**1.1E+07**	**1.6E+07**		**6.8E+06**	**1.1E+07**	**1.6E+07**



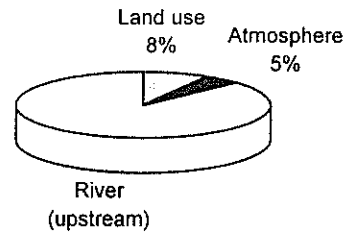
Watershed delineation ends at tidally-influenced reach of the Merrimack

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 10. Comparison of nitrogen loadings by source for Plum Island Sound Includes Parker River, Rowley River and Eagle Hill River Subwatersheds

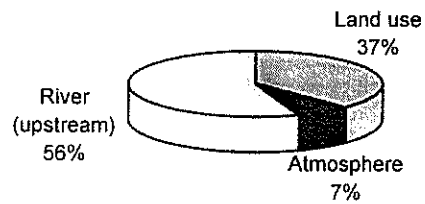
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	6.5E+03	1.6E+04	5.3E+04	7.4E+03	2.1E+04	6.0E+04
Atmosphere	5.7E+03	8.8E+03	2.0E+04	5.7E+03	8.8E+03	2.0E+04
River (upstream)	1.3E+05	1.7E+05	2.0E+05	1.3E+05	1.7E+05	2.0E+05
1000 m delineation total	**1.4E+05**	**1.9E+05**	**2.8E+05**	**1.4E+05**	**2.0E+05**	**2.8E+05**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.3E+04	4.7E+04	1.0E+05	2.6E+04	6.3E+04	1.3E+05
Atmosphere	5.8E+03	9.0E+03	2.0E+04	5.8E+03	9.0E+03	2.0E+04
River (upstream)	5.4E+04	7.0E+04	8.5E+04	5.4E+04	7.0E+04	8.5E+04
Watershed total	**8.3E+04**	**1.3E+05**	**2.1E+05**	**8.6E+04**	**1.4E+05**	**2.3E+05**

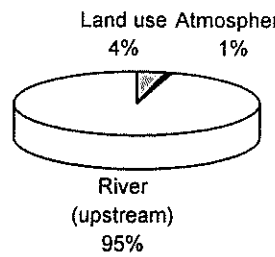


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 11. Comparison of nitrogen loadings by source for Parker River

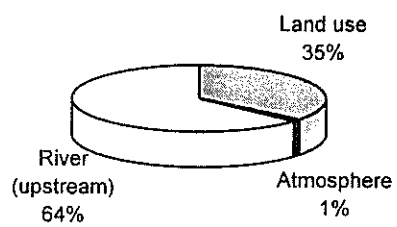
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	3.2E+03	6.4E+03	1.7E+04	3.6E+03	9.1E+03	2.1E+04
Atmosphere	6.6E+02	1.0E+03	2.3E+03	6.6E+02	1.0E+03	2.3E+03
River (upstream)	1.2E+05	1.5E+05	1.9E+05	1.2E+05	1.5E+05	1.9E+05
1000 m delineation total	**1.2E+05**	**1.6E+05**	**2.1E+05**	**1.2E+05**	**1.6E+05**	**2.1E+05**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.8E+04	3.4E+04	6.3E+04	2.0E+04	4.6E+04	8.0E+04
Atmosphere	7.5E+02	1.2E+03	2.6E+03	7.5E+02	1.2E+03	2.6E+03
River (upstream)	4.6E+04	6.1E+04	7.6E+04	4.6E+04	6.1E+04	7.6E+04
Watershed total	**6.5E+04**	**9.7E+04**	**1.4E+05**	**6.7E+04**	**1.1E+05**	**1.6E+05**



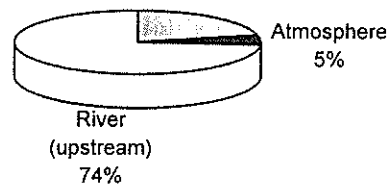
Watershed delineation ends at the first upstream dam

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 12. Comparison of nitrogen loadings by source for Rowley River

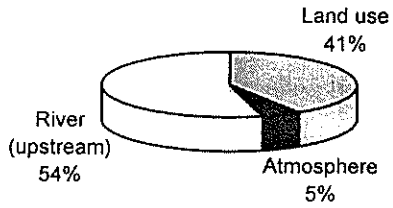
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.3E+03	3.5E+03	1.1E+04	1.8E+03	5.3E+03	1.3E+04
Atmosphere	5.0E+02	7.7E+02	1.7E+03	5.0E+02	7.7E+02	1.7E+03
River (upstream)	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04
1000 m delineation total	**1.4E+04**	**1.6E+04**	**2.4E+04**	**1.4E+04**	**1.8E+04**	**2.7E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.7E+03	6.2E+03	1.4E+04	3.4E+03	8.8E+03	1.8E+04
Atmosphere	5.0E+02	7.7E+02	1.7E+03	5.0E+02	7.7E+02	1.7E+03
River (upstream)	8.2E+03	8.2E+03	8.2E+03	8.2E+03	8.2E+03	8.2E+03
Watershed total	**1.1E+04**	**1.5E+04**	**2.4E+04**	**1.2E+04**	**1.8E+04**	**2.8E+04**



Watershed delineation ends at the first upstream dam

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 13. Comparison of nitrogen loadings by source for Eagle Hill River

Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})				Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high		low	mean	high
Point sources							
Effluent	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
Non-point sources							
Land use	7.6E+02	1.9E+03	7.1E+03	Atmosphere 36% / Land use 64%	6.7E+02	2.1E+03	7.3E+03
Atmosphere	7.2E+02	1.1E+03	2.4E+03		7.2E+02	1.1E+03	2.4E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**1.5E+03**	**3.0E+03**	**9.5E+03**		**1.4E+03**	**3.2E+03**	**9.7E+03**

Loadings for watershed delineation

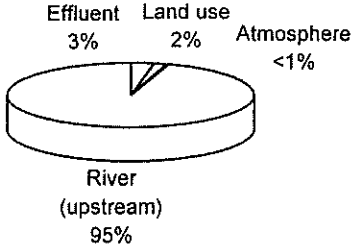
	Present nitrogen loading (kg y^{-1})				Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high		low	mean	high
Point sources							
Effluent	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
Non-point sources							
Land use	7.6E+02	1.9E+03	7.1E+03	Atmosphere 36% / Land use 64%	6.7E+02	2.1E+03	7.3E+03
Atmosphere	7.2E+02	1.1E+03	2.4E+03		7.2E+02	1.1E+03	2.4E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
Watershed total	**1.5E+03**	**3.0E+03**	**9.5E+03**		**1.4E+03**	**3.2E+03**	**9.7E+03**

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 14. Comparison of nitrogen loadings by source for Ipswich River

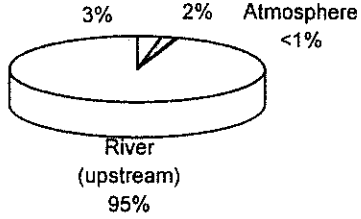
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})				Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high		low	mean	high
Point sources							
Effluent	6.5E+02	9.4E+03	3.0E+04		6.5E+02	9.4E+03	3.0E+04
Non-point sources							
Land use	2.3E+03	5.1E+03	1.2E+04		2.0E+03	5.4E+03	1.3E+04
Atmosphere	5.7E+02	8.7E+02	1.9E+03		5.7E+02	8.7E+02	1.9E+03
River (upstream)	1.9E+05	2.9E+05	5.9E+05		1.9E+05	2.9E+05	5.9E+05
1000 m delineation total	**1.9E+05**	**3.1E+05**	**6.4E+05**		**1.9E+05**	**3.1E+05**	**6.4E+05**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})				Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high		low	mean	high
Point sources							
Effluent	6.5E+02	9.4E+03	3.0E+04		6.5E+02	9.4E+03	3.0E+04
Non-point sources							
Land use	3.1E+03	6.3E+03	1.4E+04		2.5E+03	6.2E+03	1.4E+04
Atmosphere	5.7E+02	8.7E+02	1.9E+03		5.7E+02	8.7E+02	1.9E+03
River (upstream)	1.9E+05	2.9E+05	5.9E+05		1.9E+05	2.9E+05	5.9E+05
Watershed total	**1.9E+05**	**3.1E+05**	**6.4E+05**		**1.9E+05**	**3.1E+05**	**6.4E+05**



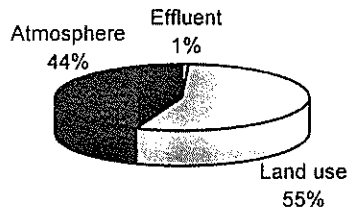
Watershed delineation ends at the first upstream dam

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 15. Comparison of nitrogen loadings by source for Ipswich Bay Includes Essex Bay and Annisquam River Subwatersheds

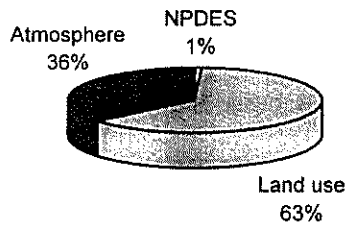
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	2.6E+02	3.6E+02	4.9E+02	2.6E+02	3.6E+02	4.9E+02
Non-point sources						
Land use	9.1E+03	2.1E+04	4.3E+04	1.1E+04	2.9E+04	5.5E+04
Atmosphere	1.1E+04	1.7E+04	3.7E+04	1.1E+04	1.7E+04	3.7E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**2.0E+04**	**3.8E+04**	**8.1E+04**	**2.2E+04**	**4.7E+04**	**9.3E+04**



Loadings for watershed delineation

	Present nitrogen loading[a] (kg y^{-1})			Future nitrogen loading[b] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
NPDES	2.6E+02	3.6E+02	4.9E+02	2.6E+02	3.6E+02	4.9E+02
Non-point sources						
Land use	1.3E+04	2.9E+04	6.0E+04	1.9E+04	5.0E+04	8.7E+04
Atmosphere	1.1E+04	1.7E+04	3.7E+04	1.1E+04	1.7E+04	3.7E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**2.4E+04**	**4.7E+04**	**9.7E+04**	**3.0E+04**	**6.7E+04**	**1.3E+05**



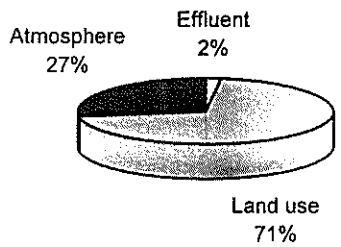
1990 land use data not available for Hamilton, Wenham, and Manchester

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 16. Comparison of nitrogen loadings by source for Essex Bay

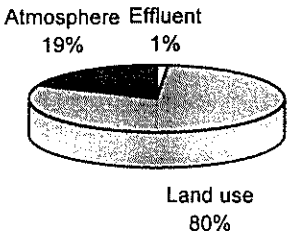
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	2.6E+02	3.6E+02	4.9E+02	2.6E+02	3.6E+02	4.9E+02
Non-point sources						
Land use	5.7E+03	1.2E+04	2.8E+04	6.5E+03	1.6E+04	3.4E+04
Atmosphere	3.1E+03	4.7E+03	1.0E+04	3.1E+03	4.7E+03	1.0E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**9.1E+03**	**1.7E+04**	**3.9E+04**	**9.8E+03**	**2.2E+04**	**4.5E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	2.6E+02	3.6E+02	4.9E+02	2.6E+02	3.6E+02	4.9E+02
Non-point sources						
Land use	9.3E+03	2.0E+04	4.3E+04	1.3E+04	3.4E+04	6.2E+04
Atmosphere	3.1E+03	4.7E+03	1.0E+04	3.1E+03	4.7E+03	1.0E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**1.3E+04**	**2.5E+04**	**5.4E+04**	**1.6E+04**	**3.9E+04**	**7.3E+04**



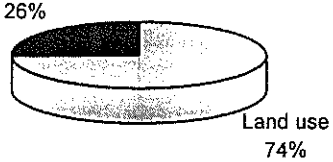
1990 land use data not available for Hamilton, Wenham, and Manchester

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 17. Comparison of nitrogen loadings by source for Annisquam River

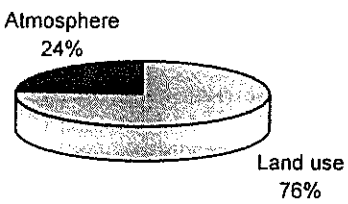
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.2E+03	6.0E+03	1.1E+04	3.2E+03	8.9E+03	1.5E+04
Atmosphere	1.3E+03	2.1E+03	4.6E+03	1.3E+03	2.1E+03	4.6E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**3.6E+03**	**8.1E+03**	**1.6E+04**	**4.6E+03**	**1.1E+04**	**1.9E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.4E+03	6.6E+03	1.2E+04	4.1E+03	1.1E+04	1.9E+04
Atmosphere	1.3E+03	2.1E+03	4.6E+03	1.3E+03	2.1E+03	4.6E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**3.8E+03**	**8.7E+03**	**1.7E+04**	**5.5E+03**	**1.4E+04**	**2.3E+04**

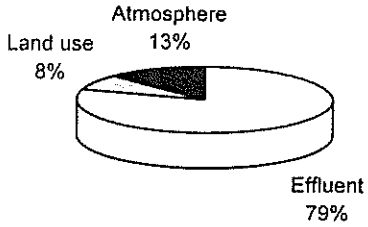


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 18. Comparison of nitrogen loadings by source for Sandy Bay

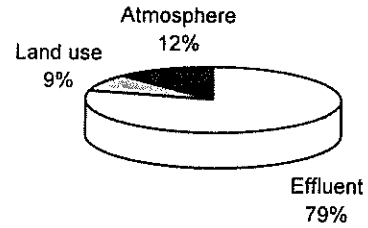
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	1.0E+04	1.4E+04	3.8E+04	1.0E+04	1.4E+04	3.8E+04
Non-point sources						
Land use	5.4E+02	1.3E+03	2.5E+03	5.9E+02	1.6E+03	3.0E+03
Atmosphere	1.4E+03	2.2E+03	4.8E+03	1.4E+03	2.2E+03	4.8E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**1.2E+04**	**1.7E+04**	**4.5E+04**	**1.2E+04**	**1.8E+04**	**4.6E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	1.0E+04	1.4E+04	3.8E+04	1.0E+04	1.4E+04	3.8E+04
Non-point sources						
Land use	6.1E+02	1.5E+03	2.9E+03	7.0E+02	1.9E+03	3.6E+03
Atmosphere	1.4E+03	2.2E+03	4.8E+03	1.4E+03	2.2E+03	4.8E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**1.2E+04**	**1.8E+04**	**4.6E+04**	**1.2E+04**	**1.8E+04**	**4.6E+04**

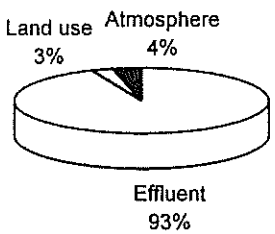


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 19. Comparison of nitrogen loadings by source for Gloucester Harbor

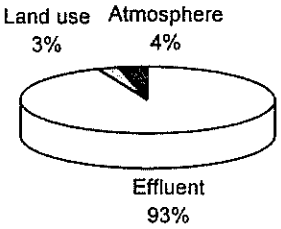
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	4.5E+04	9.1E+04	1.7E+05	4.5E+04	9.1E+04	1.7E+05
Non-point sources						
Land use	1.4E+03	2.7E+03	4.8E+03	1.5E+03	3.0E+03	5.4E+03
Atmosphere	2.3E+03	3.6E+03	7.9E+03	2.3E+03	3.6E+03	7.9E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**4.9E+04**	**9.7E+04**	**1.9E+05**	**4.9E+04**	**9.8E+04**	**1.9E+05**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	4.5E+04	9.1E+04	1.7E+05	4.5E+04	9.1E+04	1.7E+05
Non-point sources						
Land use	1.4E+03	2.7E+03	4.9E+03	1.5E+03	3.0E+03	5.4E+03
Atmosphere	2.3E+03	3.6E+03	7.9E+03	2.3E+03	3.6E+03	7.9E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**4.9E+04**	**9.7E+04**	**1.9E+05**	**4.9E+04**	**9.8E+04**	**1.9E+05**

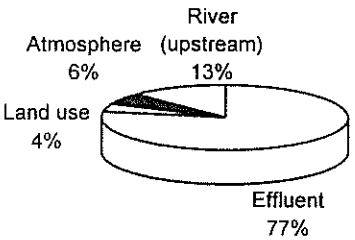


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 20. Comparison of nitrogen loadings by source for Hingham Bay
Includes Weymouth Fore and Weymouth Back Rivers, Higham Harbor, Weir River and Hull Bay

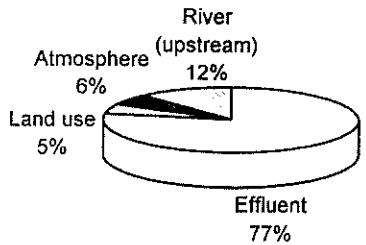
Loadings for 1000 m delineation

	Present nitrogen loading ($kg\ y^{-1}$)				Future nitrogen loading[a] ($kg\ y^{-1}$)		
	low	mean	high		low	mean	high
Point sources							
Effluent	2.7E+05	2.8E+05	3.7E+05		2.7E+05	2.8E+05	3.7E+05
Non-point sources							
Land use	6.6E+03	1.5E+04	2.8E+04		6.5E+03	1.5E+04	2.9E+04
Atmosphere	1.3E+04	2.0E+04	4.5E+04		1.3E+04	2.0E+04	4.5E+04
River (upstream)	4.6E+04	4.6E+04	4.6E+04		4.6E+04	4.6E+04	4.6E+04
1000 m delineation total	**3.3E+05**	**3.6E+05**	**4.9E+05**		**3.3E+05**	**3.6E+05**	**4.9E+05**



Loadings for watershed delineation

	Present nitrogen loading ($kg\ y^{-1}$)				Future nitrogen loading[a] ($kg\ y^{-1}$)		
	low	mean	high		low	mean	high
Point sources							
Effluent	2.7E+05	2.8E+05	3.7E+05		2.7E+05	2.8E+05	3.7E+05
Non-point sources							
Land use	8.0E+03	1.8E+04	3.3E+04		8.0E+03	1.9E+04	3.4E+04
Atmosphere	1.3E+04	2.0E+04	4.5E+04		1.3E+04	2.0E+04	4.5E+04
River (upstream)	4.4E+04	4.4E+04	4.4E+04		4.4E+04	4.4E+04	4.4E+04
Watershed total	**3.3E+05**	**3.6E+05**	**4.9E+05**		**3.3E+05**	**3.7E+05**	**4.9E+05**



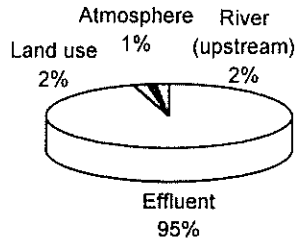
1990 land use data not available for Hull, Cohassett and Weymouth

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 21. Comparison of nitrogen loadings by source for Weymouth Fore River

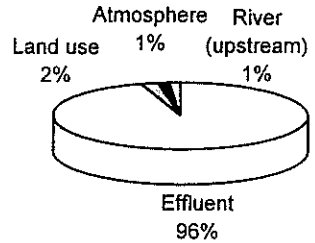
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})				Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high		low	mean	high
Point sources							
Effluent	2.4E+05	2.4E+05	3.0E+05		2.4E+05	2.4E+05	3.0E+05
Non-point sources							
Land use	2.4E+03	5.1E+03	1.1E+04		2.4E+03	5.3E+03	1.1E+04
Atmosphere	1.9E+03	3.0E+03	6.6E+03		1.9E+03	3.0E+03	6.6E+03
River (upstream)	3.9E+03	3.9E+03	3.9E+03		3.9E+03	3.9E+03	3.9E+03
1000 m delineation total	**2.5E+05**	**2.5E+05**	**3.2E+05**		**2.5E+05**	**2.5E+05**	**3.2E+05**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})				Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high		low	mean	high
Point sources							
Effluent	2.4E+05	2.4E+05	3.0E+05		2.4E+05	2.4E+05	3.0E+05
Non-point sources							
Land use	2.8E+03	6.2E+03	1.3E+04		2.9E+03	6.4E+03	1.3E+04
Atmosphere	1.9E+03	3.0E+03	6.6E+03		1.9E+03	3.0E+03	6.6E+03
River (upstream)	3.7E+03	3.7E+03	3.7E+03		3.7E+03	3.7E+03	3.7E+03
Watershed total	**2.5E+05**	**2.5E+05**	**3.2E+05**		**2.5E+05**	**2.5E+05**	**3.2E+05**

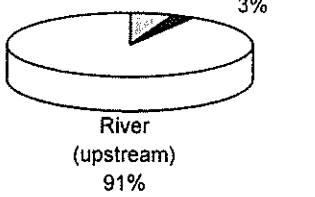


Watershed delineation ends at the tidally-influenced reach of the Weymouth Fore River
1990 land use data not available for Weymouth
[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 22. Comparison of nitrogen loadings by source for Weymouth Back River

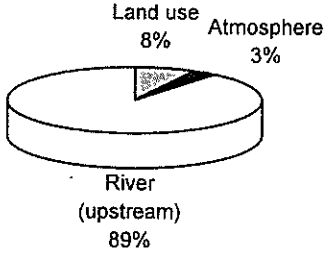
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.1E+03	2.6E+03	4.7E+03	1.2E+03	2.9E+03	5.2E+03
Atmosphere	8.4E+02	1.3E+03	2.9E+03	8.4E+02	1.3E+03	2.9E+03
River (upstream)	4.0E+04	4.0E+04	4.0E+04	4.0E+04	4.0E+04	4.0E+04
1000 m delineation total	**4.2E+04**	**4.4E+04**	**4.8E+04**	**4.2E+04**	**4.4E+04**	**4.8E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.5E+03	3.3E+03	5.8E+03	1.6E+03	3.7E+03	6.6E+03
Atmosphere	8.4E+02	1.3E+03	2.9E+03	8.4E+02	1.3E+03	2.9E+03
River (upstream)	3.8E+04	3.8E+04	3.8E+04	3.8E+04	3.8E+04	3.8E+04
Watershed total	**4.0E+04**	**4.2E+04**	**4.6E+04**	**4.0E+04**	**4.3E+04**	**4.7E+04**

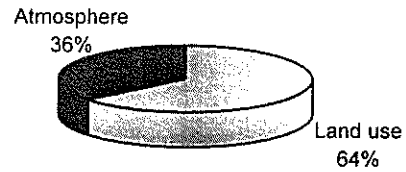


Watershed delineation ends at the first upstream fish ladder
1990 land use data not available for Weymouth
[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 23. Comparison of nitrogen loadings by source for Hingham Harbor

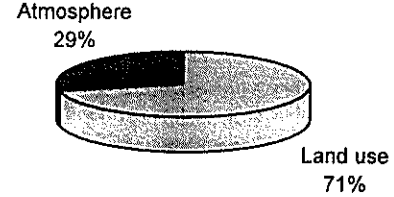
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.2E+03	2.9E+03	4.6E+03	1.2E+03	3.0E+03	4.8E+03
Atmosphere	1.1E+03	1.7E+03	3.7E+03	1.1E+03	1.7E+03	3.7E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**2.3E+03**	**4.6E+03**	**8.3E+03**	**2.3E+03**	**4.6E+03**	**8.5E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.9E+03	4.1E+03	6.3E+03	1.9E+03	4.3E+03	6.7E+03
Atmosphere	1.1E+03	1.7E+03	3.7E+03	1.1E+03	1.7E+03	3.7E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**3.0E+03**	**5.8E+03**	**1.0E+04**	**3.0E+03**	**6.0E+03**	**1.0E+04**

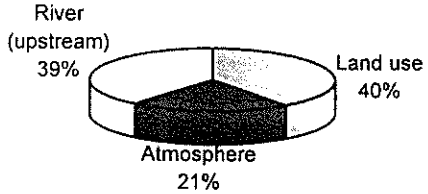


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 24. Comparison of nitrogen loadings by source for Weir River

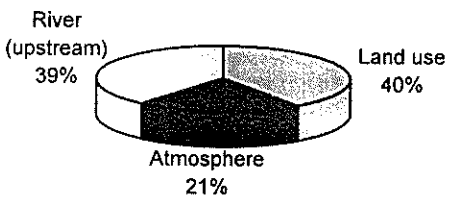
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.1E+03	2.4E+03	4.2E+03	9.9E+02	2.5E+03	4.5E+03
Atmosphere	8.1E+02	1.2E+03	2.8E+03	8.1E+02	1.2E+03	2.8E+03
River (upstream)	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03
1000 m delineation total	**4.2E+03**	**5.9E+03**	**9.3E+03**	**4.1E+03**	**6.0E+03**	**9.6E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.1E+03	2.4E+03	4.2E+03	1.0E+03	2.5E+03	4.5E+03
Atmosphere	8.1E+02	1.2E+03	2.8E+03	8.1E+02	1.2E+03	2.8E+03
River (upstream)	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03
Watershed total	**4.2E+03**	**5.9E+03**	**9.3E+03**	**4.1E+03**	**6.1E+03**	**9.6E+03**

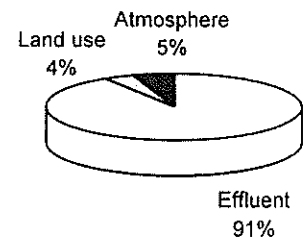


Watershed delineation ends at the first upstream dam
1990 land use data not available for Hull and Cohasset
[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 25. Comparison of nitrogen loadings by source for Hull Bay

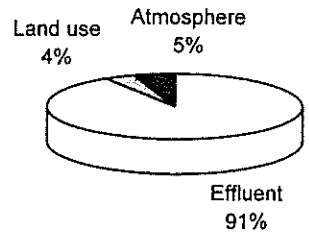
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	2.7E+04	4.3E+04	7.5E+04	2.7E+04	4.3E+04	7.5E+04
Non-point sources						
Land use	6.6E+02	1.8E+03	2.7E+03	6.6E+02	1.8E+03	2.8E+03
Atmosphere	1.6E+03	2.5E+03	5.5E+03	1.6E+03	2.5E+03	5.5E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**2.9E+04**	**4.7E+04**	**8.3E+04**	**2.9E+04**	**4.7E+04**	**8.3E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	2.7E+04	4.3E+04	7.5E+04	2.7E+04	4.3E+04	7.5E+04
Non-point sources						
Land use	6.6E+02	1.8E+03	2.7E+03	6.6E+02	1.8E+03	2.8E+03
Atmosphere	1.6E+03	2.5E+03	5.5E+03	1.6E+03	2.5E+03	5.5E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**2.9E+04**	**4.7E+04**	**8.3E+04**	**2.9E+04**	**4.7E+04**	**8.3E+04**



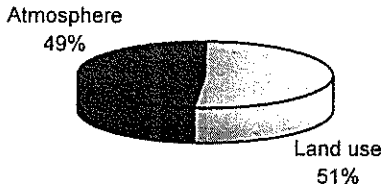
1990 land use data not available for Hull

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 26. Comparison of nitrogen loadings by source for Salem Harbor

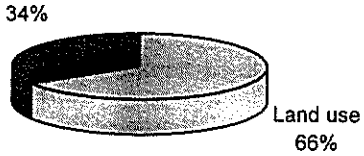
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.1E+03	2.3E+03	4.5E+03	1.2E+03	2.4E+03	4.6E+03
Atmosphere	1.4E+03	2.2E+03	4.8E+03	1.4E+03	2.2E+03	4.8E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**2.6E+03**	**4.5E+03**	**9.3E+03**	**2.6E+03**	**4.6E+03**	**9.5E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.3E+03	4.2E+03	8.0E+03	2.4E+03	4.6E+03	8.7E+03
Atmosphere	1.4E+03	2.2E+03	4.8E+03	1.4E+03	2.2E+03	4.8E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**3.7E+03**	**6.4E+03**	**1.3E+04**	**3.8E+03**	**6.8E+03**	**1.4E+04**



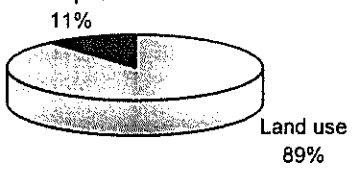
1990 land use data not available for this watershed

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 27. Comparison of nitrogen loadings by source for Bass River

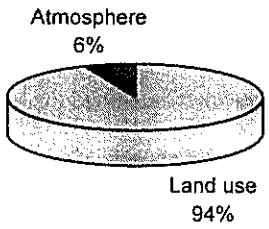
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	9.3E+02	1.4E+03	2.4E+03	9.3E+02	1.4E+03	2.4E+03
Atmosphere	1.2E+02	1.8E+02	4.0E+02	1.2E+02	1.8E+02	4.0E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**1.1E+03**	**1.6E+03**	**2.8E+03**	**1.1E+03**	**1.6E+03**	**2.8E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.7E+03	2.6E+03	4.4E+03	1.7E+03	2.7E+03	4.4E+03
Atmosphere	1.2E+02	1.8E+02	4.0E+02	1.2E+02	1.8E+02	4.0E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**1.8E+03**	**2.8E+03**	**4.8E+03**	**1.8E+03**	**2.8E+03**	**4.8E+03**

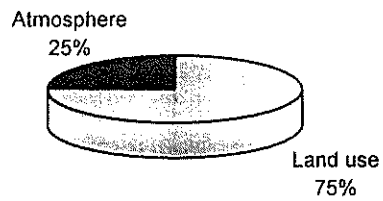


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 28. Comparison of nitrogen loadings by source for North River (North Shore)

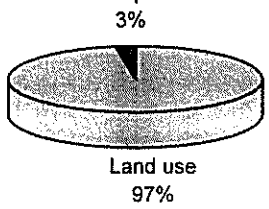
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	3.7E+02	6.5E+02	1.2E+03	3.7E+02	6.4E+02	1.2E+03
Atmosphere	1.4E+02	2.1E+02	4.7E+02	1.4E+02	2.1E+02	4.7E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**5.1E+02**	**8.6E+02**	**1.6E+03**	**5.1E+02**	**8.5E+02**	**1.6E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	4.1E+03	8.0E+03	1.5E+04	4.3E+03	8.6E+03	1.7E+04
Atmosphere	1.4E+02	2.1E+02	4.7E+02	1.4E+02	2.1E+02	4.7E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**4.3E+03**	**8.2E+03**	**1.6E+04**	**4.4E+03**	**8.8E+03**	**1.7E+04**



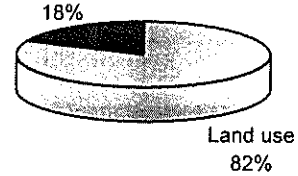
1990 land use data not available for Lynnfield, Salem, and Lynn

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 29. Comparison of nitrogen loadings by source for Danvers River

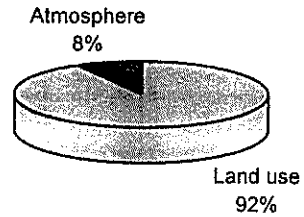
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.9E+03	5.0E+03	9.1E+03	2.7E+03	4.8E+03	9.0E+03
Atmosphere	7.3E+02	1.1E+03	2.5E+03	7.3E+02	1.1E+03	2.5E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**3.6E+03**	**6.1E+03**	**1.2E+04**	**3.4E+03**	**6.0E+03**	**1.1E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	6.5E+03	1.2E+04	2.2E+04	5.8E+03	1.2E+04	2.2E+04
Atmosphere	7.3E+02	1.1E+03	2.5E+03	7.3E+02	1.1E+03	2.5E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**7.3E+03**	**1.4E+04**	**2.5E+04**	**6.6E+03**	**1.3E+04**	**2.5E+04**



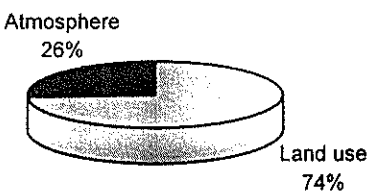
1990 land use data not available for Wenham and Salem

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 30. Comparison of nitrogen loadings by source for Beverly Harbor Includes Bass River, North River and Danvers River

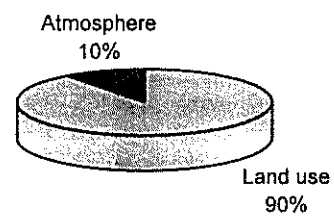
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	4.8E+03	8.2E+03	1.5E+04	4.6E+03	8.0E+03	1.5E+04
Atmosphere	1.9E+03	2.9E+03	6.4E+03	1.9E+03	2.9E+03	6.4E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**6.7E+03**	**1.1E+04**	**2.1E+04**	**6.5E+03**	**1.1E+04**	**2.1E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.3E+04	2.5E+04	4.6E+04	1.3E+04	2.5E+04	4.7E+04
Atmosphere	1.9E+03	2.9E+03	6.4E+03	1.9E+03	2.9E+03	6.4E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**1.5E+04**	**2.8E+04**	**5.2E+04**	**1.5E+04**	**2.8E+04**	**5.3E+04**



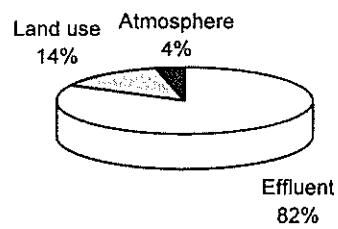
1990 land use data not available for Wenham, Lynnfield, Salem, and Lynn

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 31. Comparison of nitrogen loadings by source for Manchester Harbor

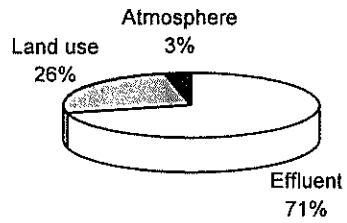
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	4.8E+03	1.1E+04	2.8E+04	4.8E+03	1.1E+04	2.8E+04
Non-point sources						
Land use	7.2E+02	1.8E+03	3.0E+03	8.2E+02	2.2E+03	3.7E+03
Atmosphere	3.1E+02	4.8E+02	1.1E+03	3.1E+02	4.8E+02	1.1E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**5.9E+03**	**1.3E+04**	**3.2E+04**	**6.0E+03**	**1.3E+04**	**3.3E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	4.8E+03	1.1E+04	2.8E+04	4.8E+03	1.1E+04	2.8E+04
Non-point sources						
Land use	2.0E+03	3.9E+03	6.5E+03	2.7E+03	6.1E+03	1.0E+04
Atmosphere	3.1E+02	4.8E+02	1.1E+03	3.1E+02	4.8E+02	1.1E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**7.2E+03**	**1.5E+04**	**3.6E+04**	**7.9E+03**	**1.7E+04**	**3.9E+04**



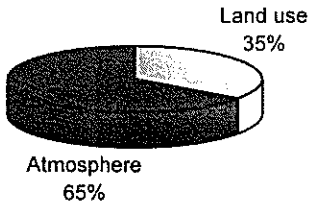
1990 land use data not available for Manchester

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 32. Comparison of nitrogen loadings by source for Marblehead Harbor

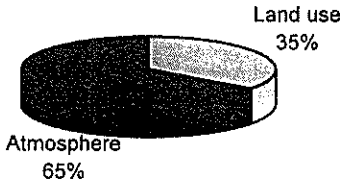
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.0E+02	4.4E+02	8.8E+02	2.1E+02	4.5E+02	9.1E+02
Atmosphere	5.3E+02	8.2E+02	1.8E+03	5.3E+02	8.2E+02	1.8E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**7.3E+02**	**1.3E+03**	**2.7E+03**	**7.3E+02**	**1.3E+03**	**2.7E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.0E+02	4.4E+02	8.8E+02	2.1E+02	4.5E+02	9.1E+02
Atmosphere	5.3E+02	8.2E+02	1.8E+03	5.3E+02	8.2E+02	1.8E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**7.3E+02**	**1.3E+03**	**2.7E+03**	**7.3E+02**	**1.3E+03**	**2.7E+03**



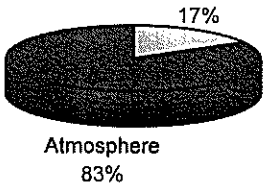
1990 land use data not available for Marblehead

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 33. Comparison of nitrogen loadings by source for Nahant Bay

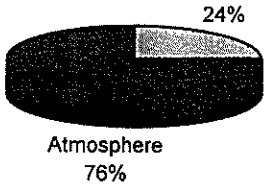
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	6.6E+02	1.5E+03	3.0E+03	6.7E+02	1.5E+03	3.1E+03
Atmosphere	4.9E+03	7.5E+03	1.7E+04	4.9E+03	7.5E+03	1.7E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**5.5E+03**	**9.0E+03**	**2.0E+04**	**5.5E+03**	**9.0E+03**	**2.0E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.1E+03	2.4E+03	5.0E+03	1.1E+03	2.6E+03	5.3E+03
Atmosphere	4.9E+03	7.5E+03	1.7E+04	4.9E+03	7.5E+03	1.7E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**5.9E+03**	**9.9E+03**	**2.2E+04**	**6.0E+03**	**1.0E+04**	**2.2E+04**



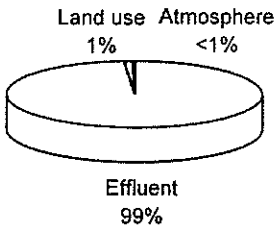
1990 land use data not available for this watershed

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 34. Comparison of nitrogen loadings by source for Lynn Harbor Includes Saugus River and Pines River

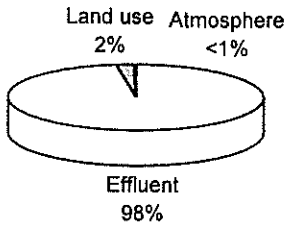
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})				Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high		low	mean	high
Point sources							
Effluent	4.9E+05	6.7E+05	1.5E+06		4.9E+05	6.7E+05	1.5E+06
Non-point sources							
Land use	2.7E+03	6.0E+03	1.6E+04		2.7E+03	6.1E+03	1.6E+04
Atmosphere	1.8E+03	2.8E+03	6.1E+03		1.8E+03	2.8E+03	6.1E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**4.9E+05**	**6.8E+05**	**1.5E+06**		**4.9E+05**	**6.8E+05**	**1.5E+06**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})				Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high		low	mean	high
Point sources							
Effluent	4.9E+05	6.7E+05	1.5E+06		4.9E+05	6.7E+05	1.5E+06
Non-point sources							
Land use	7.3E+03	1.5E+04	3.2E+04		7.5E+03	1.6E+04	3.4E+04
Atmosphere	1.8E+03	2.8E+03	6.1E+03		1.8E+03	2.8E+03	6.1E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
Watershed total	**5.0E+05**	**6.9E+05**	**1.6E+06**		**5.0E+05**	**6.9E+05**	**1.6E+06**



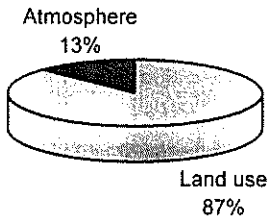
1990 land use data not available for Lynn, Nahant and Melrose

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 35. Comparison of nitrogen loadings by source for Saugus River

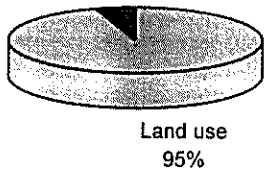
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.2E+03	2.7E+03	6.2E+03	1.2E+03	2.8E+03	6.4E+03
Atmosphere	2.6E+02	4.0E+02	8.8E+02	2.6E+02	4.0E+02	8.8E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**1.5E+03**	**3.1E+03**	**7.0E+03**	**1.5E+03**	**3.2E+03**	**7.2E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	3.8E+03	7.6E+03	1.5E+04	3.9E+03	8.2E+03	1.6E+04
Atmosphere	2.6E+02	4.0E+02	8.8E+02	2.6E+02	4.0E+02	8.8E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**4.1E+03**	**8.0E+03**	**1.6E+04**	**4.2E+03**	**8.6E+03**	**1.7E+04**



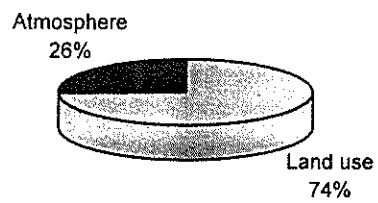
1990 land use data not available for Lynn and Melrose

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 36. Comparison of nitrogen loadings by source for Pines River

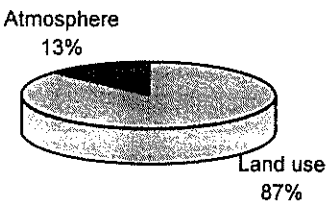
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.3E+03	2.8E+03	8.7E+03	1.3E+03	2.9E+03	8.8E+03
Atmosphere	6.4E+02	9.8E+02	2.2E+03	6.4E+02	9.8E+02	2.2E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**1.9E+03**	**3.8E+03**	**1.1E+04**	**1.9E+03**	**3.9E+03**	**1.1E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	3.1E+03	6.4E+03	1.5E+04	3.1E+03	6.6E+03	1.6E+04
Atmosphere	6.4E+02	9.8E+02	2.2E+03	6.4E+02	9.8E+02	2.2E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**3.7E+03**	**7.4E+03**	**1.8E+04**	**3.8E+03**	**7.6E+03**	**1.8E+04**



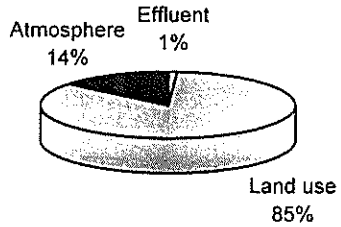
1990 data not available for Melrose

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 37. Comparison of nitrogen loadings by source for Cohasset Harbor

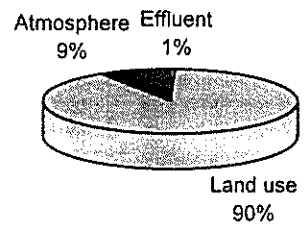
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	9.4E+00	9.7E+01	3.5E+02	9.4E+00	9.7E+01	3.5E+02
Non-point sources						
Land use	3.2E+03	7.9E+03	1.3E+04	3.9E+03	9.8E+03	1.6E+04
Atmosphere	8.6E+02	1.3E+03	2.9E+03	8.6E+02	1.3E+03	2.9E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**4.1E+03**	**9.3E+03**	**1.7E+04**	**4.7E+03**	**1.1E+04**	**1.9E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	9.4E+00	9.7E+01	3.5E+02	9.4E+00	9.7E+01	3.5E+02
Non-point sources						
Land use	5.4E+03	1.3E+04	2.3E+04	8.1E+03	2.1E+04	3.3E+04
Atmosphere	8.6E+02	1.3E+03	2.9E+03	8.6E+02	1.3E+03	2.9E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**6.3E+03**	**1.5E+04**	**2.6E+04**	**9.0E+03**	**2.3E+04**	**3.7E+04**



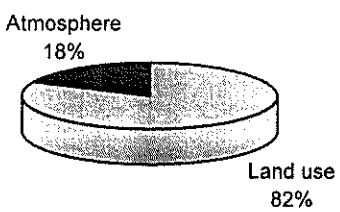
1990 data not available for Cohasset and Scituate

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 38. Comparison of nitrogen loadings by source for Scituate Harbor

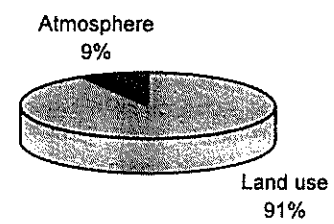
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	8.9E+02	2.3E+03	3.8E+03	9.5E+02	2.5E+03	4.1E+03
Atmosphere	3.3E+02	5.1E+02	1.1E+03	3.3E+02	5.1E+02	1.1E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**1.2E+03**	**2.8E+03**	**4.9E+03**	**1.3E+03**	**3.0E+03**	**5.2E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.1E+03	5.4E+03	8.3E+03	2.3E+03	6.1E+03	9.2E+03
Atmosphere	3.3E+02	5.1E+02	1.1E+03	3.3E+02	5.1E+02	1.1E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**2.4E+03**	**5.9E+03**	**9.4E+03**	**2.6E+03**	**6.6E+03**	**1.0E+04**



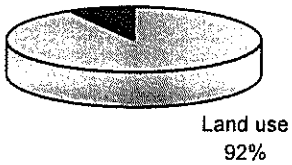
1990 land use data not available for this watershed

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 39. Comparison of nitrogen loadings by source for South River

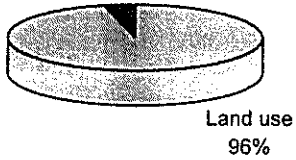
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	4.0E+03	1.1E+04	1.9E+04	4.8E+03	1.3E+04	2.3E+04
Atmosphere	6.4E+02	9.8E+02	2.2E+03	6.4E+02	9.8E+02	2.2E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**4.7E+03**	**1.2E+04**	**2.2E+04**	**5.4E+03**	**1.4E+04**	**2.5E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	9.9E+03	2.5E+04	4.1E+04	1.4E+04	3.6E+04	5.6E+04
Atmosphere	6.4E+02	9.8E+02	2.2E+03	6.4E+02	9.8E+02	2.2E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**1.1E+04**	**2.6E+04**	**4.4E+04**	**1.4E+04**	**3.7E+04**	**5.9E+04**



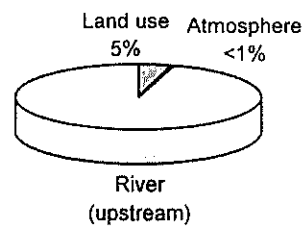
1990 land use data not available for Scituate

[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 40. Comparison of nitrogen loadings by source for North River (South Shore)

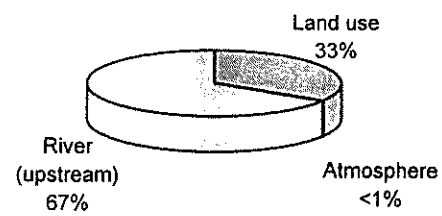
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	4.0E+03	9.9E+03	2.0E+04	5.6E+03	1.5E+04	2.7E+04
Atmosphere	4.2E+02	6.5E+02	1.4E+03	4.2E+02	6.5E+02	1.4E+03
River (upstream)	2.1E+05	2.1E+05	2.1E+05	2.1E+05	2.1E+05	2.1E+05
1000 m delineation total	**2.1E+05**	**2.2E+05**	**2.3E+05**	**2.1E+05**	**2.2E+05**	**2.4E+05**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.1E+04	5.1E+04	8.3E+04	3.1E+04	8.2E+04	1.2E+05
Atmosphere	4.2E+02	6.5E+02	1.4E+03	4.2E+02	6.5E+02	1.4E+03
River (upstream)	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05
Watershed total	**1.2E+05**	**1.5E+05**	**1.9E+05**	**1.3E+05**	**1.8E+05**	**2.3E+05**

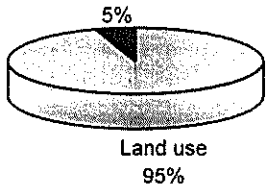


Watershed delineation ends at the first upstream fish ladder
1990 land use data not available for Scituate
[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 41. Comparison of nitrogen loadings by source for Green Harbor River

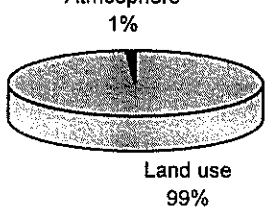
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	7.1E+02	2.1E+03	4.8E+03	7.9E+02	2.4E+03	5.2E+03
Atmosphere	7.1E+01	1.1E+02	2.4E+02	7.1E+01	1.1E+02	2.4E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**7.8E+02**	**2.2E+03**	**5.0E+03**	**8.6E+02**	**2.5E+03**	**5.5E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	4.6E+03	1.0E+04	1.8E+04	5.0E+03	1.2E+04	2.1E+04
Atmosphere	7.1E+01	1.1E+02	2.4E+02	7.1E+01	1.1E+02	2.4E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**4.6E+03**	**1.0E+04**	**1.8E+04**	**5.1E+03**	**1.2E+04**	**2.1E+04**

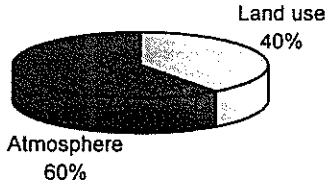


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 42. Comparison of nitrogen loadings by source for Duxbury Bay

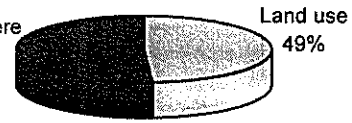
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	3.1E+03	7.6E+03	1.6E+04	3.4E+03	8.6E+03	1.7E+04
Atmosphere	7.4E+03	1.1E+04	2.5E+04	7.4E+03	1.1E+04	2.5E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**1.0E+04**	**1.9E+04**	**4.1E+04**	**1.1E+04**	**2.0E+04**	**4.2E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	4.8E+03	1.1E+04	2.1E+04	5.6E+03	1.3E+04	2.4E+04
Atmosphere	7.4E+03	1.1E+04	2.5E+04	7.4E+03	1.1E+04	2.5E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**1.2E+04**	**2.2E+04**	**4.6E+04**	**1.3E+04**	**2.5E+04**	**4.9E+04**

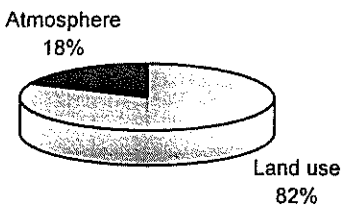


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 43. Comparison of nitrogen loadings by source for Kingston Bay

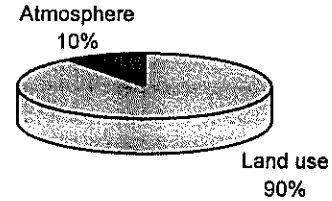
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})				Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high		low	mean	high
Point sources							
Effluent	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
Non-point sources							
Land use	3.6E+03	9.1E+03	1.4E+04		4.2E+03	1.1E+04	1.6E+04
Atmosphere	1.3E+03	2.0E+03	4.5E+03		1.3E+03	2.0E+03	4.5E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**4.9E+03**	**1.1E+04**	**1.8E+04**		**5.6E+03**	**1.3E+04**	**2.1E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})				Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high		low	mean	high
Point sources							
Effluent	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
Non-point sources							
Land use	7.2E+03	1.8E+04	2.7E+04		9.4E+03	2.5E+04	3.6E+04
Atmosphere	1.3E+03	2.0E+03	4.5E+03		1.3E+03	2.0E+03	4.5E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
Watershed total	**8.5E+03**	**2.0E+04**	**3.2E+04**		**1.1E+04**	**2.7E+04**	**4.1E+04**

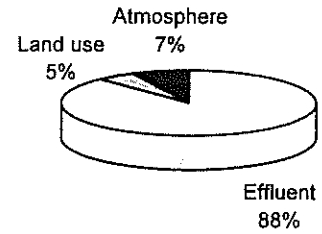


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 44. Comparison of nitrogen loadings by source for Plymouth Harbor

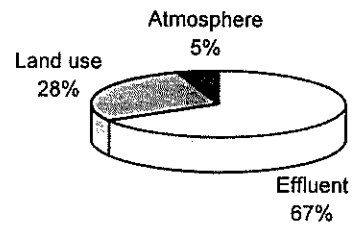
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	2.9E+04	4.0E+04	6.7E+04	2.9E+04	4.0E+04	6.7E+04
Non-point sources						
Land use	1.2E+03	2.4E+03	4.1E+03	1.2E+03	2.5E+03	4.4E+03
Atmosphere	2.1E+03	3.3E+03	7.2E+03	2.1E+03	3.3E+03	7.2E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**3.3E+04**	**4.6E+04**	**7.8E+04**	**3.3E+04**	**4.6E+04**	**7.8E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	2.9E+04	4.0E+04	6.7E+04	2.9E+04	4.0E+04	6.7E+04
Non-point sources						
Land use	7.1E+03	1.7E+04	2.7E+04	8.4E+03	2.1E+04	3.3E+04
Atmosphere	2.1E+03	3.3E+03	7.2E+03	2.1E+03	3.3E+03	7.2E+03
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**3.8E+04**	**6.1E+04**	**1.0E+05**	**4.0E+04**	**6.5E+04**	**1.1E+05**

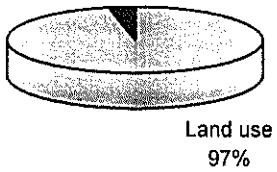


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 45. Comparison of nitrogen loadings by source for Sandwich Harbor

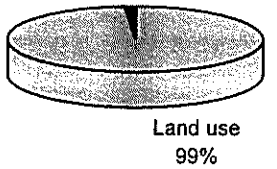
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.7E+03	4.4E+03	8.3E+03	1.9E+03	5.2E+03	9.2E+03
Atmosphere	9.8E+01	1.5E+02	3.3E+02	9.8E+01	1.5E+02	3.3E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**1.8E+03**	**4.6E+03**	**8.6E+03**	**2.0E+03**	**5.3E+03**	**9.6E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	4.3E+03	1.1E+04	1.7E+04	7.3E+03	1.9E+04	2.8E+04
Atmosphere	9.8E+01	1.5E+02	3.3E+02	9.8E+01	1.5E+02	3.3E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**4.4E+03**	**1.1E+04**	**1.8E+04**	**7.4E+03**	**1.9E+04**	**2.9E+04**

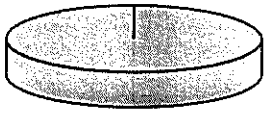


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 46. Comparison of nitrogen loadings by source for Scorton Harbor

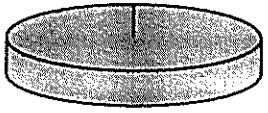
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high		Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources							
Effluent	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
Non-point sources							
Land use	1.1E+03	3.3E+03	6.8E+03		1.6E+03	4.5E+03	8.6E+03
Atmosphere	1.6E+00	2.5E+00	5.5E+00		1.6E+00	2.5E+00	5.5E+00
River (upstream)	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**1.1E+03**	**3.3E+03**	**6.8E+03**		**1.6E+03**	**4.6E+03**	**8.6E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high		Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources							
Effluent	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
Non-point sources							
Land use	6.1E+03	1.4E+04	2.2E+04		9.7E+03	2.4E+04	3.4E+04
Atmosphere	1.6E+00	2.5E+00	5.5E+00		1.6E+00	2.5E+00	5.5E+00
River (upstream)	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
Watershed total	**6.1E+03**	**1.4E+04**	**2.2E+04**		**9.7E+03**	**2.4E+04**	**3.4E+04**

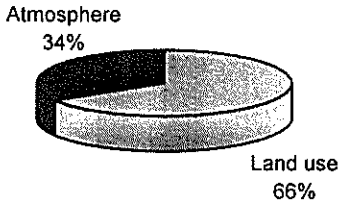


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 47. Comparison of nitrogen loadings by source for Barnstable Harbor

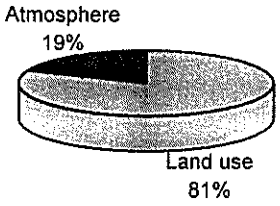
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	5.4E+03	1.5E+04	3.9E+04	6.6E+03	1.9E+04	4.5E+04
Atmosphere	4.9E+03	7.6E+03	1.7E+04	4.9E+03	7.6E+03	1.7E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**1.0E+04**	**2.2E+04**	**5.6E+04**	**1.1E+04**	**2.6E+04**	**6.1E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.3E+04	3.2E+04	6.5E+04	1.7E+04	4.5E+04	8.2E+04
Atmosphere	4.9E+03	7.6E+03	1.7E+04	4.9E+03	7.6E+03	1.7E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**1.8E+04**	**4.0E+04**	**8.2E+04**	**2.2E+04**	**5.2E+04**	**9.8E+04**

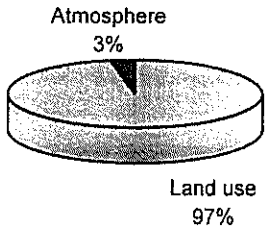


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 48. Comparison of nitrogen loadings by source for Sesuit Harbor

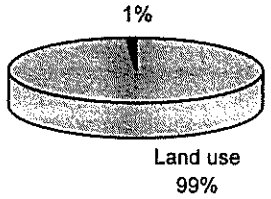
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	8.9E+02	2.2E+03	3.6E+03	9.8E+02	2.6E+03	4.2E+03
Atmosphere	4.4E+01	6.7E+01	1.5E+02	4.4E+01	6.7E+01	1.5E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**9.3E+02**	**2.2E+03**	**3.8E+03**	**1.0E+03**	**2.7E+03**	**4.3E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.6E+03	5.5E+03	8.0E+03	2.9E+03	6.7E+03	9.6E+03
Atmosphere	4.4E+01	6.7E+01	1.5E+02	4.4E+01	6.7E+01	1.5E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**2.6E+03**	**5.6E+03**	**8.1E+03**	**3.0E+03**	**6.8E+03**	**9.8E+03**

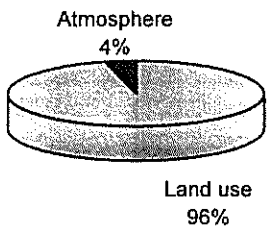


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 49. Comparison of nitrogen loadings by source for Rock Harbor

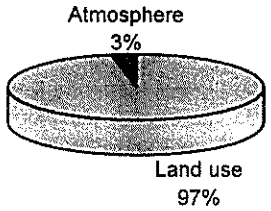
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	2.8E+02	7.9E+02	1.4E+03	3.2E+02	9.0E+02	1.5E+03
Atmosphere	2.1E+01	3.2E+01	7.2E+01	2.1E+01	3.2E+01	7.2E+01
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**3.0E+02**	**8.2E+02**	**1.4E+03**	**3.4E+02**	**9.4E+02**	**1.6E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	3.6E+02	9.9E+02	1.8E+03	4.1E+02	1.1E+03	2.0E+03
Atmosphere	2.1E+01	3.2E+01	7.2E+01	2.1E+01	3.2E+01	7.2E+01
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**3.8E+02**	**1.0E+03**	**1.9E+03**	**4.3E+02**	**1.2E+03**	**2.1E+03**

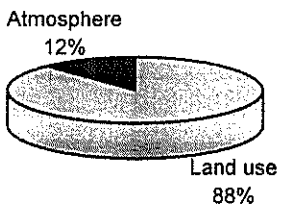


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 50. Comparison of nitrogen loadings by source for Pamet River

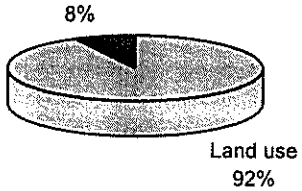
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	4.8E+02	1.3E+03	3.1E+03	6.4E+02	1.8E+03	3.8E+03
Atmosphere	1.2E+02	1.8E+02	4.0E+02	1.2E+02	1.8E+02	4.0E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**6.0E+02**	**1.5E+03**	**3.5E+03**	**7.6E+02**	**2.0E+03**	**4.2E+03**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	7.8E+02	2.1E+03	5.0E+03	1.3E+03	3.8E+03	7.6E+03
Atmosphere	1.2E+02	1.8E+02	4.0E+02	1.2E+02	1.8E+02	4.0E+02
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**9.0E+02**	**2.3E+03**	**5.4E+03**	**1.5E+03**	**4.0E+03**	**8.0E+03**

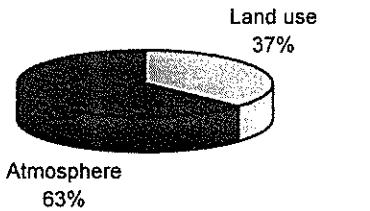


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 51. Comparison of nitrogen loadings by source for Wellfleet Harbor

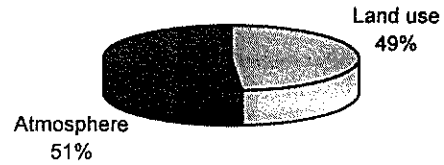
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	3.2E+03	8.4E+03	1.7E+04	4.1E+03	1.1E+04	2.1E+04
Atmosphere	9.3E+03	1.4E+04	3.2E+04	9.3E+03	1.4E+04	3.2E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**1.2E+04**	**2.3E+04**	**4.9E+04**	**1.3E+04**	**2.5E+04**	**5.3E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1}) low	mean	high	Future nitrogen loading[a] (kg y^{-1}) low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	5.1E+03	1.3E+04	2.8E+04	8.1E+03	2.2E+04	4.0E+04
Atmosphere	9.3E+03	1.4E+04	3.2E+04	9.3E+03	1.4E+04	3.2E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**1.4E+04**	**2.8E+04**	**5.9E+04**	**1.7E+04**	**3.7E+04**	**7.2E+04**

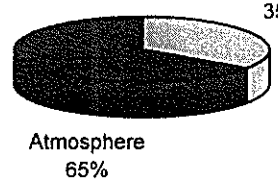


[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 52. Comparison of nitrogen loadings by source for Provincetown Harbor

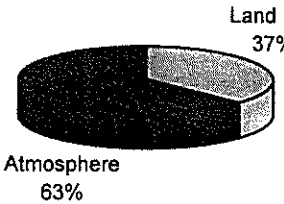
Loadings for 1000 m delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.5E+03	4.0E+03	8.7E+03	1.8E+03	4.7E+03	9.7E+03
Atmosphere	5.0E+03	7.6E+03	1.7E+04	5.0E+03	7.6E+03	1.7E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1000 m delineation total	**6.5E+03**	**1.2E+04**	**2.6E+04**	**6.7E+03**	**1.2E+04**	**2.7E+04**



Loadings for watershed delineation

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading[a] (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources						
Effluent	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources						
Land use	1.7E+03	4.5E+03	1.0E+04	2.2E+03	5.8E+03	1.2E+04
Atmosphere	5.0E+03	7.6E+03	1.7E+04	5.0E+03	7.6E+03	1.7E+04
River (upstream)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Watershed total	**6.6E+03**	**1.2E+04**	**2.7E+04**	**7.1E+03**	**1.3E+04**	**2.9E+04**



[a]Future nitrogen loadings for land use are based on buildout projections. All other future loadings are equivalent to present loadings.

Table 53. Nitrogen loading ranks

	Nitrogen loading[1] (kg yr^{-1})	Surface area (ha)	Nitrogen loading[1] (kg ha^{-1} yr^{-1})	Rank
Scorton Harbor	1.4E+04	4.4E-01	3.2E+04	some potential for eutrophication[2]
Merrimack River	1.1E+07	8.9E+02	1.3E+04	
Ipswich River	3.1E+05	1.5E+02	2.0E+03	
Lynn Harbor	6.9E+05	4.8E+02	1.4E+03	
North River (South Shore)	1.5E+05	1.1E+02	1.3E+03	
Green Harbor River	1.0E+04	1.9E+01	5.4E+02	
Weymouth Fore River	2.5E+05	5.2E+02	4.8E+02	
Parker River	9.7E+04	2.0E+02	4.8E+02	
Sesuit Harbor	5.6E+03	1.2E+01	4.7E+02	
Sandwich Harbor	1.1E+04	2.6E+01	4.0E+02	
North River (North Shore)	8.2E+03	3.7E+01	2.2E+02	
Weymouth Back River	4.2E+04	2.3E+02	1.9E+02	
Rock Harbor	1.0E+03	5.7E+00	1.8E+02	
Manchester Harbor	1.5E+04	8.5E+01	1.8E+02	
Gloucester Harbor	9.7E+04	6.3E+02	1.6E+02	
South River	2.6E+04	1.7E+02	1.5E+02	
Saugus River	8.0E+03	7.0E+01	1.2E+02	low potential for eutrophication[3]
Rowley River	1.5E+04	1.3E+02	1.1E+02	
Hull Bay	4.7E+04	4.4E+02	1.1E+02	
Plymouth Harbor	6.1E+04	5.7E+02	1.1E+02	
Hingham Bay	3.6E+05	3.5E+03	1.0E+02	
Bass River	2.8E+03	3.2E+01	8.8E+01	
Plum Island Sound	1.3E+05	1.6E+03	8.0E+01	
Pamet River	2.3E+03	3.2E+01	7.2E+01	
Danvers River	1.4E+04	2.0E+02	6.8E+01	
Scituate Harbor	5.9E+03	9.0E+01	6.6E+01	
Cohasset Harbor	1.5E+04	2.3E+02	6.3E+01	
Kingston Bay	2.0E+04	3.6E+02	5.6E+01	
Beverly Harbor	2.8E+04	5.0E+02	5.5E+01	
Sandy Bay	1.8E+04	3.8E+02	4.6E+01	non-eutrophic[4]
Pines River	7.4E+03	1.7E+02	4.3E+01	
Essex Bay	2.5E+04	8.3E+02	3.0E+01	
Barnstable Harbor	4.0E+04	1.3E+03	3.0E+01	
Weir River	5.9E+03	2.2E+02	2.7E+01	
Annisquam River	8.7E+03	3.6E+02	2.4E+01	
Hingham Harbor	5.8E+03	2.9E+02	2.0E+01	
Salem Harbor	6.4E+03	3.8E+02	1.7E+01	
Ipswich Bay	4.7E+04	3.0E+03	1.6E+01	
Eagle Hill River	3.0E+03	1.9E+02	1.6E+01	
Duxbury Bay	2.2E+04	2.0E+03	1.1E+01	
Wellfleet Harbor	2.8E+04	2.5E+03	1.1E+01	
Provincetown Harbor	1.2E+04	1.3E+03	9.0E+00	
Marblehead Harbor	1.3E+03	1.4E+02	8.8E+00	
Nahant Bay	9.9E+03	1.3E+03	7.5E+00	

[1]Values are the average nitrogen loadings for watershed delineations

[2]Loadings in this range are above the general range of loadings reported for nitrogen limited estuaries that are eutrophic (Jaworski, 1981).

[3]Loadings in this range are above the "permissible" loading of 54 kg ha^{-1} yr^{-1} estimated by Jaworski (1981), but are below the upper range of loadings (128 kg ha^{-1} yr^{-1}) reported for non-eutrophic estuaries.

[4]Loadings in this range are below the "permissible" loading of 54 kg ha^{-1} yr^{-1} estimated by Jaworski (1981); empirical data from Jaworski also suggest loadings in this range would not result in eutrophication.

Table 54. Nitrogen sensitivity ranks

	Embayment surface area:saltwater wetlands score	Embayment surface area:inlet width score	Shoreline development	Total score	Rank
Danvers River	40	60	100	200	High[1]
Duxbury Bay	40	40	100	180	
Ipswich River	10	60	100	170	
Plum Island Sound	10	60	100	170	
Weir River	40	30	100	170	
Weymouth Fore River	40	30	100	170	
Annisquam River	30	30	100	160	
Wellfleet Harbor	80	40	40	160	
Weymouth Back River	40	20	100	160	
Barnstable Harbor	10	40	100	150	Moderate[2]
Essex Bay	10	40	100	150	
Merrimack River	10	40	100	150	
Pines River	10	40	100	150	
Sandwich Harbor	10	40	100	150	
South River	10	40	100	150	
Gloucester Harbor	80	30	30	140	
Parker River	10	30	100	140	
Rowley River	10	30	100	140	
Salem Harbor	80	30	30	140	
Saugus River	30	10	100	140	
Green Harbor River	10	20	100	130	
Manchester Harbor	80	10	40	130	
North River (South Shore)	10	20	100	130	
Provincetown Harbor	80	40	10	130	
Bass River	80	10	30	120	
Beverly Harbor	80	30	10	120	
Eagle Hill River	10	10	100	120	
Hingham Bay	80	30	10	120	
Hingham Harbor	80	20	10	110	
Marblehead Harbor	80	20	10	110	
Nahant Bay	80	20	10	110	
Plymouth Harbor	80	20	10	110	
Hull Bay	80	10	10	100	Low[3]
North River (North Shore)	80	10	10	100	
Sandy Bay	80	10	10	100	
Kingston Bay	40	20	30	90	
Scituate Harbor	30	20	40	90	
Lynn Harbor	30	20	30	80	
Pamet River	10	30	40	80	
Ipswich Bay	30	30	10	70	
Cohasset Harbor	10	20	30	60	
Rock Harbor	10	10	30	50	
Sesuit Harbor	10	20	10	40	
Scorton Harbor	10	10	10	30	

[1]High rank contains values greater than the 75th percentile
[2]Moderate rank contains values between the 25th to 75th percentile
[3]Low rank contains values less than the 25th percentile

Table 55. Comparison of nitrogen loading and nitrogen sensitivity ranks

Nitrogen sensitivity relative to other study embayments

increasing risk of eutrophication

Nitrogen loading

increasing risk of eutrophication

	High[4]	**Moderate[5]**	**Low[6]**
some potential for eutrophication[1]	Ipswich River Weymouth Fore River Weymouth Back River	Merrimack River North River (South) Parker River Sandwich Harbor Green Harbor River South River Gloucester Harbor Manchester Harbor	Lynn Harbor Scorton Harbor Sesuit Harbor North River (North) Rock Harbor
low potential for eutrophication[2]	Plum Island Sound Danvers River	Beverly Harbor Hingham Bay Plymouth Harbor Saugus River Bass River Rowley River	Cohassett Harbor Hull Bay Pamet River Scituate Harbor Kingston Bay
non-eutrophic[3]	Weir River Annisquam River Duxbury Bay Wellfleet Harbor	Essex Bay Pines River Barnstable Harbor Salem Harbor Hingham Harbor Eagle Hill River Nahant Bay Provincetown Harbor Marblehead Harbor	Sandy Bay Ipswich Bay

[1]Loadings in this range are above the general range of loadings reported for nitrogen limited estuaries that are eutrophic (Jaworski, 1981).
[2]Loadings in this range are above the "permissible" loading of 54 kg ha^{-1} yr^{-1} estimated by Jaworski (1981), but are below the upper range of loadings (128 kg ha^{-1} yr^{-1}) reported for non-eutrophic estuaries.
[3]Loadings in this range are below the "permissible" loading of 54 kg ha^{-1} yr^{-1} estimated by Jaworski (1981); empirical data from Jaworski also suggest loadings in this range would not result in eutrophication.
[4]High rank contains values greater than the 75th percentile
[5]Moderate rank contains values between the 25th to 75th percentile
[6]Low rank contains values less than the 25th percentile

Table A-1. Population and land use data for the Merrimack River Watershed

1971 and 1985 land use data not available for this watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	27,074
Housing units within 1000 m boundary:	12,510
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	81

MassGIS and NHGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	—	—	443.0	221.5	—	—	—	—	- 221.5	- 50.0
C2 Pasture	—	—	128.4	64.2	—	—	—	—	- 64.2	- 50.0
C3 Forest	—	—	1711.7	855.9	—	—	—	—	- 855.9	- 50.0
C4 Non-forested wetland	—	—	83.1	83.1	—	—	—	—	+ 0.0	+ 0.0
C5 Mining	—	—	61.1	61.1	—	—	—	—	+ 0.0	+ 0.0
C6 Open land	—	—	138.4	138.4	—	—	—	—	+ 0.0	+ 0.0
C7 Participatory recreation	—	—	31.9	31.9	—	—	—	—	+ 0.0	+ 0.0
C8 Spectator recreation	—	—	29.1	29.1	—	—	—	—	+ 0.0	+ 0.0
C9 Water-based recreation	—	—	57.6	57.6	—	—	—	—	+ 0.0	+ 0.0
C10 Residential, multi-family	—	—	29.3	55.4	—	—	—	—	+ 26.1	+ 88.8
C11 Residential, < ¼ acre lots	—	—	421.1	421.1	—	—	—	—	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	—	—	503.4	950.3	—	—	—	—	+ 446.9	+ 88.8
C13 Residential, > ½ acre lots	—	—	483.1	912.0	—	—	—	—	+ 428.9	+ 88.8
C14 Salt marsh	—	—	961.9	961.9	—	—	—	—	+ 0.0	+ 0.0
C15 Commercial	—	—	137.7	224.2	—	—	—	—	+ 86.4	+ 62.8
C16 Industrial	—	—	43.4	70.6	—	—	—	—	+ 27.2	+ 62.8
C17 Urban open	—	—	103.2	168.0	—	—	—	—	+ 64.8	+ 62.8
C18 Transportation	—	—	159.3	259.3	—	—	—	—	+ 100.0	+ 62.8
C19 Waste disposal	—	—	26.0	26.0	—	—	—	—	+ 0.0	+ 0.0
C20 Open water	—	—	646.6	646.6	—	—	—	—	+ 0.0	+ 0.0
C21 Woody perennial	—	—	77.5	38.7	—	—	—	—	- 38.7	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	34,830
Housing units within watershed:	15,426
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	77

MassGIS and NHGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	—	—	1234.9	617.5	—	—	—	—	- 617.5	- 50.0
C2 Pasture	—	—	318.9	159.5	—	—	—	—	- 159.5	- 50.0
C3 Forest	—	—	4109.7	2054.9	—	—	—	—	- 2054.9	- 50.0
C4 Non-forested wetland	—	—	213.9	213.9	—	—	—	—	+ 0.0	+ 0.0
C5 Mining	—	—	113.2	113.2	—	—	—	—	+ 0.0	+ 0.0
C6 Open land	—	—	245.7	245.7	—	—	—	—	+ 0.0	+ 0.0
C7 Participatory recreation	—	—	66.6	66.6	—	—	—	—	+ 0.0	+ 0.0
C8 Spectator recreation	—	—	44.6	44.6	—	—	—	—	+ 0.0	+ 0.0
C9 Water-based recreation	—	—	57.6	57.6	—	—	—	—	+ 0.0	+ 0.0
C10 Residential, multi-family	—	—	70.5	160.3	—	—	—	—	+ 89.8	+ 127.4
C11 Residential, < ¼ acre lots	—	—	452.5	452.5	—	—	—	—	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	—	—	746.1	1696.5	—	—	—	—	+ 950.4	+ 127.4
C13 Residential, > ½ acre lots	—	—	892.8	2030.0	—	—	—	—	+ 1137.2	+ 127.4
C14 Salt marsh	—	—	961.9	961.9	—	—	—	—	+ 0.0	+ 0.0
C15 Commercial	—	—	178.6	358.5	—	—	—	—	+ 179.9	+ 100.7
C16 Industrial	—	—	122.0	244.9	—	—	—	—	+ 122.9	+ 100.7
C17 Urban open	—	—	185.1	371.6	—	—	—	—	+ 186.4	+ 100.7
C18 Transportation	—	—	233.9	469.4	—	—	—	—	+ 235.5	+ 100.7
C19 Waste disposal	—	—	42.1	42.1	—	—	—	—	+ 0.0	+ 0.0
C20 Open water	—	—	754.9	754.9	—	—	—	—	+ 0.0	+ 0.0
C21 Woody perennial	—	—	140.6	70.3	—	—	—	—	- 70.3	- 50.0

Table A-2. Population and land use data for the Plum Island Sound Watershed
Includes Parker River, Rowley River and Eagle Hill River Subwatersheds

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	3,125
Housing units within 1000 m boundary:	1,311
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	12

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	291.0	278.3	267.5	133.7	- 12.7	- 4.4	- 10.9	- 3.9	- 133.7	- 50.0
C2	Pasture	134.2	122.0	120.9	60.4	- 12.1	- 9.0	- 1.2	- 0.9	- 60.4	- 50.0
C3	Forest	1367.2	1299.8	1277.2	638.6	- 67.3	- 4.9	- 22.6	- 1.7	- 638.6	- 50.0
C4	Non-forested wetland	47.2	45.4	45.4	45.4	- 1.8	- 3.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	35.6	36.8	34.4	34.4	+ 1.2	+ 3.4	- 2.4	- 6.6	+ 0.0	+ 0.0
C6	Open land	345.3	340.1	332.5	332.5	- 5.2	- 1.5	- 7.6	- 2.2	+ 0.0	+ 0.0
C7	Participatory recreation	19.3	19.3	19.3	19.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	8.3	8.8	8.8	8.8	+ 0.5	+ 6.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	25.6	25.6	25.6	25.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.7	0.7	2.0	+ 0.7	—	+ 0.0	+ 0.0	+ 1.4	+ 208.0
C11	Residential, < ¼ acre lots	14.8	14.8	14.8	14.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	104.9	104.2	106.2	327.1	- 0.7	- 0.6	+ 2.0	+ 1.9	+ 220.9	+ 208.0
C13	Residential, > ½ acre lots	120.5	203.6	242.4	746.5	+ 83.2	+ 69.1	+ 38.8	+ 19.0	+ 504.1	+ 208.0
C14	Salt marsh	3307.4	3304.7	3304.7	3304.7	- 2.7	- 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	3.2	5.5	5.7	17.0	+ 2.3	+ 70.4	+ 0.2	+ 3.3	+ 11.3	+ 199.5
C16	Industrial	0.0	8.2	12.4	37.1	+ 8.2	—	+ 4.1	+ 50.2	+ 24.7	+ 199.5
C17	Urban open	40.8	37.4	37.4	112.0	- 3.4	- 8.3	+ 0.0	+ 0.0	+ 74.6	+ 199.5
C18	Transportation	0.0	1.8	2.8	8.3	+ 1.8	—	+ 1.0	+ 53.5	+ 5.5	+ 199.5
C19	Waste disposal	5.1	13.1	13.1	13.1	+ 8.0	+ 158.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	22.5	22.5	22.5	22.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	20.9	20.9	19.4	9.7	+ 0.0	+ 0.0	- 1.4	- 6.9	- 9.7	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	15,192
Housing units within watershed:	5,682
Occupancy rate (persons per unit):	2.7
Housing units sewered (%):	38

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	1039.9	980.9	851.4	425.7	- 59.0	- 5.7	- 129.6	- 13.2	- 425.7	- 50.0
C2	Pasture	416.0	378.4	378.7	189.3	- 37.6	- 9.0	+ 0.3	+ 0.1	- 189.3	- 50.0
C3	Forest	6055.5	5742.2	5572.8	2786.4	- 313.3	- 5.2	- 169.4	- 3.0	- 2786.4	- 50.0
C4	Non-forested wetland	417.7	395.5	389.2	389.2	- 22.2	- 5.3	- 6.2	- 1.6	+ 0.0	+ 0.0
C5	Mining	65.7	60.2	53.4	53.4	- 5.5	- 8.4	- 6.8	- 11.2	+ 0.0	+ 0.0
C6	Open land	716.7	668.5	646.1	646.1	- 48.2	- 6.7	- 22.4	- 3.4	+ 0.0	+ 0.0
C7	Participatory recreation	71.8	72.5	85.2	85.2	+ 0.7	+ 1.0	+ 12.7	+ 17.5	+ 0.0	+ 0.0
C8	Spectator recreation	32.2	43.8	49.4	49.4	+ 11.7	+ 36.3	+ 5.6	+ 12.8	+ 0.0	+ 0.0
C9	Water-based recreation	27.8	25.6	25.6	25.6	- 2.2	- 7.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	6.1	17.7	18.7	45.9	+ 11.5	+ 187.9	+ 1.0	+ 5.6	+ 27.2	+ 145.9
C11	Residential, < ¼ acre lots	27.0	27.0	27.0	27.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	464.4	500.6	564.7	1388.6	+ 36.2	+ 7.8	+ 64.2	+ 12.8	+ 823.9	+ 145.9
C13	Residential, > ½ acre lots	679.5	959.0	1151.0	2830.0	+ 279.5	+ 41.1	+ 192.0	+ 20.0	+ 1679.0	+ 145.9
C14	Salt marsh	3469.8	3467.2	3467.2	3467.2	- 2.7	- 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	70.3	88.8	102.9	250.6	+ 18.5	+ 26.3	+ 14.0	+ 15.8	+ 147.8	+ 143.6
C16	Industrial	40.5	126.6	221.8	540.3	+ 86.1	+ 212.4	+ 95.2	+ 75.2	+ 318.5	+ 143.6
C17	Urban open	176.4	186.4	135.6	330.3	+ 10.0	+ 5.7	- 50.8	- 27.3	+ 194.8	+ 143.6
C18	Transportation	134.8	161.8	165.6	403.4	+ 27.0	+ 20.0	+ 3.8	+ 2.3	+ 237.8	+ 143.6
C19	Waste disposal	35.7	43.8	41.9	41.9	+ 8.0	+ 22.5	- 1.8	- 4.2	+ 0.0	+ 0.0
C20	Open water	44.6	46.1	48.2	48.2	+ 1.5	+ 3.4	+ 2.1	+ 4.6	+ 0.0	+ 0.0
C21	Woody perennial	58.9	58.9	55.1	27.6	+ 0.0	+ 0.0	- 3.8	- 6.4	- 27.6	- 50.0

Table A-3. Population and land use data for the Parker River Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	875
Housing units within 1000 m boundary:	328
Occupancy rate (persons per unit):	2.7
Housing units sewered (%):	8

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	165.5	156.1	153.1	76.5	- 9.4	- 5.7	- 3.0	- 1.9	- 76.5	- 50.0
C2	Pasture	56.2	51.6	49.9	25.0	- 4.5	- 8.1	- 1.7	- 3.3	- 25.0	- 50.0
C3	Forest	684.2	646.7	634.2	317.1	- 37.6	- 5.5	- 12.5	- 1.9	- 317.1	- 50.0
C4	Non-forested wetland	45.5	43.7	43.7	43.7	- 1.8	- 4.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	15.2	13.2	12.3	12.3	- 2.0	- 12.9	- 0.9	- 7.1	+ 0.0	+ 0.0
C7	Participatory recreation	19.0	19.0	19.0	19.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	6.3	6.3	6.3	6.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	2.8	2.8	2.8	2.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	10.7	10.7	10.7	40.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 29.4	+ 274.1
C13	Residential, > ½ acre lots	63.5	112.0	130.4	488.0	+ 48.6	+ 76.5	+ 18.4	+ 16.4	+ 357.5	+ 274.1
C14	Salt marsh	854.9	853.6	853.6	853.6	- 1.3	- 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	2.3	3.2	3.3	12.5	+ 0.9	+ 37.3	+ 0.2	+ 5.7	+ 9.2	+ 274.1
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	5.4	5.4	5.4	20.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 14.9	+ 274.1
C18	Transportation	0.0	1.8	2.8	10.3	+ 1.8	—	+ 1.0	+ 53.5	+ 7.6	+ 274.1
C19	Waste disposal	4.0	9.3	9.3	9.3	+ 5.3	+ 133.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	1.2	1.2	1.2	1.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	1.4	1.4	0.0	0.0	+ 0.0	+ 0.0	- 1.4	—	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	12,213
Housing units within watershed:	4,418
Occupancy rate (persons per unit):	2.8
Housing units sewered (%):	45

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	866.4	811.1	692.4	346.2	- 55.3	- 6.4	- 118.8	- 14.6	- 346.2	- 50.0
C2	Pasture	308.2	284.2	287.8	143.9	- 24.0	- 7.8	+ 3.6	+ 1.3	- 143.9	- 50.0
C3	Forest	5193.8	4917.0	4761.1	2380.6	- 276.8	- 5.3	- 155.8	- 3.2	- 2380.6	- 50.0
C4	Non-forested wetland	403.0	380.8	374.6	374.6	- 22.2	- 5.5	- 6.2	- 1.6	+ 0.0	+ 0.0
C5	Mining	30.1	23.4	19.0	19.0	- 6.7	- 22.4	- 4.4	- 18.6	+ 0.0	+ 0.0
C6	Open land	357.0	313.5	303.4	303.4	- 43.5	- 12.2	- 10.0	- 3.2	+ 0.0	+ 0.0
C7	Participatory recreation	66.0	66.8	79.4	79.4	+ 0.7	+ 1.1	+ 12.7	+ 19.0	+ 0.0	+ 0.0
C8	Spectator recreation	25.7	36.9	42.5	42.5	+ 11.2	+ 43.3	+ 5.6	+ 15.2	+ 0.0	+ 0.0
C9	Water-based recreation	5.0	2.8	2.8	2.8	- 2.2	- 43.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	6.1	17.0	18.0	44.7	+ 10.9	+ 177.2	+ 1.0	+ 5.8	+ 26.7	+ 148.1
C11	Residential, < ¼ acre lots	9.9	9.9	9.9	9.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	294.0	330.8	388.6	964.1	+ 36.8	+ 12.5	+ 57.7	+ 17.5	+ 575.5	+ 148.1
C13	Residential, > ½ acre lots	606.0	847.1	1011.9	2510.5	+ 241.1	+ 39.8	+ 164.8	+ 19.5	+ 1498.6	+ 148.1
C14	Salt marsh	1017.3	1016.1	1016.1	1016.1	- 1.3	- 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	63.1	79.4	93.4	230.9	+ 16.3	+ 25.8	+ 14.0	+ 17.7	+ 137.4	+ 147.1
C16	Industrial	38.5	107.1	191.9	474.1	+ 68.6	+ 178.4	+ 84.8	+ 79.1	+ 282.2	+ 147.1
C17	Urban open	124.4	137.8	86.8	214.3	+ 13.4	+ 10.8	- 51.1	- 37.1	+ 127.6	+ 147.1
C18	Transportation	132.5	158.7	162.4	401.4	+ 26.2	+ 19.8	+ 3.8	+ 2.4	+ 238.9	+ 147.1
C19	Waste disposal	32.8	38.1	38.1	38.1	+ 5.3	+ 16.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	22.1	23.6	25.7	25.7	+ 1.5	+ 6.9	+ 2.1	+ 9.0	+ 0.0	+ 0.0
C21	Woody perennial	36.3	36.3	32.5	16.2	+ 0.0	+ 0.0	- 3.8	- 10.5	- 16.2	- 50.0

Table A-4. Population and land use data for the Rowley River Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	1,175
Housing units within 1000 m boundary:	432
Occupancy rate (persons per unit):	2.7
Housing units sewered (%):	14

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	44.1	42.7	34.9	17.4	- 1.4	- 3.2	- 7.8	- 18.3	- 17.4	- 50.0
C2	Pasture	40.2	32.6	31.7	15.9	- 7.6	- 18.9	- 0.9	- 2.7	- 15.9	- 50.0
C3	Forest	398.7	384.2	383.0	191.5	- 14.5	- 3.6	- 1.2	- 0.3	- 191.5	- 50.0
C4	Non-forested wetland	0.4	0.4	0.4	0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	35.6	36.8	34.4	34.4	+ 1.2	+ 3.4	- 2.4	- 6.6	+ 0.0	+ 0.0
C6	Open land	35.7	32.7	27.0	27.0	- 3.0	- 8.4	- 5.7	- 17.5	+ 0.0	+ 0.0
C7	Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	2.0	2.6	2.6	2.6	+ 0.5	+ 25.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	0.7	0.7	0.7	0.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.7	0.7	2.2	+ 0.7	---	+ 0.0	+ 0.0	+ 1.5	+ 234.8
C11	Residential, < ¼ acre lots	7.8	7.8	7.8	7.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	27.8	27.2	29.1	97.6	- 0.7	- 2.4	+ 2.0	+ 7.3	+ 68.4	+ 234.8
C13	Residential, > ½ acre lots	16.4	36.5	48.5	162.3	+ 20.1	+ 122.4	+ 11.9	+ 32.7	+ 113.8	+ 234.8
C14	Salt marsh	614.2	612.8	612.8	612.8	- 1.4	- 0.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	0.9	0.9	0.9	2.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 2.0	+ 213.6
C16	Industrial	0.0	8.2	12.4	38.9	+ 8.2	—	+ 4.1	+ 50.2	+ 26.5	+ 213.6
C17	Urban open	13.9	10.5	10.5	32.8	- 3.4	- 24.5	+ 0.0	+ 0.0	+ 22.3	+ 213.6
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	0.0	1.2	1.2	1.2	+ 1.2	---	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	3.8	3.8	3.8	3.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	19.4	19.4	19.4	9.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 9.7	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	1,895
Housing units within watershed:	709
Occupancy rate (persons per unit):	2.7
Housing units sewered (%):	11

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	80.2	78.3	67.5	33.8	- 1.9	- 2.4	- 10.8	- 13.8	- 33.8	- 50.0
C2	Pasture	65.5	51.9	47.3	23.6	- 13.6	- 20.7	- 4.6	- 8.9	- 23.6	- 50.0
C3	Forest	574.4	553.2	548.6	274.3	- 21.2	- 3.7	- 4.6	- 0.8	- 274.3	- 50.0
C4	Non-forested wetland	13.4	13.4	13.4	13.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	35.6	36.8	34.4	34.4	+ 1.2	+ 3.4	- 2.4	- 6.6	+ 0.0	+ 0.0
C6	Open land	65.3	60.8	49.3	49.3	- 4.4	- 6.8	- 11.5	- 18.9	+ 0.0	+ 0.0
C7	Participatory recreation	5.5	5.5	5.5	5.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	6.4	6.9	6.9	6.9	+ 0.5	+ 8.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	0.7	0.7	0.7	0.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.7	0.7	1.6	+ 0.7	---	+ 0.0	+ 0.0	+ 0.9	+ 141.3
C11	Residential, < ¼ acre lots	10.1	10.1	10.1	10.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	96.1	95.4	101.8	245.7	- 0.7	- 0.7	+ 6.4	+ 6.7	+ 143.9	+ 141.3
C13	Residential, > ½ acre lots	32.9	56.8	75.6	182.4	+ 23.9	+ 72.5	+ 18.7	+ 33.0	+ 106.8	+ 141.3
C14	Salt marsh	614.2	612.8	612.8	612.8	- 1.4	- 0.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	7.2	8.0	8.0	18.7	+ 0.8	+ 11.3	+ 0.0	+ 0.0	+ 10.7	+ 133.7
C16	Industrial	2.1	19.5	29.9	69.8	+ 17.4	+ 848.4	+ 10.4	+ 53.4	+ 39.9	+ 133.7
C17	Urban open	30.5	27.1	27.3	63.9	- 3.4	- 11.2	+ 0.3	+ 1.0	+ 36.6	+ 133.7
C18	Transportation	2.3	3.1	3.1	7.3	+ 0.8	+ 35.3	+ 0.0	+ 0.0	+ 4.2	+ 133.7
C19	Waste disposal	1.8	3.1	1.2	1.2	+ 1.2	+ 65.6	- 1.8	- 60.4	+ 0.0	+ 0.0
C20	Open water	5.0	5.0	5.0	5.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	22.6	22.6	22.6	11.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 11.3	- 50.0

Table A-5. Population and land use data for the Eagle Hill River Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	143
Housing units within 1000 m boundary:	64
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	20

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	35.5	33.7	33.7	16.8	- 1.8	- 5.1	- 0.0	- 0.0	- 16.8	- 50.0
C2	Pasture	34.3	34.3	34.3	17.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 17.1	- 50.0
C3	Forest	104.4	97.3	96.7	48.3	- 7.1	- 6.8	- 0.6	- 0.7	- 48.3	- 50.0
C4	Non-forested wetland	1.3	1.3	1.3	1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	1.7	1.7	0.7	0.7	+ 0.0	+ 0.0	- 0.9	- 55.3	+ 0.0	+ 0.0
C7	Participatory recreation	0.3	0.3	0.3	0.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	2.6	2.6	2.6	2.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	13.7	13.7	13.7	33.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 19.9	+ 144.9
C13	Residential, > ½ acre lots	15.4	21.5	23.0	56.4	+ 6.0	+ 39.3	+ 1.6	+ 7.3	+ 33.4	+ 144.9
C14	Salt marsh	484.9	484.9	484.9	484.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	0.0	1.4	1.4	3.4	+ 1.4	—	+ 0.0	+ 0.0	+ 2.0	+ 144.9
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	18.6	18.6	18.6	45.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 27.0	+ 144.9
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	0.6	2.1	2.1	2.1	+ 1.5	+ 235.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	143
Housing units within watershed:	64
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	20

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	35.5	33.7	33.7	16.8	- 1.8	- 5.1	- 0.0	- 0.0	- 16.8	- 50.0
C2	Pasture	34.3	34.3	34.3	17.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 17.1	- 50.0
C3	Forest	104.4	97.3	96.7	48.3	- 7.1	- 6.8	- 0.6	- 0.7	- 48.3	- 50.0
C4	Non-forested wetland	1.3	1.3	1.3	1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	1.7	1.7	0.7	0.7	+ 0.0	+ 0.0	- 0.9	- 55.3	+ 0.0	+ 0.0
C7	Participatory recreation	0.3	0.3	0.3	0.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	2.6	2.6	2.6	2.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	13.7	13.7	13.7	33.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 19.9	+ 144.9
C13	Residential, > ½ acre lots	15.4	21.5	23.0	56.4	+ 6.0	+ 39.3	+ 1.6	+ 7.3	+ 33.4	+ 144.9
C14	Salt marsh	484.9	484.9	484.9	484.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	0.0	1.4	1.4	3.4	+ 1.4	—	+ 0.0	+ 0.0	+ 2.0	+ 144.9
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	18.6	18.6	18.6	45.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 27.0	+ 144.9
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	0.6	2.1	2.1	2.1	+ 1.5	+ 235.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-6. Population and land use data for the Ipswich River Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	2,923
Housing units within 1000 m boundary:	1,308
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	70

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	78.8	78.0	78.0	39.0	- 0.8	- 1.0	+ 0.0	+ 0.0	- 39.0	- 50.0
C2 Pasture	82.2	81.6	81.6	40.8	- 0.6	- 0.7	+ 0.0	+ 0.0	- 40.8	- 50.0
C3 Forest	370.2	348.1	337.6	168.8	- 22.1	- 6.0	- 10.5	- 3.0	- 168.8	- 50.0
C4 Non-forested wetland	9.8	9.8	9.8	9.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	55.5	52.6	52.6	52.6	- 2.9	- 5.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	2.2	2.2	2.2	2.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	3.0	3.0	3.0	3.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11 Residential, < ¼ acre lots	73.0	73.0	73.0	73.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	110.9	110.9	115.0	237.1	+ 0.0	+ 0.0	+ 4.1	+ 3.7	+ 122.0	+ 106.1
C13 Residential, > ½ acre lots	69.6	97.6	103.8	213.9	+ 28.0	+ 40.2	+ 6.2	+ 6.4	+ 110.1	+ 106.1
C14 Salt marsh	494.0	494.0	494.0	494.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	5.4	5.4	5.4	9.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 4.3	+ 79.6
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	21.5	21.5	22.3	40.0	+ 0.0	+ 0.0	+ 0.8	+ 3.7	+ 17.7	+ 79.6
C18 Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19 Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	15.8	15.8	15.8	15.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	13.5	11.8	11.2	5.6	- 1.7	- 12.3	- 0.6	- 5.3	- 5.6	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	2,979
Housing units within watershed:	1,330
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	69

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	142.7	142.0	142.0	71.0	- 0.8	- 0.5	+ 0.0	+ 0.0	- 71.0	- 50.0
C2 Pasture	85.5	84.9	84.9	42.4	- 0.6	- 0.7	+ 0.0	+ 0.0	- 42.4	- 50.0
C3 Forest	385.5	362.8	352.3	176.2	- 22.7	- 5.9	- 10.5	- 2.9	- 176.2	- 50.0
C4 Non-forested wetland	10.4	10.4	10.4	10.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	62.9	60.0	60.0	60.0	- 2.9	- 4.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	2.2	2.2	2.2	2.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	3.0	3.0	3.0	3.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11 Residential, < ¼ acre lots	73.0	73.0	73.0	73.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	117.2	117.2	121.3	264.7	+ 0.0	+ 0.0	+ 4.1	+ 3.5	+ 143.4	+ 118.2
C13 Residential, > ½ acre lots	72.6	101.2	107.4	234.3	+ 28.6	+ 39.4	+ 6.2	+ 6.1	+ 126.9	+ 118.2
C14 Salt marsh	494.0	494.0	494.0	494.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	5.4	5.4	5.4	10.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 4.9	+ 89.6
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	21.5	21.5	22.3	42.2	+ 0.0	+ 0.0	+ 0.8	+ 3.7	+ 20.0	+ 89.6
C18 Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19 Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	15.8	15.8	15.8	15.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	13.5	11.8	11.2	5.6	- 1.7	- 12.3	- 0.6	- 5.3	- 5.6	- 50.0

Table A-7. Population and land use data for the Ipswich Bay Watershed
Includes Essex Bay and Annisquam River Subwatersheds

1990 land use data not available for Hamilton, Wenham, and Manchester

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	8,521
Housing units within 1000 m boundary:	3,939
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	23

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	214.1	214.1	212.4	106.2	+ 0.0	+ 0.0	- 1.7	- 0.8	- 106.2	- 50.0
C2	Pasture	121.5	117.6	120.7	60.3	- 3.9	- 3.2	+ 3.1	+ 2.6	- 60.3	- 50.0
C3	Forest	2058.0	1999.0	1952.5	976.3	- 58.9	- 2.9	- 46.5	- 2.3	- 976.3	- 50.0
C4	Non-forested wetland	32.9	32.3	32.3	32.3	- 0.6	- 1.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	237.0	225.2	222.6	222.6	- 11.8	- 5.0	- 2.5	- 1.1	+ 0.0	+ 0.0
C7	Participatory recreation	22.6	23.3	23.3	23.3	+ 0.7	+ 3.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	8.4	8.4	8.4	8.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	122.7	123.6	123.6	123.6	+ 0.9	+ 0.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	4.6	4.6	4.6	9.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 4.7	+ 101.9
C11	Residential, < ¼ acre lots	33.0	33.0	33.0	33.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	514.5	521.4	522.5	1054.7	+ 6.9	+ 1.3	+ 1.1	+ 0.2	+ 532.2	+ 101.9
C13	Residential, > ½ acre lots	405.6	467.4	510.9	1031.3	+ 61.8	+ 15.2	+ 43.5	+ 9.3	+ 520.4	+ 101.9
C14	Salt marsh	1358.1	1357.2	1357.2	1357.2	- 0.9	- 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	15.8	18.3	19.2	38.2	+ 2.5	+ 15.7	+ 1.0	+ 5.2	+ 19.0	+ 98.7
C16	Industrial	8.9	8.9	9.7	19.4	+ 0.0	+ 0.0	+ 0.9	+ 9.6	+ 9.6	+ 98.7
C17	Urban open	43.1	44.6	45.8	91.0	+ 1.5	+ 3.5	+ 1.2	+ 2.7	+ 45.2	+ 98.7
C18	Transportation	25.9	25.9	25.9	51.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 25.5	+ 98.7
C19	Waste disposal	5.1	6.1	6.1	6.1	+ 1.0	+ 20.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	61.4	62.3	62.3	62.3	+ 0.8	+ 1.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	27.6	27.6	27.6	13.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 13.8	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	12,139
Housing units within watershed:	5,136
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	21

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	319.2	320.9	315.4	157.7	+ 1.7	+ 0.5	- 5.5	- 1.7	- 157.7	- 50.0
C2	Pasture	173.3	167.0	170.1	85.1	- 6.3	- 3.6	+ 3.1	+ 1.8	- 85.1	- 50.0
C3	Forest	4643.8	4544.3	4477.7	2238.9	- 99.5	- 2.1	- 66.6	- 1.5	- 2238.9	- 50.0
C4	Non-forested wetland	274.5	272.0	272.0	272.0	- 2.5	- 0.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	2.5	0.0	0.0	0.0	- 2.5	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	278.2	259.8	256.6	256.6	- 18.4	- 6.6	- 3.1	- 1.2	+ 0.0	+ 0.0
C7	Participatory recreation	22.6	23.7	23.7	23.7	+ 1.1	+ 4.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	8.4	8.4	8.4	8.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	123.0	123.9	123.9	123.9	+ 0.9	+ 0.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	4.6	4.6	4.6	12.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 7.5	+ 165.3
C11	Residential, < ¼ acre lots	33.0	33.0	33.0	33.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	607.6	614.5	615.7	1633.1	+ 6.9	+ 1.1	+ 1.1	+ 0.2	+ 1017.5	+ 165.3
C13	Residential, > ½ acre lots	531.8	635.5	703.5	1866.1	+ 103.7	+ 19.5	+ 68.0	+ 10.7	+ 1162.6	+ 165.3
C14	Salt marsh	1374.7	1373.9	1373.9	1373.9	- 0.9	- 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	20.4	22.9	24.9	65.0	+ 2.5	+ 12.2	+ 2.0	+ 8.7	+ 40.1	+ 161.2
C16	Industrial	15.8	17.8	19.0	49.6	+ 2.0	+ 12.6	+ 1.2	+ 6.5	+ 30.6	+ 161.2
C17	Urban open	71.5	78.3	79.8	208.4	+ 6.8	+ 9.5	+ 1.5	+ 1.9	+ 128.7	+ 161.2
C18	Transportation	66.4	68.8	68.8	179.8	+ 2.5	+ 3.7	+ 0.0	+ 0.0	+ 111.0	+ 161.2
C19	Waste disposal	6.9	7.9	7.9	7.9	+ 1.0	+ 14.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	263.0	263.9	263.9	263.9	+ 0.8	+ 0.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	34.4	34.4	32.8	16.4	+ 0.0	+ 0.0	- 1.6	- 4.8	- 16.4	- 50.0

Table A-8. Population and land use data for the Essex Bay Watershed

1990 land use data not available for Hamilton, Wenham, and Manchester

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	2,701
Housing units within 1000 m boundary:	1,249
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	20

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	214.1	214.1	212.4	106.2	+ 0.0	+ 0.0	- 1.7	- 0.8	- 106.2	- 50.0
C2 Pasture	114.3	110.4	113.5	56.8	- 3.9	- 3.4	+ 3.1	+ 2.8	- 56.8	- 50.0
C3 Forest	1242.4	1206.0	1176.3	588.1	- 36.4	- 2.9	- 29.7	- 2.5	- 588.1	- 50.0
C4 Non-forested wetland	15.8	15.8	15.8	15.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	169.0	160.2	159.1	159.1	- 8.8	- 5.2	- 1.1	- 0.7	+ 0.0	+ 0.0
C7 Participatory recreation	20.1	20.1	20.1	20.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	3.0	3.0	3.0	3.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	39.5	39.5	39.5	39.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	1.4	1.4	1.4	3.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 2.3	+ 161.1
C11 Residential, < ¼ acre lots	8.3	8.3	8.3	8.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	124.7	124.7	124.7	325.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 200.9	+ 161.1
C13 Residential, > ½ acre lots	244.0	290.1	318.0	830.4	+ 46.0	+ 18.9	+ 28.0	+ 9.6	+ 512.4	+ 161.1
C14 Salt marsh	1150.5	1150.5	1150.5	1150.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	9.9	10.9	11.9	30.7	+ 1.1	+ 10.7	+ 1.0	+ 8.7	+ 18.8	+ 158.2
C16 Industrial	2.2	2.2	3.1	7.9	+ 0.0	+ 0.0	+ 0.9	+ 38.6	+ 4.8	+ 158.2
C17 Urban open	15.4	16.0	15.7	40.5	+ 0.6	+ 3.9	- 0.3	- 1.7	+ 24.8	+ 158.2
C18 Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19 Waste disposal	3.7	4.3	4.3	4.3	+ 0.5	+ 14.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	11.0	11.8	11.8	11.8	+ 0.8	+ 7.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	25.9	25.9	25.9	13.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 13.0	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	6,110
Housing units within watershed:	2,366
Occupancy rate (persons per unit):	2.6
Housing units sewered (%):	18

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	319.2	320.9	315.4	157.7	+ 1.7	+ 0.5	- 5.5	- 1.7	- 157.7	- 50.0
C2 Pasture	163.5	157.3	160.3	80.2	- 6.3	- 3.8	+ 3.1	+ 2.0	- 80.2	- 50.0
C3 Forest	3310.6	3229.6	3182.7	1591.4	- 81.1	- 2.4	- 46.8	- 1.4	- 1591.4	- 50.0
C4 Non-forested wetland	246.7	244.8	244.8	244.8	- 1.9	- 0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	2.5	0.0	0.0	0.0	- 2.5	---	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	202.6	193.8	193.1	193.1	- 8.8	- 4.3	- 0.7	- 0.3	+ 0.0	+ 0.0
C7 Participatory recreation	20.1	20.6	20.6	20.6	+ 0.4	+ 2.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	3.0	3.0	3.0	3.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	39.8	39.8	39.8	39.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	1.4	1.4	1.4	4.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 3.2	+ 223.0
C11 Residential, < ¼ acre lots	8.3	8.3	8.3	8.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	217.9	217.9	217.9	703.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 485.9	+ 223.0
C13 Residential, > ½ acre lots	364.3	451.4	501.2	1619.0	+ 87.1	+ 23.9	+ 49.8	+ 11.0	+ 1117.8	+ 223.0
C14 Salt marsh	1160.8	1160.8	1160.8	1160.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	14.2	15.2	16.2	51.9	+ 1.1	+ 7.4	+ 1.0	+ 6.2	+ 35.7	+ 220.5
C16 Industrial	3.1	5.1	6.0	19.1	+ 2.0	+ 64.6	+ 0.9	+ 16.7	+ 13.1	+ 220.5
C17 Urban open	43.8	48.0	48.1	154.1	+ 4.3	+ 9.7	+ 0.0	+ 0.1	+ 106.0	+ 220.5
C18 Transportation	35.2	37.7	37.7	120.7	+ 2.5	+ 7.0	+ 0.0	+ 0.0	+ 83.0	+ 220.5
C19 Waste disposal	5.5	6.1	6.1	6.1	+ 0.5	+ 9.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	165.9	166.7	166.7	166.7	+ 0.8	+ 0.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	32.8	32.8	31.1	15.6	+ 0.0	+ 0.0	- 1.6	- 5.0	- 15.6	- 50.0

Table A-9. Population and land use data for the Annisquam River Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	4,459
Housing units within 1000 m boundary:	1,956
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	32

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2	Pasture	2.0	2.0	2.0	1.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 1.0	- 50.0
C3	Forest	657.6	637.5	620.7	310.4	- 20.1	- 3.1	- 16.8	- 2.6	- 310.4	- 50.0
C4	Non-forested wetland	12.8	12.2	12.2	12.2	- 0.6	- 4.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	44.5	43.2	41.8	41.8	- 1.3	- 2.9	- 1.4	- 3.2	+ 0.0	+ 0.0
C7	Participatory recreation	2.3	3.0	3.0	3.0	+ 0.7	+ 30.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	4.4	4.4	4.4	4.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	11.3	12.2	12.2	12.2	+ 0.9	+ 7.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	3.1	3.1	3.1	5.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 2.1	+ 67.2
C11	Residential, < ¼ acre lots	24.7	24.7	24.7	24.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	267.8	273.0	274.1	458.3	+ 5.2	+ 1.9	+ 1.1	+ 0.4	+ 184.1	+ 67.2
C13	Residential, > ½ acre lots	105.3	119.1	134.6	225.0	+ 13.8	+ 13.1	+ 15.5	+ 13.0	+ 90.4	+ 67.2
C14	Salt marsh	206.7	205.9	205.9	205.9	- 0.9	- 0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	5.9	7.3	7.3	12.0	+ 1.4	+ 24.2	+ 0.0	+ 0.0	+ 4.6	+ 63.4
C16	Industrial	6.7	6.7	6.7	10.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 4.2	+ 63.4
C17	Urban open	13.7	14.7	16.2	26.4	+ 0.9	+ 6.7	+ 1.5	+ 10.1	+ 10.2	+ 63.4
C18	Transportation	25.9	25.9	25.9	42.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 16.4	+ 63.4
C19	Waste disposal	1.3	1.3	1.3	1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	43.8	43.8	43.8	43.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	1.6	1.6	1.6	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.8	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	4,644
Housing units within watershed:	2,027
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	29

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2	Pasture	2.0	2.0	2.0	1.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 1.0	- 50.0
C3	Forest	1077.5	1055.7	1036.0	518.0	- 21.7	- 2.0	- 19.8	- 1.9	- 518.0	- 50.0
C4	Non-forested wetland	22.1	21.5	21.5	21.5	- 0.6	- 2.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	45.5	44.2	41.8	41.8	- 1.3	- 2.9	- 2.4	- 5.5	+ 0.0	+ 0.0
C7	Participatory recreation	2.3	3.0	3.0	3.0	+ 0.7	+ 30.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	4.4	4.4	4.4	4.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	11.3	12.2	12.2	12.2	+ 0.9	+ 7.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	3.1	3.1	3.1	6.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 3.4	+ 107.4
C11	Residential, < ¼ acre lots	24.7	24.7	24.7	24.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	267.8	273.0	274.1	568.6	+ 5.2	+ 1.9	+ 1.1	+ 0.4	+ 294.5	+ 107.4
C13	Residential, > ½ acre lots	107.9	121.7	139.9	290.3	+ 13.8	+ 12.8	+ 18.2	+ 15.0	+ 150.3	+ 107.4
C14	Salt marsh	213.1	212.2	212.2	212.2	- 0.9	- 0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	6.2	7.7	8.7	17.5	+ 1.4	+ 22.9	+ 1.0	+ 13.5	+ 8.8	+ 101.4
C16	Industrial	12.7	12.7	13.0	26.3	+ 0.0	+ 0.0	+ 0.3	+ 2.4	+ 13.2	+ 101.4
C17	Urban open	13.7	16.3	17.7	35.7	+ 2.5	+ 18.3	+ 1.5	+ 9.2	+ 18.0	+ 101.4
C18	Transportation	31.2	31.2	31.2	62.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 31.6	+ 101.4
C19	Waste disposal	1.3	1.3	1.3	1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	88.6	88.6	88.6	88.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	1.6	1.6	1.6	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.8	- 50.0

Table A-10. Population and land use data for the Sandy Bay Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	4,217
Housing units within 1000 m boundary:	2,465
Occupancy rate (persons per unit):	1.7
Housing units sewered (%):	90

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	1.1	1.1	1.1	0.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.6	- 50.0
C2	Pasture	6.5	4.2	4.2	2.1	- 2.2	- 34.4	+ 0.0	+ 0.0	- 2.1	- 50.0
C3	Forest	195.2	173.9	161.2	80.6	- 21.3	- 10.9	- 12.7	- 7.3	- 80.6	- 50.0
C4	Non-forested wetland	2.2	2.2	2.2	2.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.9	0.9	0.9	0.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	11.3	11.3	11.3	11.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	2.8	3.4	2.8	2.8	+ 0.6	+ 22.6	- 0.6	- 18.4	+ 0.0	+ 0.0
C9	Water-based recreation	11.5	11.5	11.5	11.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	1.8	5.4	8.6	12.6	+ 3.6	+ 195.2	+ 3.1	+ 57.6	+ 4.0	+ 46.6
C11	Residential, < ¼ acre lots	90.8	90.8	90.8	90.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	112.4	114.4	117.3	171.9	+ 1.9	+ 1.7	+ 2.9	+ 2.5	+ 54.6	+ 46.6
C13	Residential, > ½ acre lots	14.0	29.4	35.9	52.7	+ 15.4	+ 110.1	+ 6.5	+ 22.1	+ 16.7	+ 46.6
C14	Salt marsh	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	15.7	15.7	16.5	21.4	+ 0.0	+ 0.0	+ 0.8	+ 5.1	+ 4.9	+ 29.8
C16	Industrial	1.9	1.9	1.9	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.6	+ 29.8
C17	Urban open	3.8	3.8	3.8	4.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.1	+ 29.8
C18	Transportation	4.5	4.5	4.5	5.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.3	+ 29.8
C19	Waste disposal	0.0	1.9	1.9	1.9	+ 1.9	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	7.5	7.5	7.5	7.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	4,578
Housing units within watershed:	2,632
Occupancy rate (persons per unit):	1.7
Housing units sewered (%):	90

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	1.1	1.1	1.1	0.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.6	- 50.0
C2	Pasture	6.5	4.2	4.2	2.1	- 2.2	- 34.4	+ 0.0	+ 0.0	- 2.1	- 50.0
C3	Forest	289.1	261.4	247.4	123.7	- 27.7	- 9.6	- 13.9	- 5.3	- 123.7	- 50.0
C4	Non-forested wetland	10.0	10.0	10.0	10.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	4.7	4.3	4.3	4.3	- 0.4	- 8.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	11.9	11.9	13.0	13.0	+ 0.0	+ 0.0	+ 1.1	+ 9.4	+ 0.0	+ 0.0
C7	Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	2.8	3.4	2.8	2.8	+ 0.6	+ 22.6	- 0.6	- 18.4	+ 0.0	+ 0.0
C9	Water-based recreation	11.5	11.5	11.5	11.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	1.8	6.7	9.9	16.4	+ 4.9	+ 264.3	+ 3.1	+ 46.7	+ 6.5	+ 66.2
C11	Residential, < ¼ acre lots	102.5	102.5	102.5	102.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	116.4	118.3	121.2	201.4	+ 1.9	+ 1.7	+ 2.9	+ 2.4	+ 80.2	+ 66.2
C13	Residential, > ½ acre lots	15.1	32.4	40.1	66.6	+ 17.3	+ 114.7	+ 7.7	+ 23.8	+ 26.5	+ 66.2
C14	Salt marsh	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	18.5	18.5	19.3	27.2	+ 0.0	+ 0.0	+ 0.8	+ 4.3	+ 8.0	+ 41.4
C16	Industrial	1.9	1.9	1.9	2.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.8	+ 41.4
C17	Urban open	3.8	4.9	6.3	8.9	+ 1.1	+ 29.8	+ 1.4	+ 29.0	+ 2.6	+ 41.4
C18	Transportation	4.5	7.0	4.5	6.3	+ 2.5	+ 56.9	- 2.5	- 36.3	+ 1.8	+ 41.4
C19	Waste disposal	0.0	2.0	2.0	2.0	+ 2.0	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	8.7	8.7	8.7	8.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-11. Population and land use data for the Gloucester Harbor Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	11,535
Housing units within 1000 m boundary:	5,451
Occupancy rate (persons per unit):	2.1
Housing units sewered (%):	89

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	0.6	0.6	0.6	0.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.3	- 50.0
C2 Pasture	1.6	1.6	1.6	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.8	- 50.0
C3 Forest	219.5	210.0	206.3	103.2	- 9.5	- 4.3	- 3.7	- 1.8	- 103.2	- 50.0
C4 Non-forested wetland	6.0	6.0	6.0	6.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	17.5	17.5	16.6	16.6	+ 0.0	+ 0.0	- 0.9	- 5.0	+ 0.0	+ 0.0
C7 Participatory recreation	22.6	22.6	22.6	22.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	15.0	15.0	15.0	15.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	23.6	23.6	23.6	23.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	4.0	5.1	10.4	15.7	+ 1.1	+ 28.1	+ 5.3	+ 103.0	+ 5.3	+ 51.3
C11 Residential, < ¼ acre lots	170.3	170.3	170.3	170.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	77.0	78.8	80.4	121.6	+ 1.8	+ 2.3	+ 1.5	+ 1.9	+ 41.2	+ 51.3
C13 Residential, > ½ acre lots	67.8	73.6	72.0	109.0	+ 5.8	+ 8.6	- 1.6	- 2.1	+ 37.0	+ 51.3
C14 Salt marsh	36.2	36.2	36.2	36.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	20.0	20.0	20.0	25.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 5.0	+ 25.1
C16 Industrial	10.6	10.1	10.1	12.6	- 0.5	- 4.5	+ 0.0	+ 0.0	+ 2.5	+ 25.1
C17 Urban open	23.9	25.7	25.0	31.3	+ 1.9	+ 8.0	- 0.7	- 2.6	+ 6.3	+ 25.1
C18 Transportation	28.4	27.7	27.7	34.7	- 0.7	- 2.3	+ 0.0	+ 0.0	+ 6.9	+ 25.1
C19 Waste disposal	5.0	5.0	5.0	5.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	2.6	2.6	2.6	2.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	11,710
Housing units within watershed:	5,520
Occupancy rate (persons per unit):	2.1
Housing units sewered (%):	89

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	0.6	0.6	0.6	0.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.3	- 50.0
C2 Pasture	1.6	1.6	1.6	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.8	- 50.0
C3 Forest	226.2	216.0	212.3	106.2	- 10.1	- 4.5	- 3.7	- 1.7	- 106.2	- 50.0
C4 Non-forested wetland	7.5	7.5	7.5	7.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	17.6	17.6	17.0	17.0	+ 0.0	+ 0.0	- 0.6	- 3.2	+ 0.0	+ 0.0
C7 Participatory recreation	22.6	22.6	22.6	22.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	15.0	15.0	15.0	15.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	23.6	23.6	23.6	23.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	4.0	5.3	10.5	16.0	+ 1.3	+ 31.8	+ 5.3	+ 100.1	+ 5.5	+ 52.0
C11 Residential, < ¼ acre lots	172.2	172.2	172.2	172.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	77.0	78.8	80.4	122.1	+ 1.8	+ 2.3	+ 1.5	+ 1.9	+ 41.8	+ 52.0
C13 Residential, > ½ acre lots	67.8	73.6	72.0	109.5	+ 5.8	+ 8.6	- 1.6	- 2.1	+ 37.4	+ 52.0
C14 Salt marsh	36.2	36.2	36.2	36.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	20.0	20.0	20.0	25.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 5.1	+ 25.3
C16 Industrial	13.9	13.6	13.6	17.1	- 0.3	- 2.2	+ 0.0	+ 0.0	+ 3.4	+ 25.3
C17 Urban open	25.4	27.6	26.6	33.3	+ 2.2	+ 8.7	- 1.0	- 3.5	+ 6.7	+ 25.3
C18 Transportation	29.9	29.3	29.3	36.7	- 0.7	- 2.2	+ 0.0	+ 0.0	+ 7.4	+ 25.3
C19 Waste disposal	5.6	5.6	5.6	5.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	2.6	2.6	2.6	2.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-12. Population and land use data for the Hingham Bay Watershed

Includes Weymouth Fore and Weymouth Back Rivers, Higham Harbor, Weir River and Hull Bay

1990 land use data not available for Hull, Cohassett and Weymouth

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	61,619
Housing units within 1000 m boundary:	26,141
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	90

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	65.7	65.7	63.0	31.5	+ 0.0	+ 0.0	- 2.7	- 4.1	- 31.5	- 50.0
C2 Pasture	17.9	17.9	17.9	9.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 9.0	- 50.0
C3 Forest	687.7	629.3	600.6	300.3	- 58.4	- 8.5	- 28.7	- 4.6	- 300.3	- 50.0
C4 Non-forested wetland	48.4	48.4	48.4	48.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	38.6	28.9	32.8	32.8	- 9.7	- 25.2	+ 3.9	+ 13.7	+ 0.0	+ 0.0
C6 Open land	111.6	109.7	113.7	113.7	- 2.0	- 1.8	+ 4.0	+ 3.7	+ 0.0	+ 0.0
C7 Participatory recreation	6.8	9.7	9.7	9.7	+ 2.8	+ 41.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	74.7	71.3	73.2	73.2	- 3.4	- 4.6	+ 1.8	+ 2.6	+ 0.0	+ 0.0
C9 Water-based recreation	44.5	44.5	50.6	50.6	- 0.0	- 0.0	+ 6.1	+ 13.7	+ 0.0	+ 0.0
C10 Residential, multi-family	36.5	79.9	104.4	140.8	+ 43.3	+ 118.6	+ 24.5	+ 30.7	+ 36.5	+ 34.9
C11 Residential, < ¼ acre lots	1347.9	1347.3	1347.6	1347.6	- 0.5	- 0.0	+ 0.3	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	419.6	424.2	425.4	574.0	+ 4.6	+ 1.1	+ 1.2	+ 0.3	+ 148.6	+ 34.9
C13 Residential, > ½ acre lots	183.4	188.8	200.2	270.1	+ 5.5	+ 3.0	+ 11.3	+ 6.0	+ 69.9	+ 34.9
C14 Salt marsh	259.0	254.7	254.7	254.7	- 4.3	- 1.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	168.3	185.1	185.1	207.8	+ 16.8	+ 10.0	+ 0.0	+ 0.0	+ 22.7	+ 12.3
C16 Industrial	239.2	244.3	244.3	274.3	+ 5.2	+ 2.2	+ 0.0	+ 0.0	+ 30.0	+ 12.3
C17 Urban open	268.1	269.9	260.6	292.6	+ 1.8	+ 0.7	- 9.3	- 3.4	+ 32.0	+ 12.3
C18 Transportation	10.7	10.7	10.7	12.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.3	+ 12.3
C19 Waste disposal	21.6	19.1	6.6	6.6	- 2.5	- 11.7	- 12.5	- 65.5	+ 0.0	+ 0.0
C20 Open water	22.1	22.1	22.1	22.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.5	0.5	0.5	0.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.2	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	71,906
Housing units within watershed:	30,304
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	91

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	65.7	65.7	63.0	31.5	+ 0.0	+ 0.0	- 2.7	- 4.1	- 31.5	- 50.0
C2 Pasture	28.7	28.7	23.3	11.6	+ 0.0	+ 0.0	- 5.4	- 18.8	- 11.6	- 50.0
C3 Forest	922.4	841.8	806.5	403.3	- 80.6	- 8.7	- 35.3	- 4.2	- 403.3	- 50.0
C4 Non-forested wetland	55.8	55.8	55.8	55.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	60.5	50.8	55.1	55.1	- 9.7	- 16.0	+ 4.3	+ 8.4	+ 0.0	+ 0.0
C6 Open land	129.4	126.7	127.7	127.7	- 2.7	- 2.1	+ 1.0	+ 0.8	+ 0.0	+ 0.0
C7 Participatory recreation	31.4	34.2	34.2	34.2	+ 2.8	+ 9.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	84.4	81.0	82.8	82.8	- 3.4	- 4.1	+ 1.8	+ 2.3	+ 0.0	+ 0.0
C9 Water-based recreation	44.5	44.5	50.6	50.6	- 0.0	- 0.0	+ 6.1	+ 13.7	+ 0.0	+ 0.0
C10 Residential, multi-family	43.7	94.2	119.8	162.8	+ 50.5	+ 115.6	+ 25.6	+ 27.2	+ 43.0	+ 35.9
C11 Residential, < ¼ acre lots	1558.1	1555.6	1555.8	1555.8	- 2.5	- 0.2	+ 0.3	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	591.7	612.2	614.5	834.9	+ 20.5	+ 3.5	+ 2.2	+ 0.4	+ 220.5	+ 35.9
C13 Residential, > ½ acre lots	187.4	195.0	218.8	297.3	+ 7.6	+ 4.0	+ 23.8	+ 12.2	+ 78.5	+ 35.9
C14 Salt marsh	259.0	254.7	254.7	254.7	- 4.3	- 1.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	194.5	215.7	215.7	245.1	+ 21.2	+ 10.9	+ 0.0	+ 0.0	+ 29.4	+ 13.6
C16 Industrial	244.0	249.2	249.2	283.1	+ 5.2	+ 2.1	+ 0.0	+ 0.0	+ 34.0	+ 13.6
C17 Urban open	303.1	301.6	292.3	332.2	- 1.5	- 0.5	- 9.3	- 3.1	+ 39.8	+ 13.6
C18 Transportation	13.7	13.7	13.7	15.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.9	+ 13.6
C19 Waste disposal	24.5	22.0	9.5	9.5	- 2.5	- 10.3	- 12.5	- 56.9	+ 0.0	+ 0.0
C20 Open water	24.4	24.4	24.4	24.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	2.7	1.3	1.3	0.7	- 1.4	- 51.0	+ 0.0	+ 0.0	- 0.7	- 50.0

Table A-13. Population and land use data for the Weymouth Fore River Watershed

1990 land use data not available for Weymouth

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	38,798
Housing units within 1000 m boundary:	16,291
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	98

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	2.2	2.2	2.2	1.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 1.1	- 50.0
C3 Forest	158.2	127.0	122.1	61.1	- 31.1	- 19.7	- 4.9	- 3.9	- 61.1	- 50.0
C4 Non-forested wetland	15.9	15.9	15.9	15.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	31.0	24.5	28.5	28.5	- 6.4	- 20.7	+ 3.9	+ 16.1	+ 0.0	+ 0.0
C6 Open land	31.9	31.0	35.0	35.0	- 0.9	- 2.9	+ 4.0	+ 13.0	+ 0.0	+ 0.0
C7 Participatory recreation	6.1	7.8	7.8	7.8	+ 1.7	+ 27.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	43.7	46.1	46.1	46.1	+ 2.4	+ 5.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	13.6	13.6	19.7	19.7	- 0.0	- 0.1	+ 6.1	+ 44.8	+ 0.0	+ 0.0
C10 Residential, multi-family	36.5	70.9	76.9	101.0	+ 34.3	+ 94.0	+ 6.0	+ 8.5	+ 24.1	+ 31.3
C11 Residential, < ¼ acre lots	830.1	827.4	827.7	827.7	- 2.7	- 0.3	+ 0.3	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	46.9	53.0	54.2	71.2	+ 6.1	+ 13.1	+ 1.2	+ 2.2	+ 17.0	+ 31.3
C13 Residential, > ½ acre lots	14.7	14.7	14.7	19.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 4.6	+ 31.3
C14 Salt marsh	122.9	118.6	118.6	118.6	- 4.3	- 3.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	99.7	108.2	108.2	113.3	+ 8.5	+ 8.6	+ 0.0	+ 0.0	+ 5.1	+ 4.7
C16 Industrial	178.3	178.6	178.6	187.0	+ 0.3	+ 0.2	+ 0.0	+ 0.0	+ 8.4	+ 4.7
C17 Urban open	69.9	65.9	61.8	64.7	- 4.0	- 5.7	- 4.1	- 6.2	+ 2.9	+ 4.7
C18 Transportation	3.7	3.7	3.7	3.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 4.7
C19 Waste disposal	16.9	12.9	0.4	0.4	- 4.0	- 23.9	- 12.5	- 97.1	+ 0.0	+ 0.0
C20 Open water	3.3	3.3	3.3	3.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	45,601
Housing units within watershed:	19,054
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	98

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	2.2	2.2	2.2	1.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 1.1	- 50.0
C3 Forest	265.5	220.8	214.9	107.4	- 44.6	- 16.8	- 6.0	- 2.7	- 107.4	- 50.0
C4 Non-forested wetland	20.2	20.2	20.2	20.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	47.7	41.3	45.2	45.2	- 6.4	- 13.4	+ 3.9	+ 9.6	+ 0.0	+ 0.0
C6 Open land	35.3	34.4	38.4	38.4	- 0.9	- 2.7	+ 4.0	+ 11.7	+ 0.0	+ 0.0
C7 Participatory recreation	6.1	7.8	7.8	7.8	+ 1.7	+ 27.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	49.4	51.8	51.8	51.8	+ 2.4	+ 4.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	13.6	13.6	19.7	19.7	- 0.0	- 0.1	+ 6.1	+ 44.8	+ 0.0	+ 0.0
C10 Residential, multi-family	42.7	77.6	83.7	112.5	+ 34.9	+ 81.8	+ 6.1	+ 7.8	+ 28.9	+ 34.5
C11 Residential, < ¼ acre lots	992.0	987.4	987.6	987.6	- 4.7	- 0.5	+ 0.3	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	116.1	136.5	138.7	186.6	+ 20.3	+ 17.5	+ 2.2	+ 1.6	+ 47.9	+ 34.5
C13 Residential, > ½ acre lots	14.7	16.1	16.1	21.7	+ 1.4	+ 9.5	+ 0.0	+ 0.0	+ 5.6	+ 34.5
C14 Salt marsh	122.9	118.6	118.6	118.6	- 4.3	- 3.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	121.5	131.1	131.1	139.9	+ 9.6	+ 7.9	+ 0.0	+ 0.0	+ 8.8	+ 6.7
C16 Industrial	182.4	182.7	182.7	195.0	+ 0.3	+ 0.2	+ 0.0	+ 0.0	+ 12.3	+ 6.7
C17 Urban open	87.6	83.3	79.1	84.4	- 4.3	- 4.9	- 4.1	- 5.0	+ 5.3	+ 6.7
C18 Transportation	4.8	4.8	4.8	5.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.3	+ 6.7
C19 Waste disposal	19.8	15.8	3.2	3.2	- 4.0	- 20.4	- 12.5	- 79.4	+ 0.0	+ 0.0
C20 Open water	4.1	4.1	4.1	4.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	2.3	0.9	0.9	0.4	- 1.4	- 61.3	+ 0.0	+ 0.0	- 0.4	- 50.0

Table A-14. Population and land use data for the Weymouth Back River Watershed

1990 land use data not available for Weymouth

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	7,305
Housing units within 1000 m boundary:	3,011
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	85

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	1.5	1.5	1.5	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.8	- 50.0
C3 Forest	245.0	224.4	215.4	107.7	- 20.6	- 8.4	- 9.0	- 4.0	- 107.7	- 50.0
C4 Non-forested wetland	5.7	5.7	5.7	5.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	3.4	0.1	0.1	0.1	- 3.3	- 96.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	21.0	20.3	20.3	20.3	- 0.6	- 3.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	0.8	1.9	1.9	1.9	+ 1.1	+ 150.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	14.3	7.2	9.1	9.1	- 7.1	- 49.4	+ 1.8	+ 25.4	+ 0.0	+ 0.0
C9 Water-based recreation	17.8	17.8	17.8	17.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	8.6	27.1	44.6	+ 8.6	—	+ 18.5	+ 214.5	+ 17.5	+ 64.7
C11 Residential, < ¼ acre lots	187.9	191.1	191.1	191.1	+ 3.3	+ 1.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	58.0	58.0	58.0	95.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 37.6	+ 64.7
C13 Residential, > ½ acre lots	11.3	11.3	5.1	8.4	- 0.0	- 0.1	- 6.2	- 54.9	+ 3.3	+ 64.7
C14 Salt marsh	46.7	46.6	46.6	46.6	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	30.5	40.5	40.5	48.9	+ 10.0	+ 32.9	+ 0.0	+ 0.0	+ 8.4	+ 20.8
C16 Industrial	58.2	63.0	63.0	76.1	+ 4.8	+ 8.3	+ 0.0	+ 0.0	+ 13.1	+ 20.8
C17 Urban open	139.9	143.0	137.8	166.4	+ 3.1	+ 2.2	- 5.1	- 3.6	+ 28.6	+ 20.8
C18 Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19 Waste disposal	1.8	1.8	1.8	1.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	9,638
Housing units within watershed:	3,940
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	86

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	3.4	3.4	2.7	1.4	+ 0.0	+ 0.0	- 0.6	- 18.2	- 1.4	- 50.0
C3 Forest	330.9	302.3	293.6	146.8	- 28.6	- 8.6	- 8.7	- 2.9	- 146.8	- 50.0
C4 Non-forested wetland	7.0	7.0	7.0	7.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	8.6	5.3	5.6	5.6	- 3.3	- 38.3	+ 0.3	+ 6.1	+ 0.0	+ 0.0
C6 Open land	26.8	26.1	26.1	26.1	- 0.7	- 2.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	6.9	8.1	8.1	8.1	+ 1.1	+ 16.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	18.2	11.2	13.0	13.0	- 7.1	- 38.7	+ 1.8	+ 16.4	+ 0.0	+ 0.0
C9 Water-based recreation	17.8	17.8	17.8	17.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	14.6	33.0	53.7	+ 14.6	—	+ 18.5	+ 126.9	+ 20.7	+ 62.6
C11 Residential, < ¼ acre lots	225.7	229.0	229.0	229.0	+ 3.3	+ 1.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	95.1	96.9	96.9	157.5	+ 1.7	+ 1.8	+ 0.0	+ 0.0	+ 60.6	+ 62.6
C13 Residential, > ½ acre lots	14.4	14.4	8.2	13.3	- 0.0	- 0.1	- 6.2	- 43.1	+ 5.1	+ 62.6
C14 Salt marsh	46.7	46.6	46.6	46.6	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	34.3	47.7	47.7	58.9	+ 13.4	+ 39.1	+ 0.0	+ 0.0	+ 11.2	+ 23.5
C16 Industrial	58.9	63.8	63.8	78.8	+ 4.8	+ 8.2	+ 0.0	+ 0.0	+ 15.0	+ 23.5
C17 Urban open	154.0	154.1	148.9	184.0	+ 0.1	+ 0.1	- 5.1	- 3.3	+ 35.1	+ 23.5
C18 Transportation	1.9	1.9	1.9	2.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.4	+ 23.5
C19 Waste disposal	1.8	1.8	1.8	1.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	1.2	1.2	1.2	1.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-15. Population and land use data for the Hingham Harbor Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	2,945
Housing units within 1000 m boundary:	1,168
Occupancy rate (persons per unit):	2.5
Housing units sewered (%):	61

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	22.9	22.9	22.9	11.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 11.5	- 50.0
C2	Pasture	6.8	6.8	6.8	3.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 3.4	- 50.0
C3	Forest	74.8	70.3	65.3	32.6	- 4.5	- 6.1	- 5.0	- 7.2	- 32.6	- 50.0
C4	Non-forested wetland	26.7	26.7	26.7	26.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	5.7	5.3	5.3	5.3	- 0.4	- 6.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	7.5	7.5	7.5	7.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	2.4	2.4	2.4	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.4	0.4	0.4	+ 0.4	---	+ 0.0	+ 0.0	+ 0.1	+ 15.9
C11	Residential, < ¼ acre lots	15.8	15.8	15.8	15.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	142.7	142.7	142.7	165.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 22.7	+ 15.9
C13	Residential, > ½ acre lots	108.9	113.5	118.5	137.4	+ 4.5	+ 4.2	+ 5.0	+ 4.4	+ 18.9	+ 15.9
C14	Salt marsh	8.4	8.4	8.4	8.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	19.0	19.0	19.0	21.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 2.9	+ 15.0
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	21.5	21.5	21.5	24.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 3.2	+ 15.0
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	7.8	7.8	7.8	7.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.5	0.5	0.5	0.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.2	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	4,055
Housing units within watershed:	1,621
Occupancy rate (persons per unit):	2.5
Housing units sewered (%):	61

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	22.9	22.9	22.9	11.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 11.5	- 50.0
C2	Pasture	15.7	15.7	10.9	5.5	+ 0.0	+ 0.0	- 4.8	- 30.4	- 5.5	- 50.0
C3	Forest	112.2	106.9	96.1	48.0	- 5.3	- 4.7	- 10.9	- 10.2	- 48.0	- 50.0
C4	Non-forested wetland	28.5	28.5	28.5	28.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	14.2	13.2	10.2	10.2	- 1.0	- 7.3	- 3.0	- 22.7	+ 0.0	+ 0.0
C7	Participatory recreation	18.3	18.3	18.3	18.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	7.5	7.5	7.5	7.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	2.4	2.4	2.4	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	1.0	2.1	3.1	3.7	+ 1.0	+ 102.1	+ 1.1	+ 52.7	+ 0.5	+ 17.0
C11	Residential, < ¼ acre lots	26.2	26.2	26.2	26.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	206.0	206.0	206.0	241.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 35.1	+ 17.0
C13	Residential, > ½ acre lots	109.9	115.1	132.7	155.2	+ 5.3	+ 4.8	+ 17.5	+ 15.2	+ 22.6	+ 17.0
C14	Salt marsh	8.4	8.4	8.4	8.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	19.6	19.6	19.6	22.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 3.1	+ 15.8
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	24.7	24.7	24.7	28.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 3.9	+ 15.8
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	8.0	8.0	8.0	8.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.5	0.5	0.5	0.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.2	- 50.0

Table A-16. Population and land use data for the Weir River Watershed

1990 land use data not available for Hull and Cohasset

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	3,154
Housing units within 1000 m boundary:	1,614
Occupancy rate (persons per unit):	2.0
Housing units sewered (%):	71

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	42.8	42.8	40.1	20.0	+ 0.0	+ 0.0	- 2.7	- 6.4	- 20.0	- 50.0
C2 Pasture	7.4	7.4	7.4	3.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 3.7	- 50.0
C3 Forest	162.8	161.2	151.4	75.7	- 1.6	- 1.0	- 9.8	- 6.1	- 75.7	- 50.0
C4 Non-forested wetland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	4.2	4.2	4.2	4.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	3.6	3.6	3.6	3.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	2.7	2.7	2.7	2.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	2.6	2.6	2.6	2.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11 Residential, < ¼ acre lots	55.2	54.1	54.1	54.1	- 1.1	- 1.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	96.5	96.5	96.5	151.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 55.0	+ 57.0
C13 Residential, > ½ acre lots	46.9	47.4	59.9	94.0	+ 0.5	+ 1.0	+ 12.5	+ 26.4	+ 34.1	+ 57.0
C14 Salt marsh	62.2	62.2	62.2	62.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	9.6	7.8	7.8	11.0	- 1.8	- 18.9	+ 0.0	+ 0.0	+ 3.3	+ 42.4
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	6.7	10.7	10.7	15.2	+ 4.0	+ 60.0	+ 0.0	+ 0.0	+ 4.5	+ 42.4
C18 Transportation	5.7	5.7	5.7	8.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 2.4	+ 42.4
C19 Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	9.6	9.6	9.6	9.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	3,196
Housing units within watershed:	1,631
Occupancy rate (persons per unit):	2.0
Housing units sewered (%):	71

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	42.8	42.8	40.1	20.0	+ 0.0	+ 0.0	- 2.7	- 6.4	- 20.0	- 50.0
C2 Pasture	7.4	7.4	7.4	3.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 3.7	- 50.0
C3 Forest	167.0	165.4	155.6	77.8	- 1.6	- 1.0	- 9.8	- 5.9	- 77.8	- 50.0
C4 Non-forested wetland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	4.2	4.2	4.2	4.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	3.6	3.6	3.6	3.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	2.7	2.7	2.7	2.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	2.6	2.6	2.6	2.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11 Residential, < ¼ acre lots	55.2	54.1	54.1	54.1	- 1.1	- 1.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	98.9	98.9	98.9	155.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 56.8	+ 57.4
C13 Residential, > ½ acre lots	46.9	47.4	59.9	94.3	+ 0.5	+ 1.0	+ 12.5	+ 26.4	+ 34.4	+ 57.4
C14 Salt marsh	62.2	62.2	62.2	62.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	9.6	7.8	7.8	11.1	- 1.8	- 18.9	+ 0.0	+ 0.0	+ 3.3	+ 42.8
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	6.8	10.8	10.8	15.5	+ 4.0	+ 58.7	+ 0.0	+ 0.0	+ 4.6	+ 42.8
C18 Transportation	5.7	5.7	5.7	8.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 2.5	+ 42.8
C19 Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	9.6	9.6	9.6	9.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-17. Population and land use data for the Hull Bay Watershed

1990 land use data not available for Hull

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	5,798
Housing units within 1000 m boundary:	2,573
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	77

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2	Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3	Forest	6.0	6.0	6.0	3.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 3.0	- 50.0
C4	Non-forested wetland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	2.0	2.0	2.0	2.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	2.4	2.4	2.4	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	3.2	3.2	3.2	3.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	180.3	180.3	180.3	180.3	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	17.7	16.2	16.2	18.6	- 1.5	- 8.6	+ 0.0	+ 0.0	+ 2.4	+ 15.1
C13	Residential, > ½ acre lots	1.5	1.5	1.5	1.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 15.1
C14	Salt marsh	10.9	10.9	10.9	10.9	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	7.1	7.1	7.1	7.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.1	+ 1.3
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	15.9	15.9	15.9	16.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 1.3
C18	Transportation	1.2	1.2	1.2	1.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.3
C19	Waste disposal	0.0	1.5	1.5	1.5	+ 1.5	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	0.7	0.7	0.7	0.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	5,798
Housing units within watershed:	2,573
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	77

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2	Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3	Forest	6.0	6.0	6.0	3.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 3.0	- 50.0
C4	Non-forested wetland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	2.0	2.0	2.0	2.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	2.4	2.4	2.4	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	3.2	3.2	3.2	3.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	180.3	180.3	180.3	180.3	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	17.7	16.2	16.2	18.6	- 1.5	- 8.6	+ 0.0	+ 0.0	+ 2.4	+ 15.1
C13	Residential, > ½ acre lots	1.5	1.5	1.5	1.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 15.1
C14	Salt marsh	10.9	10.9	10.9	10.9	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	7.1	7.1	7.1	7.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.1	+ 1.3
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	15.9	15.9	15.9	16.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 1.3
C18	Transportation	1.2	1.2	1.2	1.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.3
C19	Waste disposal	0.0	1.5	1.5	1.5	+ 1.5	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	0.7	0.7	0.7	0.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-18. Population and land use data for the Salem Harbor Watershed

1990 land use data not available for this watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	19,994
Housing units within 1000 m boundary:	8,834
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	98

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	4.1	1.8	1.8	0.9	- 2.3	- 56.2	+ 0.0	+ 0.0	- 0.9	- 50.0
C2 Pasture	0.8	0.8	0.8	0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.4	- 50.0
C3 Forest	84.4	75.3	75.3	37.6	- 9.1	- 10.8	+ 0.0	+ 0.0	- 37.6	- 50.0
C4 Non-forested wetland	14.6	14.6	14.6	14.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	47.4	39.9	39.9	39.9	- 7.5	- 15.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	12.6	12.6	12.6	12.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	17.8	14.5	14.5	14.5	- 3.2	- 18.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	8.4	8.4	8.4	8.4	- 0.0	- 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	1.9	3.7	3.7	4.6	+ 1.9	+ 101.3	+ 0.0	+ 0.0	+ 0.8	+ 22.3
C11 Residential, < ¼ acre lots	329.4	329.3	329.3	329.3	- 0.2	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	98.6	109.1	109.1	133.4	+ 10.4	+ 10.6	+ 0.0	+ 0.0	+ 24.3	+ 22.3
C13 Residential, > ½ acre lots	6.2	9.6	9.6	11.8	+ 3.4	+ 55.9	+ 0.0	+ 0.0	+ 2.1	+ 22.3
C14 Salt marsh	3.3	3.3	3.3	3.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	40.9	46.6	46.6	49.4	+ 5.6	+ 13.8	+ 0.0	+ 0.0	+ 2.8	+ 6.0
C16 Industrial	64.1	64.1	64.1	67.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 3.9	+ 6.0
C17 Urban open	54.5	57.3	57.3	60.7	+ 2.8	+ 5.1	+ 0.0	+ 0.0	+ 3.5	+ 6.0
C18 Transportation	27.2	25.3	25.3	26.8	- 1.9	- 6.9	+ 0.0	+ 0.0	+ 1.5	+ 6.0
C19 Waste disposal	1.9	1.9	1.9	1.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	5.1	5.1	5.1	5.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	27,112
Housing units within watershed:	12,012
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	96

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	4.1	1.8	1.8	0.9	- 2.3	- 56.2	+ 0.0	+ 0.0	- 0.9	- 50.0
C2 Pasture	0.8	0.8	0.8	0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.4	- 50.0
C3 Forest	394.7	346.9	346.9	173.5	- 47.7	- 12.1	+ 0.0	+ 0.0	- 173.5	- 50.0
C4 Non-forested wetland	67.1	66.4	66.4	66.4	- 0.7	- 1.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	21.7	24.0	24.0	24.0	+ 2.3	+ 10.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	239.4	200.0	200.0	200.0	- 39.4	- 16.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	43.7	43.7	43.7	43.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	21.3	22.0	22.0	22.0	+ 0.7	+ 3.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	8.4	8.4	8.4	8.4	- 0.0	- 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	3.9	14.4	14.4	21.9	+ 10.6	+ 276.7	- 0.0	+ 0.0	+ 7.5	+ 51.7
C11 Residential, < ¼ acre lots	377.6	377.4	377.4	377.4	- 0.2	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	178.3	195.7	195.7	296.8	+ 17.3	+ 9.7	+ 0.0	+ 0.0	+ 101.2	+ 51.7
C13 Residential, > ½ acre lots	14.0	17.3	17.3	26.2	+ 3.2	+ 23.1	+ 0.0	+ 0.0	+ 8.9	+ 51.7
C14 Salt marsh	3.3	3.3	3.3	3.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	55.8	77.0	77.0	91.9	+ 21.2	+ 38.0	+ 0.0	+ 0.0	+ 15.0	+ 19.4
C16 Industrial	72.0	82.3	82.3	98.3	+ 10.2	+ 14.2	+ 0.0	+ 0.0	+ 16.0	+ 19.4
C17 Urban open	69.1	96.7	96.7	115.5	+ 27.6	+ 39.9	+ 0.0	+ 0.0	+ 18.8	+ 19.4
C18 Transportation	40.5	38.5	38.5	45.9	- 2.0	- 5.0	+ 0.0	+ 0.0	+ 7.5	+ 19.4
C19 Waste disposal	6.1	5.2	5.2	5.2	- 0.9	- 15.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	10.1	10.1	10.1	10.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-19. Population and land use data for the Bass River Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	10,258
Housing units within 1000 m boundary:	4,572
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	100

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	1.2	1.2	1.2	0.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.6	- 50.0
C2	Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3	Forest	19.3	19.3	17.5	8.7	+ 0.0	+ 0.0	- 1.8	- 9.4	- 8.7	- 50.0
C4	Non-forested wetland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	0.1	0.1	0.1	0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	20.8	20.8	20.8	20.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	14.8	16.9	16.9	16.9	+ 2.2	+ 14.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	2.5	2.5	2.5	2.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	131.6	131.6	131.6	131.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	39.8	39.8	41.6	47.2	+ 0.0	+ 0.0	+ 1.8	+ 4.6	+ 5.5	+ 13.3
C13	Residential, > ½ acre lots	2.1	2.1	2.1	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.3	+ 13.3
C14	Salt marsh	0.6	0.6	0.6	0.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	50.1	50.1	50.1	51.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.7	+ 3.3
C16	Industrial	34.2	35.5	35.5	36.7	+ 1.3	+ 3.9	+ 0.0	+ 0.0	+ 1.2	+ 3.3
C17	Urban open	17.7	15.5	15.5	16.1	- 2.2	- 12.2	+ 0.0	+ 0.0	+ 0.5	+ 3.3
C18	Transportation	4.5	4.5	4.5	4.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.1	+ 3.3
C19	Waste disposal	1.3	0.0	0.0	0.0	- 1.3	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	8.5	8.5	8.5	8.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	14,624
Housing units within watershed:	6,284
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	99

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	1.2	1.2	1.2	0.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.6	- 50.0
C2	Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3	Forest	76.8	65.1	56.5	28.3	- 11.7	- 15.3	- 8.6	- 13.2	- 28.3	- 50.0
C4	Non-forested wetland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	22.5	7.4	5.7	5.7	- 15.1	- 67.1	- 1.7	- 23.2	+ 0.0	+ 0.0
C7	Participatory recreation	41.1	42.4	42.4	42.4	+ 1.4	+ 3.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	23.6	25.4	25.4	25.4	+ 1.9	+ 7.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	2.5	2.5	2.5	2.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	9.6	10.6	10.6	13.2	+ 1.0	+ 10.2	+ 0.0	+ 0.0	+ 2.7	+ 26.2
C11	Residential, < ¼ acre lots	259.7	263.7	266.3	266.3	+ 4.0	+ 1.5	+ 2.6	+ 1.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	53.7	53.7	57.0	71.3	+ 0.0	+ 0.0	+ 3.3	+ 6.2	+ 14.4	+ 25.2
C13	Residential, > ½ acre lots	4.0	4.0	4.0	5.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.0	+ 25.2
C14	Salt marsh	0.6	0.6	0.6	0.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	74.6	86.0	88.7	93.5	+ 11.4	+ 15.3	+ 2.7	+ 3.2	+ 4.7	+ 5.3
C16	Industrial	39.5	43.4	43.7	46.0	+ 3.9	+ 10.0	+ 0.3	+ 0.6	+ 2.3	+ 5.3
C17	Urban open	44.1	48.7	50.1	52.8	+ 4.6	+ 10.5	+ 1.4	+ 2.9	+ 2.7	+ 5.3
C18	Transportation	19.8	19.8	19.8	20.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.1	+ 5.3
C19	Waste disposal	1.3	0.0	0.0	0.0	- 1.3	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	8.5	8.5	8.5	8.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-20. Population and land use data for the North River (North Shore) Watershed

1990 land use data not available for Lynnfield, Salem, and Lynn

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	6,614
Housing units within 1000 m boundary:	2,977
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	100

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2	Pasture	2.0	2.0	2.0	1.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 1.0	- 50.0
C3	Forest	3.4	2.9	2.9	1.5	- 0.5	- 14.6	+ 0.0	+ 0.0	- 1.5	- 50.0
C4	Non-forested wetland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	0.7	0.7	0.7	0.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	11.7	11.7	11.7	11.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	112.9	112.9	112.9	112.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C13	Residential, > ½ acre lots	1.1	1.6	1.6	3.2	+ 0.5	+ 45.0	+ 0.0	+ 0.0	+ 1.6	+ 98.9
C14	Salt marsh	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	11.3	11.3	11.3	11.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 1.4
C16	Industrial	16.5	16.5	16.5	16.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 1.4
C17	Urban open	14.5	14.5	14.5	14.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 1.4
C18	Transportation	20.7	20.7	20.7	21.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.3	+ 1.4
C19	Waste disposal	0.9	0.9	0.9	0.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	2.0	2.0	2.0	2.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	41,112
Housing units within watershed:	17,001
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	96

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	9.7	9.7	6.5	3.3	+ 0.0	+ 0.0	- 3.2	- 32.8	- 3.3	- 50.0
C2	Pasture	6.9	6.9	6.9	3.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 3.5	- 50.0
C3	Forest	961.3	828.5	731.7	365.9	- 132.7	- 13.8	- 96.8	- 11.7	- 365.9	- 50.0
C4	Non-forested wetland	104.0	96.9	98.0	98.0	- 7.1	- 6.8	+ 1.1	+ 1.1	+ 0.0	+ 0.0
C5	Mining	48.7	43.7	45.6	45.6	- 5.0	- 10.3	+ 1.9	+ 4.5	+ 0.0	+ 0.0
C6	Open land	216.9	190.4	192.9	192.9	- 26.6	- 12.2	+ 2.5	+ 1.3	+ 0.0	+ 0.0
C7	Participatory recreation	50.1	50.9	50.9	50.9	+ 0.8	+ 1.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	49.8	49.8	49.8	49.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	0.0	0.6	0.6	0.6	+ 0.6	---	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	29.3	36.0	56.0	78.9	+ 6.7	+ 23.0	+ 20.0	+ 55.5	+ 22.9	+ 40.9
C11	Residential, < ¼ acre lots	568.9	568.8	579.9	579.9	- 0.0	- 0.0	+ 11.0	+ 1.9	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	439.5	447.6	471.8	664.7	+ 8.1	+ 1.8	+ 24.2	+ 5.4	+ 192.8	+ 40.9
C13	Residential, > ½ acre lots	50.9	48.9	43.2	60.8	- 2.0	- 3.9	- 5.8	- 11.8	+ 17.6	+ 40.9
C14	Salt marsh	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	149.7	212.5	226.6	272.5	+ 62.7	+ 41.9	+ 14.1	+ 6.6	+ 45.9	+ 20.3
C16	Industrial	137.3	154.7	165.8	199.5	+ 17.4	+ 12.7	+ 11.1	+ 7.2	+ 33.6	+ 20.3
C17	Urban open	95.8	124.0	130.3	156.7	+ 28.2	+ 29.5	+ 6.3	+ 5.1	+ 26.4	+ 20.3
C18	Transportation	124.9	172.4	188.3	226.5	+ 47.6	+ 38.1	+ 15.9	+ 9.2	+ 38.2	+ 20.3
C19	Waste disposal	3.5	4.5	3.1	3.1	+ 1.0	+ 27.1	- 1.3	- 29.7	+ 0.0	+ 0.0
C20	Open water	62.8	63.0	63.0	63.0	+ 0.2	+ 0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	11.1	11.1	9.9	5.0	+ 0.0	+ 0.0	- 1.1	- 10.2	- 5.0	- 50.0

Table A-21. Population and land use data for the Danvers River Watershed

1990 land use data not available for Wenham and Salem

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	19,261
Housing units within 1000 m boundary:	7,502
Occupancy rate (persons per unit):	2.6
Housing units sewered (%):	98

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	54.2	33.3	26.8	13.4	- 20.9	- 38.5	- 6.5	- 19.5	- 13.4	- 50.0
C2	Pasture	33.0	30.3	28.3	14.1	- 2.8	- 8.3	- 2.0	- 6.6	- 14.1	- 50.0
C3	Forest	126.1	114.8	102.4	51.2	- 11.3	- 8.9	- 12.4	- 10.8	- 51.2	- 50.0
C4	Non-forested wetland	16.2	15.4	15.4	15.4	- 0.8	- 5.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	5.1	0.0	0.0	0.0	- 5.1	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	134.4	117.2	112.5	112.5	- 17.2	- 12.8	- 4.7	- 4.0	+ 0.0	+ 0.0
C7	Participatory recreation	59.3	60.1	60.1	60.1	+ 0.8	+ 1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	14.0	14.0	14.9	14.9	+ 0.0	+ 0.0	+ 1.0	+ 6.9	+ 0.0	+ 0.0
C9	Water-based recreation	8.4	8.9	14.9	14.9	+ 0.5	+ 5.7	+ 6.0	+ 67.7	+ 0.0	+ 0.0
C10	Residential, multi-family	6.1	7.7	16.9	18.7	+ 1.6	+ 25.8	+ 9.2	+ 119.1	+ 1.8	+ 10.5
C11	Residential, < ¼ acre lots	211.0	211.0	211.0	211.0	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	421.3	433.5	437.2	483.3	+ 12.3	+ 2.9	+ 3.6	+ 0.8	+ 46.1	+ 10.5
C13	Residential, > ½ acre lots	41.6	42.4	48.5	53.6	+ 0.7	+ 1.8	+ 6.1	+ 14.5	+ 5.1	+ 10.5
C14	Salt marsh	30.0	30.0	30.0	30.0	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	112.2	150.2	159.5	171.4	+ 38.0	+ 33.9	+ 9.3	+ 6.2	+ 11.8	+ 7.4
C16	Industrial	37.0	37.9	40.5	43.6	+ 1.0	+ 2.6	+ 2.6	+ 6.9	+ 3.0	+ 7.4
C17	Urban open	107.2	110.2	96.6	103.8	+ 3.1	+ 2.9	- 13.6	- 12.4	+ 7.2	+ 7.4
C18	Transportation	52.2	52.2	56.3	60.5	+ 0.0	+ 0.0	+ 4.1	+ 7.9	+ 4.2	+ 7.4
C19	Waste disposal	2.6	2.6	0.0	0.0	+ 0.0	+ 0.0	- 2.6	—	+ 0.0	+ 0.0
C20	Open water	17.8	17.8	17.8	17.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	1.0	1.0	1.0	0.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.5	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	34,892
Housing units within watershed:	13,615
Occupancy rate (persons per unit):	2.6
Housing units sewered (%):	96

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	206.5	144.0	129.1	64.6	- 62.5	- 30.3	- 14.9	- 10.3	- 64.6	- 50.0
C2	Pasture	85.2	48.2	45.5	22.7	- 37.0	- 43.4	- 2.7	- 5.7	- 22.7	- 50.0
C3	Forest	725.7	606.0	557.7	278.8	- 119.7	- 16.5	- 48.4	- 8.0	- 278.8	- 50.0
C4	Non-forested wetland	84.4	82.1	82.8	82.8	- 2.3	- 2.7	+ 0.7	+ 0.8	+ 0.0	+ 0.0
C5	Mining	60.7	31.7	33.3	33.3	- 29.0	- 47.7	+ 1.6	+ 4.9	+ 0.0	+ 0.0
C6	Open land	285.3	237.5	250.4	250.4	- 47.8	- 16.8	+ 12.9	+ 5.4	+ 0.0	+ 0.0
C7	Participatory recreation	70.0	67.9	68.0	68.0	- 2.1	- 3.0	+ 0.1	+ 0.2	+ 0.0	+ 0.0
C8	Spectator recreation	30.9	33.7	34.7	34.7	+ 2.8	+ 9.2	+ 1.0	+ 2.9	+ 0.0	+ 0.0
C9	Water-based recreation	8.4	8.9	19.0	19.0	+ 0.5	+ 5.7	+ 10.1	+ 113.0	+ 0.0	+ 0.0
C10	Residential, multi-family	14.3	50.8	70.5	83.7	+ 36.5	+ 256.1	+ 19.7	+ 38.8	+ 13.2	+ 18.8
C11	Residential, < ¼ acre lots	301.9	302.6	302.6	302.6	+ 0.7	+ 0.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	950.5	1005.1	1011.8	1201.9	+ 54.6	+ 5.7	+ 6.7	+ 0.7	+ 190.1	+ 18.8
C13	Residential, > ½ acre lots	198.4	239.3	257.3	305.7	+ 40.9	+ 20.6	+ 18.0	+ 7.5	+ 48.4	+ 18.8
C14	Salt marsh	30.0	30.0	30.0	30.0	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	182.8	250.8	294.7	339.9	+ 68.0	+ 37.2	+ 43.9	+ 17.5	+ 45.2	+ 15.3
C16	Industrial	85.1	145.3	156.3	180.3	+ 60.2	+ 70.7	+ 11.0	+ 7.6	+ 24.0	+ 15.3
C17	Urban open	195.7	227.5	179.9	207.5	+ 31.8	+ 16.2	- 47.5	- 20.9	+ 27.6	+ 15.3
C18	Transportation	250.0	243.6	246.1	283.8	- 6.4	- 2.6	+ 2.4	+ 1.0	+ 37.7	+ 15.3
C19	Waste disposal	4.6	14.5	0.0	0.0	+ 9.9	+ 214.8	- 14.5	—	+ 0.0	+ 0.0
C20	Open water	18.3	19.1	19.1	19.1	+ 0.8	+ 4.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	40.1	40.1	40.1	20.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 20.0	- 50.0

Table A-22. Population and land use data for the Beverly Harbor Watershed
Includes Bass River, North River and Danvers River

1990 land use data not available for Wenham, Lynnfield, Salem, and Lynn

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	44,560
Housing units within 1000 m boundary:	19,075
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	99

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	57.8	37.0	28.0	14.0	- 20.9	- 36.1	- 9.0	- 24.3	- 14.0	- 50.0
C2	Pasture	35.1	32.3	30.3	15.2	- 2.8	- 7.8	- 2.0	- 6.2	- 15.2	- 50.0
C3	Forest	171.4	158.1	141.5	70.8	- 13.4	- 7.8	- 16.6	- 10.5	- 70.8	- 50.0
C4	Non-forested wetland	16.2	15.4	15.4	15.4	- 0.8	- 5.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	5.1	0.0	0.0	0.0	- 5.1	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	149.1	132.0	126.2	126.2	- 17.2	- 11.5	- 5.7	- 4.3	+ 0.0	+ 0.0
C7	Participatory recreation	85.7	86.5	86.5	86.5	+ 0.8	+ 0.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	59.8	62.0	63.0	63.0	+ 2.2	+ 3.6	+ 1.0	+ 1.6	+ 0.0	+ 0.0
C9	Water-based recreation	18.9	18.2	24.2	24.2	- 0.7	- 3.7	+ 6.0	+ 33.1	+ 0.0	+ 0.0
C10	Residential, multi-family	8.3	13.7	23.3	26.0	+ 5.4	+ 64.6	+ 9.6	+ 70.3	+ 2.6	+ 11.3
C11	Residential, < ¼ acre lots	621.2	621.1	621.1	621.1	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	490.3	503.0	513.8	572.0	+ 12.6	+ 2.6	+ 10.8	+ 2.1	+ 58.3	+ 11.3
C13	Residential, > ½ acre lots	59.2	60.4	66.5	74.1	+ 1.2	+ 2.1	+ 6.1	+ 10.1	+ 7.5	+ 11.3
C14	Salt marsh	30.6	30.6	30.6	30.6	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	193.7	231.7	241.0	254.5	+ 38.0	+ 19.6	+ 9.3	+ 4.0	+ 13.5	+ 5.6
C16	Industrial	87.7	90.0	92.6	97.8	+ 2.3	+ 2.6	+ 2.6	+ 2.9	+ 5.2	+ 5.6
C17	Urban open	165.2	166.2	152.5	161.0	+ 0.9	+ 0.6	- 13.6	- 8.2	+ 8.5	+ 5.6
C18	Transportation	87.3	85.8	89.9	95.0	- 1.4	- 1.6	+ 4.1	+ 4.8	+ 5.0	+ 5.6
C19	Waste disposal	5.6	4.2	1.6	1.6	- 1.3	- 23.9	- 2.6	- 61.5	+ 0.0	+ 0.0
C20	Open water	28.4	28.4	28.4	28.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	1.5	1.5	1.5	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.8	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	101,342
Housing units within watershed:	41,869
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	97

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	220.2	157.6	136.8	68.4	- 62.5	- 28.4	- 20.8	- 13.2	- 68.4	- 50.0
C2	Pasture	104.4	67.4	64.6	32.3	- 37.0	- 35.5	- 2.8	- 4.1	- 32.3	- 50.0
C3	Forest	1887.1	1610.7	1452.7	726.4	- 276.4	- 14.6	- 158.0	- 9.8	- 726.4	- 50.0
C4	Non-forested wetland	190.2	180.9	182.6	182.6	- 9.4	- 4.9	+ 1.7	+ 1.0	+ 0.0	+ 0.0
C5	Mining	109.4	75.4	78.9	78.9	- 34.0	- 31.1	+ 3.5	+ 4.7	+ 0.0	+ 0.0
C6	Open land	554.5	463.7	480.9	480.9	- 90.8	- 16.4	+ 17.3	+ 3.7	+ 0.0	+ 0.0
C7	Participatory recreation	170.0	172.5	172.6	172.6	+ 2.5	+ 1.5	+ 0.1	+ 0.1	+ 0.0	+ 0.0
C8	Spectator recreation	126.0	130.7	131.6	131.6	+ 4.7	+ 3.7	+ 1.0	+ 0.7	+ 0.0	+ 0.0
C9	Water-based recreation	18.9	18.8	28.9	28.9	- 0.1	- 0.3	+ 10.1	+ 53.4	+ 0.0	+ 0.0
C10	Residential, multi-family	63.8	114.8	154.9	195.9	+ 51.0	+ 80.0	+ 40.1	+ 35.0	+ 41.0	+ 26.5
C11	Residential, < ¼ acre lots	1349.6	1354.3	1368.0	1368.0	+ 4.7	+ 0.3	+ 13.6	+ 1.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	1505.1	1568.2	1609.7	2035.6	+ 63.1	+ 4.2	+ 41.5	+ 2.6	+ 425.9	+ 26.5
C13	Residential, > ½ acre lots	275.2	316.9	329.1	416.2	+ 41.7	+ 15.2	+ 12.2	+ 3.9	+ 87.1	+ 26.5
C14	Salt marsh	30.6	30.6	30.6	30.6	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	430.8	575.1	635.8	737.6	+ 144.4	+ 33.5	+ 60.7	+ 10.6	+ 101.7	+ 16.0
C16	Industrial	261.9	343.5	366.1	424.7	+ 81.5	+ 31.1	+ 22.6	+ 6.6	+ 58.6	+ 16.0
C17	Urban open	373.4	439.5	399.7	463.7	+ 66.1	+ 17.7	- 39.8	- 9.0	+ 64.0	+ 16.0
C18	Transportation	405.0	444.7	463.0	537.1	+ 39.8	+ 9.8	+ 18.3	+ 4.1	+ 74.1	+ 16.0
C19	Waste disposal	14.7	24.2	3.9	3.9	+ 9.5	+ 65.0	- 20.4	- 84.1	+ 0.0	+ 0.0
C20	Open water	91.3	92.3	92.3	92.3	+ 1.1	+ 1.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	51.7	51.7	50.5	25.3	+ 0.0	+ 0.0	- 1.1	- 2.2	- 25.3	- 50.0

Table A-23. Population and land use data for the Manchester Harbor Watershed

1990 land use data not available for Manchester

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	2,797
Housing units within 1000 m boundary:	1,304
Occupancy rate (persons per unit):	2.1
Housing units sewered (%):	77

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	0.0	0.7	0.7	0.3	+ 0.7	---	+ 0.0	+ 0.0	- 0.3	- 50.0
C2	Pasture	6.1	6.1	6.1	3.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 3.1	- 50.0
C3	Forest	224.4	208.3	208.3	104.1	- 16.1	- 7.2	+ 0.0	+ 0.0	- 104.1	- 50.0
C4	Non-forested wetland	8.4	8.4	8.4	8.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	6.4	4.6	4.6	4.6	- 1.8	- 27.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	0.3	0.7	0.7	0.7	+ 0.4	+ 128.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	4.3	4.3	4.3	4.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	6.3	6.3	6.3	6.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	72.9	72.9	72.9	72.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	59.8	59.8	59.8	93.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 33.7	+ 56.4
C13	Residential, > ½ acre lots	102.1	116.8	116.8	182.7	+ 14.7	+ 14.4	+ 0.0	+ 0.0	+ 65.9	+ 56.4
C14	Salt marsh	2.4	2.4	2.4	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	4.2	4.2	4.2	5.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.7	+ 39.9
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	11.8	13.9	13.9	19.4	+ 2.1	+ 17.8	+ 0.0	+ 0.0	+ 5.5	+ 39.9
C18	Transportation	1.8	1.8	1.8	2.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.7	+ 39.9
C19	Waste disposal	0.6	0.6	0.6	0.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	4.2	4.2	4.2	4.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	3,976
Housing units within watershed:	1,781
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	73

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	1.7	2.4	2.4	1.2	+ 0.7	+ 37.2	+ 0.0	+ 0.0	- 1.2	- 50.0
C2	Pasture	6.1	6.1	6.1	3.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 3.1	- 50.0
C3	Forest	1130.1	1089.5	1089.5	544.7	- 40.6	- 3.6	+ 0.0	+ 0.0	- 544.7	- 50.0
C4	Non-forested wetland	24.6	24.6	24.6	24.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	9.6	14.7	14.7	14.7	+ 5.1	+ 52.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	14.0	10.7	10.7	10.7	- 3.3	- 23.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	35.3	37.2	37.2	37.2	+ 2.0	+ 5.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	5.9	5.9	5.9	5.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	6.3	6.3	6.3	6.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	84.6	86.2	86.2	86.2	+ 1.6	+ 1.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	101.1	107.0	107.0	287.9	+ 5.9	+ 5.9	+ 0.0	+ 0.0	+ 180.9	+ 169.0
C13	Residential, > ½ acre lots	137.7	161.8	161.8	435.4	+ 24.1	+ 17.5	+ 0.0	+ 0.0	+ 273.5	+ 169.0
C14	Salt marsh	2.4	2.4	2.4	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	5.3	5.3	5.3	12.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 6.8	+ 128.0
C16	Industrial	0.5	0.5	2.3	5.2	+ 0.0	+ 0.0	+ 1.8	+ 369.2	+ 2.9	+ 128.0
C17	Urban open	21.7	26.3	24.5	55.9	+ 4.6	+ 21.4	- 1.8	- 6.8	+ 31.4	+ 128.0
C18	Transportation	41.8	41.8	41.8	95.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 53.5	+ 128.0
C19	Waste disposal	0.6	0.6	0.6	0.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	5.5	5.5	5.5	5.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-24. Population and land use data for the Marblehead Harbor Watershed

1990 land use data not available for Marblehead

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	3,768
Housing units within 1000 m boundary:	2,059
Occupancy rate (persons per unit):	1.8
Housing units sewered (%):	100

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3 Forest	20.6	13.6	13.6	6.8	- 6.9	- 33.8	+ 0.0	+ 0.0	- 6.8	- 50.0
C4 Non-forested wetland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	0.6	0.6	0.6	0.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	3.2	3.2	3.2	3.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	8.1	8.1	8.1	8.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.4	0.4	0.4	0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 11.7
C11 Residential, < ¼ acre lots	56.9	56.9	56.9	56.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	24.8	29.9	29.9	33.4	+ 5.0	+ 20.3	+ 0.0	+ 0.0	+ 3.5	+ 11.7
C13 Residential, > ½ acre lots	17.8	19.8	19.8	22.1	+ 1.9	+ 10.7	+ 0.0	+ 0.0	+ 2.3	+ 11.7
C14 Salt marsh	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	14.3	14.3	14.3	15.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.8	+ 5.5
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	2.8	2.8	2.8	3.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 5.5
C18 Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19 Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	3,768
Housing units within watershed:	2,059
Occupancy rate (persons per unit):	1.8
Housing units sewered (%):	100

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3 Forest	20.6	13.6	13.6	6.8	- 6.9	- 33.8	+ 0.0	+ 0.0	- 6.8	- 50.0
C4 Non-forested wetland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	0.6	0.6	0.6	0.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	3.2	3.2	3.2	3.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	8.1	8.1	8.1	8.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.4	0.4	0.4	0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 11.7
C11 Residential, < ¼ acre lots	56.9	56.9	56.9	56.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	24.8	29.9	29.9	33.4	+ 5.0	+ 20.3	+ 0.0	+ 0.0	+ 3.5	+ 11.7
C13 Residential, > ½ acre lots	17.8	19.8	19.8	22.1	+ 1.9	+ 10.7	+ 0.0	+ 0.0	+ 2.3	+ 11.7
C14 Salt marsh	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	14.3	14.3	14.3	15.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.8	+ 5.5
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	2.8	2.8	2.8	3.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 5.5
C18 Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19 Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-25. Population and land use data for the Nahant Bay Watershed

1990 land use data not available for this watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	17,469
Housing units within 1000 m boundary:	7,891
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	100

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2	Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3	Forest	27.2	21.7	21.7	10.8	- 5.5	- 20.1	+ 0.0	+ 0.0	- 10.8	- 50.0
C4	Non-forested wetland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	5.3	2.5	2.5	2.5	- 2.8	- 52.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	0.9	0.9	0.9	0.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	11.1	11.1	11.1	11.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	26.5	26.3	26.3	26.3	- 0.1	- 0.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	88.4	88.4	88.4	92.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 3.9	+ 4.5
C11	Residential, < ¼ acre lots	170.6	172.6	172.6	172.6	+ 2.0	+ 1.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	98.5	104.0	104.0	108.6	+ 5.4	+ 5.5	+ 0.0	+ 0.0	+ 4.6	+ 4.5
C13	Residential, > ½ acre lots	22.5	22.5	22.5	23.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.0	+ 4.5
C14	Salt marsh	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	18.3	18.8	18.8	19.3	+ 0.5	+ 2.6	+ 0.0	+ 0.0	+ 0.5	+ 2.5
C16	Industrial	4.3	4.3	4.3	4.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.1	+ 2.5
C17	Urban open	18.3	18.8	18.8	19.2	+ 0.5	+ 2.6	+ 0.0	+ 0.0	+ 0.5	+ 2.5
C18	Transportation	9.9	9.9	9.9	10.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 2.5
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	0.4	0.4	0.4	0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	26,185
Housing units within watershed:	11,307
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	100

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2	Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3	Forest	153.6	144.1	144.1	72.0	- 9.5	- 6.2	+ 0.0	+ 0.0	- 72.0	- 50.0
C4	Non-forested wetland	7.5	7.5	7.5	7.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	16.4	16.4	16.4	16.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	14.2	9.2	9.2	9.2	- 5.0	- 35.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	4.7	4.7	4.7	4.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	15.2	15.2	15.2	15.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	26.5	26.3	26.3	26.3	- 0.1	- 0.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	89.6	93.6	93.6	115.1	+ 4.1	+ 4.5	- 0.0	+ 0.0	+ 21.5	+ 22.9
C11	Residential, < ¼ acre lots	330.5	333.9	333.9	333.9	+ 3.5	+ 1.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	138.5	144.6	144.6	177.8	+ 6.2	+ 4.5	+ 0.0	+ 0.0	+ 33.1	+ 22.9
C13	Residential, > ½ acre lots	44.3	44.3	44.3	54.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 10.1	+ 22.9
C14	Salt marsh	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	24.5	25.0	25.0	27.6	+ 0.5	+ 2.0	+ 0.0	+ 0.0	+ 2.6	+ 10.5
C16	Industrial	5.4	5.4	5.4	6.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.6	+ 10.5
C17	Urban open	28.4	28.9	28.9	32.0	+ 0.5	+ 1.7	+ 0.0	+ 0.0	+ 3.0	+ 10.5
C18	Transportation	10.1	10.1	10.1	11.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.1	+ 10.5
C19	Waste disposal	0.1	0.0	0.0	0.0	- 0.0	- 30.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	10.6	10.6	10.6	10.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-26. Population and land use data for the Lynn Harbor Watershed
Includes Saugus River and Pines River

1990 land use data not available for Lynn, Nahant and Melrose

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	46,484
Housing units within 1000 m boundary:	20,086
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	98

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2	Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3	Forest	164.0	138.0	137.8	68.9	- 26.0	- 15.8	- 0.2	- 0.1	- 68.9	- 50.0
C4	Non-forested wetland	57.8	51.1	49.6	49.6	- 6.7	- 11.7	- 1.5	- 3.0	+ 0.0	+ 0.0
C5	Mining	19.1	19.1	19.1	19.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	53.7	40.3	38.0	38.0	- 13.5	- 25.0	- 2.3	- 5.6	+ 0.0	+ 0.0
C7	Participatory recreation	2.6	3.0	3.0	3.0	+ 0.5	+ 17.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	66.8	58.8	59.2	59.2	- 8.0	- 12.0	+ 0.4	+ 0.6	+ 0.0	+ 0.0
C9	Water-based recreation	11.7	11.7	11.7	11.7	- 0.0	- 0.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	126.6	132.6	134.0	160.5	+ 5.9	+ 4.7	+ 1.4	+ 1.1	+ 26.5	+ 19.8
C11	Residential, < ¼ acre lots	703.9	715.0	726.2	726.2	+ 11.1	+ 1.6	+ 11.3	+ 1.6	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	52.2	57.3	57.3	68.6	+ 5.1	+ 9.8	+ 0.0	+ 0.0	+ 11.3	+ 19.8
C13	Residential, > ½ acre lots	16.7	21.5	21.5	25.8	+ 4.8	+ 28.5	+ 0.0	+ 0.0	+ 4.3	+ 19.8
C14	Salt marsh	477.5	464.4	466.4	466.4	- 13.0	- 2.7	+ 2.0	+ 0.4	+ 0.0	+ 0.0
C15	Commercial	161.7	197.0	204.1	213.2	+ 35.3	+ 21.8	+ 7.1	+ 3.6	+ 9.2	+ 4.5
C16	Industrial	160.2	177.7	177.7	185.7	+ 17.5	+ 10.9	+ 0.0	+ 0.0	+ 8.0	+ 4.5
C17	Urban open	116.5	97.2	85.4	89.2	- 19.4	- 16.6	- 11.8	- 12.1	+ 3.8	+ 4.5
C18	Transportation	129.6	131.8	130.4	136.2	+ 2.2	+ 1.7	- 1.4	- 1.1	+ 5.8	+ 4.5
C19	Waste disposal	89.8	96.1	96.1	96.1	+ 6.3	+ 7.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	41.1	39.0	39.0	39.0	- 2.1	- 5.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	4.9	4.9	0.0	0.0	+ 0.0	+ 0.0	- 4.9	—	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	128,826
Housing units within watershed:	53,274
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	99

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	16.0	7.5	7.5	3.8	- 8.5	- 52.9	+ 0.0	+ 0.0	- 3.8	- 50.0
C2	Pasture	2.8	2.8	2.8	1.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 1.4	- 50.0
C3	Forest	897.0	811.8	773.1	386.6	- 85.3	- 9.5	- 38.7	- 4.8	- 386.6	- 50.0
C4	Non-forested wetland	89.1	80.2	78.3	78.3	- 8.9	- 10.0	- 2.0	- 2.4	+ 0.0	+ 0.0
C5	Mining	53.4	46.8	48.8	48.8	- 6.6	- 12.3	+ 2.0	+ 4.2	+ 0.0	+ 0.0
C6	Open land	131.2	107.5	98.3	98.3	- 23.7	- 18.1	- 9.2	- 8.6	+ 0.0	+ 0.0
C7	Participatory recreation	84.3	84.6	84.6	84.6	+ 0.3	+ 0.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	117.1	108.3	108.6	108.6	- 8.9	- 7.6	+ 0.4	+ 0.3	+ 0.0	+ 0.0
C9	Water-based recreation	11.7	11.7	11.7	11.7	- 0.0	- 0.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	343.9	377.6	380.4	496.5	+ 33.7	+ 9.8	+ 2.7	+ 0.7	+ 116.2	+ 30.5
C11	Residential, < ¼ acre lots	1721.3	1742.7	1761.7	1761.7	+ 21.4	+ 1.2	+ 19.0	+ 1.1	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	369.4	392.6	398.5	520.3	+ 23.2	+ 6.3	+ 5.9	+ 1.5	+ 121.7	+ 30.5
C13	Residential, > ½ acre lots	103.8	110.7	133.5	174.3	+ 6.9	+ 6.7	+ 22.8	+ 20.6	+ 40.8	+ 30.5
C14	Salt marsh	477.5	464.4	466.4	466.4	- 13.1	- 2.7	+ 2.0	+ 0.4	+ 0.0	+ 0.0
C15	Commercial	329.0	392.4	409.7	452.4	+ 63.4	+ 19.3	+ 17.3	+ 4.4	+ 42.7	+ 10.4
C16	Industrial	178.6	199.3	202.8	224.0	+ 20.6	+ 11.6	+ 3.6	+ 1.8	+ 21.1	+ 10.4
C17	Urban open	327.3	318.1	298.8	329.9	- 9.2	- 2.8	- 19.3	- 6.1	+ 31.1	+ 10.4
C18	Transportation	175.0	177.2	175.8	194.1	+ 2.2	+ 1.2	- 1.4	- 0.8	+ 18.3	+ 10.4
C19	Waste disposal	101.2	107.5	107.5	107.5	+ 6.3	+ 6.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	70.4	68.3	68.3	68.3	- 2.1	- 3.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	17.7	5.7	0.6	0.3	- 11.9	- 67.6	- 5.1	- 89.4	- 0.3	- 50.0

Table A-27. Population and land use data for the Saugus River Watershed

1990 land use data not available for Lynn and Melrose

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	22,574
Housing units within 1000 m boundary:	8,847
Occupancy rate (persons per unit):	2.6
Housing units sewered (%):	99

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3 Forest	111.6	96.7	94.3	47.2	- 15.0	- 13.4	- 2.3	- 2.4	- 47.2	- 50.0
C4 Non-forested wetland	38.2	36.2	36.2	36.2	- 2.1	- 5.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	22.2	12.9	12.9	12.9	- 9.3	- 41.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	2.6	2.6	2.6	2.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	17.6	19.0	19.0	19.0	+ 1.4	+ 8.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	3.4	3.4	3.4	3.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	88.4	88.9	88.9	112.8	+ 0.6	+ 0.6	+ 0.0	+ 0.0	+ 23.9	+ 26.9
C11 Residential, < ¼ acre lots	418.7	428.4	429.5	429.5	+ 9.7	+ 2.3	+ 1.1	+ 0.3	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	15.8	20.7	20.7	26.2	+ 4.9	+ 30.7	+ 0.0	+ 0.0	+ 5.6	+ 26.9
C13 Residential, > ½ acre lots	2.2	2.2	2.2	2.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.6	+ 26.9
C14 Salt marsh	48.4	45.5	45.5	45.5	- 2.9	- 6.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	61.9	70.7	70.7	74.7	+ 8.8	+ 14.3	+ 0.0	+ 0.0	+ 3.9	+ 5.6
C16 Industrial	133.6	138.8	138.8	146.5	+ 5.2	+ 3.9	+ 0.0	+ 0.0	+ 7.7	+ 5.6
C17 Urban open	49.7	48.6	49.8	52.6	- 1.1	- 2.2	+ 1.3	+ 2.6	+ 2.8	+ 5.6
C18 Transportation	45.8	48.0	48.0	50.6	+ 2.2	+ 4.7	+ 0.0	+ 0.0	+ 2.7	+ 5.6
C19 Waste disposal	17.4	17.1	17.1	17.1	- 0.3	- 1.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	31.8	29.7	29.7	29.7	- 2.1	- 6.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	45,757
Housing units within watershed:	17,954
Occupancy rate (persons per unit):	2.5
Housing units sewered (%):	98

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1 Cropland	16.0	7.5	7.5	3.8	- 8.5	- 52.9	+ 0.0	+ 0.0	- 3.8	- 50.0
C2 Pasture	2.8	2.8	2.8	1.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 1.4	- 50.0
C3 Forest	674.3	623.9	581.4	290.7	- 50.4	- 7.5	- 42.5	- 6.8	- 290.7	- 50.0
C4 Non-forested wetland	65.8	62.0	61.6	61.6	- 3.8	- 5.7	- 0.4	- 0.7	+ 0.0	+ 0.0
C5 Mining	34.3	27.8	29.7	29.7	- 6.6	- 19.1	+ 2.0	+ 7.1	+ 0.0	+ 0.0
C6 Open land	61.3	52.0	52.7	52.7	- 9.3	- 15.2	+ 0.7	+ 1.4	+ 0.0	+ 0.0
C7 Participatory recreation	59.9	59.9	59.9	59.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	35.4	32.6	32.6	32.6	- 2.8	- 8.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	3.4	3.4	3.4	3.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	140.6	155.7	157.1	219.6	+ 15.1	+ 10.7	+ 1.3	+ 0.9	+ 62.6	+ 39.8
C11 Residential, < ¼ acre lots	767.3	775.5	778.0	778.0	+ 8.2	+ 1.1	+ 2.5	+ 0.3	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	236.1	257.9	263.8	368.8	+ 21.8	+ 9.2	+ 5.9	+ 2.3	+ 105.1	+ 39.8
C13 Residential, > ½ acre lots	79.8	81.7	104.5	146.2	+ 1.9	+ 2.4	+ 22.8	+ 28.0	+ 41.6	+ 39.8
C14 Salt marsh	48.4	45.5	45.5	45.5	- 2.9	- 6.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	168.3	202.9	213.1	247.4	+ 34.7	+ 20.6	+ 10.2	+ 5.0	+ 34.2	+ 16.1
C16 Industrial	137.3	144.7	148.2	172.0	+ 7.4	+ 5.4	+ 3.5	+ 2.4	+ 23.8	+ 16.1
C17 Urban open	90.7	96.1	90.1	104.6	+ 5.4	+ 5.9	- 6.0	- 6.3	+ 14.5	+ 16.1
C18 Transportation	85.8	88.0	88.0	102.1	+ 2.2	+ 2.5	+ 0.0	+ 0.0	+ 14.1	+ 16.1
C19 Waste disposal	28.7	28.4	28.4	28.4	- 0.3	- 1.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	52.3	50.2	50.2	50.2	- 2.1	- 4.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	10.0	0.0	0.0	0.0	- 10.0	---	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-28. Population and land use data for the Pines River Watershed

1990 data not available for Melrose

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	15,756
Housing units within 1000 m boundary:	6,581
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	98

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3 Forest	52.4	41.4	43.5	21.8	- 11.0	- 21.0	+ 2.2	+ 5.2	- 21.8	- 50.0
C4 Non-forested wetland	19.6	14.9	13.4	13.4	- 4.7	- 23.9	- 1.5	- 10.3	+ 0.0	+ 0.0
C5 Mining	19.1	19.1	19.1	19.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	31.5	27.3	25.1	25.1	- 4.2	- 13.2	- 2.3	- 8.3	+ 0.0	+ 0.0
C7 Participatory recreation	0.0	0.5	0.5	0.5	+ 0.5	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	46.4	37.1	37.5	37.5	- 9.3	- 20.1	+ 0.4	+ 1.0	+ 0.0	+ 0.0
C9 Water-based recreation	2.0	2.0	2.0	2.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	8.2	11.3	12.7	15.6	+ 3.0	+ 36.9	+ 1.4	+ 12.4	+ 2.9	+ 23.3
C11 Residential, < ¼ acre lots	277.2	278.5	288.7	288.7	+ 1.4	+ 0.5	+ 10.2	+ 3.7	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	29.9	30.1	30.1	37.1	+ 0.2	+ 0.8	+ 0.0	+ 0.0	+ 7.0	+ 23.3
C13 Residential, > ½ acre lots	14.5	19.3	19.3	23.8	+ 4.8	+ 32.8	+ 0.0	+ 0.0	+ 4.5	+ 23.3
C14 Salt marsh	419.4	409.6	411.6	411.6	- 9.8	- 2.3	+ 2.0	+ 0.5	+ 0.0	+ 0.0
C15 Commercial	47.3	73.7	80.8	84.1	+ 26.4	+ 55.8	+ 7.1	+ 9.6	+ 3.3	+ 4.1
C16 Industrial	6.4	18.4	18.4	19.2	+ 12.0	+ 186.6	+ 0.0	+ 0.0	+ 0.8	+ 4.1
C17 Urban open	47.8	31.8	18.7	19.5	- 16.0	- 33.5	- 13.0	- 41.1	+ 0.8	+ 4.1
C18 Transportation	61.2	61.3	59.9	62.3	+ 0.1	+ 0.2	- 1.4	- 2.3	+ 2.5	+ 4.1
C19 Waste disposal	67.0	73.6	73.6	73.6	+ 6.6	+ 9.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	9.4	9.4	9.4	9.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	4.9	4.9	0.0	0.0	+ 0.0	+ 0.0	- 4.9	—	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	59,516
Housing units within watershed:	24,559
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	99

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3 Forest	214.3	181.2	185.0	92.5	- 33.1	- 15.5	+ 3.8	+ 2.1	- 92.5	- 50.0
C4 Non-forested wetland	23.3	18.2	16.7	16.7	- 5.1	- 21.9	- 1.5	- 8.4	+ 0.0	+ 0.0
C5 Mining	19.1	19.1	19.1	19.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	68.8	54.4	44.4	44.4	- 14.4	- 21.0	- 10.0	- 18.4	+ 0.0	+ 0.0
C7 Participatory recreation	24.4	24.7	24.7	24.7	+ 0.3	+ 1.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	71.2	66.0	66.3	66.3	- 5.3	- 7.4	+ 0.4	+ 0.5	+ 0.0	+ 0.0
C9 Water-based recreation	2.0	2.0	2.0	2.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	154.3	170.5	171.9	207.3	+ 16.3	+ 10.6	+ 1.4	+ 0.8	+ 35.4	+ 20.6
C11 Residential, < ¼ acre lots	771.5	782.9	799.5	799.5	+ 11.4	+ 1.5	+ 16.6	+ 2.1	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	126.8	128.2	128.2	154.6	+ 1.5	+ 1.1	+ 0.0	+ 0.0	+ 26.4	+ 20.6
C13 Residential, > ½ acre lots	23.5	28.5	28.5	34.3	+ 5.0	+ 21.2	+ 0.0	+ 0.0	+ 5.9	+ 20.6
C14 Salt marsh	419.4	409.6	411.6	411.6	- 9.8	- 2.3	+ 2.0	+ 0.5	+ 0.0	+ 0.0
C15 Commercial	104.8	132.8	139.9	148.3	+ 28.0	+ 26.7	+ 7.1	+ 5.3	+ 8.4	+ 6.0
C16 Industrial	20.9	33.8	33.9	35.9	+ 12.8	+ 61.3	+ 0.1	+ 0.3	+ 2.0	+ 6.0
C17 Urban open	205.6	193.3	179.9	190.7	- 12.3	- 6.0	- 13.3	- 6.9	+ 10.8	+ 6.0
C18 Transportation	66.6	66.7	65.3	69.2	+ 0.1	+ 0.2	- 1.4	- 2.1	+ 3.9	+ 6.0
C19 Waste disposal	67.0	73.6	73.6	73.6	+ 6.6	+ 9.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	18.2	18.2	18.2	18.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	7.7	5.7	0.6	0.3	- 1.9	- 25.4	- 5.1	- 89.4	- 0.3	- 50.0

Table A-29. Population and land use data for the Cohasset Harbor Watershed

1990 data not available for Cohasset and Scituate

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	4,945
Housing units within 1000 m boundary:	1,964
Occupancy rate (persons per unit):	2.5
Housing units sewered (%):	30

MassGIS land use data for the 1000 m delineation

	MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	0.4	0.4	0.4	0.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.2	- 50.0
C2	Pasture	6.6	6.6	6.6	3.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 3.3	- 50.0
C3	Forest	414.3	399.5	399.5	199.7	- 14.8	- 3.6	+ 0.0	+ 0.0	- 199.7	- 50.0
C4	Non-forested wetland	2.6	2.6	2.6	2.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	16.0	9.2	9.2	9.2	- 6.9	- 42.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	40.6	40.6	40.6	40.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	1.2	1.2	1.2	1.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	7.1	7.1	7.1	7.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	2.2	2.2	3.0	+ 2.2	---	+ 0.0	+ 0.0	+ 0.8	+ 37.7
C11	Residential, < ¼ acre lots	45.2	45.2	45.2	45.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	205.3	206.4	206.4	284.2	+ 1.1	+ 0.5	+ 0.0	+ 0.0	+ 77.8	+ 37.7
C13	Residential, > ½ acre lots	276.6	293.2	293.2	403.6	+ 16.5	+ 6.0	+ 0.0	+ 0.0	+ 110.5	+ 37.7
C14	Salt marsh	247.5	247.5	247.5	247.5	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	23.4	23.4	23.4	31.5	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 8.1	+ 34.6
C16	Industrial	1.8	1.8	1.8	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.6	+ 34.6
C17	Urban open	15.1	16.9	16.9	22.7	+ 1.8	+ 12.1	+ 0.0	+ 0.0	+ 5.8	+ 34.6
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	28.9	28.9	28.9	28.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.8	0.8	0.8	0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.4	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	7,523
Housing units within watershed:	2,914
Occupancy rate (persons per unit):	2.6
Housing units sewered (%):	22

MassGIS land use data for the watershed delineation

	MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	11.2	10.4	10.4	5.2	- 0.8	- 6.8	+ 0.0	+ 0.0	- 5.2	- 50.0
C2	Pasture	22.1	19.8	19.8	9.9	- 2.3	- 10.5	+ 0.0	+ 0.0	- 9.9	- 50.0
C3	Forest	1638.9	1604.9	1604.9	802.5	- 34.0	- 2.1	+ 0.0	+ 0.0	- 802.5	- 50.0
C4	Non-forested wetland	151.3	150.1	150.1	150.1	- 1.1	- 0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	30.0	22.8	22.8	22.8	- 7.2	- 23.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	40.6	40.6	40.6	40.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	7.5	7.5	7.5	7.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	7.1	7.1	7.1	7.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	6.3	6.3	12.2	+ 6.3	---	+ 0.0	+ 0.0	+ 5.8	+ 92.6
C11	Residential, < ¼ acre lots	45.2	45.2	45.2	45.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	308.8	310.2	310.2	597.5	+ 1.4	+ 0.5	+ 0.0	+ 0.0	+ 287.3	+ 92.6
C13	Residential, > ½ acre lots	446.7	478.7	478.8	922.1	+ 32.0	+ 7.2	+ 0.1	+ 0.0	+ 443.3	+ 92.6
C14	Salt marsh	247.5	247.5	247.5	247.5	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	43.0	44.9	44.9	84.3	+ 1.9	+ 4.4	+ 0.0	+ 0.0	+ 39.4	+ 87.6
C16	Industrial	8.0	8.0	8.0	15.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 7.0	+ 87.6
C17	Urban open	37.4	40.2	40.1	75.3	+ 2.8	+ 7.5	- 0.1	- 0.2	+ 35.2	+ 87.6
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	50.8	51.7	51.7	51.7	+ 0.9	+ 1.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.8	0.8	0.8	0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.4	- 50.0

Table A-30. Population and land use data for the Scituate Harbor Watershed

1990 land use data not available for this watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	2,147
Housing units within 1000 m boundary:	921
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	46

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	5.3	2.0	2.0	1.0	- 3.3	- 62.7	+ 0.0	+ 0.0	- 1.0	- 50.0
C2 Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3 Forest	47.5	47.5	47.5	23.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 23.8	- 50.0
C4 Non-forested wetland	8.5	8.5	8.5	8.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.8	0.8	0.8	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	0.9	0.9	0.9	0.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	2.3	2.3	2.3	2.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	2.5	2.5	2.5	2.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	8.6	8.6	8.6	8.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	3.3	3.3	3.8	+ 3.3	—	+ 0.0	+ 0.0	+ 0.4	+ 13.0
C11 Residential, < ¼ acre lots	24.1	24.1	24.1	24.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	122.4	122.4	122.4	138.2	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 15.9	+ 13.0
C13 Residential, > ½ acre lots	36.9	36.9	36.9	41.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 4.8	+ 13.0
C14 Salt marsh	46.3	46.3	46.3	46.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	11.8	11.8	11.8	13.2	- 0.0	- 0.1	+ 0.0	+ 0.0	+ 1.3	+ 11.3
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	20.8	20.8	20.8	23.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 2.3	+ 11.3
C18 Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19 Waste disposal	1.0	1.0	1.0	1.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	1.2	1.2	1.2	1.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	4,287
Housing units within watershed:	1,720
Occupancy rate (persons per unit):	2.5
Housing units sewered (%):	37

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	9.9	5.8	5.8	2.9	- 4.1	- 41.4	+ 0.0	+ 0.0	- 2.9	- 50.0
C2 Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3 Forest	141.8	141.8	141.8	70.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 70.9	- 50.0
C4 Non-forested wetland	48.1	48.1	48.1	48.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.8	0.8	0.8	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	3.1	3.1	3.1	3.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	2.3	2.3	2.3	2.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	9.4	9.4	9.4	9.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	8.6	8.6	8.6	8.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	3.3	3.3	4.0	+ 3.3	—	+ 0.0	+ 0.0	+ 0.6	+ 18.3
C11 Residential, < ¼ acre lots	29.1	29.1	29.1	29.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	279.4	279.4	279.4	330.7	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 51.2	+ 18.3
C13 Residential, > ½ acre lots	77.8	77.0	77.0	91.1	- 0.8	- 1.1	+ 0.0	+ 0.0	+ 14.1	+ 18.3
C14 Salt marsh	46.3	46.3	46.3	46.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	14.0	14.0	14.0	16.4	- 0.0	- 0.1	+ 0.0	+ 0.0	+ 2.4	+ 17.0
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	30.5	32.1	32.1	37.5	+ 1.6	+ 5.2	+ 0.0	+ 0.0	+ 5.4	+ 17.0
C18 Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19 Waste disposal	1.0	1.0	1.0	1.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	1.2	1.2	1.2	1.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-31. Population and land use data for the South River Watershed

1990 land use data not available for Scituate

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	5,961
Housing units within 1000 m boundary:	2,576
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	34

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	15.9	15.9	10.7	5.4	+ 0.0	+ 0.0	- 5.2	- 32.7	- 5.4	- 50.0
C2	Pasture	16.7	16.7	16.7	8.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 8.4	- 50.0
C3	Forest	630.5	566.9	508.6	254.3	- 63.5	- 10.1	- 58.3	- 10.3	- 254.3	- 50.0
C4	Non-forested wetland	7.8	7.8	7.8	7.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	26.2	24.9	21.9	21.9	- 1.3	- 4.9	- 3.0	- 12.1	+ 0.0	+ 0.0
C6	Open land	28.5	21.4	21.4	21.4	- 7.1	- 24.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	4.2	4.2	4.2	4.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	16.9	19.3	22.6	22.6	+ 2.4	+ 13.9	+ 3.3	+ 17.0	+ 0.0	+ 0.0
C9	Water-based recreation	8.3	8.3	8.3	8.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	2.0	6.4	14.1	19.8	+ 4.4	+ 216.8	+ 7.7	+ 120.8	+ 5.7	+ 40.6
C11	Residential, < ¼ acre lots	89.4	89.3	89.3	89.3	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	331.5	343.5	348.3	489.6	+ 12.0	+ 3.6	+ 4.8	+ 1.4	+ 141.3	+ 40.6
C13	Residential, > ½ acre lots	167.5	213.8	262.7	369.2	+ 46.3	+ 27.7	+ 48.8	+ 22.8	+ 106.6	+ 40.6
C14	Salt marsh	514.1	514.1	514.1	514.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	36.6	39.7	43.3	58.7	+ 3.2	+ 8.7	+ 3.6	+ 9.0	+ 15.4	+ 35.5
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	20.8	24.5	17.6	23.9	+ 3.7	+ 17.7	- 6.9	- 28.0	+ 6.3	+ 35.5
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	8.3	8.3	8.3	8.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	9.3	9.3	14.4	7.2	+ 0.0	+ 0.0	+ 5.1	+ 55.1	- 7.2	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	12,487
Housing units within watershed:	4,732
Occupancy rate (persons per unit):	2.6
Housing units sewered (%):	27

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	40.6	35.4	33.4	16.7	- 5.2	- 12.8	- 2.1	- 5.9	- 16.7	- 50.0
C2	Pasture	35.6	34.7	33.8	16.9	- 0.9	- 2.5	- 0.9	- 2.6	- 16.9	- 50.0
C3	Forest	2916.3	2611.4	2488.6	1244.3	- 304.9	- 10.5	- 122.8	- 4.7	- 1244.3	- 50.0
C4	Non-forested wetland	138.8	138.8	136.9	136.9	+ 0.0	+ 0.0	- 2.0	- 1.4	+ 0.0	+ 0.0
C5	Mining	94.5	93.0	76.3	76.3	- 1.5	- 1.5	- 16.7	- 17.9	+ 0.0	+ 0.0
C6	Open land	99.7	84.4	106.6	106.6	- 15.3	- 15.3	+ 22.2	+ 26.3	+ 0.0	+ 0.0
C7	Participatory recreation	26.0	26.1	26.1	26.1	+ 0.1	+ 0.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	41.0	42.9	46.2	46.2	+ 2.0	+ 4.8	+ 3.3	+ 7.6	+ 0.0	+ 0.0
C9	Water-based recreation	8.8	8.8	8.8	8.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	2.0	6.4	14.1	25.2	+ 4.4	+ 216.8	+ 7.7	+ 120.8	+ 11.1	+ 78.8
C11	Residential, < ¼ acre lots	89.4	89.3	89.3	89.3	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	387.5	438.5	448.6	802.1	+ 51.0	+ 13.2	+ 10.0	+ 2.3	+ 353.5	+ 78.8
C13	Residential, > ½ acre lots	693.1	956.3	1045.1	1868.8	+ 263.2	+ 38.0	+ 88.8	+ 9.3	+ 823.7	+ 78.8
C14	Salt marsh	514.1	514.1	514.1	514.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	48.3	57.8	63.9	111.5	+ 9.6	+ 19.8	+ 6.1	+ 10.5	+ 47.6	+ 74.4
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	63.6	56.2	54.2	94.5	- 7.4	- 11.7	- 2.0	- 3.5	+ 40.3	+ 74.4
C18	Transportation	64.2	64.2	64.2	112.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 47.8	+ 74.4
C19	Waste disposal	3.9	7.4	7.8	7.8	+ 3.4	+ 87.4	+ 0.4	+ 6.0	+ 0.0	+ 0.0
C20	Open water	74.7	74.7	74.7	74.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	82.9	84.4	92.3	46.2	+ 1.5	+ 1.8	+ 7.9	+ 9.4	- 46.2	- 50.0

Table A-32. Population and land use data for the North River (South Shore) Watershed

1990 land use data not available for Scituate

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	3,508
Housing units within 1000 m boundary:	1,236
Occupancy rate (persons per unit):	2.8
Housing units sewered (%):	14

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	47.3	46.9	50.6	25.3	- 0.4	- 0.8	+ 3.7	+ 7.8	- 25.3	- 50.0
C2 Pasture	52.7	54.3	53.9	27.0	+ 1.6	+ 3.0	- 0.4	- 0.7	- 27.0	- 50.0
C3 Forest	1231.2	1148.8	1115.2	557.6	- 82.3	- 6.7	- 33.7	- 2.9	- 557.6	- 50.0
C4 Non-forested wetland	16.9	16.9	16.9	16.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	23.6	31.8	31.8	31.8	+ 8.2	+ 35.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	44.7	43.0	44.2	44.2	- 1.7	- 3.9	+ 1.2	+ 2.9	+ 0.0	+ 0.0
C7 Participatory recreation	16.1	16.1	16.1	16.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	0.8	0.8	0.8	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	2.4	2.4	2.4	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	0.4	0.4	0.7	+ 0.4	—	+ 0.0	+ 0.0	+ 0.3	+ 91.5
C11 Residential, < ¼ acre lots	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	67.9	67.9	67.9	130.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 62.1	+ 91.5
C13 Residential, > ½ acre lots	420.7	490.3	519.9	995.7	+ 69.6	+ 16.5	+ 29.6	+ 6.0	+ 475.7	+ 91.5
C14 Salt marsh	579.7	579.7	579.7	579.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	10.6	14.2	14.2	27.2	+ 3.6	+ 33.8	+ 0.0	+ 0.0	+ 13.0	+ 91.5
C16 Industrial	8.9	8.9	8.9	17.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 8.2	+ 91.5
C17 Urban open	44.1	41.8	41.4	79.2	- 2.4	- 5.3	- 0.4	- 1.0	+ 37.8	+ 91.5
C18 Transportation	11.0	14.4	14.4	27.5	+ 3.4	+ 31.0	+ 0.0	+ 0.0	+ 13.1	+ 91.5
C19 Waste disposal	4.3	4.3	4.3	4.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	67.7	67.7	67.7	67.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	1.0	1.0	1.0	0.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.5	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	21,256
Housing units within watershed:	7,277
Occupancy rate (persons per unit):	2.9
Housing units sewered (%):	15

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	157.6	151.5	138.5	69.3	- 6.1	- 3.9	- 13.0	- 8.6	- 69.3	- 50.0
C2 Pasture	149.4	168.0	152.6	76.3	+ 18.6	+ 12.4	- 15.4	- 9.2	- 76.3	- 50.0
C3 Forest	6996.8	6461.1	6101.7	3050.8	- 535.7	- 7.7	- 359.5	- 5.6	- 3050.8	- 50.0
C4 Non-forested wetland	439.6	451.4	451.4	451.4	+ 11.8	+ 2.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	105.3	101.4	82.3	82.3	- 3.9	- 3.7	- 19.1	- 18.9	+ 0.0	+ 0.0
C6 Open land	180.3	163.0	179.3	179.3	- 17.3	- 9.6	+ 16.3	+ 10.0	+ 0.0	+ 0.0
C7 Participatory recreation	42.1	45.3	51.4	51.4	+ 3.2	+ 7.6	+ 6.0	+ 13.3	+ 0.0	+ 0.0
C8 Spectator recreation	31.5	45.5	45.5	45.5	+ 14.0	+ 44.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	2.4	2.4	2.4	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	7.1	29.7	40.3	75.7	+ 22.7	+ 319.7	+ 10.6	+ 35.6	+ 35.4	+ 87.8
C11 Residential, < ¼ acre lots	8.6	8.6	9.9	9.9	+ 0.0	+ 0.0	+ 1.3	+ 14.6	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	530.0	685.6	724.4	1360.5	+ 155.6	+ 29.4	+ 38.8	+ 5.7	+ 636.1	+ 87.8
C13 Residential, > ½ acre lots	1741.9	2003.6	2276.6	4275.9	+ 261.7	+ 15.0	+ 273.0	+ 13.6	+ 1999.3	+ 87.8
C14 Salt marsh	630.5	630.5	630.5	630.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	182.9	225.2	262.2	491.7	+ 42.3	+ 23.1	+ 37.0	+ 16.4	+ 229.5	+ 87.5
C16 Industrial	29.4	46.2	53.2	99.7	+ 16.8	+ 57.0	+ 7.0	+ 15.1	+ 46.6	+ 87.5
C17 Urban open	162.4	184.2	189.6	355.6	+ 21.8	+ 13.4	+ 5.4	+ 2.9	+ 166.0	+ 87.5
C18 Transportation	124.8	128.2	131.5	246.5	+ 3.4	+ 2.7	+ 3.3	+ 2.5	+ 115.1	+ 87.5
C19 Waste disposal	16.0	18.9	18.9	18.9	+ 2.9	+ 18.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	199.3	200.3	201.1	201.1	+ 1.1	+ 0.5	+ 0.7	+ 0.4	+ 0.0	+ 0.0
C21 Woody perennial	68.2	55.4	63.1	31.5	- 12.7	- 18.7	+ 7.6	+ 13.7	- 31.5	- 50.0

Table A-33. Population and land use data for the Green Harbor River Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	4,310
Housing units within 1000 m boundary:	2,161
Occupancy rate (persons per unit):	2.0
Housing units sewered (%):	85

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3 Forest	145.1	143.4	138.8	69.4	- 1.7	- 1.1	- 4.6	- 3.2	- 69.4	- 50.0
C4 Non-forested wetland	40.1	40.1	40.1	40.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	23.0	13.6	12.4	12.4	- 9.4	- 40.8	- 1.1	- 8.4	+ 0.0	+ 0.0
C7 Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	3.4	3.4	3.4	3.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	5.8	5.8	5.8	5.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	1.8	1.8	5.8	9.6	+ 0.0	+ 0.0	+ 4.0	+ 223.6	+ 3.8	+ 65.3
C11 Residential, < ¼ acre lots	193.6	193.0	196.1	196.1	- 0.7	- 0.3	+ 3.2	+ 1.6	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	86.2	86.9	90.2	149.0	+ 0.7	+ 0.9	+ 3.2	+ 3.7	+ 58.9	+ 65.3
C13 Residential, > ½ acre lots	2.7	2.7	1.2	1.9	+ 0.0	+ 0.0	- 1.5	- 55.9	+ 0.8	+ 65.3
C14 Salt marsh	97.6	97.6	97.6	97.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	12.6	15.5	15.9	19.4	+ 2.9	+ 23.1	+ 0.4	+ 2.8	+ 3.4	+ 21.6
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	7.1	10.6	7.9	9.7	+ 3.5	+ 50.1	- 2.7	- 25.1	+ 1.7	+ 21.6
C18 Transportation	4.8	4.8	3.9	4.7	+ 0.0	+ 0.0	- 1.0	- 19.9	+ 0.8	+ 21.6
C19 Waste disposal	0.0	4.5	4.5	4.5	+ 4.5	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	16.7	16.7	16.7	16.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	7,940
Housing units within watershed:	3,306
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	62

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	28.1	29.5	29.5	14.7	+ 1.4	+ 5.0	+ 0.0	+ 0.0	- 14.7	- 50.0
C2 Pasture	5.4	6.7	6.3	3.2	+ 1.3	+ 23.9	- 0.3	- 5.2	- 3.2	- 50.0
C3 Forest	871.2	723.8	675.8	337.9	- 147.4	- 16.9	- 48.0	- 6.6	- 337.9	- 50.0
C4 Non-forested wetland	218.5	219.8	219.8	219.8	+ 1.3	+ 0.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	19.4	7.3	7.3	7.3	- 12.1	- 62.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	71.0	61.0	58.9	58.9	- 10.0	- 14.1	- 2.1	- 3.4	+ 0.0	+ 0.0
C7 Participatory recreation	48.8	67.5	67.5	67.5	+ 18.8	+ 38.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	6.5	6.5	6.5	6.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	5.8	5.8	5.8	5.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	1.8	10.6	14.6	24.8	+ 8.8	+ 489.5	+ 4.0	+ 37.9	+ 10.3	+ 70.3
C11 Residential, < ¼ acre lots	194.8	194.1	197.3	197.3	- 0.7	- 0.3	+ 3.2	+ 1.6	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	197.0	251.1	255.1	434.4	+ 54.1	+ 27.5	+ 4.0	+ 1.6	+ 179.3	+ 70.3
C13 Residential, > ½ acre lots	122.8	200.9	246.3	419.3	+ 78.1	+ 63.6	+ 45.4	+ 22.6	+ 173.1	+ 70.3
C14 Salt marsh	100.9	100.9	100.9	100.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	12.7	15.8	17.9	27.0	+ 3.2	+ 25.1	+ 2.0	+ 12.8	+ 9.1	+ 50.8
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	16.5	17.4	10.2	15.3	+ 0.9	+ 5.3	- 7.2	- 41.5	+ 5.2	+ 50.8
C18 Transportation	26.8	26.8	25.9	39.0	+ 0.0	+ 0.0	- 1.0	- 3.6	+ 13.2	+ 50.8
C19 Waste disposal	0.0	4.5	4.5	4.5	+ 4.5	—	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	62.4	62.4	62.4	62.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	70.5	68.4	68.4	34.2	- 2.0	- 2.9	+ 0.0	+ 0.0	- 34.2	- 50.0

Table A-34. Population and land use data for the Duxbury Bay Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	3,196
Housing units within 1000 m boundary:	1,432
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	23

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	5.9	5.9	5.9	2.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 2.9	- 50.0
C2	Pasture	7.5	4.9	3.8	1.9	- 2.6	- 34.7	- 1.1	- 22.3	- 1.9	- 50.0
C3	Forest	283.3	254.1	240.5	120.2	- 29.2	- 10.3	- 13.6	- 5.4	- 120.2	- 50.0
C4	Non-forested wetland	7.9	7.9	7.9	7.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	2.2	2.2	2.2	2.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	52.3	41.9	41.9	41.9	- 10.4	- 19.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	34.6	34.6	36.0	36.0	+ 0.0	+ 0.0	+ 1.3	+ 3.8	+ 0.0	+ 0.0
C8	Spectator recreation	15.9	16.6	16.6	16.6	+ 0.7	+ 4.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	12.6	11.8	11.8	11.8	- 0.8	- 6.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	2.3	4.2	5.0	6.2	+ 1.9	+ 79.4	+ 0.8	+ 19.8	+ 1.1	+ 22.5
C11	Residential, < ¼ acre lots	15.1	15.1	15.1	15.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	105.6	131.0	132.5	162.2	+ 25.4	+ 24.0	+ 1.5	+ 1.2	+ 29.8	+ 22.5
C13	Residential, > ½ acre lots	361.8	377.3	391.0	478.9	+ 15.5	+ 4.3	+ 13.7	+ 3.6	+ 87.8	+ 22.5
C14	Salt marsh	532.2	532.2	532.2	532.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	9.1	10.4	10.5	12.7	+ 1.2	+ 13.4	+ 0.1	+ 0.8	+ 2.3	+ 21.8
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	26.6	24.7	22.7	27.7	- 1.8	- 6.8	- 2.0	- 8.2	+ 5.0	+ 21.8
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	1.5	1.5	1.5	1.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	23.3	23.3	23.3	23.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	2.6	2.6	1.8	0.9	+ 0.0	+ 0.0	- 0.8	- 29.4	- 0.9	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	4,479
Housing units within watershed:	1,889
Occupancy rate (persons per unit):	2.4
Housing units sewered (%):	24

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	11.8	11.8	11.8	5.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 5.9	- 50.0
C2	Pasture	18.6	16.5	12.4	6.2	- 2.1	- 11.1	- 4.2	- 25.1	- 6.2	- 50.0
C3	Forest	682.3	634.0	594.4	297.2	- 48.4	- 7.1	- 39.6	- 6.2	- 297.2	- 50.0
C4	Non-forested wetland	46.9	46.9	27.5	27.5	+ 0.0	+ 0.0	- 19.4	- 41.3	+ 0.0	+ 0.0
C5	Mining	4.8	4.8	4.8	4.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	58.2	46.6	44.9	44.9	- 11.6	- 20.0	- 1.7	- 3.6	+ 0.0	+ 0.0
C7	Participatory recreation	75.4	75.4	76.7	76.7	+ 0.0	+ 0.0	+ 1.3	+ 1.8	+ 0.0	+ 0.0
C8	Spectator recreation	16.9	17.8	17.8	17.8	+ 0.9	+ 5.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	12.6	11.8	11.8	11.8	- 0.8	- 6.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	2.9	4.8	5.9	8.5	+ 1.9	+ 63.3	+ 1.2	+ 24.2	+ 2.5	+ 42.2
C11	Residential, < ¼ acre lots	15.1	15.1	15.1	15.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	121.5	152.2	153.7	218.5	+ 30.7	+ 25.3	+ 1.5	+ 1.0	+ 64.8	+ 42.2
C13	Residential, > ½ acre lots	469.2	498.8	540.8	768.8	+ 29.5	+ 6.3	+ 42.0	+ 8.4	+ 228.0	+ 42.2
C14	Salt marsh	532.2	532.2	532.2	532.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	12.3	13.5	16.2	22.9	+ 1.2	+ 10.0	+ 2.7	+ 20.0	+ 6.7	+ 41.3
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	37.5	36.1	33.7	47.6	- 1.4	- 3.9	- 2.4	- 6.6	+ 13.9	+ 41.3
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	2.9	2.9	2.9	2.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	42.5	42.5	61.9	61.9	+ 0.0	+ 0.0	+ 19.4	+ 45.6	+ 0.0	+ 0.0
C21	Woody perennial	14.2	14.2	13.3	6.7	+ 0.0	+ 0.0	- 0.9	- 6.5	- 6.7	- 50.0

Table A-35. Population and land use data for the Kingston Bay Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	5,178
Housing units within 1000 m boundary:	2,211
Occupancy rate (persons per unit):	2.3
Housing units sewered (%):	7

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	10.4	8.9	8.7	4.3	- 1.4	- 13.9	- 0.3	- 2.9	- 4.3	- 50.0
C2	Pasture	27.0	27.4	26.2	13.1	+ 0.4	+ 1.3	- 1.2	- 4.3	- 13.1	- 50.0
C3	Forest	473.1	439.0	390.8	195.4	- 34.1	- 7.2	- 48.2	- 11.0	- 195.4	- 50.0
C4	Non-forested wetland	21.2	21.2	21.2	21.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	2.7	2.7	2.8	2.8	- 0.0	- 0.1	+ 0.1	+ 4.9	+ 0.0	+ 0.0
C6	Open land	69.8	63.8	64.0	64.0	- 6.0	- 8.6	+ 0.3	+ 0.4	+ 0.0	+ 0.0
C7	Participatory recreation	2.5	2.5	3.4	3.4	+ 0.0	+ 0.0	+ 0.9	+ 35.1	+ 0.0	+ 0.0
C8	Spectator recreation	9.2	10.4	9.5	9.5	+ 1.2	+ 13.1	- 0.8	- 8.1	+ 0.0	+ 0.0
C9	Water-based recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.6	8.3	11.2	+ 0.6	—	+ 7.7	+ 1245.0	+ 2.9	+ 34.9
C11	Residential, < ¼ acre lots	34.2	34.2	34.2	34.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	219.4	223.0	223.8	302.0	+ 3.6	+ 1.6	+ 0.9	+ 0.4	+ 78.2	+ 34.9
C13	Residential, > ½ acre lots	251.0	272.1	311.4	420.1	+ 21.1	+ 8.4	+ 39.3	+ 14.4	+ 108.8	+ 34.9
C14	Salt marsh	87.0	87.0	87.0	87.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	16.6	18.9	20.0	26.6	+ 2.3	+ 13.7	+ 1.1	+ 5.9	+ 6.6	+ 32.9
C16	Industrial	4.9	11.8	11.8	15.7	+ 6.9	+ 141.6	+ 0.0	+ 0.0	+ 3.9	+ 32.9
C17	Urban open	25.9	30.9	30.7	40.7	+ 5.0	+ 19.2	- 0.2	- 0.7	+ 10.1	+ 32.9
C18	Transportation	23.0	23.0	23.0	30.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 7.6	+ 32.9
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	12.4	12.4	12.4	12.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	9.1	9.6	10.1	5.1	+ 0.5	+ 5.4	+ 0.5	+ 5.4	- 5.1	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	9,412
Housing units within watershed:	3,730
Occupancy rate (persons per unit):	2.5
Housing units sewered (%):	11

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	36.4	34.9	34.7	17.3	- 1.4	- 4.0	- 0.3	- 0.7	- 17.3	- 50.0
C2	Pasture	53.7	54.3	48.0	24.0	+ 0.6	+ 1.1	- 6.4	- 11.7	- 24.0	- 50.0
C3	Forest	1873.3	1642.5	1460.1	730.1	- 230.8	- 12.3	- 182.4	- 11.1	- 730.1	- 50.0
C4	Non-forested wetland	86.1	84.5	81.2	81.2	- 1.6	- 1.9	- 3.2	- 3.8	+ 0.0	+ 0.0
C5	Mining	23.5	19.3	85.4	85.4	- 4.3	- 18.1	+ 66.1	+ 343.4	+ 0.0	+ 0.0
C6	Open land	142.7	130.7	129.8	129.8	- 11.9	- 8.4	- 0.9	- 0.7	+ 0.0	+ 0.0
C7	Participatory recreation	2.5	2.5	3.4	3.4	+ 0.0	+ 0.0	+ 0.9	+ 35.1	+ 0.0	+ 0.0
C8	Spectator recreation	16.5	17.4	16.6	16.6	+ 1.0	+ 5.9	- 0.8	- 4.8	+ 0.0	+ 0.0
C9	Water-based recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	2.6	13.6	23.5	39.2	+ 11.0	+ 420.3	+ 9.9	+ 72.9	+ 15.7	+ 66.7
C11	Residential, < ¼ acre lots	34.5	42.0	54.8	54.8	+ 7.5	+ 21.8	+ 12.8	+ 30.4	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	244.9	269.5	271.7	452.8	+ 24.6	+ 10.1	+ 2.2	+ 0.8	+ 181.1	+ 66.7
C13	Residential, > ½ acre lots	512.4	635.6	693.0	1155.1	+ 123.3	+ 24.1	+ 57.4	+ 9.0	+ 462.1	+ 66.7
C14	Salt marsh	87.0	87.0	87.0	87.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	19.1	47.7	95.9	156.4	+ 28.6	+ 150.1	+ 48.2	+ 101.1	+ 60.6	+ 63.2
C16	Industrial	4.9	32.5	33.8	55.2	+ 27.6	+ 564.7	+ 1.3	+ 4.0	+ 21.4	+ 63.2
C17	Urban open	31.9	60.7	51.2	83.6	+ 28.8	+ 90.3	- 9.4	- 15.6	+ 32.4	+ 63.2
C18	Transportation	66.1	66.1	66.1	107.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 41.8	+ 63.2
C19	Waste disposal	4.2	6.0	6.0	6.0	+ 1.8	+ 41.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	71.2	71.2	71.2	71.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	87.3	82.6	87.2	43.6	- 4.7	- 5.4	+ 4.7	+ 5.7	- 43.6	- 50.0

Table A-36. Population and land use data for the Plymouth Harbor Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	5,909
Housing units within 1000 m boundary:	2,723
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	87

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	3.2	3.2	3.2	1.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 1.6	- 50.0
C2	Pasture	11.1	11.1	2.8	1.4	+ 0.0	+ 0.0	- 8.3	- 74.8	- 1.4	- 50.0
C3	Forest	125.8	106.1	99.7	49.9	- 19.7	- 15.7	- 6.3	- 6.0	- 49.9	- 50.0
C4	Non-forested wetland	3.9	3.9	3.9	3.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	37.2	35.2	35.2	35.2	- 2.0	- 5.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	14.8	16.8	16.8	16.8	+ 2.0	+ 13.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	11.0	11.8	11.8	11.8	+ 0.9	+ 8.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	15.4	15.4	15.4	15.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	4.4	4.4	5.0	5.6	+ 0.0	+ 0.0	+ 0.6	+ 13.8	+ 0.6	+ 11.8
C11	Residential, < ¼ acre lots	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	258.0	258.0	269.3	301.0	+ 0.0	+ 0.0	+ 11.3	+ 4.4	+ 31.7	+ 11.8
C13	Residential, > ½ acre lots	34.0	53.0	60.0	67.0	+ 19.0	+ 55.8	+ 6.9	+ 13.1	+ 7.0	+ 11.8
C14	Salt marsh	10.7	10.7	10.7	10.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	57.3	59.5	61.0	68.1	+ 2.2	+ 3.8	+ 1.4	+ 2.4	+ 7.2	+ 11.8
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	62.5	60.1	54.5	60.9	- 2.4	- 3.8	- 5.7	- 9.4	+ 6.4	+ 11.8
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	1.4	1.4	1.4	1.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	3.2	3.2	3.2	3.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	19,177
Housing units within watershed:	7,307
Occupancy rate (persons per unit):	2.6
Housing units sewered (%):	55

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	54.6	50.5	50.5	25.3	- 4.1	- 7.5	+ 0.0	+ 0.0	- 25.3	- 50.0
C2	Pasture	61.1	51.9	22.9	11.5	- 9.3	- 15.1	- 28.9	- 55.8	- 11.5	- 50.0
C3	Forest	2139.7	1601.9	1447.1	723.5	- 537.9	- 25.1	- 154.8	- 9.7	- 723.5	- 50.0
C4	Non-forested wetland	30.5	30.5	33.3	33.3	+ 0.0	+ 0.0	+ 2.8	+ 9.1	+ 0.0	+ 0.0
C5	Mining	21.5	25.2	23.5	23.5	+ 3.7	+ 17.5	- 1.7	- 6.6	+ 0.0	+ 0.0
C6	Open land	114.3	130.1	127.3	127.3	+ 15.8	+ 13.8	- 2.8	- 2.1	+ 0.0	+ 0.0
C7	Participatory recreation	26.2	28.2	28.2	28.2	+ 2.0	+ 7.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	15.4	16.3	17.8	17.8	+ 0.9	+ 5.7	+ 1.5	+ 9.2	+ 0.0	+ 0.0
C9	Water-based recreation	15.4	15.4	15.4	15.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	16.5	28.0	35.8	53.3	+ 11.5	+ 69.7	+ 7.7	+ 27.6	+ 17.5	+ 49.0
C11	Residential, < ¼ acre lots	30.7	52.0	56.3	56.3	+ 21.3	+ 69.4	+ 4.3	+ 8.2	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	503.9	813.2	860.3	1282.1	+ 309.3	+ 61.4	+ 47.1	+ 5.8	+ 421.8	+ 49.0
C13	Residential, > ½ acre lots	130.3	241.2	289.8	431.8	+ 110.9	+ 85.1	+ 48.6	+ 20.1	+ 142.1	+ 49.0
C14	Salt marsh	10.7	10.7	10.7	10.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	99.6	105.4	166.9	245.0	+ 5.7	+ 5.7	+ 61.5	+ 58.4	+ 78.1	+ 46.8
C16	Industrial	2.5	40.6	53.5	78.5	+ 38.1	+ 1518.0	+ 12.9	+ 31.9	+ 25.0	+ 46.8
C17	Urban open	117.3	136.8	143.9	211.2	+ 19.6	+ 16.7	+ 7.0	+ 5.1	+ 67.3	+ 46.8
C18	Transportation	86.1	94.1	94.1	138.1	+ 8.0	+ 9.3	+ 0.0	+ 0.0	+ 44.0	+ 46.8
C19	Waste disposal	6.4	6.4	6.4	6.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	224.2	224.2	224.2	224.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	72.2	74.1	71.4	35.7	+ 1.9	+ 2.6	- 2.8	- 3.8	- 35.7	- 50.0

Table A-37. Population and land use data for the Sandwich Harbor Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	1,464
Housing units within 1000 m boundary:	779
Occupancy rate (persons per unit):	2.8
Housing units sewered (%):	16

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases three-fold for three months of the year.)

MassGIS land use data for the 1000 m delineation

		1971	1985	1990	Projected	1971 to 1985 change		1985 to 1990 change		1990 to buildout change	
MassGIS Category		(ha)	(ha)	(ha)	buildout (ha)	(ha)	(%)	(ha)	(%)	(ha)	(%)
C1	Cropland	13.6	14.6	13.4	6.7	+ 1.0	+ 7.1	- 1.2	- 8.4	- 6.7	- 50.0
C2	Pasture	1.2	1.2	2.6	1.3	+ 0.0	+ 0.0	+ 1.4	+ 114.4	- 1.3	- 50.0
C3	Forest	202.0	162.5	150.4	75.2	- 39.6	- 19.6	- 12.1	- 7.4	- 75.2	- 50.0
C4	Non-forested wetland	15.7	17.0	17.4	17.4	+ 1.4	+ 8.8	+ 0.3	+ 1.9	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	28.4	26.8	31.2	31.2	- 1.7	- 5.9	+ 4.5	+ 16.7	+ 0.0	+ 0.0
C7	Participatory recreation	0.6	0.6	0.6	0.6	+ 0.0	+ 1.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	8.1	8.1	8.1	8.1	+ 0.0	+ 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	1.6	1.6	1.6	1.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.3	1.2	1.8	+ 0.3	—	+ 0.9	+ 300.3	+ 0.6	+ 50.4
C11	Residential, < ¼ acre lots	44.9	45.1	45.1	45.1	+ 0.2	+ 0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	34.2	40.2	40.2	60.5	+ 6.0	+ 17.7	+ 0.0	+ 0.0	+ 20.2	+ 50.4
C13	Residential, > ½ acre lots	73.1	105.2	118.4	178.1	+ 32.1	+ 43.9	+ 13.2	+ 12.6	+ 59.6	+ 50.4
C14	Salt marsh	246.2	244.3	238.9	238.9	- 1.9	- 0.8	- 5.4	- 2.2	+ 0.0	+ 0.0
C15	Commercial	16.4	19.5	19.5	27.1	+ 3.1	+ 18.6	+ 0.0	+ 0.0	+ 7.7	+ 39.3
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	11.8	11.4	10.1	14.0	- 0.4	- 3.1	- 1.3	- 11.5	+ 4.0	+ 39.3
C18	Transportation	0.6	0.6	0.6	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 39.3
C19	Waste disposal	2.2	2.2	2.2	2.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	4.9	4.9	4.9	4.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	19.1	18.6	18.2	9.1	- 0.5	- 2.5	- 0.3	- 1.8	- 9.1	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	3,754
Housing units within watershed:	1,715
Occupancy rate (persons per unit):	3.3
Housing units sewered (%):	15

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases three-fold for three months of the year.)

MassGIS land use data for the watershed delineation

		1971	1985	1990	Projected	1971 to 1985 change		1985 to 1990 change		1990 to buildout change	
MassGIS Category		(ha)	(ha)	(ha)	buildout (ha)	(ha)	(%)	(ha)	(%)	(ha)	(%)
C1	Cropland	46.9	44.1	24.6	12.3	- 2.8	- 6.0	- 19.5	- 44.2	- 12.3	- 50.0
C2	Pasture	9.4	9.6	7.3	3.6	+ 0.3	+ 2.9	- 2.4	- 24.5	- 3.6	- 50.0
C3	Forest	1849.9	1629.6	1524.6	762.3	- 220.3	- 11.9	- 105.0	- 6.4	- 762.3	- 50.0
C4	Non-forested wetland	23.3	24.9	25.2	25.2	+ 1.6	+ 6.9	+ 0.3	+ 1.3	+ 0.0	+ 0.0
C5	Mining	0.0	17.3	45.5	45.5	+ 17.3	---	+ 28.2	+ 163.1	+ 0.0	+ 0.0
C6	Open land	111.8	101.8	112.6	112.6	- 10.0	- 8.9	+ 10.8	+ 10.6	+ 0.0	+ 0.0
C7	Participatory recreation	0.6	0.7	0.7	0.7	+ 0.1	+ 12.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	8.4	14.6	14.6	14.6	+ 6.2	+ 73.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	1.6	1.6	1.6	1.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	8.1	9.9	24.1	+ 8.1	—	+ 1.8	+ 22.6	+ 14.3	+ 144.4
C11	Residential, < ¼ acre lots	44.9	45.1	45.1	45.1	+ 0.2	+ 0.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	41.5	137.1	140.7	344.0	+ 95.6	+ 230.4	+ 3.6	+ 2.6	+ 203.3	+ 144.4
C13	Residential, > ½ acre lots	108.4	203.4	269.1	657.7	+ 95.0	+ 87.7	+ 65.7	+ 32.3	+ 388.6	+ 144.4
C14	Salt marsh	246.2	244.3	238.9	238.9	- 1.9	- 0.8	- 5.4	- 2.2	+ 0.0	+ 0.0
C15	Commercial	17.2	28.7	38.1	87.8	+ 11.5	+ 67.1	+ 9.4	+ 32.9	+ 49.7	+ 130.4
C16	Industrial	1.1	8.0	23.3	53.7	+ 6.9	+ 597.5	+ 15.3	+ 190.9	+ 30.4	+ 130.4
C17	Urban open	43.8	33.8	31.2	71.9	- 10.0	- 22.8	- 2.6	- 7.8	+ 40.7	+ 130.4
C18	Transportation	46.3	49.2	49.2	113.5	+ 2.9	+ 6.3	+ 0.0	+ 0.0	+ 64.2	+ 130.4
C19	Waste disposal	9.1	10.6	10.6	10.6	+ 1.4	+ 15.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	24.0	24.0	24.0	24.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	28.1	26.1	25.8	12.9	- 2.0	- 7.0	- 0.3	- 1.3	- 12.9	- 50.0

Table A-38. Population and land use data for the Scorton Harbor Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	1,191
Housing units within 1000 m boundary:	708
Occupancy rate (persons per unit):	2.5
Housing units sewered (%):	15

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases three-fold for three months of the year.)

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	1.9	1.9	2.5	1.3	+ 0.0	+ 0.0	+ 0.7	+ 35.7	- 1.3	- 50.0
C2	Pasture	1.6	1.6	1.6	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.8	- 50.0
C3	Forest	460.1	389.4	340.8	170.4	- 70.6	- 15.4	- 48.6	- 12.5	- 170.4	- 50.0
C4	Non-forested wetland	73.9	72.7	70.8	70.8	- 1.2	- 1.6	- 1.9	- 2.6	+ 0.0	+ 0.0
C5	Mining	1.3	1.3	1.3	1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	18.7	20.7	16.4	16.4	+ 1.9	+ 10.4	- 4.3	- 20.9	+ 0.0	+ 0.0
C7	Participatory recreation	0.0	0.0	0.2	0.2	+ 0.0	+ 0.0	+ 0.2	—	+ 0.0	+ 0.0
C8	Spectator recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	0.1	0.1	0.1	0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	12.0	13.2	14.1	14.1	+ 1.2	+ 9.8	+ 0.8	+ 6.3	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	21.2	21.2	21.2	38.0	+ 0.0	+ 0.1	+ 0.0	+ 0.0	+ 16.8	+ 79.2
C13	Residential, > ½ acre lots	58.6	123.7	169.1	303.0	+ 65.1	+ 111.0	+ 45.4	+ 36.7	+ 133.9	+ 79.2
C14	Salt marsh	151.5	151.9	154.2	154.2	+ 0.3	+ 0.2	+ 2.4	+ 1.6	+ 0.0	+ 0.0
C15	Commercial	14.6	17.8	19.7	34.3	+ 3.3	+ 22.4	+ 1.9	+ 10.8	+ 14.6	+ 73.7
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	16.6	16.6	20.5	35.6	- 0.0	- 0.0	+ 3.9	+ 23.3	+ 15.1	+ 73.7
C18	Transportation	6.0	6.0	6.0	10.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 4.4	+ 73.7
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	11.0	11.6	11.6	11.6	+ 0.5	+ 4.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	25.5	25.0	24.6	12.3	- 0.5	- 2.0	- 0.4	- 1.8	- 12.3	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	4,385
Housing units within watershed:	1,945
Occupancy rate (persons per unit):	3.4
Housing units sewered (%):	8

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases three-fold for three months of the year.)

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1	Cropland	10.9	6.6	5.2	2.6	- 4.4	- 39.9	- 1.3	- 20.4	- 2.6	- 50.0
C2	Pasture	5.2	3.6	3.6	1.8	- 1.6	- 30.1	+ 0.0	+ 0.0	- 1.8	- 50.0
C3	Forest	2007.3	1750.8	1552.1	776.1	- 256.5	- 12.8	- 198.7	- 11.3	- 776.1	- 50.0
C4	Non-forested wetland	79.1	77.9	76.0	76.0	- 1.2	- 1.5	- 1.9	- 2.5	+ 0.0	+ 0.0
C5	Mining	8.8	9.7	3.9	3.9	+ 0.8	+ 9.4	- 5.7	- 59.3	+ 0.0	+ 0.0
C6	Open land	62.2	59.2	45.0	45.0	- 3.0	- 4.8	- 14.2	- 24.0	+ 0.0	+ 0.0
C7	Participatory recreation	70.4	71.3	76.0	76.0	+ 0.8	+ 1.2	+ 4.7	+ 6.6	+ 0.0	+ 0.0
C8	Spectator recreation	0.0	2.9	8.1	8.1	+ 2.9	—	+ 5.2	+ 182.1	+ 0.0	+ 0.0
C9	Water-based recreation	1.7	1.7	1.7	1.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.8	0.8	6.2	12.8	+ 0.0	+ 0.0	+ 5.4	+ 668.7	+ 6.6	+ 106.2
C11	Residential, < ¼ acre lots	12.0	13.2	14.1	14.1	+ 1.2	+ 9.8	+ 0.8	+ 6.3	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	22.7	180.1	218.2	449.9	+ 157.5	+ 694.4	+ 38.0	+ 21.1	+ 231.7	+ 106.2
C13	Residential, > ½ acre lots	170.2	255.3	383.4	790.5	+ 85.0	+ 49.9	+ 128.1	+ 50.2	+ 407.2	+ 106.2
C14	Salt marsh	151.5	151.9	154.2	154.2	+ 0.3	+ 0.2	+ 2.4	+ 1.6	+ 0.0	+ 0.0
C15	Commercial	16.9	24.6	39.7	81.0	+ 7.7	+ 45.6	+ 15.2	+ 61.8	+ 41.2	+ 103.8
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	18.3	28.7	51.2	104.3	+ 10.4	+ 56.7	+ 22.5	+ 78.3	+ 53.1	+ 103.8
C18	Transportation	54.4	54.5	54.5	111.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 56.5	+ 103.8
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	70.8	71.3	71.3	71.3	+ 0.5	+ 0.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	32.7	32.2	31.7	15.9	- 0.5	- 1.6	- 0.4	- 1.4	- 15.9	- 50.0

Table A-39. Population and land use data for the Barnstable Harbor Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	4,238
Housing units within 1000 m boundary:	2,920
Occupancy rate (persons per unit):	2.2
Housing units sewered (%):	16

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases three-fold for three months of the year.)

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	66.5	56.2	56.1	28.1	- 10.3	- 15.5	- 0.1	- 0.1	- 28.1	- 50.0
C2 Pasture	49.4	28.7	31.4	15.7	- 20.7	- 42.0	+ 2.8	+ 9.7	- 15.7	- 50.0
C3 Forest	1190.5	1040.8	926.4	463.2	- 149.8	- 12.6	- 114.4	- 11.0	- 463.2	- 50.0
C4 Non-forested wetland	57.6	55.4	53.5	53.5	- 2.3	- 3.9	- 1.8	- 3.3	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	419.3	424.3	409.5	409.5	+ 5.0	+ 1.2	- 14.8	- 3.5	+ 0.0	+ 0.0
C7 Participatory recreation	25.8	25.3	39.4	39.4	- 0.5	- 2.0	+ 14.1	+ 55.6	+ 0.0	+ 0.0
C8 Spectator recreation	1.2	2.6	2.6	2.6	+ 1.4	+ 114.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	9.2	9.5	10.9	10.9	+ 0.3	+ 3.2	+ 1.4	+ 14.7	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	0.0	13.7	21.8	+ 0.0	+ 0.0	+ 13.7	—	+ 8.0	+ 58.3
C11 Residential, < ¼ acre lots	50.9	52.0	52.6	52.6	+ 1.1	+ 2.3	+ 0.6	+ 1.1	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	148.0	181.8	188.6	298.6	+ 33.8	+ 22.8	+ 6.8	+ 3.8	+ 110.0	+ 58.3
C13 Residential, > ½ acre lots	393.0	529.1	600.9	951.4	+ 136.1	+ 34.6	+ 71.8	+ 13.6	+ 350.5	+ 58.3
C14 Salt marsh	1924.1	1924.9	1922.4	1922.4	+ 0.8	+ 0.0	- 2.5	- 0.1	+ 0.0	+ 0.0
C15 Commercial	27.3	29.2	35.0	54.2	+ 1.8	+ 6.7	+ 5.9	+ 20.2	+ 19.2	+ 54.7
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	26.3	30.0	36.8	57.0	+ 3.8	+ 14.3	+ 6.8	+ 22.6	+ 20.2	+ 54.7
C18 Transportation	2.0	3.3	3.3	5.1	+ 1.2	+ 60.6	+ 0.0	+ 0.0	+ 1.8	+ 54.7
C19 Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	31.0	31.0	31.0	31.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	2.1	2.1	5.5	2.7	+ 0.0	+ 0.0	+ 3.4	+ 159.1	- 2.7	- 50.0

U.S. Census data for watershed delineation

Population within watershed:	10,430
Housing units within watershed:	6,183
Occupancy rate (persons per unit):	2.5
Housing units sewered (%):	15

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases three-fold for three months of the year.)

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	91.3	79.6	81.6	40.8	- 11.6	- 12.7	+ 1.9	+ 2.4	- 40.8	- 50.0
C2 Pasture	68.6	48.2	55.7	27.9	- 20.3	- 29.7	+ 7.5	+ 15.5	- 27.9	- 50.0
C3 Forest	3856.4	3301.1	2880.9	1440.4	- 555.3	- 14.4	- 420.2	- 12.7	- 1440.4	- 50.0
C4 Non-forested wetland	116.0	113.9	110.8	110.8	- 2.1	- 1.8	- 3.1	- 2.7	+ 0.0	+ 0.0
C5 Mining	43.3	47.3	45.8	45.8	+ 3.9	+ 9.1	- 1.4	- 3.0	+ 0.0	+ 0.0
C6 Open land	542.2	543.3	531.0	531.0	+ 1.2	+ 0.2	- 12.3	- 2.3	+ 0.0	+ 0.0
C7 Participatory recreation	52.5	100.1	127.4	127.4	+ 47.6	+ 90.6	+ 27.3	+ 27.3	+ 0.0	+ 0.0
C8 Spectator recreation	8.3	12.6	12.4	12.4	+ 4.3	+ 52.1	- 0.2	- 1.6	+ 0.0	+ 0.0
C9 Water-based recreation	10.4	10.6	12.9	12.9	+ 0.3	+ 2.8	+ 2.2	+ 20.7	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	13.5	28.2	49.5	+ 13.5	—	+ 14.8	+ 109.7	+ 21.3	+ 75.4
C11 Residential, < ¼ acre lots	97.9	111.2	111.7	111.7	+ 13.3	+ 13.6	+ 0.6	+ 0.5	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	241.6	320.1	355.3	623.3	+ 78.4	+ 32.5	+ 35.2	+ 11.0	+ 268.0	+ 75.4
C13 Residential, > ½ acre lots	611.8	1000.9	1272.9	2233.0	+ 389.1	+ 63.6	+ 271.9	+ 27.2	+ 960.1	+ 75.4
C14 Salt marsh	1940.4	1941.2	1938.6	1938.6	+ 0.8	+ 0.0	- 2.5	- 0.1	+ 0.0	+ 0.0
C15 Commercial	45.8	65.8	77.7	132.5	+ 20.1	+ 43.8	+ 11.8	+ 18.0	+ 54.9	+ 70.7
C16 Industrial	2.5	14.7	21.7	37.0	+ 12.2	+ 497.1	+ 7.0	+ 47.7	+ 15.3	+ 70.7
C17 Urban open	73.2	75.0	121.4	207.2	+ 1.8	+ 2.5	+ 46.4	+ 61.9	+ 85.8	+ 70.7
C18 Transportation	185.5	187.9	190.3	324.8	+ 2.4	+ 1.3	+ 2.4	+ 1.3	+ 134.5	+ 70.7
C19 Waste disposal	3.3	3.3	3.3	3.3	- 0.0	- 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	114.3	114.3	114.3	114.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	55.0	57.3	61.6	30.8	+ 2.3	+ 4.3	+ 4.3	+ 7.5	- 30.8	- 50.0

Table A-40. Population and land use data for the Sesuit Harbor Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	578
Housing units within 1000 m boundary:	499
Occupancy rate (persons per unit):	1.7
Housing units sewered (%):	5

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases three-fold for three months of the year.)

MassGIS land use data for the 1000 m delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	17.2	17.2	17.8	8.9	+ 0.0	+ 0.0	+ 0.6	+ 3.6	- 8.9	- 50.0
C2	Pasture	1.2	1.2	0.0	0.0	+ 0.0	+ 0.0	- 1.2	---	+ 0.0	+ 0.0
C3	Forest	158.6	96.7	87.2	43.6	- 61.9	- 39.0	- 9.5	- 9.9	- 43.6	- 50.0
C4	Non-forested wetland	5.6	5.6	5.6	5.6	+ 0.0	+ 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	16.4	16.1	16.1	16.1	- 0.4	- 2.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	0.9	1.5	1.5	1.5	+ 0.5	+ 54.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	6.2	6.2	6.2	6.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	1.0	1.0	1.4	+ 1.0	—	+ 0.0	+ 0.0	+ 0.3	+ 33.6
C11	Residential, < ¼ acre lots	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	43.0	100.6	101.0	134.9	+ 57.6	+ 134.2	+ 0.4	+ 0.4	+ 33.9	+ 33.6
C13	Residential, > ½ acre lots	29.8	33.1	42.5	56.8	+ 3.3	+ 11.1	+ 9.4	+ 28.4	+ 14.3	+ 33.6
C14	Salt marsh	51.6	51.6	51.6	51.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	10.1	9.9	10.2	13.7	- 0.2	- 2.2	+ 0.3	+ 3.3	+ 3.4	+ 33.6
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	1.5	1.5	1.5	2.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.5	+ 33.6
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	5.2	5.2	5.2	5.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	1,441
Housing units within watershed:	1,032
Occupancy rate (persons per unit):	2.1
Housing units sewered (%):	5

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases three-fold for three months of the year.)

MassGIS land use data for the watershed delineation

MassGIS Category		1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	17.2	17.4	20.8	10.4	+ 0.2	+ 1.3	+ 3.4	+ 19.2	- 10.4	- 50.0
C2	Pasture	1.2	1.2	0.0	0.0	+ 0.0	+ 0.0	- 1.2	---	+ 0.0	+ 0.0
C3	Forest	423.0	262.9	220.6	110.3	- 160.0	- 37.8	- 42.3	- 16.1	- 110.3	- 50.0
C4	Non-forested wetland	6.4	6.5	6.5	6.5	+ 0.0	+ 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	18.8	12.9	17.7	17.7	- 5.9	- 31.2	+ 4.8	+ 37.1	+ 0.0	+ 0.0
C6	Open land	16.4	16.1	16.1	16.1	- 0.4	- 2.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7	Participatory recreation	15.7	38.7	38.7	38.7	+ 23.0	+ 146.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	3.9	4.0	3.5	3.5	+ 0.0	+ 0.6	- 0.4	- 10.5	+ 0.0	+ 0.0
C9	Water-based recreation	6.2	6.2	6.2	6.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	1.0	1.0	1.4	+ 1.0	---	+ 0.0	+ 0.0	+ 0.4	+ 41.6
C11	Residential, < ¼ acre lots	18.8	20.9	20.9	20.9	+ 2.1	+ 11.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	51.3	163.2	173.4	245.5	+ 111.9	+ 218.1	+ 10.2	+ 6.3	+ 72.1	+ 41.6
C13	Residential, > ½ acre lots	50.7	74.6	95.2	134.8	+ 23.8	+ 47.0	+ 20.6	+ 27.6	+ 39.6	+ 41.6
C14	Salt marsh	51.6	51.6	51.6	51.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	10.6	11.5	11.8	16.4	+ 0.9	+ 8.7	+ 0.3	+ 2.8	+ 4.6	+ 38.6
C16	Industrial	0.0	2.1	4.9	6.8	+ 2.1	---	+ 2.8	+ 133.0	+ 1.9	+ 38.6
C17	Urban open	2.5	3.7	5.5	7.7	+ 1.1	+ 45.0	+ 1.8	+ 49.8	+ 2.1	+ 38.6
C18	Transportation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	14.3	14.3	14.3	14.3	+ 0.0	+ 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-41. Population and land use data for the Rock Harbor Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	294
Housing units within 1000 m boundary:	136
Occupancy rate (persons per unit):	3.2
Housing units sewered (%):	0

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases three-fold for three months of the year.)

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	2.1	2.1	1.6	0.8	+ 0.0	+ 0.0	- 0.5	- 24.3	- 0.8	- 50.0
C3 Forest	24.7	20.9	17.5	8.7	- 3.8	- 15.6	- 3.4	- 16.3	- 8.7	- 50.0
C4 Non-forested wetland	3.4	3.4	3.4	3.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	15.7	14.2	14.2	14.2	- 1.5	- 9.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C7 Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	2.4	2.4	2.4	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11 Residential, < ¼ acre lots	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	8.0	8.0	8.0	9.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.5	+ 18.1
C13 Residential, > ½ acre lots	31.8	36.7	40.3	47.5	+ 4.8	+ 15.2	+ 3.6	+ 9.8	+ 7.3	+ 18.1
C14 Salt marsh	27.0	27.0	27.0	27.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	0.0	0.5	0.9	1.0	+ 0.5	—	+ 0.3	+ 64.7	+ 0.2	+ 18.1
C16 Industrial	0.7	0.7	0.7	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.1	+ 18.1
C17 Urban open	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C18 Transportation	2.8	2.8	2.8	3.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.5	+ 18.1
C19 Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	811
Housing units within watershed:	574
	2.1
Housing units sewered (%):	21

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases three-fold for three months of the year.)

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	2.1	2.1	1.6	0.8	+ 0.0	+ 0.0	- 0.5	- 24.3	- 0.8	- 50.0
C3 Forest	57.0	49.0	44.8	22.4	- 8.0	- 14.0	- 4.2	- 8.7	- 22.4	- 50.0
C4 Non-forested wetland	4.4	4.4	4.4	4.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	19.9	16.5	16.3	16.3	- 3.4	- 17.2	- 0.2	- 0.9	+ 0.0	+ 0.0
C7 Participatory recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	2.4	2.4	2.4	2.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.2	6.8	6.8	8.1	+ 6.6	+ 3833.1	+ 0.0	+ 0.0	+ 1.3	+ 19.3
C11 Residential, < ¼ acre lots	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	12.0	10.8	10.8	12.9	- 1.2	- 10.0	+ 0.0	+ 0.0	+ 2.1	+ 19.3
C13 Residential, > ½ acre lots	52.2	56.2	59.9	71.5	+ 3.9	+ 7.5	+ 3.8	+ 6.7	+ 11.6	+ 19.3
C14 Salt marsh	27.0	27.0	27.0	27.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	30.6	33.9	35.0	41.8	+ 3.3	+ 10.6	+ 1.2	+ 3.4	+ 6.8	+ 19.3
C16 Industrial	0.8	0.8	0.8	1.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 19.3
C17 Urban open	2.9	1.8	1.8	2.1	- 1.1	- 39.1	+ 0.0	+ 0.0	+ 0.3	+ 19.3
C18 Transportation	4.8	4.8	4.8	5.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.9	+ 19.3
C19 Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	6.7	6.7	6.7	6.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-42. Population and land use data for the Pamet River Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	233
Housing units within 1000 m boundary:	319
Occupancy rate (persons per unit):	1.3
Housing units sewered (%):	2

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases four-fold for three months of the year.)

MassGIS land use data for the 1000 m delineation

	MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2	Pasture	1.5	1.5	1.5	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.8	- 50.0
C3	Forest	209.3	187.5	172.4	86.2	- 21.8	- 10.4	- 15.1	- 8.0	- 86.2	- 50.0
C4	Non-forested wetland	20.4	20.4	20.4	20.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	47.3	46.6	45.3	45.3	- 0.7	- 1.6	- 1.3	- 2.9	+ 0.0	+ 0.0
C7	Participatory recreation	1.3	1.3	1.3	1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	1.7	1.4	1.4	1.4	- 0.2	- 12.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	1.7	1.7	1.7	1.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	6.6	6.6	6.6	10.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 3.5	+ 53.4
C13	Residential, > ½ acre lots	99.6	121.5	137.9	211.5	+ 21.9	+ 22.0	+ 16.4	+ 13.5	+ 73.6	+ 53.4
C14	Salt marsh	90.9	90.9	90.9	90.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	3.4	4.1	4.1	6.3	+ 0.7	+ 21.6	+ 0.0	+ 0.0	+ 2.2	+ 53.4
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	3.5	3.5	3.5	5.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 1.9	+ 53.4
C18	Transportation	10.7	10.9	10.9	16.7	+ 0.1	+ 1.3	+ 0.0	+ 0.0	+ 5.8	+ 53.4
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	351
Housing units within watershed:	462
Occupancy rate (persons per unit):	1.3
Housing units sewered (%):	1

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases four-fold for three months of the year.)

MassGIS land use data for the watershed delineation

	MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1	Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2	Pasture	1.6	1.6	1.6	0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	- 0.8	- 50.0
C3	Forest	648.8	612.1	584.4	292.2	- 36.7	- 5.7	- 27.7	- 4.5	- 292.2	- 50.0
C4	Non-forested wetland	85.3	85.3	85.3	85.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5	Mining	4.3	5.9	5.9	5.9	+ 1.6	+ 36.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6	Open land	52.6	51.9	50.5	50.5	- 0.7	- 1.4	- 1.3	- 2.6	+ 0.0	+ 0.0
C7	Participatory recreation	1.3	1.3	1.3	1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8	Spectator recreation	1.7	1.4	1.4	1.4	- 0.2	- 12.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9	Water-based recreation	1.7	1.7	1.7	1.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10	Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11	Residential, < ¼ acre lots	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12	Residential, ¼ to ½ acre lots	6.7	6.7	6.7	15.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 8.3	+ 125.0
C13	Residential, > ½ acre lots	137.5	173.3	202.4	455.5	+ 35.8	+ 26.1	+ 29.1	+ 16.8	+ 253.0	+ 125.0
C14	Salt marsh	91.5	90.9	90.9	90.9	- 0.7	- 0.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15	Commercial	4.5	5.2	5.2	11.7	+ 0.7	+ 16.3	+ 0.0	+ 0.0	+ 6.5	+ 125.0
C16	Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17	Urban open	3.5	3.5	3.5	8.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 4.4	+ 125.0
C18	Transportation	16.4	16.6	16.6	37.3	+ 0.1	+ 0.9	+ 0.0	+ 0.0	+ 20.7	+ 125.0
C19	Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20	Open water	0.9	0.9	0.9	0.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21	Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-43. Population and land use data for the Wellfleet Harbor Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	1,748
Housing units within 1000 m boundary:	2,709
Occupancy rate (persons per unit):	1.5
Housing units sewered (%):	2

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases six-fold for three months of the year.)

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	8.3	5.2	5.2	2.6	- 1.1	- 17.6	+ 0.0	+ 0.0	- 2.6	- 50.0
C3 Forest	1015.2	919.0	798.2	399.1	- 96.2	- 9.5	- 120.8	- 13.1	- 399.1	- 50.0
C4 Non-forested wetland	186.4	186.5	184.5	184.5	+ 0.1	+ 0.0	- 2.0	- 1.1	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	298.8	278.6	257.7	257.7	- 20.3	- 6.8	- 20.9	- 7.5	+ 0.0	+ 0.0
C7 Participatory recreation	22.5	22.5	23.5	23.5	+ 0.0	+ 0.0	+ 1.0	+ 4.5	+ 0.0	+ 0.0
C8 Spectator recreation	4.7	4.7	4.7	4.7	- 0.0	- 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	19.9	19.9	19.9	19.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11 Residential, < ¼ acre lots	35.9	36.3	36.3	36.3	+ 0.5	+ 1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	151.8	156.8	157.4	239.0	+ 5.0	+ 3.3	+ 0.6	+ 0.4	+ 81.6	+ 51.8
C13 Residential, > ½ acre lots	294.2	400.7	538.8	817.9	+ 106.5	+ 36.2	+ 138.1	+ 34.5	+ 279.2	+ 51.8
C14 Salt marsh	302.7	306.6	306.6	306.6	+ 3.8	+ 1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	24.2	28.9	29.4	43.8	+ 4.7	+ 19.5	+ 0.5	+ 1.8	+ 14.5	+ 49.3
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	21.4	26.3	28.6	42.7	+ 4.9	+ 23.0	+ 2.3	+ 8.7	+ 14.1	+ 49.3
C18 Transportation	25.1	25.1	25.1	37.5	+ 0.0	+ 0.1	+ 0.0	+ 0.0	+ 12.4	+ 49.3
C19 Waste disposal	1.5	1.5	1.5	1.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	25.5	25.5	25.5	25.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	2,919
Housing units within watershed:	3,852
Occupancy rate (persons per unit):	1.7
Housing units sewered (%):	2

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases six-fold for three months of the year.)

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	(%)	1985 to 1990 change (ha)	(%)	1990 to buildout change (ha)	(%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	7.3	6.2	6.2	3.1	- 1.1	- 15.2	+ 0.0	+ 0.0	- 3.1	- 50.0
C3 Forest	2820.9	2598.6	2379.1	1189.6	- 222.3	- 7.9	- 219.5	- 8.4	- 1189.6	- 50.0
C4 Non-forested wetland	443.2	442.0	440.1	440.1	- 1.2	- 0.3	- 2.0	- 0.4	+ 0.0	+ 0.0
C5 Mining	8.9	13.1	21.4	21.4	+ 4.2	+ 46.9	+ 8.3	+ 63.2	+ 0.0	+ 0.0
C6 Open land	356.3	335.8	313.9	313.9	- 20.4	- 5.7	- 21.9	- 6.5	+ 0.0	+ 0.0
C7 Participatory recreation	24.4	24.4	25.4	25.4	- 0.0	- 0.0	+ 1.0	+ 4.2	+ 0.0	+ 0.0
C8 Spectator recreation	6.1	6.0	6.0	6.0	- 0.0	- 0.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	20.4	20.4	20.4	20.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C11 Residential, < ¼ acre lots	36.0	36.4	36.4	36.4	+ 0.5	+ 1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	166.9	176.0	180.0	362.7	+ 9.1	+ 5.5	+ 4.0	+ 2.3	+ 182.7	+ 101.5
C13 Residential, > ½ acre lots	412.3	632.1	862.5	1738.0	+ 219.8	+ 53.3	+ 230.4	+ 36.5	+ 875.4	+ 101.5
C14 Salt marsh	302.7	306.6	306.6	306.6	+ 3.8	+ 1.3	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	34.9	42.5	43.0	85.2	+ 7.6	+ 21.8	+ 0.5	+ 1.2	+ 42.2	+ 98.1
C16 Industrial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C17 Urban open	33.7	41.6	39.5	78.3	+ 7.9	+ 23.3	- 2.1	- 5.0	+ 38.7	+ 98.1
C18 Transportation	54.6	54.7	54.7	108.2	+ 0.0	+ 0.1	+ 0.0	+ 0.0	+ 53.6	+ 98.1
C19 Waste disposal	1.5	1.5	1.5	1.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	88.0	88.0	88.0	88.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table A-44. Population and land use data for the Provincetown Harbor Watershed

U.S. Census data for 1000 m delineation

Population within 1000 m boundary:	3,401
Housing units within 1000 m boundary:	3,736
Occupancy rate (persons per unit):	1.6
Housing units sewered (%):	21

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases four-fold for three months of the year.)

MassGIS land use data for the 1000 m delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3 Forest	259.9	234.1	226.3	113.1	- 25.8	- 9.9	- 7.9	- 3.4	- 113.1	- 50.0
C4 Non-forested wetland	106.9	105.6	105.6	105.6	- 1.3	- 1.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	280.9	279.8	278.8	278.8	- 1.2	- 0.4	- 0.9	- 0.3	+ 0.0	+ 0.0
C7 Participatory recreation	11.5	11.6	11.6	11.6	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	2.7	2.7	2.7	2.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	15.9	15.1	15.1	15.1	- 0.8	- 5.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	6.1	8.4	10.4	19.3	+ 2.3	+ 38.1	+ 2.0	+ 23.5	+ 8.9	+ 85.0
C11 Residential, < ¼ acre lots	106.1	107.2	107.2	107.2	+ 1.0	+ 1.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	11.1	35.1	36.7	68.0	+ 24.0	+ 217.2	+ 1.7	+ 4.8	+ 31.2	+ 85.0
C13 Residential, > ½ acre lots	24.0	21.0	27.4	50.7	- 3.0	- 12.4	+ 6.4	+ 30.4	+ 23.3	+ 85.0
C14 Salt marsh	105.9	105.9	105.9	105.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	75.4	79.6	80.9	109.2	+ 4.2	+ 5.6	+ 1.3	+ 1.6	+ 28.2	+ 34.9
C16 Industrial	0.7	0.7	0.7	1.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.2	+ 34.9
C17 Urban open	23.1	23.5	21.0	28.3	+ 0.5	+ 2.0	- 2.6	- 10.8	+ 7.3	+ 34.9
C18 Transportation	39.9	39.9	39.9	53.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 13.9	+ 34.9
C19 Waste disposal	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	136.9	136.9	136.9	136.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

U.S. Census data for watershed delineation

Population within watershed:	3,512
Housing units within watershed:	3,833
Occupancy rate (persons per unit):	1.6
Housing units sewered (%):	21

(Population data includes permanent residents only. Occupancy rate assumes the seasonal population increases four-fold for three months of the year.)

MassGIS land use data for the watershed delineation

MassGIS Category	1971 (ha)	1985 (ha)	1990 (ha)	Projected buildout (ha)	1971 to 1985 change (ha)	1971 to 1985 change (%)	1985 to 1990 change (ha)	1985 to 1990 change (%)	1990 to buildout change (ha)	1990 to buildout change (%)
C1 Cropland	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C2 Pasture	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C3 Forest	505.0	475.3	467.3	233.6	- 29.7	- 5.9	- 8.0	- 1.7	- 233.6	- 50.0
C4 Non-forested wetland	161.8	160.5	160.5	160.5	- 1.3	- 0.8	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C5 Mining	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C6 Open land	385.5	384.3	383.4	383.4	- 1.2	- 0.3	- 0.9	- 0.2	+ 0.0	+ 0.0
C7 Participatory recreation	13.1	13.1	13.1	13.1	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C8 Spectator recreation	2.7	2.7	2.7	2.7	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C9 Water-based recreation	15.9	15.1	15.1	15.1	- 0.8	- 5.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C10 Residential, multi-family	6.1	8.4	10.4	27.3	+ 2.3	+ 38.1	+ 2.0	+ 23.5	+ 16.9	+ 162.2
C11 Residential, < ¼ acre lots	106.1	107.2	107.2	107.2	+ 1.0	+ 1.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C12 Residential, ¼ to ½ acre lots	11.1	35.8	37.4	98.1	+ 24.7	+ 223.4	+ 1.7	+ 4.7	+ 60.7	+ 162.2
C13 Residential, > ½ acre lots	28.6	25.6	32.1	84.3	- 3.0	- 10.5	+ 6.6	+ 25.6	+ 52.1	+ 162.2
C14 Salt marsh	105.9	105.9	105.9	105.9	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C15 Commercial	77.0	81.2	82.5	139.8	+ 4.2	+ 5.4	+ 1.3	+ 1.6	+ 57.2	+ 69.3
C16 Industrial	0.8	0.8	0.8	1.4	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.6	+ 69.3
C17 Urban open	24.9	25.3	22.8	38.5	+ 0.5	+ 1.9	- 2.6	- 10.1	+ 15.8	+ 69.3
C18 Transportation	43.8	43.8	43.8	74.2	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 30.4	+ 69.3
C19 Waste disposal	5.4	8.6	8.6	8.6	+ 3.3	+ 61.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C20 Open water	163.5	163.5	163.5	163.5	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0
C21 Woody perennial	0.0	0.0	0.0	0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0	+ 0.0

Table B-1. Nitrogen loading analysis for the Merrimack River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading ($kg\ y^{-1}$)			Future nitrogen loading (buildout) ($kg\ y^{-1}$)		
	low	mean	high	low	mean	high
Point sources	1.1E+05	1.4E+05	2.4E+05	1.1E+05	1.4E+05	2.4E+05
Non-point sources	6.7E+06	1.1E+07	1.6E+07	6.7E+06	1.1E+07	1.6E+07
Watershed total	6.8E+06	1.1E+07	1.6E+07	6.8E+06	1.1E+07	1.6E+07

➢ **Point sources**

	Nitrogen loading ($kg\ y^{-1}$)		
	low	mean	high
i. NPDES facilities			
Newburyport WPCF	5.1E+04	6.9E+04	1.2E+05
Salisbury WWTF	1.1E+04	1.4E+04	2.2E+04
Amesbury WWTP	2.6E+04	3.5E+04	7.4E+04
Merrimack WWTF	2.0E+04	2.0E+04	2.0E+04
Point source total	1.1E+05	1.4E+05	2.4E+05

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	443.0	7.1	11.2	16.0	21.3	5.0E+03	7.1E+03	9.4E+03
Pasture	128.4	2.0	5.8	8.3	11.3	7.4E+02	1.1E+03	1.5E+03
Forest	1711.7	27.3	0.3	0.5	1.1	5.1E+02	8.6E+02	1.9E+03
Non-forested wetland	83.1	1.3	0.0	1.3	10.8	0.0E+00	1.1E+02	9.0E+02
Mining	61.1	1.0	0.9	1.4	3.2	5.5E+01	8.5E+01	2.0E+02
Open land	138.4	2.2	0.3	0.5	1.1	4.2E+01	6.9E+01	1.5E+02
Participatory recreation	31.9	0.5	17.9	19.3	22.2	5.7E+02	6.1E+02	7.1E+02
Spectator recreation	29.1	0.5	17.9	19.3	22.2	5.2E+02	5.6E+02	6.5E+02
Water-based recreation	57.6	0.9	3.7	5.7	12.6	2.1E+02	3.3E+02	7.3E+02
Residential, multi-family	29.3	0.5	3.2	9.1	13.1	9.4E+01	2.7E+02	3.8E+02
Residential, < ¼ acre lots	421.1	6.7	2.6	7.4	11.2	1.1E+03	3.1E+03	4.7E+03
Residential, ¼ to ½ acre lots	503.4	8.0	1.8	5.3	8.8	8.9E+02	2.7E+03	4.4E+03
Residential, > ½ acre lots	483.1	7.7	1.3	4.0	7.3	6.2E+02	1.9E+03	3.6E+03
Salt marsh	961.9	15.3	0.0	1.3	10.8	0.0E+00	1.3E+03	1.0E+04
Commercial	137.7	2.2	0.9	1.4	3.2	1.2E+02	1.9E+02	4.4E+02
Industrial	43.4	0.7	0.9	1.4	3.2	3.9E+01	6.1E+01	1.4E+02
Urban open	103.2	1.6	0.3	0.5	1.1	3.1E+01	5.2E+01	1.1E+02
Transportation	159.3	2.5	0.9	1.4	3.2	1.4E+02	2.2E+02	5.1E+02
Waste disposal	26.0	0.4	0.9	1.4	3.2	2.3E+01	3.6E+01	8.3E+01
Open water	646.6	10.3	0.0	2.5	10.8	0.0E+00	1.6E+03	7.0E+03
Woody perennial	77.5	1.2	5.4	14.8	21.0	4.2E+02	1.1E+03	1.6E+03
Land use total	6276.8	100.0				1.1E+04	2.3E+04	4.9E+04

	Embayment area (ha)	Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	888.4	3.7	5.7	12.6	3.3E+03	5.1E+03	1.1E+04

	River flow ($m^3\ s^{-1}$)	Nitrogen concentration (mg/L)			Nitrogen loading ($kg\ y^{-1}$)		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	242.6	0.87	1.44	2.03	6.7E+06	1.1E+07	1.6E+07

Non-point source total	6.7E+06	1.1E+07	1.6E+07

Table B-2. Nitrogen loading analysis for the Merrimack River Watershed Delineation

Watershed delineation ends at tidally-influenced reach of the Merrimack

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	1.1E+05	1.4E+05	2.4E+05	1.1E+05	1.4E+05	2.4E+05
Non-point sources	6.7E+06	1.1E+07	1.6E+07	6.7E+06	1.1E+07	1.6E+07
Watershed total	6.8E+06	1.1E+07	1.6E+07	6.8E+06	1.1E+07	1.6E+07

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Newburyport WPCF	5.1E+04	6.9E+04	1.2E+05
Salisbury WWTF	1.1E+04	1.4E+04	2.2E+04
Amesbury WWTP	2.6E+04	3.5E+04	7.4E+04
Merrimck WWTF	2.0E+04	2.0E+04	2.0E+04
Point source total	1.1E+05	1.4E+05	2.4E+05

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	1234.9	11.0	11.2	16.0	21.3	1.4E+04	2.0E+04	2.6E+04
Pasture	318.9	2.9	5.8	8.3	11.3	1.8E+03	2.6E+03	3.6E+03
Forest	4109.7	36.7	0.3	0.5	1.1	1.2E+03	2.1E+03	4.5E+03
Non-forested wetland	213.9	1.9	0.0	1.3	10.8	0.0E+00	2.8E+02	2.3E+03
Mining	113.2	1.0	0.9	1.4	3.2	1.0E+02	1.6E+02	3.6E+02
Open land	245.7	2.2	0.3	0.5	1.1	7.4E+01	1.2E+02	2.7E+02
Participatory recreation	66.6	0.6	17.9	19.3	22.2	1.2E+03	1.3E+03	1.5E+03
Spectator recreation	44.6	0.4	17.9	19.3	22.2	8.0E+02	8.6E+02	9.9E+02
Water-based recreation	57.6	0.5	3.7	5.7	12.6	2.1E+02	3.3E+02	7.3E+02
Residential, multi-family	70.5	0.6	3.8	10.7	14.9	2.7E+02	7.6E+02	1.1E+03
Residential, < ¼ acre lots	452.5	4.0	3.0	8.6	12.6	1.4E+03	3.9E+03	5.7E+03
Residential, ¼ to ½ acre lots	746.1	6.7	2.0	5.9	9.5	1.5E+03	4.4E+03	7.1E+03
Residential, > ½ acre lots	892.8	8.0	1.4	4.3	7.7	1.3E+03	3.9E+03	6.9E+03
Salt marsh	961.9	8.6	0.0	1.3	10.8	0.0E+00	1.3E+03	1.0E+04
Commercial	178.6	1.6	0.9	1.4	3.2	1.6E+02	2.5E+02	5.7E+02
Industrial	122.0	1.1	0.9	1.4	3.2	1.1E+02	1.7E+02	3.9E+02
Urban open	185.1	1.7	0.3	0.5	1.1	5.6E+01	9.3E+01	2.0E+02
Transportation	233.9	2.1	0.9	1.4	3.2	2.1E+02	3.3E+02	7.5E+02
Waste disposal	42.1	0.4	0.9	1.4	3.2	3.8E+01	5.9E+01	1.3E+02
Open water	754.9	6.7	0.0	2.5	10.8	0.0E+00	1.9E+03	8.2E+03
Woody perennial	140.6	1.3	5.4	14.8	21.0	7.6E+02	2.1E+03	3.0E+03
Land use total	11186.3	100.0				2.5E+04	4.7E+04	8.5E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	888.4	3.7	5.7	12.6	3.3E+03	5.1E+03	1.1E+04

	River flow (m^3 s^{-1}) mean	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
iii. River (upstream of delineation)	241.7	0.87	1.44	2.03	6.6E+06	1.1E+07	1.5E+07

Non-point source total	6.7E+06	1.1E+07	1.6E+07

Table B-3. Nitrogen loading analysis for the Plum Island Sound 1000 m Boundary Delineation
Includes Parker River, Rowley River and Eagle Hill River Subwatersheds

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.4E+05	1.9E+05	2.8E+05	1.4E+05	2.0E+05	2.8E+05
Watershed total	1.4E+05	1.9E+05	2.8E+05	1.4E+05	2.0E+05	2.8E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	267.5	4.5	11.2	16.0	21.3	3.0E+03	4.3E+03	5.7E+03
Pasture	120.9	2.0	5.8	8.3	11.3	7.0E+02	1.0E+03	1.4E+03
Forest	1277.2	21.6	0.3	0.5	1.1	3.8E+02	6.4E+02	1.4E+03
Non-forested wetland	45.4	0.8	0.0	1.3	10.8	0.0E+00	5.9E+01	4.9E+02
Mining	34.4	0.6	0.9	1.4	3.2	3.1E+01	4.8E+01	1.1E+02
Open land	332.5	5.6	0.3	0.5	1.1	1.0E+02	1.7E+02	3.7E+02
Participatory recreation	19.3	0.3	17.9	19.3	22.2	3.5E+02	3.7E+02	4.3E+02
Spectator recreation	8.8	0.1	17.9	19.3	22.2	1.6E+02	1.7E+02	2.0E+02
Water-based recreation	25.6	0.4	3.7	5.7	12.6	9.5E+01	1.5E+02	3.2E+02
Residential, multi-family	0.7	0.0	12.9	35.0	42.3	8.5E+00	2.3E+01	2.8E+01
Residential, < ¼ acre lots	14.8	0.2	9.8	26.7	32.9	1.4E+02	3.9E+02	4.9E+02
Residential, ¼ to ½ acre lots	106.2	1.8	5.7	15.7	20.6	6.0E+02	1.7E+03	2.2E+03
Residential, > ½ acre lots	242.4	4.1	3.2	9.2	13.2	7.9E+02	2.2E+03	3.2E+03
Salt marsh	3304.7	55.9	0.0	1.3	10.8	0.0E+00	4.3E+03	3.6E+04
Commercial	5.7	0.1	0.9	1.4	3.2	5.1E+00	7.9E+00	1.8E+01
Industrial	12.4	0.2	0.9	1.4	3.2	1.1E+01	1.7E+01	4.0E+01
Urban open	37.4	0.6	0.3	0.5	1.1	1.1E+01	1.9E+01	4.1E+01
Transportation	2.8	0.0	0.9	1.4	3.2	2.5E+00	3.9E+00	8.8E+00
Waste disposal	13.1	0.2	0.9	1.4	3.2	1.2E+01	1.8E+01	4.2E+01
Open water	22.5	0.4	0.0	2.5	10.8	0.0E+00	5.6E+01	2.4E+02
Woody perennial	19.4	0.3	5.4	14.8	21.0	1.1E+02	2.9E+02	4.1E+02
Land use total	5913.7	100.0				6.5E+03	1.6E+04	5.3E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	1551.3	3.7	5.7	12.6	5.7E+03	8.8E+03	2.0E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)					1.3E+05	1.7E+05	2.0E+05
Non-point source total					1.4E+05	1.9E+05	2.8E+05

Table B-4. Nitrogen loading analysis for the Plum Island Sound Watershed Delineation
Includes Parker River, Rowley River and Eagle Hill River Subwatersheds

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	8.3E+04	1.3E+05	2.1E+05	8.6E+04	1.4E+05	2.3E+05
Watershed total	8.3E+04	1.3E+05	2.1E+05	8.6E+04	1.4E+05	2.3E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	851.4	6.1	11.2	16.0	21.3	9.5E+03	1.4E+04	1.8E+04
Pasture	378.7	2.7	5.8	8.3	11.3	2.2E+03	3.1E+03	4.3E+03
Forest	5572.8	39.7	0.3	0.5	1.1	1.7E+03	2.8E+03	6.1E+03
Non-forested wetland	389.2	2.8	0.0	1.3	10.8	0.0E+00	5.1E+02	4.2E+03
Mining	53.4	0.4	0.9	1.4	3.2	4.8E+01	7.5E+01	1.7E+02
Open land	646.1	4.6	0.3	0.5	1.1	1.9E+02	3.2E+02	7.1E+02
Participatory recreation	85.2	0.6	17.9	19.3	22.2	1.5E+03	1.6E+03	1.9E+03
Spectator recreation	49.4	0.4	17.9	19.3	22.2	8.8E+02	9.5E+02	1.1E+03
Water-based recreation	25.6	0.2	3.7	5.7	12.6	9.5E+01	1.5E+02	3.2E+02
Residential, multi-family	18.7	0.1	10.4	28.3	34.7	1.9E+02	5.3E+02	6.5E+02
Residential, < ¼ acre lots	27.0	0.2	7.9	21.7	27.3	2.1E+02	5.9E+02	7.4E+02
Residential, ¼ to ½ acre lots	564.7	4.0	4.7	13.0	17.5	2.6E+03	7.4E+03	9.9E+03
Residential, > ½ acre lots	1151.0	8.2	2.7	7.9	11.7	3.1E+03	9.0E+03	1.3E+04
Salt marsh	3467.2	24.7	0.0	1.3	10.8	0.0E+00	4.5E+03	3.7E+04
Commercial	102.9	0.7	0.9	1.4	3.2	9.3E+01	1.4E+02	3.3E+02
Industrial	221.8	1.6	0.9	1.4	3.2	2.0E+02	3.1E+02	7.1E+02
Urban open	135.6	1.0	0.3	0.5	1.1	4.1E+01	6.8E+01	1.5E+02
Transportation	165.6	1.2	0.9	1.4	3.2	1.5E+02	2.3E+02	5.3E+02
Waste disposal	41.9	0.3	0.9	1.4	3.2	3.8E+01	5.9E+01	1.3E+02
Open water	48.2	0.3	0.0	2.5	10.8	0.0E+00	1.2E+02	5.2E+02
Woody perennial	55.1	0.4	5.4	14.8	21.0	3.0E+02	8.2E+02	1.2E+03
Land use total	14051.5	100.0				2.3E+04	4.7E+04	1.0E+05

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	1575.9	3.7	5.7	12.6	5.8E+03	9.0E+03	2.0E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)					5.4E+04	7.0E+04	8.5E+04
Non-point source total					8.3E+04	1.3E+05	2.1E+05

Table B-5. Nitrogen loading analysis for the Parker River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.2E+05	1.6E+05	2.1E+05	1.2E+05	1.6E+05	2.1E+05
Watershed total	1.2E+05	1.6E+05	2.1E+05	1.2E+05	1.6E+05	2.1E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	153.1	7.9	11.2	16.0	21.3	1.7E+03	2.4E+03	3.3E+03
Pasture	49.9	2.6	5.8	8.3	11.3	2.9E+02	4.1E+02	5.6E+02
Forest	634.2	32.7	0.3	0.5	1.1	1.9E+02	3.2E+02	7.0E+02
Non-forested wetland	43.7	2.3	0.0	1.3	10.8	0.0E+00	5.7E+01	4.7E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	12.3	0.6	0.3	0.5	1.1	3.7E+00	6.1E+00	1.3E+01
Participatory recreation	19.0	1.0	17.9	19.3	22.2	3.4E+02	3.7E+02	4.2E+02
Spectator recreation	6.3	0.3	17.9	19.3	22.2	1.1E+02	1.2E+02	1.4E+02
Water-based recreation	2.8	0.1	3.7	5.7	12.6	1.1E+01	1.6E+01	3.6E+01
Residential, multi-family	0.0	0.0	15.0	40.5	48.4	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	0.0	0.0	11.3	30.7	37.4	0.0E+00	0.0E+00	0.0E+00
Residential, ¼ to ½ acre lots	10.7	0.6	6.5	17.9	23.0	7.0E+01	1.9E+02	2.5E+02
Residential, > ½ acre lots	130.4	6.7	3.7	10.3	14.5	4.8E+02	1.3E+03	1.9E+03
Salt marsh	853.6	44.0	0.0	1.3	10.8	0.0E+00	1.1E+03	9.2E+03
Commercial	3.3	0.2	0.9	1.4	3.2	3.0E+00	4.7E+00	1.1E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	5.4	0.3	0.3	0.5	1.1	1.6E+00	2.7E+00	6.0E+00
Transportation	2.8	0.1	0.9	1.4	3.2	2.5E+00	3.9E+00	8.8E+00
Waste disposal	9.3	0.5	0.9	1.4	3.2	8.4E+00	1.3E+01	3.0E+01
Open water	1.2	0.1	0.0	2.5	10.8	0.0E+00	2.9E+00	1.3E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	1938.2	100.0				3.2E+03	6.4E+03	1.7E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	178.8	3.7	5.7	12.6	6.6E+02	1.0E+03	2.3E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	2.4	1.51	2.01	2.50	1.2E+05	1.5E+05	1.9E+05

Non-point source total	1.2E+05	1.6E+05	2.1E+05

Table B-6. Nitrogen loading analysis for the Parker River Watershed Delineation

Watershed delineation ends at the first upstream dam

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	6.5E+04	9.7E+04	1.4E+05	6.7E+04	1.1E+05	1.6E+05
Watershed total	6.5E+04	9.7E+04	1.4E+05	6.7E+04	1.1E+05	1.6E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	692.4	7.2	11.2	16.0	21.3	7.8E+03	1.1E+04	1.5E+04
Pasture	287.8	3.0	5.8	8.3	11.3	1.7E+03	2.4E+03	3.3E+03
Forest	4761.1	49.4	0.3	0.5	1.1	1.4E+03	2.4E+03	5.2E+03
Non-forested wetland	374.6	3.9	0.0	1.3	10.8	0.0E+00	4.9E+02	4.0E+03
Mining	19.0	0.2	0.9	1.4	3.2	1.7E+01	2.7E+01	6.1E+01
Open land	303.4	3.1	0.3	0.5	1.1	9.1E+01	1.5E+02	3.3E+02
Participatory recreation	79.4	0.8	17.9	19.3	22.2	1.4E+03	1.5E+03	1.8E+03
Spectator recreation	42.5	0.4	17.9	19.3	22.2	7.6E+02	8.2E+02	9.4E+02
Water-based recreation	2.8	0.0	3.7	5.7	12.6	1.1E+01	1.6E+01	3.6E+01
Residential, multi-family	18.0	0.2	9.5	26.0	32.1	1.7E+02	4.7E+02	5.8E+02
Residential, < ¼ acre lots	9.9	0.1	7.3	20.0	25.4	7.2E+01	2.0E+02	2.5E+02
Residential, ¼ to ½ acre lots	388.6	4.0	4.3	12.1	16.5	1.7E+03	4.7E+03	6.4E+03
Residential, > ½ acre lots	1011.9	10.5	2.6	7.4	11.2	2.6E+03	7.5E+03	1.1E+04
Salt marsh	1016.1	10.5	0.0	1.3	10.8	0.0E+00	1.3E+03	1.1E+04
Commercial	93.4	1.0	0.9	1.4	3.2	8.4E+01	1.3E+02	3.0E+02
Industrial	191.9	2.0	0.9	1.4	3.2	1.7E+02	2.7E+02	6.1E+02
Urban open	86.8	0.9	0.3	0.5	1.1	2.6E+01	4.3E+01	9.5E+01
Transportation	162.4	1.7	0.9	1.4	3.2	1.5E+02	2.3E+02	5.2E+02
Waste disposal	38.1	0.4	0.9	1.4	3.2	3.4E+01	5.3E+01	1.2E+02
Open water	25.7	0.3	0.0	2.5	10.8	0.0E+00	6.4E+01	2.8E+02
Woody perennial	32.5	0.3	5.4	14.8	21.0	1.8E+02	4.8E+02	6.8E+02
Land use total	9638.4	100.0				1.8E+04	3.4E+04	6.3E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	203.4	3.7	5.7	12.6	7.5E+02	1.2E+03	2.6E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	1.0	1.51	2.01	2.50	4.6E+04	6.1E+04	7.6E+04
Non-point source total					6.5E+04	9.7E+04	1.4E+05

Table B-7. Nitrogen loading analysis for the Rowley River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.4E+04	1.6E+04	2.4E+04	1.4E+04	1.8E+04	2.7E+04
Watershed total	1.4E+04	1.6E+04	2.4E+04	1.4E+04	1.8E+04	2.7E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	34.9	2.8	11.2	16.0	21.3	3.9E+02	5.6E+02	7.4E+02
Pasture	31.7	2.5	5.8	8.3	11.3	1.8E+02	2.6E+02	3.6E+02
Forest	383.0	30.4	0.3	0.5	1.1	1.1E+02	1.9E+02	4.2E+02
Non-forested wetland	0.4	0.0	0.0	1.3	10.8	0.0E+00	4.9E-01	4.1E+00
Mining	34.4	2.7	0.9	1.4	3.2	3.1E+01	4.8E+01	1.1E+02
Open land	27.0	2.1	0.3	0.5	1.1	8.1E+00	1.3E+01	3.0E+01
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	2.6	0.2	17.9	19.3	22.2	4.6E+01	4.9E+01	5.7E+01
Water-based recreation	0.7	0.1	3.7	5.7	12.6	2.7E+00	4.2E+00	9.3E+00
Residential, multi-family	0.7	0.1	14.4	39.0	46.7	9.5E+00	2.6E+01	3.1E+01
Residential, < ¼ acre lots	7.8	0.6	10.9	29.6	36.2	8.5E+01	2.3E+02	2.8E+02
Residential, ¼ to ½ acre lots	29.1	2.3	6.3	17.3	22.4	1.8E+02	5.1E+02	6.5E+02
Residential, > ½ acre lots	48.5	3.8	3.5	10.0	14.1	1.7E+02	4.9E+02	6.9E+02
Salt marsh	612.8	48.6	0.0	1.3	10.8	0.0E+00	8.0E+02	6.6E+03
Commercial	0.9	0.1	0.9	1.4	3.2	8.2E-01	1.3E+00	2.9E+00
Industrial	12.4	1.0	0.9	1.4	3.2	1.1E+01	1.7E+01	4.0E+01
Urban open	10.5	0.8	0.3	0.5	1.1	3.1E+00	5.2E+00	1.2E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	1.2	0.1	0.9	1.4	3.2	1.1E+00	1.7E+00	3.9E+00
Open water	3.8	0.3	0.0	2.5	10.8	0.0E+00	9.4E+00	4.1E+01
Woody perennial	19.4	1.5	5.4	14.8	21.0	1.1E+02	2.9E+02	4.1E+02
Land use total	1261.6	100.0				1.3E+03	3.5E+03	1.1E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	134.9	3.7	5.7	12.6	5.0E+02	7.7E+02	1.7E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.24	1.6	1.6	1.6	1.2E+04	1.2E+04	1.2E+04
Non-point source total					1.4E+04	1.6E+04	2.4E+04

Table B-8. Nitrogen loading analysis for the Rowley River Watershed Delineation

Watershed delineation ends at the first upstream dam

➢ **Summary**

	Present nitrogen loading ($kg\ y^{-1}$)			Future nitrogen loading (buildout) ($kg\ y^{-1}$)		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.1E+04	1.5E+04	2.4E+04	1.2E+04	1.8E+04	2.8E+04
Watershed total	1.1E+04	1.5E+04	2.4E+04	1.2E+04	1.8E+04	2.8E+04

➢ **Point sources**

	Nitrogen loading ($kg\ y^{-1}$)		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	67.5	4.0	11.2	16.0	21.3	7.6E+02	1.1E+03	1.4E+03
Pasture	47.3	2.8	5.8	8.3	11.3	2.7E+02	3.9E+02	5.3E+02
Forest	548.6	32.8	0.3	0.5	1.1	1.6E+02	2.7E+02	6.0E+02
Non-forested wetland	13.4	0.8	0.0	1.3	10.8	0.0E+00	1.7E+01	1.4E+02
Mining	34.4	2.1	0.9	1.4	3.2	3.1E+01	4.8E+01	1.1E+02
Open land	49.3	3.0	0.3	0.5	1.1	1.5E+01	2.5E+01	5.4E+01
Participatory recreation	5.5	0.3	17.9	19.3	22.2	9.8E+01	1.1E+02	1.2E+02
Spectator recreation	6.9	0.4	17.9	19.3	22.2	1.2E+02	1.3E+02	1.5E+02
Water-based recreation	0.7	0.0	3.7	5.7	12.6	2.7E+00	4.2E+00	9.3E+00
Residential, multi-family	0.7	0.0	14.5	39.3	47.1	9.5E+00	2.6E+01	3.1E+01
Residential, < ¼ acre lots	10.1	0.6	11.0	29.9	36.5	1.1E+02	3.0E+02	3.7E+02
Residential, ¼ to ½ acre lots	101.8	6.1	6.3	17.5	22.5	6.5E+02	1.8E+03	2.3E+03
Residential, > ½ acre lots	75.6	4.5	3.6	10.1	14.2	2.7E+02	7.6E+02	1.1E+03
Salt marsh	612.8	36.7	0.0	1.3	10.8	0.0E+00	8.0E+02	6.6E+03
Commercial	8.0	0.5	0.9	1.4	3.2	7.2E+00	1.1E+01	2.6E+01
Industrial	29.9	1.8	0.9	1.4	3.2	2.7E+01	4.2E+01	9.6E+01
Urban open	27.3	1.6	0.3	0.5	1.1	8.2E+00	1.4E+01	3.0E+01
Transportation	3.1	0.2	0.9	1.4	3.2	2.8E+00	4.4E+00	1.0E+01
Waste disposal	1.2	0.1	0.9	1.4	3.2	1.1E+00	1.7E+00	3.9E+00
Open water	5.0	0.3	0.0	2.5	10.8	0.0E+00	1.2E+01	5.4E+01
Woody perennial	22.6	1.4	5.4	14.8	21.0	1.2E+02	3.4E+02	4.8E+02
Land use total	1671.9	100.0				2.7E+03	6.2E+03	1.4E+04

	Embayment area (ha)	Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	134.9	3.7	5.7	12.6	5.0E+02	7.7E+02	1.7E+03

	River flow ($m^3\ s^{-1}$)	Nitrogen concentration (mg/L)			Nitrogen loading ($kg\ y^{-1}$)		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.16	1.6	1.6	1.6	8.2E+03	8.2E+03	8.2E+03
Non-point source total					1.1E+04	1.5E+04	2.4E+04

Table B-9. Nitrogen loading analysis for the Eagle Hill River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.5E+03	3.0E+03	9.5E+03	1.4E+03	3.2E+03	9.7E+03
Watershed total	1.5E+03	3.0E+03	9.5E+03	1.4E+03	3.2E+03	9.7E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	33.7	4.7	11.2	16.0	21.3	3.8E+02	5.4E+02	7.2E+02
Pasture	34.3	4.8	5.8	8.3	11.3	2.0E+02	2.8E+02	3.9E+02
Forest	96.7	13.6	0.3	0.5	1.1	2.9E+01	4.8E+01	1.1E+02
Non-forested wetland	1.3	0.2	0.0	1.3	10.8	0.0E+00	1.7E+00	1.4E+01
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	0.7	0.1	0.3	0.5	1.1	2.2E-01	3.7E-01	8.2E-01
Participatory recreation	0.3	0.0	17.9	19.3	22.2	5.1E+00	5.5E+00	6.4E+00
Spectator recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Water-based recreation	2.6	0.4	3.7	5.7	12.6	9.7E+00	1.5E+01	3.3E+01
Residential, multi-family	0.0	0.0	11.2	30.4	37.0	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	0.0	0.0	8.5	23.2	29.0	0.0E+00	0.0E+00	0.0E+00
Residential, ¼ to ½ acre lots	13.7	1.9	5.0	13.9	18.5	6.8E+01	1.9E+02	2.5E+02
Residential, > ½ acre lots	23.0	3.2	2.9	8.3	12.2	6.7E+01	1.9E+02	2.8E+02
Salt marsh	484.9	68.0	0.0	1.3	10.8	0.0E+00	6.3E+02	5.2E+03
Commercial	1.4	0.2	0.9	1.4	3.2	1.3E+00	2.0E+00	4.5E+00
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	18.6	2.6	0.3	0.5	1.1	5.6E+00	9.3E+00	2.0E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	2.1	0.3	0.9	1.4	3.2	1.9E+00	3.0E+00	6.8E+00
Open water	0.0	0.0	0.0	2.5	10.8	0.0E+00	0.0E+00	0.0E+00
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	713.3	100.0				7.6E+02	1.9E+03	7.1E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	193.5	3.7	5.7	12.6	7.2E+02	1.1E+03	2.4E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.00	0.00	0.00	0.00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.5E+03	3.0E+03	9.5E+03

Table B-10. Nitrogen loading analysis for the Eagle Hill River Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.5E+03	3.0E+03	9.5E+03	1.4E+03	3.2E+03	9.7E+03
Watershed total	1.5E+03	3.0E+03	9.5E+03	1.4E+03	3.2E+03	9.7E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	33.7	4.7	11.2	16.0	21.3	3.8E+02	5.4E+02	7.2E+02
Pasture	34.3	4.8	5.8	8.3	11.3	2.0E+02	2.8E+02	3.9E+02
Forest	96.7	13.6	0.3	0.5	1.1	2.9E+01	4.8E+01	1.1E+02
Non-forested wetland	1.3	0.2	0.0	1.3	10.8	0.0E+00	1.7E+00	1.4E+01
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	0.7	0.1	0.3	0.5	1.1	2.2E-01	3.7E-01	8.2E-01
Participatory recreation	0.3	0.0	17.9	19.3	22.2	5.1E+00	5.5E+00	6.4E+00
Spectator recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Water-based recreation	2.6	0.4	3.7	5.7	12.6	9.7E+00	1.5E+01	3.3E+01
Residential, multi-family	0.0	0.0	11.2	30.4	37.0	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	0.0	0.0	8.5	23.2	29.0	0.0E+00	0.0E+00	0.0E+00
Residential, ¼ to ½ acre lots	13.7	1.9	5.0	13.9	18.5	6.8E+01	1.9E+02	2.5E+02
Residential, > ½ acre lots	23.0	3.2	2.9	8.3	12.2	6.7E+01	1.9E+02	2.8E+02
Salt marsh	484.9	68.0	0.0	1.3	10.8	0.0E+00	6.3E+02	5.2E+03
Commercial	1.4	0.2	0.9	1.4	3.2	1.3E+00	2.0E+00	4.5E+00
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	18.6	2.6	0.3	0.5	1.1	5.6E+00	9.3E+00	2.0E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	2.1	0.3	0.9	1.4	3.2	1.9E+00	3.0E+00	6.8E+00
Open water	0.0	0.0	0.0	2.5	10.8	0.0E+00	0.0E+00	0.0E+00
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	713.3	100.0				7.6E+02	1.9E+03	7.1E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	193.5	3.7	5.7	12.6	7.2E+02	1.1E+03	2.4E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.00	0.00	0.00	0.00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.5E+03	3.0E+03	9.5E+03

Table B-11. Nitrogen loading analysis for the Ipswich River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	6.5E+02	9.4E+03	3.0E+04	6.5E+02	9.4E+03	3.0E+04
Non-point sources	1.9E+05	3.0E+05	6.1E+05	1.9E+05	3.0E+05	6.1E+05
Watershed total	1.9E+05	3.1E+05	6.4E+05	1.9E+05	3.1E+05	6.4E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Ipswich WWTF	6.5E+02	9.4E+03	3.0E+04
Point source total	6.5E+02	9.4E+03	3.0E+04

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	78.0	5.6	11.2	16.0	21.3	8.7E+02	1.2E+03	1.7E+03
Pasture	81.6	5.8	5.8	8.3	11.3	4.7E+02	6.8E+02	9.2E+02
Forest	337.6	24.0	0.3	0.5	1.1	1.0E+02	1.7E+02	3.7E+02
Non-forested wetland	9.8	0.7	0.0	1.3	10.8	0.0E+00	1.3E+01	1.1E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	52.6	3.7	0.3	0.5	1.1	1.6E+01	2.6E+01	5.8E+01
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	2.2	0.2	17.9	19.3	22.2	3.9E+01	4.3E+01	4.9E+01
Water-based recreation	3.0	0.2	3.7	5.7	12.6	1.1E+01	1.7E+01	3.8E+01
Residential, multi-family	0.0	0.0	4.8	13.2	17.8	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	73.0	5.2	3.7	10.5	14.7	2.7E+02	7.7E+02	1.1E+03
Residential, ¼ to ½ acre lots	115.0	8.2	2.4	7.0	10.7	2.8E+02	8.0E+02	1.2E+03
Residential, > ½ acre lots	103.8	7.4	1.6	4.8	8.3	1.7E+02	5.0E+02	8.6E+02
Salt marsh	494.0	35.2	0.0	1.3	10.8	0.0E+00	6.4E+02	5.3E+03
Commercial	5.4	0.4	0.9	1.4	3.2	4.9E+00	7.6E+00	1.7E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	22.3	1.6	0.3	0.5	1.1	6.7E+00	1.1E+01	2.5E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	15.8	1.1	0.0	2.5	10.8	0.0E+00	3.9E+01	1.7E+02
Woody perennial	11.2	0.8	5.4	14.8	21.0	6.0E+01	1.7E+02	2.4E+02
Land use total	1405.3	100.0				2.3E+03	5.1E+03	1.2E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	153.4	3.7	5.7	12.6	5.7E+02	8.7E+02	1.9E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	6.2	0.97	1.49	3.00	1.9E+05	2.9E+05	5.9E+05
Non-point source total					1.9E+05	3.0E+05	6.1E+05

Table B-12. Nitrogen loading analysis for the Ipswich River Watershed Delineation

Watershed delineation ends at the first upstream dam

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	6.5E+02	9.4E+03	3.0E+04	6.5E+02	9.4E+03	3.0E+04
Non-point sources	1.9E+05	3.0E+05	6.1E+05	1.9E+05	3.0E+05	6.1E+05
Watershed total	1.9E+05	3.1E+05	6.4E+05	1.9E+05	3.1E+05	6.4E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Ipswich WWTF	6.5E+02	9.4E+03	3.0E+04
Point source total	6.5E+02	9.4E+03	3.0E+04

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	142.0	9.4	11.2	16.0	21.3	1.6E+03	2.3E+03	3.0E+03
Pasture	84.9	5.6	5.8	8.3	11.3	4.9E+02	7.0E+02	9.6E+02
Forest	352.3	23.4	0.3	0.5	1.1	1.1E+02	1.8E+02	3.9E+02
Non-forested wetland	10.4	0.7	0.0	1.3	10.8	0.0E+00	1.4E+01	1.1E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	60.0	4.0	0.3	0.5	1.1	1.8E+01	3.0E+01	6.6E+01
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	2.2	0.1	17.9	19.3	22.2	3.9E+01	4.3E+01	4.9E+01
Water-based recreation	3.0	0.2	3.7	5.7	12.6	1.1E+01	1.7E+01	3.8E+01
Residential, multi-family	0.0	0.0	4.8	13.4	17.9	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	73.0	4.8	3.8	10.6	14.8	2.8E+02	7.8E+02	1.1E+03
Residential, ¼ to ½ acre lots	121.3	8.1	2.4	7.0	10.7	2.9E+02	8.5E+02	1.3E+03
Residential, > ½ acre lots	107.4	7.1	1.6	4.9	8.3	1.7E+02	5.2E+02	8.9E+02
Salt marsh	494.0	32.8	0.0	1.3	10.8	0.0E+00	6.4E+02	5.3E+03
Commercial	5.4	0.4	0.9	1.4	3.2	4.9E+00	7.6E+00	1.7E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	22.3	1.5	0.3	0.5	1.1	6.7E+00	1.1E+01	2.5E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	15.8	1.0	0.0	2.5	10.8	0.0E+00	3.9E+01	1.7E+02
Woody perennial	11.2	0.7	5.4	14.8	21.0	6.0E+01	1.7E+02	2.4E+02
Land use total	1505.1	100.0				3.1E+03	6.3E+03	1.4E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	153.4	3.7	5.7	12.6	5.7E+02	8.7E+02	1.9E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	6.2	0.97	1.49	3.00	1.9E+05	2.9E+05	5.9E+05
Non-point source total					1.9E+05	3.0E+05	6.1E+05

Table B-13. Nitrogen loading analysis for the Ipswich Bay 1000 m Boundary Delineation
Includes Essex Bay and Annisquam River Subwatersheds

➢ Summary

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	2.6E+02	3.6E+02	4.9E+02	2.6E+02	3.6E+02	4.9E+02
Non-point sources	2.0E+04	3.8E+04	8.1E+04	2.2E+04	4.6E+04	9.2E+04
Watershed total	2.0E+04	3.8E+04	8.1E+04	2.2E+04	4.7E+04	9.3E+04

➢ Point sources

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Essex Housing Authority WWTP	2.6E+02	3.6E+02	4.9E+02
Point source total	2.6E+02	3.6E+02	4.9E+02

➢ Non-point sources

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	212.4	4.0	11.2	16.0	21.3	2.4E+03	3.4E+03	4.5E+03
Pasture	120.7	2.3	5.8	8.3	11.3	7.0E+02	1.0E+03	1.4E+03
Forest	1952.5	36.7	0.3	0.5	1.1	5.9E+02	9.8E+02	2.1E+03
Non-forested wetland	32.3	0.6	0.0	1.3	10.8	0.0E+00	4.2E+01	3.5E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	222.6	4.2	0.3	0.5	1.1	6.7E+01	1.1E+02	2.4E+02
Participatory recreation	23.3	0.4	17.9	19.3	22.2	4.2E+02	4.5E+02	5.2E+02
Spectator recreation	8.4	0.2	17.9	19.3	22.2	1.5E+02	1.6E+02	1.9E+02
Water-based recreation	123.6	2.3	3.7	5.7	12.6	4.6E+02	7.0E+02	1.6E+03
Residential, multi-family	4.6	0.1	10.4	28.4	34.8	4.8E+01	1.3E+02	1.6E+02
Residential, < ¼ acre lots	33.0	0.6	7.9	21.7	27.3	2.6E+02	7.2E+02	9.0E+02
Residential, ¼ to ½ acre lots	522.5	9.8	4.7	13.0	17.5	2.4E+03	6.8E+03	9.2E+03
Residential, > ½ acre lots	510.9	9.6	2.7	7.9	11.7	1.4E+03	4.0E+03	6.0E+03
Salt marsh	1357.2	25.5	0.0	1.3	10.8	0.0E+00	1.8E+03	1.5E+04
Commercial	19.2	0.4	0.9	1.4	3.2	1.7E+01	2.7E+01	6.1E+01
Industrial	9.7	0.2	0.9	1.4	3.2	8.8E+00	1.4E+01	3.1E+01
Urban open	45.8	0.9	0.3	0.5	1.1	1.4E+01	2.3E+01	5.0E+01
Transportation	25.9	0.5	0.9	1.4	3.2	2.3E+01	3.6E+01	8.3E+01
Waste disposal	6.1	0.1	0.9	1.4	3.2	5.5E+00	8.5E+00	1.9E+01
Open water	62.3	1.2	0.0	2.5	10.8	0.0E+00	1.6E+02	6.7E+02
Woody perennial	27.6	0.5	5.4	14.8	21.0	1.5E+02	4.1E+02	5.8E+02
Land use total	5320.6	100.0				9.1E+03	2.1E+04	4.3E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	2964.9	3.7	5.7	12.6	1.1E+04	1.7E+04	3.7E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					2.0E+04	3.8E+04	8.1E+04

Table B-14. Nitrogen loading analysis for the Ipswich Bay Watershed Delineation
Includes Essex Bay and Annisquam River Subwatersheds

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	2.6E+02	3.6E+02	4.9E+02	2.6E+02	3.6E+02	4.9E+02
Non-point sources	2.4E+04	4.6E+04	9.7E+04	3.0E+04	6.7E+04	1.2E+05
Watershed total	2.4E+04	4.7E+04	9.7E+04	3.0E+04	6.7E+04	1.3E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Essex Housing Authority WWTP	2.6E+02	3.6E+02	4.9E+02
Point source total	2.6E+02	3.6E+02	4.9E+02

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	315.4	3.6	11.2	16.0	21.3	3.5E+03	5.0E+03	6.7E+03
Pasture	170.1	1.9	5.8	8.3	11.3	9.9E+02	1.4E+03	1.9E+03
Forest	4477.7	50.5	0.3	0.5	1.1	1.3E+03	2.2E+03	4.9E+03
Non-forested wetland	272.0	3.1	0.0	1.3	10.8	0.0E+00	3.5E+02	2.9E+03
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	256.6	2.9	0.3	0.5	1.1	7.7E+01	1.3E+02	2.8E+02
Participatory recreation	23.7	0.3	17.9	19.3	22.2	4.3E+02	4.6E+02	5.3E+02
Spectator recreation	8.4	0.1	17.9	19.3	22.2	1.5E+02	1.6E+02	1.9E+02
Water-based recreation	123.9	1.4	3.7	5.7	12.6	4.6E+02	7.1E+02	1.6E+03
Residential, multi-family	4.6	0.1	11.7	31.6	38.5	5.3E+01	1.4E+02	1.8E+02
Residential, < ¼ acre lots	33.0	0.4	8.9	24.2	30.1	2.9E+02	8.0E+02	9.9E+02
Residential, ¼ to ½ acre lots	615.7	6.9	5.2	14.4	19.0	3.2E+03	8.8E+03	1.2E+04
Residential, > ½ acre lots	703.5	7.9	3.0	8.5	12.5	2.1E+03	6.0E+03	8.8E+03
Salt marsh	1373.9	15.5	0.0	1.3	10.8	0.0E+00	1.8E+03	1.5E+04
Commercial	24.9	0.3	0.9	1.4	3.2	2.2E+01	3.5E+01	8.0E+01
Industrial	19.0	0.2	0.9	1.4	3.2	1.7E+01	2.7E+01	6.1E+01
Urban open	79.8	0.9	0.3	0.5	1.1	2.4E+01	4.0E+01	8.8E+01
Transportation	68.8	0.8	0.9	1.4	3.2	6.2E+01	9.6E+01	2.2E+02
Waste disposal	7.9	0.1	0.9	1.4	3.2	7.1E+00	1.1E+01	2.5E+01
Open water	263.9	3.0	0.0	2.5	10.8	0.0E+00	6.6E+02	2.8E+03
Woody perennial	32.8	0.4	5.4	14.8	21.0	1.8E+02	4.8E+02	6.9E+02
Land use total	8875.5	100.0				1.3E+04	2.9E+04	6.0E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	2964.9	3.7	5.7	12.6	1.1E+04	1.7E+04	3.7E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					2.4E+04	4.6E+04	9.7E+04

Table B-15. Nitrogen loading analysis for the Essex Bay 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	2.6E+02	3.6E+02	4.9E+02	2.6E+02	3.6E+02	4.9E+02
Non-point sources	8.8E+03	1.7E+04	3.8E+04	9.5E+03	2.1E+04	4.4E+04
Watershed total	9.1E+03	1.7E+04	3.9E+04	9.8E+03	2.2E+04	4.5E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Essex Housing Authority WWTP	2.6E+02	3.6E+02	4.9E+02
Point source total	2.6E+02	3.6E+02	4.9E+02

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	212.4	6.2	11.2	16.0	21.3	2.4E+03	3.4E+03	4.5E+03
Pasture	113.5	3.3	5.8	8.3	11.3	6.6E+02	9.4E+02	1.3E+03
Forest	1176.3	34.4	0.3	0.5	1.1	3.5E+02	5.9E+02	1.3E+03
Non-forested wetland	15.8	0.5	0.0	1.3	10.8	0.0E+00	2.0E+01	1.7E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	159.1	4.7	0.3	0.5	1.1	4.8E+01	8.0E+01	1.7E+02
Participatory recreation	20.1	0.6	17.9	19.3	22.2	3.6E+02	3.9E+02	4.5E+02
Spectator recreation	3.0	0.1	17.9	19.3	22.2	5.4E+01	5.8E+01	6.7E+01
Water-based recreation	39.5	1.2	3.7	5.7	12.6	1.5E+02	2.3E+02	5.0E+02
Residential, multi-family	1.4	0.0	10.8	29.4	36.0	1.6E+01	4.2E+01	5.2E+01
Residential, < ¼ acre lots	8.3	0.2	8.2	22.5	28.2	6.8E+01	1.9E+02	2.3E+02
Residential, ¼ to ½ acre lots	124.7	3.7	4.8	13.5	18.0	6.0E+02	1.7E+03	2.2E+03
Residential, > ½ acre lots	318.0	9.3	2.8	8.1	12.0	9.0E+02	2.6E+03	3.8E+03
Salt marsh	1150.5	33.7	0.0	1.3	10.8	0.0E+00	1.5E+03	1.2E+04
Commercial	11.9	0.3	0.9	1.4	3.2	1.1E+01	1.7E+01	3.8E+01
Industrial	3.1	0.1	0.9	1.4	3.2	2.8E+00	4.3E+00	9.8E+00
Urban open	15.7	0.5	0.3	0.5	1.1	4.7E+00	7.8E+00	1.7E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	4.3	0.1	0.9	1.4	3.2	3.9E+00	6.0E+00	1.4E+01
Open water	11.8	0.3	0.0	2.5	10.8	0.0E+00	3.0E+01	1.3E+02
Woody perennial	25.9	0.8	5.4	14.8	21.0	1.4E+02	3.8E+02	5.4E+02
Land use total	3415.4	100.0				5.7E+03	1.2E+04	2.8E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	825.7	3.7	5.7	12.6	3.1E+03	4.7E+03	1.0E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					8.8E+03	1.7E+04	3.8E+04

Table B-16. Nitrogen loading analysis for the Essex Bay Watershed Delineation

➢ **Summary**

	Present nitrogen loading ($kg\ y^{-1}$)			Future nitrogen loading (buildout) ($kg\ y^{-1}$)		
	low	mean	high	low	mean	high
Point sources	2.6E+02	3.6E+02	4.9E+02	2.6E+02	3.6E+02	4.9E+02
Non-point sources	1.2E+04	2.5E+04	5.3E+04	1.6E+04	3.9E+04	7.3E+04
Watershed total	1.3E+04	2.5E+04	5.4E+04	1.6E+04	3.9E+04	7.3E+04

➢ **Point sources**

	Nitrogen loading ($kg\ y^{-1}$)		
	low	mean	high
i. NPDES facilities			
Essex Housing Authority WWTP	2.6E+02	3.6E+02	4.9E+02
Point source total	2.6E+02	3.6E+02	4.9E+02

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	315.4	5.0	11.2	16.0	21.3	3.5E+03	5.0E+03	6.7E+03
Pasture	160.3	2.5	5.8	8.3	11.3	9.3E+02	1.3E+03	1.8E+03
Forest	3182.7	50.0	0.3	0.5	1.1	9.5E+02	1.6E+03	3.5E+03
Non-forested wetland	244.8	3.8	0.0	1.3	10.8	0.0E+00	3.2E+02	2.6E+03
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	193.1	3.0	0.3	0.5	1.1	5.8E+01	9.7E+01	2.1E+02
Participatory recreation	20.6	0.3	17.9	19.3	22.2	3.7E+02	4.0E+02	4.6E+02
Spectator recreation	3.0	0.0	17.9	19.3	22.2	5.4E+01	5.8E+01	6.7E+01
Water-based recreation	39.8	0.6	3.7	5.7	12.6	1.5E+02	2.3E+02	5.0E+02
Residential, multi-family	1.4	0.0	13.1	35.6	42.9	1.9E+01	5.1E+01	6.2E+01
Residential, < ¼ acre lots	8.3	0.1	10.0	27.1	33.4	8.2E+01	2.2E+02	2.8E+02
Residential, ¼ to ½ acre lots	217.9	3.4	5.8	16.0	20.8	1.3E+03	3.5E+03	4.5E+03
Residential, > ½ acre lots	501.2	7.9	3.3	9.3	13.4	1.6E+03	4.7E+03	6.7E+03
Salt marsh	1160.8	18.2	0.0	1.3	10.8	0.0E+00	1.5E+03	1.3E+04
Commercial	16.2	0.3	0.9	1.4	3.2	1.5E+01	2.3E+01	5.2E+01
Industrial	6.0	0.1	0.9	1.4	3.2	5.4E+00	8.3E+00	1.9E+01
Urban open	48.1	0.8	0.3	0.5	1.1	1.4E+01	2.4E+01	5.3E+01
Transportation	37.7	0.6	0.9	1.4	3.2	3.4E+01	5.3E+01	1.2E+02
Waste disposal	6.1	0.1	0.9	1.4	3.2	5.5E+00	8.5E+00	1.9E+01
Open water	166.7	2.6	0.0	2.5	10.8	0.0E+00	4.2E+02	1.8E+03
Woody perennial	31.1	0.5	5.4	14.8	21.0	1.7E+02	4.6E+02	6.5E+02
Land use total	6361.1	100.0				9.3E+03	2.0E+04	4.3E+04

	Embayment area (ha)	Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	825.7	3.7	5.7	12.6	3.1E+03	4.7E+03	1.0E+04

	River flow ($m^3\ s^{-1}$)	Nitrogen concentration (mg/L)			Nitrogen loading ($kg\ y^{-1}$)		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.2E+04	2.5E+04	5.3E+04

Table B-17. Nitrogen loading analysis for the Annisquam River 1000 m Boundary Delineation

➢ Summary

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	3.6E+03	8.1E+03	1.6E+04	4.6E+03	1.1E+04	1.9E+04
Watershed total	3.6E+03	8.1E+03	1.6E+04	4.6E+03	1.1E+04	1.9E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	2.0	0.1	5.8	8.3	11.3	1.1E+01	1.6E+01	2.2E+01
Forest	620.7	43.1	0.3	0.5	1.1	1.9E+02	3.1E+02	6.8E+02
Non-forested wetland	12.2	0.8	0.0	1.3	10.8	0.0E+00	1.6E+01	1.3E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	41.8	2.9	0.3	0.5	1.1	1.3E+01	2.1E+01	4.6E+01
Participatory recreation	3.0	0.2	17.9	19.3	22.2	5.3E+01	5.7E+01	6.6E+01
Spectator recreation	4.4	0.3	17.9	19.3	22.2	7.9E+01	8.5E+01	9.8E+01
Water-based recreation	12.2	0.8	3.7	5.7	12.6	4.5E+01	7.0E+01	1.5E+02
Residential, multi-family	3.1	0.2	9.8	26.7	32.9	3.1E+01	8.3E+01	1.0E+02
Residential, < ¼ acre lots	24.7	1.7	7.5	20.5	26.0	1.9E+02	5.1E+02	6.4E+02
Residential, ¼ to ½ acre lots	274.1	19.0	4.4	12.4	16.8	1.2E+03	3.4E+03	4.6E+03
Residential, > ½ acre lots	134.6	9.3	2.6	7.5	11.3	3.5E+02	1.0E+03	1.5E+03
Salt marsh	205.9	14.3	0.0	1.3	10.8	0.0E+00	2.7E+02	2.2E+03
Commercial	7.3	0.5	0.9	1.4	3.2	6.6E+00	1.0E+01	2.3E+01
Industrial	6.7	0.5	0.9	1.4	3.2	6.0E+00	9.4E+00	2.1E+01
Urban open	16.2	1.1	0.3	0.5	1.1	4.8E+00	8.1E+00	1.8E+01
Transportation	25.9	1.8	0.9	1.4	3.2	2.3E+01	3.6E+01	8.3E+01
Waste disposal	1.3	0.1	0.9	1.4	3.2	1.2E+00	1.9E+00	4.2E+00
Open water	43.8	3.0	0.0	2.5	10.8	0.0E+00	1.1E+02	4.7E+02
Woody perennial	1.6	0.1	5.4	14.8	21.0	8.8E+00	2.4E+01	3.4E+01
Land use total	1441.5	100.0				2.2E+03	6.0E+03	1.1E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	363.9	3.7	5.7	12.6	1.3E+03	2.1E+03	4.6E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					3.6E+03	8.1E+03	1.6E+04

Table B-18. Nitrogen loading analysis for the Annisquam River Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	3.8E+03	8.7E+03	1.7E+04	5.5E+03	1.4E+04	2.3E+04
Watershed total	3.8E+03	8.7E+03	1.7E+04	5.5E+03	1.4E+04	2.3E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	2.0	0.1	5.8	8.3	11.3	1.1E+01	1.6E+01	2.2E+01
Forest	1036.0	53.5	0.3	0.5	1.1	3.1E+02	5.2E+02	1.1E+03
Non-forested wetland	21.5	1.1	0.0	1.3	10.8	0.0E+00	2.8E+01	2.3E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	41.8	2.2	0.3	0.5	1.1	1.3E+01	2.1E+01	4.6E+01
Participatory recreation	3.0	0.2	17.9	19.3	22.2	5.3E+01	5.7E+01	6.6E+01
Spectator recreation	4.4	0.2	17.9	19.3	22.2	7.9E+01	8.5E+01	9.8E+01
Water-based recreation	12.2	0.6	3.7	5.7	12.6	4.5E+01	7.0E+01	1.5E+02
Residential, multi-family	3.1	0.2	10.2	27.7	34.1	3.2E+01	8.7E+01	1.1E+02
Residential, < ¼ acre lots	24.7	1.3	7.8	21.3	26.8	1.9E+02	5.3E+02	6.6E+02
Residential, ¼ to ½ acre lots	274.1	14.2	4.6	12.8	17.3	1.3E+03	3.5E+03	4.7E+03
Residential, > ½ acre lots	139.9	7.2	2.7	7.7	11.6	3.8E+02	1.1E+03	1.6E+03
Salt marsh	212.2	11.0	0.0	1.3	10.8	0.0E+00	2.8E+02	2.3E+03
Commercial	8.7	0.4	0.9	1.4	3.2	7.8E+00	1.2E+01	2.8E+01
Industrial	13.0	0.7	0.9	1.4	3.2	1.2E+01	1.8E+01	4.2E+01
Urban open	17.7	0.9	0.3	0.5	1.1	5.3E+00	8.9E+00	2.0E+01
Transportation	31.2	1.6	0.9	1.4	3.2	2.8E+01	4.4E+01	1.0E+02
Waste disposal	1.3	0.1	0.9	1.4	3.2	1.2E+00	1.9E+00	4.2E+00
Open water	88.6	4.6	0.0	2.5	10.8	0.0E+00	2.2E+02	9.6E+02
Woody perennial	1.6	0.1	5.4	14.8	21.0	8.8E+00	2.4E+01	3.4E+01
Land use total	1937.2	100.0				2.4E+03	6.6E+03	1.2E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	363.9	3.7	5.7	12.6	1.3E+03	2.1E+03	4.6E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					3.8E+03	8.7E+03	1.7E+04

Table B-19. Nitrogen loading analysis for the Sandy Bay 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	1.0E+04	1.4E+04	3.8E+04	1.0E+04	1.4E+04	3.8E+04
Non-point sources	2.0E+03	3.5E+03	7.4E+03	2.0E+03	3.7E+03	7.8E+03
Watershed total	1.2E+04	1.7E+04	4.5E+04	1.2E+04	1.8E+04	4.6E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Rockport WWTF	1.0E+04	1.4E+04	3.8E+04
Point source total	1.0E+04	1.4E+04	3.8E+04

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	1.1	0.2	11.2	16.0	21.3	1.2E+01	1.8E+01	2.4E+01
Pasture	4.2	0.9	5.8	8.3	11.3	2.5E+01	3.5E+01	4.8E+01
Forest	161.2	33.3	0.3	0.5	1.1	4.8E+01	8.1E+01	1.8E+02
Non-forested wetland	2.2	0.5	0.0	1.3	10.8	0.0E+00	2.9E+00	2.4E+01
Mining	0.9	0.2	0.9	1.4	3.2	8.4E-01	1.3E+00	3.0E+00
Open land	11.3	2.3	0.3	0.5	1.1	3.4E+00	5.6E+00	1.2E+01
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	2.8	0.6	17.9	19.3	22.2	5.0E+01	5.4E+01	6.2E+01
Water-based recreation	11.5	2.4	3.7	5.7	12.6	4.3E+01	6.6E+01	1.5E+02
Residential, multi-family	8.6	1.8	1.8	5.3	8.9	1.5E+01	4.6E+01	7.6E+01
Residential, < ¼ acre lots	90.8	18.8	1.5	4.7	8.1	1.4E+02	4.2E+02	7.4E+02
Residential, ¼ to ½ acre lots	117.3	24.2	1.2	3.8	7.1	1.4E+02	4.4E+02	8.3E+02
Residential, > ½ acre lots	35.9	7.4	1.0	3.2	6.5	3.6E+01	1.2E+02	2.3E+02
Salt marsh	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Commercial	16.5	3.4	0.9	1.4	3.2	1.5E+01	2.3E+01	5.3E+01
Industrial	1.9	0.4	0.9	1.4	3.2	1.7E+00	2.6E+00	6.0E+00
Urban open	3.8	0.8	0.3	0.5	1.1	1.1E+00	1.9E+00	4.1E+00
Transportation	4.5	0.9	0.9	1.4	3.2	4.0E+00	6.2E+00	1.4E+01
Waste disposal	1.9	0.4	0.9	1.4	3.2	1.7E+00	2.7E+00	6.2E+00
Open water	7.5	1.5	0.0	2.5	10.8	0.0E+00	1.9E+01	8.1E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	483.8	100.0				5.4E+02	1.3E+03	2.5E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	382.8	3.7	5.7	12.6	1.4E+03	2.2E+03	4.8E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					2.0E+03	3.5E+03	7.4E+03

Table B-20. Nitrogen loading analysis for the Sandy Bay Watershed Delineation

➢ **Summary**

	Present nitrogen loading ($kg\ y^{-1}$)			Future nitrogen loading (buildout) ($kg\ y^{-1}$)		
	low	mean	high	low	mean	high
Point sources	1.0E+04	1.4E+04	3.8E+04	1.0E+04	1.4E+04	3.8E+04
Non-point sources	2.0E+03	3.7E+03	7.8E+03	2.1E+03	4.1E+03	8.4E+03
Watershed total	1.2E+04	1.8E+04	4.6E+04	1.2E+04	1.8E+04	4.6E+04

➢ **Point sources**

	Nitrogen loading ($kg\ y^{-1}$)		
	low	mean	high
i. NPDES facilities			
Rockport WWTF	1.0E+04	1.4E+04	3.8E+04
Point source total	1.0E+04	1.4E+04	3.8E+04

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	1.1	0.2	11.2	16.0	21.3	1.2E+01	1.8E+01	2.4E+01
Pasture	4.2	0.7	5.8	8.3	11.3	2.5E+01	3.5E+01	4.8E+01
Forest	247.4	40.5	0.3	0.5	1.1	7.4E+01	1.2E+02	2.7E+02
Non-forested wetland	10.0	1.6	0.0	1.3	10.8	0.0E+00	1.3E+01	1.1E+02
Mining	4.3	0.7	0.9	1.4	3.2	3.9E+00	6.0E+00	1.4E+01
Open land	13.0	2.1	0.3	0.5	1.1	3.9E+00	6.5E+00	1.4E+01
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	2.8	0.5	17.9	19.3	22.2	5.0E+01	5.4E+01	6.2E+01
Water-based recreation	11.5	1.9	3.7	5.7	12.6	4.3E+01	6.6E+01	1.5E+02
Residential, multi-family	9.9	1.6	1.9	5.5	9.1	1.8E+01	5.4E+01	8.9E+01
Residential, < ¼ acre lots	102.5	16.8	1.6	4.8	8.3	1.6E+02	4.9E+02	8.5E+02
Residential, ¼ to ½ acre lots	121.2	19.8	1.2	3.8	7.2	1.5E+02	4.6E+02	8.7E+02
Residential, > ½ acre lots	40.1	6.6	1.0	3.3	6.5	4.1E+01	1.3E+02	2.6E+02
Salt marsh	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Commercial	19.3	3.2	0.9	1.4	3.2	1.7E+01	2.7E+01	6.2E+01
Industrial	1.9	0.3	0.9	1.4	3.2	1.7E+00	2.6E+00	6.0E+00
Urban open	6.3	1.0	0.3	0.5	1.1	1.9E+00	3.1E+00	6.9E+00
Transportation	4.5	0.7	0.9	1.4	3.2	4.0E+00	6.2E+00	1.4E+01
Waste disposal	2.0	0.3	0.9	1.4	3.2	1.8E+00	2.7E+00	6.2E+00
Open water	8.7	1.4	0.0	2.5	10.8	0.0E+00	2.2E+01	9.4E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	610.6	100.0				6.1E+02	1.5E+03	2.9E+03

	Embayment area (ha)	Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	382.8	3.7	5.7	12.6	1.4E+03	2.2E+03	4.8E+03

	River flow ($m^3\ s^{-1}$)	Nitrogen concentration (mg/L)			Nitrogen loading ($kg\ y^{-1}$)		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					2.0E+03	3.7E+03	7.8E+03

Table B-21. Nitrogen loading analysis for the Gloucester Harbor 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	4.5E+04	9.1E+04	1.7E+05	4.5E+04	9.1E+04	1.7E+05
Non-point sources	3.7E+03	6.3E+03	1.3E+04	3.8E+03	6.6E+03	1.3E+04
Watershed total	4.9E+04	9.7E+04	1.9E+05	4.9E+04	9.8E+04	1.9E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Gloucester WPCF	4.5E+04	9.1E+04	1.7E+05
Point source total	4.5E+04	9.1E+04	1.7E+05

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.6	0.1	11.2	16.0	21.3	7.0E+00	1.0E+01	1.3E+01
Pasture	1.6	0.2	5.8	8.3	11.3	9.4E+00	1.3E+01	1.8E+01
Forest	206.3	27.4	0.3	0.5	1.1	6.2E+01	1.0E+02	2.3E+02
Non-forested wetland	6.0	0.8	0.0	1.3	10.8	0.0E+00	7.9E+00	6.5E+01
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	16.6	2.2	0.3	0.5	1.1	5.0E+00	8.3E+00	1.8E+01
Participatory recreation	22.6	3.0	17.9	19.3	22.2	4.0E+02	4.4E+02	5.0E+02
Spectator recreation	15.0	2.0	17.9	19.3	22.2	2.7E+02	2.9E+02	3.3E+02
Water-based recreation	23.6	3.1	3.7	5.7	12.6	8.7E+01	1.3E+02	3.0E+02
Residential, multi-family	10.4	1.4	2.1	6.3	9.9	2.2E+01	6.5E+01	1.0E+02
Residential, < ¼ acre lots	170.3	22.6	1.8	5.3	8.9	3.1E+02	9.1E+02	1.5E+03
Residential, ¼ to ½ acre lots	80.4	10.7	1.3	4.1	7.5	1.1E+02	3.3E+02	6.0E+02
Residential, > ½ acre lots	72.0	9.6	1.1	3.4	6.7	7.7E+01	2.5E+02	4.8E+02
Salt marsh	36.2	4.8	0.0	1.3	10.8	0.0E+00	4.7E+01	3.9E+02
Commercial	20.0	2.7	0.9	1.4	3.2	1.8E+01	2.8E+01	6.4E+01
Industrial	10.1	1.3	0.9	1.4	3.2	9.1E+00	1.4E+01	3.2E+01
Urban open	25.0	3.3	0.3	0.5	1.1	7.5E+00	1.3E+01	2.8E+01
Transportation	27.7	3.7	0.9	1.4	3.2	2.5E+01	3.9E+01	8.9E+01
Waste disposal	5.0	0.7	0.9	1.4	3.2	4.5E+00	7.0E+00	1.6E+01
Open water	2.6	0.4	0.0	2.5	10.8	0.0E+00	6.6E+00	2.8E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	752.2	100.0				1.4E+03	2.7E+03	4.8E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	625.3	3.7	5.7	12.6	2.3E+03	3.6E+03	7.9E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					3.7E+03	6.3E+03	1.3E+04

Table B-22. Nitrogen loading analysis for the Gloucester Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	4.5E+04	9.1E+04	1.7E+05	4.5E+04	9.1E+04	1.7E+05
Non-point sources	3.7E+03	6.3E+03	1.3E+04	3.8E+03	6.6E+03	1.3E+04
Watershed total	4.9E+04	9.7E+04	1.9E+05	4.9E+04	9.8E+04	1.9E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Gloucester WPCF	4.5E+04	9.1E+04	1.7E+05
Point source total	4.5E+04	9.1E+04	1.7E+05

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.6	0.1	11.2	16.0	21.3	7.0E+00	1.0E+01	1.3E+01
Pasture	1 6	0.2	5.8	8.3	11.3	9.4E+00	1.3E+01	1.8E+01
Forest	212.3	27.6	0.3	0.5	1.1	6.4E+01	1.1E+02	2.3E+02
Non-forested wetland	7.5	1.0	0.0	1.3	10.8	0.0E+00	9.7E+00	8.1E+01
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	17 0	2.2	0.3	0.5	1.1	5.1E+00	8.5E+00	1.9E+01
Participatory recreation	22.6	2.9	17.9	19.3	22.2	4.0E+02	4.4E+02	5.0E+02
Spectator recreation	15.0	2.0	17.9	19.3	22.2	2.7E+02	2.9E+02	3.3E+02
Water-based recreation	23.6	3.1	3.7	5.7	12.6	8.7E+01	1.3E+02	3.0E+02
Residential, multi-family	10 5	1.4	2.1	6.2	9.9	2.2E+01	6.6E+01	1.0E+02
Residential, < ¼ acre lots	172.2	22.4	1.8	5.3	8.9	3.1E+02	9.2E+02	1.5E+03
Residential, ¼ to ½ acre lots	80.4	10.4	1.3	4.1	7.5	1.1E+02	3.3E+02	6.0E+02
Residential, > ½ acre lots	72.0	9.4	1.1	3.4	6.7	7.7E+01	2.5E+02	4.8E+02
Salt marsh	36.2	4.7	0.0	1.3	10.8	0.0E+00	4.7E+01	3.9E+02
Commercial	20.0	2.6	0.9	1.4	3.2	1.8E+01	2.8E+01	6.4E+01
Industrial	13.6	1.8	0.9	1.4	3.2	1.2E+01	1.9E+01	4.4E+01
Urban open	26.6	3.5	0.3	0.5	1.1	8.0E+00	1.3E+01	2.9E+01
Transportation	29.3	3.8	0.9	1.4	3.2	2.6E+01	4.1E+01	9.4E+01
Waste disposal	5.6	0.7	0.9	1.4	3.2	5.0E+00	7.8E+00	1.8E+01
Open water	2.6	0.3	0.0	2.5	10.8	0.0E+00	6.6E+00	2.8E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	769.2	100.0				1.4E+03	2.7E+03	4.9E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	625.3	3.7	5.7	12.6	2.3E+03	3.6E+03	7.9E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					3.7E+03	6.3E+03	1.3E+04

Table B-23. Nitrogen loading analysis for the Hingham Bay 1000 m Boundary Delineation
Includes Weymouth Fore and Weymouth Back Rivers, Higham Harbor, Weir River and Hull Bay

➢ Summary

	Present nitrogen loading ($kg\ y^{-1}$)			Future nitrogen loading (buildout) ($kg\ y^{-1}$)		
	low	mean	high	low	mean	high
Point sources	2.7E+05	2.8E+05	3.7E+05	2.7E+05	2.8E+05	3.7E+05
Non-point sources	6.6E+04	8.2E+04	1.2E+05	6.6E+04	8.2E+04	1.2E+05
Watershed total	3.3E+05	3.6E+05	4.9E+05	3.3E+05	3.6E+05	4.9E+05

➢ Point sources

	Nitrogen loading ($kg\ y^{-1}$)		
	low	mean	high
i. NPDES facilities			
Hull WPCF	2.7E+04	4.3E+04	7.5E+04
Nut Island	2.4E+05	2.4E+05	3.0E+05
(assumes 9% of Nut Island effluent enters the Fore River; MWRA, 1995)			
Point source total	2.7E+05	2.8E+05	3.7E+05

➢ Non-point sources

	Area within 1000 m boundary		Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	63.0	1.5	11.2	16.0	21.3	7.1E+02	1.0E+03	1.3E+03
Pasture	17.9	0.4	5.8	8.3	11.3	1.0E+02	1.5E+02	2.0E+02
Forest	600.6	14.7	0.3	0.5	1.1	1.8E+02	3.0E+02	6.6E+02
Non-forested wetland	48.4	1.2	0.0	1.3	10.8	0.0E+00	6.3E+01	5.2E+02
Mining	32.8	0.8	0.9	1.4	3.2	3.0E+01	4.6E+01	1.1E+02
Open land	113.7	2.8	0.3	0.5	1.1	3.4E+01	5.7E+01	1.3E+02
Participatory recreation	9.7	0.2	17.9	19.3	22.2	1.7E+02	1.9E+02	2.1E+02
Spectator recreation	73.2	1.8	17.9	19.3	22.2	1.3E+03	1.4E+03	1.6E+03
Water-based recreation	50.6	1.2	3.7	5.7	12.6	1.9E+02	2.9E+02	6.4E+02
Residential, multi-family	104.4	2.6	2.1	6.3	9.9	2.2E+02	6.5E+02	1.0E+03
Residential, < ¼ acre lots	1347.6	33.1	1.8	5.3	8.9	2.4E+03	7.2E+03	1.2E+04
Residential, ¼ to ½ acre lots	425.4	10.4	1.3	4.1	7.5	5.7E+02	1.8E+03	3.2E+03
Residential, > ½ acre lots	200.2	4.9	1.1	3.4	6.7	2.1E+02	6.8E+02	1.3E+03
Salt marsh	254.7	6.3	0.0	1.3	10.8	0.0E+00	3.3E+02	2.8E+03
Commercial	185.1	4.5	0.9	1.4	3.2	1.7E+02	2.6E+02	5.9E+02
Industrial	244.3	6.0	0.9	1.4	3.2	2.2E+02	3.4E+02	7.8E+02
Urban open	260.6	6.4	0.3	0.5	1.1	7.8E+01	1.3E+02	2.9E+02
Transportation	10.7	0.3	0.9	1.4	3.2	9.6E+00	1.5E+01	3.4E+01
Waste disposal	6.6	0.2	0.9	1.4	3.2	5.9E+00	9.2E+00	2.1E+01
Open water	22.1	0.5	0.0	2.5	10.8	0.0E+00	5.5E+01	2.4E+02
Woody perennial	0.5	0.0	5.4	14.8	21.0	2.5E+00	6.8E+00	9.7E+00
Land use total	4072.0	100.0				6.6E+03	1.5E+04	2.8E+04

	Embayment area (ha)	Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	3536.2	3.7	5.7	12.6	1.3E+04	2.0E+04	4.5E+04

	River flow ($m^3\ s^{-1}$) mean	Nitrogen concentration (mg/L)			Nitrogen loading ($kg\ y^{-1}$)		
		low	mean	high	low	mean	high
iii. River (upstream of delineation)					4.6E+04	4.6E+04	4.6E+04
Non-point source total					6.6E+04	8.2E+04	1.2E+05

Table B-24. Nitrogen loading analysis for the Hingham Bay Watershed Delineation
Includes Weymouth Fore and Weymouth Back Rivers, Higham Harbor, Weir River and Hull Bay

➢ Summary

	Present nitrogen loading ($kg\ y^{-1}$)			Future nitrogen loading (buildout) ($kg\ y^{-1}$)		
	low	mean	high	low	mean	high
Point sources	2.7E+05	2.8E+05	3.7E+05	2.7E+05	2.8E+05	3.7E+05
Non-point sources	6.5E+04	8.2E+04	1.2E+05	6.5E+04	8.2E+04	1.2E+05
Watershed total	3.3E+05	3.6E+05	4.9E+05	3.3E+05	3.7E+05	4.9E+05

➢ Point sources

	Nitrogen loading ($kg\ y^{-1}$)		
	low	mean	high
i. NPDES facilities			
Hull WPCF	2.7E+04	4.3E+04	7.5E+04
Nut Island	2.4E+05	2.4E+05	3.0E+05
(assumes 9% of Nut Island effluent enters the Fore River; MWRA, 1995)			
Point source total	2.7E+05	2.8E+05	3.7E+05

➢ Non-point sources

	Area within watershed		Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	63.0	1.3	11.2	16.0	21.3	7.1E+02	1.0E+03	1.3E+03
Pasture	23.3	0.5	5.8	8.3	11.3	1.4E+02	1.9E+02	2.6E+02
Forest	806.5	16.6	0.3	0.5	1.1	2.4E+02	4.0E+02	8.9E+02
Non-forested wetland	55.8	1.1	0.0	1.3	10.8	0.0E+00	7.3E+01	6.0E+02
Mining	55.1	1.1	0.9	1.4	3.2	5.0E+01	7.7E+01	1.8E+02
Open land	127.7	2.6	0.3	0.5	1.1	3.8E+01	6.4E+01	1.4E+02
Participatory recreation	34.2	0.7	17.9	19.3	22.2	6.1E+02	6.6E+02	7.6E+02
Spectator recreation	82.8	1.7	17.9	19.3	22.2	1.5E+03	1.6E+03	1.8E+03
Water-based recreation	50.6	1.0	3.7	5.7	12.6	1.9E+02	2.9E+02	6.4E+02
Residential, multi-family	119.8	2.5	2.1	6.2	9.8	2.5E+02	7.4E+02	1.2E+03
Residential, < ¼ acre lots	1555.8	32.0	1.8	5.3	8.8	2.8E+03	8.2E+03	1.4E+04
Residential, ¼ to ½ acre lots	614.5	12.6	1.3	4.1	7.5	8.2E+02	2.5E+03	4.6E+03
Residential, > ½ acre lots	218.8	4.5	1.1	3.4	6.7	2.3E+02	7.4E+02	1.5E+03
Salt marsh	254.7	5.2	0.0	1.3	10.8	0.0E+00	3.3E+02	2.8E+03
Commercial	215.7	4.4	0.9	1.4	3.2	1.9E+02	3.0E+02	6.9E+02
Industrial	249.2	5.1	0.9	1.4	3.2	2.2E+02	3.5E+02	8.0E+02
Urban open	292.3	6.0	0.3	0.5	1.1	8.8E+01	1.5E+02	3.2E+02
Transportation	13.7	0.3	0.9	1.4	3.2	1.2E+01	1.9E+01	4.4E+01
Waste disposal	9.5	0.2	0.9	1.4	3.2	8.5E+00	1.3E+01	3.0E+01
Open water	24.4	0.5	0.0	2.5	10.8	0.0E+00	6.1E+01	2.6E+02
Woody perennial	1.3	0.0	5.4	14.8	21.0	7.3E+00	2.0E+01	2.8E+01
Land use total	4868.8	100.0				8.0E+03	1.8E+04	3.3E+04

	Embayment area (ha)	Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	3536.2	3.7	5.7	12.6	1.3E+04	2.0E+04	4.5E+04

	River flow ($m^3\ s^{-1}$) mean	Nitrogen concentration (mg/L)			Nitrogen loading ($kg\ y^{-1}$)		
		low	mean	high	low	mean	high
iii. River (upstream of delineation)					4.4E+04	4.4E+04	4.4E+04

Non-point source total	6.5E+04	8.2E+04	1.2E+05

Table B-25. Nitrogen loading analysis for the Weymouth Fore River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	2.4E+05	2.4E+05	3.0E+05	2.4E+05	2.4E+05	3.0E+05
Non-point sources	8.2E+03	1.2E+04	2.1E+04	8.2E+03	1.2E+04	2.1E+04
Watershed total	2.5E+05	2.5E+05	3.2E+05	2.5E+05	2.5E+05	3.2E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Nut Island	2.4E+05	2.4E+05	3.0E+05
(assumes 9% of Nut Island effluent enters the Fore River; MWRA, 1995)			
Point source total	2.4E+05	2.4E+05	3.0E+05

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	2.2	0.1	5.8	8.3	11.3	1.3E+01	1.8E+01	2.5E+01
Forest	122.1	7.1	0.3	0.5	1.1	3.7E+01	6.1E+01	1.3E+02
Non-forested wetland	15.9	0.9	0.0	1.3	10.8	0.0E+00	2.1E+01	1.7E+02
Mining	28.5	1.7	0.9	1.4	3.2	2.6E+01	4.0E+01	9.1E+01
Open land	35.0	2.0	0.3	0.5	1.1	1.0E+01	1.7E+01	3.8E+01
Participatory recreation	7.8	0.5	17.9	19.3	22.2	1.4E+02	1.5E+02	1.7E+02
Spectator recreation	46.1	2.7	17.9	19.3	22.2	8.3E+02	8.9E+02	1.0E+03
Water-based recreation	19.7	1.1	3.7	5.7	12.6	7.3E+01	1.1E+02	2.5E+02
Residential, multi-family	76.9	4.5	1.1	3.5	6.8	8.5E+01	2.7E+02	5.3E+02
Residential, < ¼ acre lots	827.7	48.0	1.0	3.3	6.6	8.5E+02	2.7E+03	5.5E+03
Residential, ¼ to ½ acre lots	54.2	3.1	0.9	3.0	6.3	5.0E+01	1.6E+02	3.4E+02
Residential, > ½ acre lots	14.7	0.9	0.9	2.9	6.1	1.3E+01	4.2E+01	9.0E+01
Salt marsh	118.6	6.9	0.0	1.3	10.8	0.0E+00	1.5E+02	1.3E+03
Commercial	108.2	6.3	0.9	1.4	3.2	9.7E+01	1.5E+02	3.5E+02
Industrial	178.6	10.4	0.9	1.4	3.2	1.6E+02	2.5E+02	5.7E+02
Urban open	61.8	3.6	0.3	0.5	1.1	1.9E+01	3.1E+01	6.8E+01
Transportation	3.7	0.2	0.9	1.4	3.2	3.3E+00	5.2E+00	1.2E+01
Waste disposal	0.4	0.0	0.9	1.4	3.2	3.3E-01	5.2E-01	1.2E+00
Open water	3.3	0.2	0.0	2.5	10.8	0.0E+00	8.2E+00	3.5E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	1725.5	100.0				2.4E+03	5.1E+03	1.1E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	521.5	3.7	5.7	12.6	1.9E+03	3.0E+03	6.6E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.08	1.6	1.6	1.6	3.9E+03	3.9E+03	3.9E+03

Non-point source total	8.2E+03	1.2E+04	2.1E+04

Table B-26. Nitrogen loading analysis for the Weymouth Fore River Watershed Delineation

Watershed delineation ends at the tidally-influenced reach of the Weymouth Fore River

➢ Summary

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	2.4E+05	2.4E+05	3.0E+05	2.4E+05	2.4E+05	3.0E+05
Non-point sources	8.5E+03	1.3E+04	2.3E+04	8.5E+03	1.3E+04	2.3E+04
Watershed total	2.5E+05	2.5E+05	3.2E+05	2.5E+05	2.5E+05	3.2E+05

➢ Point sources

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Nut Island	2.4E+05	2.4E+05	3.0E+05
(assumes 9% of Nut Island effluent enters the Fore River; MWRA, 1995)			
Point source total	2.4E+05	2.4E+05	3.0E+05

➢ Non-point sources

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	2.2	0.1	5.8	8.3	11.3	1.3E+01	1.8E+01	2.5E+01
Forest	214.9	10.0	0.3	0.5	1.1	6.4E+01	1.1E+02	2.4E+02
Non-forested wetland	20.2	0.9	0.0	1.3	10.8	0.0E+00	2.6E+01	2.2E+02
Mining	45.2	2.1	0.9	1.4	3.2	4.1E+01	6.3E+01	1.4E+02
Open land	38.4	1.8	0.3	0.5	1.1	1.2E+01	1.9E+01	4.2E+01
Participatory recreation	7.8	0.4	17.9	19.3	22.2	1.4E+02	1.5E+02	1.7E+02
Spectator recreation	51.8	2.4	17.9	19.3	22.2	9.3E+02	1.0E+03	1.2E+03
Water-based recreation	19.7	0.9	3.7	5.7	12.6	7.3E+01	1.1E+02	2.5E+02
Residential, multi-family	83.7	3.9	1.1	3.5	6.8	9.1E+01	2.9E+02	5.7E+02
Residential, < ¼ acre lots	987.6	45.9	1.0	3.3	6.5	1.0E+03	3.2E+03	6.5E+03
Residential, ¼ to ½ acre lots	138.7	6.4	0.9	3.0	6.3	1.3E+02	4.2E+02	8.7E+02
Residential, > ½ acre lots	16.1	0.7	0.9	2.9	6.1	1.4E+01	4.6E+01	9.8E+01
Salt marsh	118.6	5.5	0.0	1.3	10.8	0.0E+00	1.5E+02	1.3E+03
Commercial	131.1	6.1	0.9	1.4	3.2	1.2E+02	1.8E+02	4.2E+02
Industrial	182.7	8.5	0.9	1.4	3.2	1.6E+02	2.6E+02	5.8E+02
Urban open	79.1	3.7	0.3	0.5	1.1	2.4E+01	4.0E+01	8.7E+01
Transportation	4.8	0.2	0.9	1.4	3.2	4.3E+00	6.7E+00	1.5E+01
Waste disposal	3.2	0.2	0.9	1.4	3.2	2.9E+00	4.5E+00	1.0E+01
Open water	4.1	0.2	0.0	2.5	10.8	0.0E+00	1.0E+01	4.4E+01
Woody perennial	0.9	0.0	5.4	14.8	21.0	4.8E+00	1.3E+01	1.9E+01
Land use total	2151.0	100.0				2.8E+03	6.2E+03	1.3E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	521.5	3.7	5.7	12.6	1.9E+03	3.0E+03	6.6E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.07	1.6	1.6	1.6	3.7E+03	3.7E+03	3.7E+03

Non-point source total	8.5E+03	1.3E+04	2.3E+04

Table B-27. Nitrogen loading analysis for the Weymouth Back River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	4.2E+04	4.4E+04	4.8E+04	4.2E+04	4.4E+04	4.8E+04
Watershed total	4.2E+04	4.4E+04	4.8E+04	4.2E+04	4.4E+04	4.8E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	1.5	0.2	5.8	8.3	11.3	9.0E+00	1.3E+01	1.7E+01
Forest	215.4	25.6	0.3	0.5	1.1	6.5E+01	1.1E+02	2.4E+02
Non-forested wetland	5.7	0.7	0.0	1.3	10.8	0.0E+00	7.4E+00	6.1E+01
Mining	0.1	0.0	0.9	1.4	3.2	9.4E-02	1.5E-01	3.3E-01
Open land	20.3	2.4	0.3	0.5	1.1	6.1E+00	1.0E+01	2.2E+01
Participatory recreation	1.9	0.2	17.9	19.3	22.2	3.4E+01	3.6E+01	4.2E+01
Spectator recreation	9.1	1.1	17.9	19.3	22.2	1.6E+02	1.7E+02	2.0E+02
Water-based recreation	17.8	2.1	3.7	5.7	12.6	6.6E+01	1.0E+02	2.2E+02
Residential, multi-family	27.1	3.2	2.9	8.2	12.1	7.8E+01	2.2E+02	3.3E+02
Residential, < ¼ acre lots	191.1	22.7	2.3	6.8	10.5	4.5E+02	1.3E+03	2.0E+03
Residential, ¼ to ½ acre lots	58.0	6.9	1.6	4.9	8.4	9.5E+01	2.9E+02	4.9E+02
Residential, > ½ acre lots	5.1	0.6	1.2	3.8	7.2	6.2E+00	1.9E+01	3.6E+01
Salt marsh	46.6	5.5	0.0	1.3	10.8	0.0E+00	6.1E+01	5.0E+02
Commercial	40.5	4.8	0.9	1.4	3.2	3.6E+01	5.7E+01	1.3E+02
Industrial	63.0	7.5	0.9	1.4	3.2	5.7E+01	8.8E+01	2.0E+02
Urban open	137.8	16.3	0.3	0.5	1.1	4.1E+01	6.9E+01	1.5E+02
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	1.8	0.2	0.9	1.4	3.2	1.6E+00	2.5E+00	5.7E+00
Open water	0.0	0.0	0.0	2.5	10.8	0.0E+00	0.0E+00	0.0E+00
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	842.9	100.0				1.1E+03	2.6E+03	4.7E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	226.2	3.7	5.7	12.6	8.4E+02	1.3E+03	2.9E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.8	1.6	1.6	1.6	4.0E+04	4.0E+04	4.0E+04
Non-point source total					4.2E+04	4.4E+04	4.8E+04

Table B-28. Nitrogen loading analysis for the Weymouth Back River Watershed Delineation

Watershed delineation ends at the first upstream fish ladder

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	4.0E+04	4.2E+04	4.6E+04	4.0E+04	4.3E+04	4.7E+04
Watershed total	4.0E+04	4.2E+04	4.6E+04	4.0E+04	4.3E+04	4.7E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	2.7	0.3	5.8	8.3	11.3	1.6E+01	2.3E+01	3.1E+01
Forest	293.6	27.9	0.3	0.5	1.1	8.8E+01	1.5E+02	3.2E+02
Non-forested wetland	7.0	0.7	0.0	1.3	10.8	0.0E+00	9.1E+00	7.6E+01
Mining	5.6	0.5	0.9	1.4	3.2	5.1E+00	7.9E+00	1.8E+01
Open land	26.1	2.5	0.3	0.5	1.1	7.8E+00	1.3E+01	2.9E+01
Participatory recreation	8.1	0.8	17.9	19.3	22.2	1.4E+02	1.6E+02	1.8E+02
Spectator recreation	13.0	1.2	17.9	19.3	22.2	2.3E+02	2.5E+02	2.9E+02
Water-based recreation	17.8	1.7	3.7	5.7	12.6	6.6E+01	1.0E+02	2.2E+02
Residential, multi-family	33.0	3.1	2.8	8.0	11.8	9.2E+01	2.6E+02	3.9E+02
Residential, < ¼ acre lots	229.0	21.7	2.3	6.6	10.3	5.2E+02	1.5E+03	2.4E+03
Residential, ¼ to ½ acre lots	96.9	9.2	1.6	4.8	8.3	1.5E+02	4.7E+02	8.0E+02
Residential, > ½ acre lots	8.2	0.8	1.2	3.8	7.1	9.8E+00	3.1E+01	5.8E+01
Salt marsh	46.6	4.4	0.0	1.3	10.8	0.0E+00	6.1E+01	5.0E+02
Commercial	47.7	4.5	0.9	1.4	3.2	4.3E+01	6.7E+01	1.5E+02
Industrial	63.8	6.1	0.9	1.4	3.2	5.7E+01	8.9E+01	2.0E+02
Urban open	148.9	14.1	0.3	0.5	1.1	4.5E+01	7.4E+01	1.6E+02
Transportation	1.9	0.2	0.9	1.4	3.2	1.7E+00	2.7E+00	6.1E+00
Waste disposal	1.8	0.2	0.9	1.4	3.2	1.6E+00	2.5E+00	5.7E+00
Open water	1.2	0.1	0.0	2.5	10.8	0.0E+00	3.0E+00	1.3E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	1052.9	100.0				1.5E+03	3.3E+03	5.8E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	226.2	3.7	5.7	12.6	8.4E+02	1.3E+03	2.9E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.7	1.6	1.6	1.6	3.8E+04	3.8E+04	3.8E+04
Non-point source total					4.0E+04	4.2E+04	4.6E+04

Table B-29. Nitrogen loading analysis for the Hingham Harbor 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	2.3E+03	4.6E+03	8.3E+03	2.3E+03	4.6E+03	8.5E+03
Watershed total	2.3E+03	4.6E+03	8.3E+03	2.3E+03	4.6E+03	8.5E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	22.9	4.9	11.2	16.0	21.3	2.6E+02	3.7E+02	4.9E+02
Pasture	6.8	1.4	5.8	8.3	11.3	3.9E+01	5.6E+01	7.6E+01
Forest	65.3	13.8	0.3	0.5	1.1	2.0E+01	3.3E+01	7.2E+01
Non-forested wetland	26.7	5.7	0.0	1.3	10.8	0.0E+00	3.5E+01	2.9E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	5.3	1.1	0.3	0.5	1.1	1.6E+00	2.7E+00	5.8E+00
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	7.5	1.6	17.9	19.3	22.2	1.3E+02	1.4E+02	1.7E+02
Water-based recreation	2.4	0.5	3.7	5.7	12.6	8.8E+00	1.4E+01	3.0E+01
Residential, multi-family	0.4	0.1	6.6	18.1	23.2	2.4E+00	6.6E+00	8.5E+00
Residential, < ¼ acre lots	15.8	3.4	5.1	14.1	18.7	8.0E+01	2.2E+02	3.0E+02
Residential, ¼ to ½ acre lots	142.7	30.3	3.1	8.9	12.9	4.5E+02	1.3E+03	1.8E+03
Residential, > ½ acre lots	118.5	25.1	2.0	5.8	9.4	2.3E+02	6.9E+02	1.1E+03
Salt marsh	8.4	1.8	0.0	1.3	10.8	0.0E+00	1.1E+01	9.1E+01
Commercial	19.0	4.0	0.9	1.4	3.2	1.7E+01	2.7E+01	6.1E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	21.5	4.6	0.3	0.5	1.1	6.5E+00	1.1E+01	2.4E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	7.8	1.6	0.0	2.5	10.8	0.0E+00	1.9E+01	8.4E+01
Woody perennial	0.5	0.1	5.4	14.8	21.0	2.5E+00	6.8E+00	9.7E+00
Land use total	471.3	100.0				1.2E+03	2.9E+03	4.6E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	289.8	3.7	5.7	12.6	1.1E+03	1.7E+03	3.7E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					2.3E+03	4.6E+03	8.3E+03

Table B-30. Nitrogen loading analysis for the Hingham Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	3.0E+03	5.8E+03	1.0E+04	3.0E+03	6.0E+03	1.0E+04
Watershed total	3.0E+03	5.8E+03	1.0E+04	3.0E+03	6.0E+03	1.0E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	22.9	3.7	11.2	16.0	21.3	2.6E+02	3.7E+02	4.9E+02
Pasture	10.9	1.7	5.8	8.3	11.3	6.3E+01	9.1E+01	1.2E+02
Forest	96.1	15.3	0.3	0.5	1.1	2.9E+01	4.8E+01	1.1E+02
Non-forested wetland	28.5	4.5	0.0	1.3	10.8	0.0E+00	3.7E+01	3.1E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	10.2	1.6	0.3	0.5	1.1	3.1E+00	5.1E+00	1.1E+01
Participatory recreation	18.3	2.9	17.9	19.3	22.2	3.3E+02	3.5E+02	4.1E+02
Spectator recreation	7.5	1.2	17.9	19.3	22.2	1.3E+02	1.4E+02	1.7E+02
Water-based recreation	2.4	0.4	3.7	5.7	12.6	8.8E+00	1.4E+01	3.0E+01
Residential, multi-family	3.1	0.5	6.5	17.9	23.0	2.0E+01	5.6E+01	7.2E+01
Residential, < ¼ acre lots	26.2	4.2	5.0	14.0	18.6	1.3E+02	3.7E+02	4.9E+02
Residential, ¼ to ½ acre lots	206.0	32.9	3.1	8.8	12.8	6.4E+02	1.8E+03	2.6E+03
Residential, > ½ acre lots	132.7	21.2	1.9	5.8	9.3	2.6E+02	7.6E+02	1.2E+03
Salt marsh	8.4	1.3	0.0	1.3	10.8	0.0E+00	1.1E+01	9.1E+01
Commercial	19.6	3.1	0.9	1.4	3.2	1.8E+01	2.7E+01	6.3E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	24.7	3.9	0.3	0.5	1.1	7.4E+00	1.2E+01	2.7E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	8.0	1.3	0.0	2.5	10.8	0.0E+00	2.0E+01	8.6E+01
Woody perennial	0.5	0.1	5.4	14.8	21.0	2.5E+00	6.8E+00	9.7E+00
Land use total	625.8	100.0				1.9E+03	4.1E+03	6.3E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	289.8	3.7	5.7	12.6	1.1E+03	1.7E+03	3.7E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					3.0E+03	5.8E+03	1.0E+04

Table B-31. Nitrogen loading analysis for the Weir River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	4.2E+03	5.9E+03	9.3E+03	4.1E+03	6.0E+03	9.6E+03
Watershed total	4.2E+03	5.9E+03	9.3E+03	4.1E+03	6.0E+03	9.6E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	40.1	7.7	11.2	16.0	21.3	4.5E+02	6.4E+02	8.5E+02
Pasture	7.4	1.4	5.8	8.3	11.3	4.3E+01	6.2E+01	8.4E+01
Forest	151.4	29.2	0.3	0.5	1.1	4.5E+01	7.6E+01	1.7E+02
Non-forested wetland	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Mining	4.2	0.8	0.9	1.4	3.2	3.8E+00	5.9E+00	1.4E+01
Open land	3.6	0.7	0.3	0.5	1.1	1.1E+00	1.8E+00	4.0E+00
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	2.7	0.5	17.9	19.3	22.2	4.8E+01	5.2E+01	6.0E+01
Water-based recreation	2.6	0.5	3.7	5.7	12.6	9.7E+00	1.5E+01	3.3E+01
Residential, multi-family	0.0	0.0	4.1	11.5	15.8	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	54.1	10.4	3.3	9.2	13.3	1.8E+02	5.0E+02	7.2E+02
Residential, ¼ to ½ acre lots	96.5	18.6	2.1	6.3	9.9	2.1E+02	6.0E+02	9.6E+02
Residential, > ½ acre lots	59.9	11.5	1.5	4.5	7.9	8.8E+01	2.7E+02	4.7E+02
Salt marsh	62.2	12.0	0.0	1.3	10.8	0.0E+00	8.1E+01	6.7E+02
Commercial	7.8	1.5	0.9	1.4	3.2	7.0E+00	1.1E+01	2.5E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	10.7	2.1	0.3	0.5	1.1	3.2E+00	5.4E+00	1.2E+01
Transportation	5.7	1.1	0.9	1.4	3.2	5.2E+00	8.0E+00	1.8E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	9.6	1.9	0.0	2.5	10.8	0.0E+00	2.4E+01	1.0E+02
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	518.6	100.0				1.1E+03	2.4E+03	4.2E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	219.3	3.7	5.7	12.6	8.1E+02	1.2E+03	2.8E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.05	1.6	1.6	1.6	2.3E+03	2.3E+03	2.3E+03

Non-point source total	4.2E+03	5.9E+03	9.3E+03

Table B-32. Nitrogen loading analysis for the Weir River Watershed Delineation

Watershed delineation ends at the first upstream dam

➢ **Summary**

	Present nitrogen loading ($kg\ y^{-1}$)			Future nitrogen loading (buildout) ($kg\ y^{-1}$)		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	4.2E+03	5.9E+03	9.3E+03	4.1E+03	6.1E+03	9.6E+03
Watershed total	4.2E+03	5.9E+03	9.3E+03	4.1E+03	6.1E+03	9.6E+03

➢ **Point sources**

	Nitrogen loading ($kg\ y^{-1}$)		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	40.1	7.6	11.2	16.0	21.3	4.5E+02	6.4E+02	8.5E+02
Pasture	7.4	1.4	5.8	8.3	11.3	4.3E+01	6.2E+01	8.4E+01
Forest	155.6	29.6	0.3	0.5	1.1	4.7E+01	7.8E+01	1.7E+02
Non-forested wetland	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Mining	4.2	0.8	0.9	1.4	3.2	3.8E+00	5.9E+00	1.4E+01
Open land	3.6	0.7	0.3	0.5	1.1	1.1E+00	1.8E+00	4.0E+00
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	2.7	0.5	17.9	19.3	22.2	4.8E+01	5.2E+01	6.0E+01
Water-based recreation	2.6	0.5	3.7	5.7	12.6	9.7E+00	1.5E+01	3.3E+01
Residential, multi-family	0.0	0.0	4.1	11.6	15.9	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	54.1	10.3	3.3	9.3	13.3	1.8E+02	5.0E+02	7.2E+02
Residential, ¼ to ½ acre lots	98.9	18.8	2.1	6.3	9.9	2.1E+02	6.2E+02	9.8E+02
Residential, > ½ acre lots	59.9	11.4	1.5	4.5	7.9	8.8E+01	2.7E+02	4.7E+02
Salt marsh	62.2	11.8	0.0	1.3	10.8	0.0E+00	8.1E+01	6.7E+02
Commercial	7.8	1.5	0.9	1.4	3.2	7.0E+00	1.1E+01	2.5E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	10.8	2.1	0.3	0.5	1.1	3.3E+00	5.4E+00	1.2E+01
Transportation	5.7	1.1	0.9	1.4	3.2	5.2E+00	8.0E+00	1.8E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	9.6	1.8	0.0	2.5	10.8	0.0E+00	2.4E+01	1.0E+02
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	525.3	100.0				1.1E+03	2.4E+03	4.2E+03

	Embayment area (ha)	Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	219.3	3.7	5.7	12.6	8.1E+02	1.2E+03	2.8E+03

	River flow ($m^3\ s^{-1}$)	Nitrogen concentration (mg/L)			Nitrogen loading ($kg\ y^{-1}$)		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.05	1.6	1.6	1.6	2.3E+03	2.3E+03	2.3E+03

Non-point source total	4.2E+03	5.9E+03	9.3E+03

Table B-33. Nitrogen loading analysis for the Hull Bay 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	2.7E+04	4.3E+04	7.5E+04	2.7E+04	4.3E+04	7.5E+04
Non-point sources	2.3E+03	4.3E+03	8.2E+03	2.3E+03	4.3E+03	8.3E+03
Watershed total	2.9E+04	4.7E+04	8.3E+04	2.9E+04	4.7E+04	8.3E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Hull WPCF	2.7E+04	4.3E+04	7.5E+04
Point source total	2.7E+04	4.3E+04	7.5E+04

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	6.0	2.4	0.3	0.5	1.1	1.8E+00	3.0E+00	6.6E+00
Non-forested wetland	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	2.0	0.8	0.3	0.5	1.1	6.1E-01	1.0E+00	2.2E+00
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	2.4	1.0	17.9	19.3	22.2	4.3E+01	4.6E+01	5.3E+01
Water-based recreation	3.2	1.3	3.7	5.7	12.6	1.2E+01	1.8E+01	4.0E+01
Residential, multi-family	0.0	0.0	3.9	10.8	15.1	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	180.3	72.4	3.1	8.7	12.7	5.5E+02	1.6E+03	2.3E+03
Residential, ¼ to ½ acre lots	16.2	6.5	2.0	6.0	9.6	3.3E+01	9.7E+01	1.6E+02
Residential, > ½ acre lots	1.5	0.6	1.4	4.3	7.7	2.1E+00	6.5E+00	1.2E+01
Salt marsh	10.9	4.4	0.0	1.3	10.8	0.0E+00	1.4E+01	1.2E+02
Commercial	7.1	2.8	0.9	1.4	3.2	6.4E+00	9.9E+00	2.3E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	15.9	6.4	0.3	0.5	1.1	4.8E+00	7.9E+00	1.7E+01
Transportation	1.2	0.5	0.9	1.4	3.2	1.1E+00	1.7E+00	3.9E+00
Waste disposal	1.5	0.6	0.9	1.4	3.2	1.4E+00	2.1E+00	4.9E+00
Open water	0.7	0.3	0.0	2.5	10.8	0.0E+00	1.9E+00	8.0E+00
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	248.9	100.0				6.6E+02	1.8E+03	2.7E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	437.6	3.7	5.7	12.6	1.6E+03	2.5E+03	5.5E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					2.3E+03	4.3E+03	8.2E+03

Table B-34. Nitrogen loading analysis for the Hull Bay Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	2.7E+04	4.3E+04	7.5E+04	2.7E+04	4.3E+04	7.5E+04
Non-point sources	2.3E+03	4.3E+03	8.2E+03	2.3E+03	4.3E+03	8.3E+03
Watershed total	2.9E+04	4.7E+04	8.3E+04	2.9E+04	4.7E+04	8.3E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Hull WPCF	2.7E+04	4.3E+04	7.5E+04
Point source total	2.7E+04	4.3E+04	7.5E+04

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	6.0	2.4	0.3	0.5	1.1	1.8E+00	3.0E+00	6.6E+00
Non-forested wetland	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	2.0	0.8	0.3	0.5	1.1	6.1E-01	1.0E+00	2.2E+00
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	2.4	1.0	17.9	19.3	22.2	4.3E+01	4.6E+01	5.3E+01
Water-based recreation	3.2	1.3	3.7	5.7	12.6	1.2E+01	1.8E+01	4.0E+01
Residential, multi-family	0.0	0.0	3.9	10.8	15.1	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	180.3	72.4	3.1	8.7	12.7	5.5E+02	1.6E+03	2.3E+03
Residential, ¼ to ½ acre lots	16.2	6.5	2.0	6.0	9.6	3.3E+01	9.7E+01	1.6E+02
Residential, > ½ acre lots	1.5	0.6	1.4	4.3	7.7	2.1E+00	6.5E+00	1.2E+01
Salt marsh	10.9	4.4	0.0	1.3	10.8	0.0E+00	1.4E+01	1.2E+02
Commercial	7.1	2.8	0.9	1.4	3.2	6.4E+00	9.9E+00	2.3E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	15.9	6.4	0.3	0.5	1.1	4.8E+00	7.9E+00	1.7E+01
Transportation	1.2	0.5	0.9	1.4	3.2	1.1E+00	1.7E+00	3.9E+00
Waste disposal	1.5	0.6	0.9	1.4	3.2	1.4E+00	2.1E+00	4.9E+00
Open water	0.7	0.3	0.0	2.5	10.8	0.0E+00	1.9E+00	8.0E+00
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	248.9	100.0				6.6E+02	1.8E+03	2.7E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	437.6	3.7	5.7	12.6	1.6E+03	2.5E+03	5.5E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					2.3E+03	4.3E+03	8.2E+03

Table B-35. Nitrogen loading analysis for the Salem Harbor 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	2.6E+03	4.5E+03	9.3E+03	2.6E+03	4.6E+03	9.5E+03
Watershed total	2.6E+03	4.5E+03	9.3E+03	2.6E+03	4.6E+03	9.5E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	1.8	0.2	11.2	16.0	21.3	2.0E+01	2.9E+01	3.8E+01
Pasture	0.8	0.1	5.8	8.3	11.3	4.5E+00	6.4E+00	8.8E+00
Forest	75.3	9.1	0.3	0.5	1.1	2.3E+01	3.8E+01	8.3E+01
Non-forested wetland	14.6	1.8	0.0	1.3	10.8	0.0E+00	1.9E+01	1.6E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	39.9	4.9	0.3	0.5	1.1	1.2E+01	2.0E+01	4.4E+01
Participatory recreation	12.6	1.5	17.9	19.3	22.2	2.2E+02	2.4E+02	2.8E+02
Spectator recreation	14.5	1.8	17.9	19.3	22.2	2.6E+02	2.8E+02	3.2E+02
Water-based recreation	8.4	1.0	3.7	5.7	12.6	3.1E+01	4.8E+01	1.1E+02
Residential, multi-family	3.7	0.5	1.0	3.3	6.6	3.8E+00	1.2E+01	2.5E+01
Residential, < ¼ acre lots	329.3	40.0	1.0	3.1	6.4	3.2E+02	1.0E+03	2.1E+03
Residential, ¼ to ½ acre lots	109.1	13.3	0.9	2.9	6.2	9.7E+01	3.2E+02	6.7E+02
Residential, > ½ acre lots	9.6	1.2	0.8	2.8	6.0	8.1E+00	2.7E+01	5.8E+01
Salt marsh	3.3	0.4	0.0	1.3	10.8	0.0E+00	4.3E+00	3.6E+01
Commercial	46.6	5.7	0.9	1.4	3.2	4.2E+01	6.5E+01	1.5E+02
Industrial	64.1	7.8	0.9	1.4	3.2	5.8E+01	9.0E+01	2.1E+02
Urban open	57.3	7.0	0.3	0.5	1.1	1.7E+01	2.9E+01	6.3E+01
Transportation	25.3	3.1	0.9	1.4	3.2	2.3E+01	3.5E+01	8.1E+01
Waste disposal	1.9	0.2	0.9	1.4	3.2	1.7E+00	2.6E+00	6.0E+00
Open water	5.1	0.6	0.0	2.5	10.8	0.0E+00	1.3E+01	5.5E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	823.0	100.0				1.1E+03	2.3E+03	4.5E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	383.1	3.7	5.7	12.6	1.4E+03	2.2E+03	4.8E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					2.6E+03	4.5E+03	9.3E+03

Table B-36. Nitrogen loading analysis for the Salem Harbor Watershed Delineation

➢ Summary

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	3.7E+03	6.4E+03	1.3E+04	3.8E+03	6.8E+03	1.4E+04
Watershed total	3.7E+03	6.4E+03	1.3E+04	3.8E+03	6.8E+03	1.4E+04

➢ Point sources

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ Non-point sources

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	1.8	0.1	11.2	16.0	21.3	2.0E+01	2.9E+01	3.8E+01
Pasture	0.8	0.0	5.8	8.3	11.3	4.5E+00	6.4E+00	8.8E+00
Forest	346.9	21.3	0.3	0.5	1.1	1.0E+02	1.7E+02	3.8E+02
Non-forested wetland	66.4	4.1	0.0	1.3	10.8	0.0E+00	8.6E+01	7.2E+02
Mining	24.0	1.5	0.9	1.4	3.2	2.2E+01	3.4E+01	7.7E+01
Open land	200.0	12.3	0.3	0.5	1.1	6.0E+01	1.0E+02	2.2E+02
Participatory recreation	43.7	2.7	17.9	19.3	22.2	7.8E+02	8.4E+02	9.7E+02
Spectator recreation	22.0	1.3	17.9	19.3	22.2	3.9E+02	4.2E+02	4.9E+02
Water-based recreation	8.4	0.5	3.7	5.7	12.6	3.1E+01	4.8E+01	1.1E+02
Residential, multi-family	14.4	0.9	1.3	4.0	7.4	1.9E+01	5.8E+01	1.1E+02
Residential, < ¼ acre lots	377.4	23.1	1.2	3.7	7.0	4.4E+02	1.4E+03	2.6E+03
Residential, ¼ to ½ acre lots	195.7	12.0	1.0	3.2	6.5	2.0E+02	6.3E+02	1.3E+03
Residential, > ½ acre lots	17.3	1.1	0.9	3.0	6.2	1.6E+01	5.1E+01	1.1E+02
Salt marsh	3.3	0.2	0.0	1.3	10.8	0.0E+00	4.3E+00	3.6E+01
Commercial	77.0	4.7	0.9	1.4	3.2	6.9E+01	1.1E+02	2.5E+02
Industrial	82.3	5.0	0.9	1.4	3.2	7.4E+01	1.2E+02	2.6E+02
Urban open	96.7	5.9	0.3	0.5	1.1	2.9E+01	4.8E+01	1.1E+02
Transportation	38.5	2.4	0.9	1.4	3.2	3.5E+01	5.4E+01	1.2E+02
Waste disposal	5.2	0.3	0.9	1.4	3.2	4.7E+00	7.3E+00	1.7E+01
Open water	10.1	0.6	0.0	2.5	10.8	0.0E+00	2.5E+01	1.1E+02
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	1631.7	100.0				2.3E+03	4.2E+03	8.0E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	383.1	3.7	5.7	12.6	1.4E+03	2.2E+03	4.8E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					3.7E+03	6.4E+03	1.3E+04

Table B-37. Nitrogen loading analysis for the Bass River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.1E+03	1.6E+03	2.8E+03	1.1E+03	1.6E+03	2.8E+03
Watershed total	1.1E+03	1.6E+03	2.8E+03	1.1E+03	1.6E+03	2.8E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	1.2	0.3	11.2	16.0	21.3	1.3E+01	1.9E+01	2.5E+01
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	17.5	5.0	0.3	0.5	1.1	5.2E+00	8.7E+00	1.9E+01
Non-forested wetland	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	0.1	0.0	0.3	0.5	1.1	1.6E-02	2.6E-02	5.7E-02
Participatory recreation	20.8	6.0	17.9	19.3	22.2	3.7E+02	4.0E+02	4.6E+02
Spectator recreation	16.9	4.9	17.9	19.3	22.2	3.0E+02	3.3E+02	3.8E+02
Water-based recreation	2.5	0.7	3.7	5.7	12.6	9.1E+00	1.4E+01	3.1E+01
Residential, multi-family	0.0	0.0	0.8	2.8	6.0	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	131.6	37.7	0.8	2.8	6.0	1.1E+02	3.7E+02	7.9E+02
Residential, ¼ to ½ acre lots	41.6	11.9	0.8	2.7	5.9	3.4E+01	1.1E+02	2.5E+02
Residential, > ½ acre lots	2.1	0.6	0.8	2.7	5.9	1.7E+00	5.6E+00	1.2E+01
Salt marsh	0.6	0.2	0.0	1.3	10.8	0.0E+00	7.4E-01	6.2E+00
Commercial	50.1	14.4	0.9	1.4	3.2	4.5E+01	7.0E+01	1.6E+02
Industrial	35.5	10.2	0.9	1.4	3.2	3.2E+01	5.0E+01	1.1E+02
Urban open	15.5	4.5	0.3	0.5	1.1	4.7E+00	7.8E+00	1.7E+01
Transportation	4.5	1.3	0.9	1.4	3.2	4.0E+00	6.3E+00	1.4E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	8.5	2.4	0.0	2.5	10.8	0.0E+00	2.1E+01	9.2E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	348.9	100.0				9.3E+02	1.4E+03	2.4E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	31.9	3.7	5.7	12.6	1.2E+02	1.8E+02	4.0E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.1E+03	1.6E+03	2.8E+03

Table B-38. Nitrogen loading analysis for the Bass River Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.8E+03	2.8E+03	4.8E+03	1.8E+03	2.8E+03	4.8E+03
Watershed total	1.8E+03	2.8E+03	4.8E+03	1.8E+03	2.8E+03	4.8E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	1.2	0.2	11.2	16.0	21.3	1.3E+01	1.9E+01	2.5E+01
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	56.5	8.3	0.3	0.5	1.1	1.7E+01	2.8E+01	6.2E+01
Non-forested wetland	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	5.7	0.8	0.3	0.5	1.1	1.7E+00	2.8E+00	6.3E+00
Participatory recreation	42.4	6.2	17.9	19.3	22.2	7.6E+02	8.2E+02	9.4E+02
Spectator recreation	25.4	3.7	17.9	19.3	22.2	4.6E+02	4.9E+02	5.6E+02
Water-based recreation	2.5	0.4	3.7	5.7	12.6	9.1E+00	1.4E+01	3.1E+01
Residential, multi-family	10.6	1.5	0.9	3.0	6.3	9.8E+00	3.2E+01	6.6E+01
Residential, < ¼ acre lots	266.3	39.0	0.9	2.9	6.2	2.4E+02	7.8E+02	1.6E+03
Residential, ¼ to ½ acre lots	57.0	8.3	0.9	2.8	6.1	4.8E+01	1.6E+02	3.4E+02
Residential, > ½ acre lots	4.0	0.6	0.8	2.8	6.0	3.3E+00	1.1E+01	2.4E+01
Salt marsh	0.6	0.1	0.0	1.3	10.8	0.0E+00	7.4E-01	6.2E+00
Commercial	88.7	13.0	0.9	1.4	3.2	8.0E+01	1.2E+02	2.8E+02
Industrial	43.7	6.4	0.9	1.4	3.2	3.9E+01	6.1E+01	1.4E+02
Urban open	50.1	7.3	0.3	0.5	1.1	1.5E+01	2.5E+01	5.5E+01
Transportation	19.8	2.9	0.9	1.4	3.2	1.8E+01	2.8E+01	6.3E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	8.5	1.2	0.0	2.5	10.8	0.0E+00	2.1E+01	9.2E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	682.9	100.0				1.7E+03	2.6E+03	4.4E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	31.9	3.7	5.7	12.6	1.2E+02	1.8E+02	4.0E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.8E+03	2.8E+03	4.8E+03

Table B-39. Nitrogen loading analysis for the North River (North Shore) 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	5.1E+02	8.6E+02	1.6E+03	5.1E+02	8.5E+02	1.6E+03
Watershed total	5.1E+02	8.6E+02	1.6E+03	5.1E+02	8.5E+02	1.6E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	2.0	1.0	5.8	8.3	11.3	1.2E+01	1.7E+01	2.3E+01
Forest	2.9	1.5	0.3	0.5	1.1	8.8E-01	1.5E+00	3.2E+00
Non-forested wetland	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	0.0	0.0	0.3	0.5	1.1	9.6E-03	1.6E-02	3.5E-02
Participatory recreation	0.7	0.4	17.9	19.3	22.2	1.3E+01	1.4E+01	1.6E+01
Spectator recreation	11.7	5.9	17.9	19.3	22.2	2.1E+02	2.2E+02	2.6E+02
Water-based recreation	0.0	0.0	3.7	5.7	12.6	0.0E+00	0.0E+00	0.0E+00
Residential, multi-family	0.0	0.0	0.8	2.7	5.9	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	112.9	57.1	0.8	2.7	5.9	9.0E+01	3.0E+02	6.7E+02
Residential, ¼ to ½ acre lots	0.0	0.0	0.8	2.7	5.9	0.0E+00	0.0E+00	0.0E+00
Residential, > ½ acre lots	1.6	0.8	0.8	2.7	5.9	1.3E+00	4.3E+00	9.5E+00
Salt marsh	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Commercial	11.3	5.7	0.9	1.4	3.2	1.0E+01	1.6E+01	3.6E+01
Industrial	16.5	8.4	0.9	1.4	3.2	1.5E+01	2.3E+01	5.3E+01
Urban open	14.5	7.3	0.3	0.5	1.1	4.4E+00	7.3E+00	1.6E+01
Transportation	20.7	10.5	0.9	1.4	3.2	1.9E+01	2.9E+01	6.6E+01
Waste disposal	0.9	0.5	0.9	1.4	3.2	8.3E-01	1.3E+00	3.0E+00
Open water	2.0	1.0	0.0	2.5	10.8	0.0E+00	5.0E+00	2.2E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	197.8	100.0				3.7E+02	6.5E+02	1.2E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	37.0	3.7	5.7	12.6	1.4E+02	2.1E+02	4.7E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					5.1E+02	8.6E+02	1.6E+03

Table B-40. Nitrogen loading analysis for the North River (North Shore) Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	4.3E+03	8.2E+03	1.6E+04	4.4E+03	8.8E+03	1.7E+04
Watershed total	4.3E+03	8.2E+03	1.6E+04	4.4E+03	8.8E+03	1.7E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	6.5	0.2	11.2	16.0	21.3	7.3E+01	1.0E+02	1.4E+02
Pasture	6.9	0.2	5.8	8.3	11.3	4.0E+01	5.7E+01	7.8E+01
Forest	731.7	23.4	0.3	0.5	1.1	2.2E+02	3.7E+02	8.0E+02
Non-forested wetland	98.0	3.1	0.0	1.3	10.8	0.0E+00	1.3E+02	1.1E+03
Mining	45.6	1.5	0.9	1.4	3.2	4.1E+01	6.4E+01	1.5E+02
Open land	192.9	6.2	0.3	0.5	1.1	5.8E+01	9.6E+01	2.1E+02
Participatory recreation	50.9	1.6	17.9	19.3	22.2	9.1E+02	9.8E+02	1.1E+03
Spectator recreation	49.8	1.6	17.9	19.3	22.2	8.9E+02	9.6E+02	1.1E+03
Water-based recreation	0.6	0.0	3.7	5.7	12.6	2.3E+00	3.6E+00	8.0E+00
Residential, multi-family	56.0	1.8	1.3	4.1	7.4	7.3E+01	2.3E+02	4.2E+02
Residential, < ¼ acre lots	579.9	18.6	1.2	3.7	7.0	6.8E+02	2.1E+03	4.1E+03
Residential, ¼ to ½ acre lots	471.8	15.1	1.0	3.2	6.5	4.7E+02	1.5E+03	3.1E+03
Residential, > ½ acre lots	43.2	1.4	0.9	3.0	6.2	3.9E+01	1.3E+02	2.7E+02
Salt marsh	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Commercial	226.6	7.3	0.9	1.4	3.2	2.0E+02	3.2E+02	7.3E+02
Industrial	165.8	5.3	0.9	1.4	3.2	1.5E+02	2.3E+02	5.3E+02
Urban open	130.3	4.2	0.3	0.5	1.1	3.9E+01	6.5E+01	1.4E+02
Transportation	188.3	6.0	0.9	1.4	3.2	1.7E+02	2.6E+02	6.0E+02
Waste disposal	3.1	0.1	0.9	1.4	3.2	2.8E+00	4.4E+00	1.0E+01
Open water	63.0	2.0	0.0	2.5	10.8	0.0E+00	1.6E+02	6.8E+02
Woody perennial	9.9	0.3	5.4	14.8	21.0	5.4E+01	1.5E+02	2.1E+02
Land use total	3121.0	100.0				4.1E+03	8.0E+03	1.5E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	37.0	3.7	5.7	12.6	1.4E+02	2.1E+02	4.7E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					4.3E+03	8.2E+03	1.6E+04

Table B-41. Nitrogen loading analysis for the Danvers River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	3.6E+03	6.1E+03	1.2E+04	3.4E+03	6.0E+03	1.1E+04
Watershed total	3.6E+03	6.1E+03	1.2E+04	3.4E+03	6.0E+03	1.1E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	26.8	1.8	11.2	16.0	21.3	3.0E+02	4.3E+02	5.7E+02
Pasture	28.3	1.9	5.8	8.3	11.3	1.6E+02	2.3E+02	3.2E+02
Forest	102.4	6.9	0.3	0.5	1.1	3.1E+01	5.1E+01	1.1E+02
Non-forested wetland	15.4	1.0	0.0	1.3	10.8	0.0E+00	2.0E+01	1.7E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	112.5	7.5	0.3	0.5	1.1	3.4E+01	5.6E+01	1.2E+02
Participatory recreation	60.1	4.0	17.9	19.3	22.2	1.1E+03	1.2E+03	1.3E+03
Spectator recreation	14.9	1.0	17.9	19.3	22.2	2.7E+02	2.9E+02	3.3E+02
Water-based recreation	14.9	1.0	3.7	5.7	12.6	5.5E+01	8.5E+01	1.9E+02
Residential, multi-family	16.9	1.1	1.1	3.4	6.7	1.8E+01	5.7E+01	1.1E+02
Residential, < ¼ acre lots	211.0	14.2	1.0	3.2	6.5	2.1E+02	6.8E+02	1.4E+03
Residential, ¼ to ½ acre lots	437.2	29.3	0.9	3.0	6.2	3.9E+02	1.3E+03	2.7E+03
Residential, > ½ acre lots	48.5	3.3	0.9	2.8	6.1	4.1E+01	1.4E+02	2.9E+02
Salt marsh	30.0	2.0	0.0	1.3	10.8	0.0E+00	3.9E+01	3.2E+02
Commercial	159.5	10.7	0.9	1.4	3.2	1.4E+02	2.2E+02	5.1E+02
Industrial	40.5	2.7	0.9	1.4	3.2	3.6E+01	5.7E+01	1.3E+02
Urban open	96.6	6.5	0.3	0.5	1.1	2.9E+01	4.8E+01	1.1E+02
Transportation	56.3	3.8	0.9	1.4	3.2	5.1E+01	7.9E+01	1.8E+02
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	17.8	1.2	0.0	2.5	10.8	0.0E+00	4.5E+01	1.9E+02
Woody perennial	1.0	0.1	5.4	14.8	21.0	5.3E+00	1.5E+01	2.1E+01
Land use total	1490.6	100.0				2.9E+03	5.0E+03	9.1E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	197.8	3.7	5.7	12.6	7.3E+02	1.1E+03	2.5E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					3.6E+03	6.1E+03	1.2E+04

Table B-42. Nitrogen loading analysis for the Danvers River Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	7.3E+03	1.4E+04	2.5E+04	6.6E+03	1.3E+04	2.5E+04
Watershed total	7.3E+03	1.4E+04	2.5E+04	6.6E+03	1.3E+04	2.5E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	129.1	3.4	11.2	16.0	21.3	1.4E+03	2.1E+03	2.8E+03
Pasture	45.5	1.2	5.8	8.3	11.3	2.6E+02	3.8E+02	5.1E+02
Forest	557.7	14.6	0.3	0.5	1.1	1.7E+02	2.8E+02	6.1E+02
Non-forested wetland	82.8	2.2	0.0	1.3	10.8	0.0E+00	1.1E+02	8.9E+02
Mining	33.3	0.9	0.9	1.4	3.2	3.0E+01	4.7E+01	1.1E+02
Open land	250.4	6.5	0.3	0.5	1.1	7.5E+01	1.3E+02	2.8E+02
Participatory recreation	68.0	1.8	17.9	19.3	22.2	1.2E+03	1.3E+03	1.5E+03
Spectator recreation	34.7	0.9	17.9	19.3	22.2	6.2E+02	6.7E+02	7.7E+02
Water-based recreation	19.0	0.5	3.7	5.7	12.6	7.0E+01	1.1E+02	2.4E+02
Residential, multi-family	70.5	1.8	1.4	4.2	7.6	9.6E+01	3.0E+02	5.4E+02
Residential, < ¼ acre lots	302.6	7.9	1.2	3.8	7.2	3.7E+02	1.2E+03	2.2E+03
Residential, ¼ to ½ acre lots	1011.8	26.4	1.0	3.3	6.6	1.0E+03	3.3E+03	6.7E+03
Residential, > ½ acre lots	257.3	6.7	0.9	3.0	6.2	2.4E+02	7.7E+02	1.6E+03
Salt marsh	30.0	0.8	0.0	1.3	10.8	0.0E+00	3.9E+01	3.2E+02
Commercial	294.7	7.7	0.9	1.4	3.2	2.7E+02	4.1E+02	9.4E+02
Industrial	156.3	4.1	0.9	1.4	3.2	1.4E+02	2.2E+02	5.0E+02
Urban open	179.9	4.7	0.3	0.5	1.1	5.4E+01	9.0E+01	2.0E+02
Transportation	246.1	6.4	0.9	1.4	3.2	2.2E+02	3.4E+02	7.9E+02
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	19.1	0.5	0.0	2.5	10.8	0.0E+00	4.8E+01	2.1E+02
Woody perennial	40.1	1.0	5.4	14.8	21.0	2.2E+02	5.9E+02	8.4E+02
Land use total	3828.9	100.0				6.5E+03	1.2E+04	2.2E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	197.8	3.7	5.7	12.6	7.3E+02	1.1E+03	2.5E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					7.3E+03	1.4E+04	2.5E+04

Table B-43. Nitrogen loading analysis for the Beverly Harbor 1000 m Boundary Delineation
Includes Bass River, North River and Danvers River

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	6.7E+03	1.1E+04	2.1E+04	6.5E+03	1.1E+04	2.1E+04
Watershed total	6.7E+03	1.1E+04	2.1E+04	6.5E+03	1.1E+04	2.1E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	28.0	1.2	11.2	16.0	21.3	3.1E+02	4.5E+02	6.0E+02
Pasture	30.3	1.3	5.8	8.3	11.3	1.8E+02	2.5E+02	3.4E+02
Forest	141.5	6.0	0.3	0.5	1.1	4.2E+01	7.1E+01	1.6E+02
Non-forested wetland	15.4	0.6	0.0	1.3	10.8	0.0E+00	2.0E+01	1.7E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	126.2	5.3	0.3	0.5	1.1	3.8E+01	6.3E+01	1.4E+02
Participatory recreation	86.5	3.6	17.9	19.3	22.2	1.5E+03	1.7E+03	1.9E+03
Spectator recreation	63.0	2.6	17.9	19.3	22.2	1.1E+03	1.2E+03	1.4E+03
Water-based recreation	24.2	1.0	3.7	5.7	12.6	9.0E+01	1.4E+02	3.1E+02
Residential, multi-family	23.3	1.0	0.9	3.0	6.3	2.1E+01	7.0E+01	1.5E+02
Residential, < ¼ acre lots	621.1	26.1	0.9	2.9	6.2	5.5E+02	1.8E+03	3.8E+03
Residential, ¼ to ½ acre lots	513.8	21.6	0.8	2.8	6.0	4.4E+02	1.5E+03	3.1E+03
Residential, > ½ acre lots	66.5	2.8	0.8	2.8	6.0	5.5E+01	1.8E+02	4.0E+02
Salt marsh	30.6	1.3	0.0	1.3	10.8	0.0E+00	4.0E+01	3.3E+02
Commercial	241.0	10.1	0.9	1.4	3.2	2.2E+02	3.4E+02	7.7E+02
Industrial	92.6	3.9	0.9	1.4	3.2	8.3E+01	1.3E+02	3.0E+02
Urban open	152.5	6.4	0.3	0.5	1.1	4.6E+01	7.6E+01	1.7E+02
Transportation	89.9	3.8	0.9	1.4	3.2	8.1E+01	1.3E+02	2.9E+02
Waste disposal	1.6	0.1	0.9	1.4	3.2	1.5E+00	2.3E+00	5.2E+00
Open water	28.4	1.2	0.0	2.5	10.8	0.0E+00	7.1E+01	3.1E+02
Woody perennial	1.5	0.1	5.4	14.8	21.0	8.2E+00	2.2E+01	3.2E+01
Land use total	2378.0	100.0				4.8E+03	8.2E+03	1.5E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	504.6	3.7	5.7	12.6	1.9E+03	2.9E+03	6.4E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					6.7E+03	1.1E+04	2.1E+04

Table B-44. Nitrogen loading analysis for the Beverly Harbor Watershed Delineation
Includes Bass River, North River and Danvers River

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.5E+04	2.8E+04	5.2E+04	1.5E+04	2.8E+04	5.3E+04
Watershed total	1.5E+04	2.8E+04	5.2E+04	1.5E+04	2.8E+04	5.3E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	136.8	1.7	11.2	16.0	21.3	1.5E+03	2.2E+03	2.9E+03
Pasture	64.6	0.8	5.8	8.3	11.3	3.7E+02	5.4E+02	7.3E+02
Forest	1452.7	17.6	0.3	0.5	1.1	4.4E+02	7.3E+02	1.6E+03
Non-forested wetland	182.6	2.2	0.0	1.3	10.8	0.0E+00	2.4E+02	2.0E+03
Mining	78.9	1.0	0.9	1.4	3.2	7.1E+01	1.1E+02	2.5E+02
Open land	480.9	5.8	0.3	0.5	1.1	1.4E+02	2.4E+02	5.3E+02
Participatory recreation	172.6	2.1	17.9	19.3	22.2	3.1E+03	3.3E+03	3.8E+03
Spectator recreation	131.6	1.6	17.9	19.3	22.2	2.4E+03	2.5E+03	2.9E+03
Water-based recreation	28.9	0.4	3.7	5.7	12.6	1.1E+02	1.6E+02	3.6E+02
Residential, multi-family	154.9	1.9	1.2	3.9	7.2	1.9E+02	6.0E+02	1.1E+03
Residential, < ¼ acre lots	1368.0	16.6	1.1	3.6	6.9	1.5E+03	4.9E+03	9.4E+03
Residential, ¼ to ½ acre lots	1609.7	19.6	1.0	3.2	6.4	1.6E+03	5.1E+03	1.0E+04
Residential, > ½ acre lots	329.1	4.0	0.9	2.9	6.2	2.9E+02	9.7E+02	2.0E+03
Salt marsh	30.6	0.4	0.0	1.3	10.8	0.0E+00	4.0E+01	3.3E+02
Commercial	635.8	7.7	0.9	1.4	3.2	5.7E+02	8.9E+02	2.0E+03
Industrial	366.1	4.4	0.9	1.4	3.2	3.3E+02	5.1E+02	1.2E+03
Urban open	399.7	4.9	0.3	0.5	1.1	1.2E+02	2.0E+02	4.4E+02
Transportation	463.0	5.6	0.9	1.4	3.2	4.2E+02	6.5E+02	1.5E+03
Waste disposal	3.9	0.0	0.9	1.4	3.2	3.5E+00	5.4E+00	1.2E+01
Open water	92.3	1.1	0.0	2.5	10.8	0.0E+00	2.3E+02	1.0E+03
Woody perennial	50.5	0.6	5.4	14.8	21.0	2.7E+02	7.5E+02	1.1E+03
Land use total	8233.4	100.0				1.3E+04	2.5E+04	4.6E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	504.6	3.7	5.7	12.6	1.9E+03	2.9E+03	6.4E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.5E+04	2.8E+04	5.2E+04

Table B-45. Nitrogen loading analysis for the Manchester Harbor 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	4.8E+03	1.1E+04	2.8E+04	4.8E+03	1.1E+04	2.8E+04
Non-point sources	1.0E+03	2.3E+03	4.1E+03	1.1E+03	2.7E+03	4.8E+03
Watershed total	5.9E+03	1.3E+04	3.2E+04	6.0E+03	1.3E+04	3.3E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Manchester WWTP	4.8E+03	1.1E+04	2.8E+04
Point source total	4.8E+03	1.1E+04	2.8E+04

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.7	0.1	11.2	16.0	21.3	7.3E+00	1.0E+01	1.4E+01
Pasture	6.1	1.2	5.8	8.3	11.3	3.5E+01	5.1E+01	6.9E+01
Forest	208.3	40.4	0.3	0.5	1.1	6.2E+01	1.0E+02	2.3E+02
Non-forested wetland	8.4	1.6	0.0	1.3	10.8	0.0E+00	1.1E+01	9.1E+01
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	4.6	0.9	0.3	0.5	1.1	1.4E+00	2.3E+00	5.1E+00
Participatory recreation	0.7	0.1	17.9	19.3	22.2	1.3E+01	1.4E+01	1.6E+01
Spectator recreation	4.3	0.8	17.9	19.3	22.2	7.6E+01	8.2E+01	9.4E+01
Water-based recreation	6.3	1.2	3.7	5.7	12.6	2.3E+01	3.6E+01	7.9E+01
Residential, multi-family	0.0	0.0	3.6	10.2	14.4	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	72.9	14.1	2.9	8.3	12.2	2.1E+02	6.0E+02	8.9E+02
Residential, ¼ to ½ acre lots	59.8	11.6	1.9	5.7	9.3	1.2E+02	3.4E+02	5.6E+02
Residential, > ½ acre lots	116.8	22.6	1.4	4.2	7.6	1.6E+02	4.9E+02	8.9E+02
Salt marsh	2.4	0.5	0.0	1.3	10.8	0.0E+00	3.2E+00	2.6E+01
Commercial	4.2	0.8	0.9	1.4	3.2	3.8E+00	5.9E+00	1.4E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	13.9	2.7	0.3	0.5	1.1	4.2E+00	6.9E+00	1.5E+01
Transportation	1.8	0.4	0.9	1.4	3.2	1.7E+00	2.6E+00	5.9E+00
Waste disposal	0.6	0.1	0.9	1.4	3.2	5.6E-01	8.7E-01	2.0E+00
Open water	4.2	0.8	0.0	2.5	10.8	0.0E+00	1.0E+01	4.5E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	516.0	100.0				7.2E+02	1.8E+03	3.0E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	83.6	3.7	5.7	12.6	3.1E+02	4.8E+02	1.1E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.0E+03	2.3E+03	4.1E+03

Table B-46. Nitrogen loading analysis for the Manchester Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	4.8E+03	1.1E+04	2.8E+04	4.8E+03	1.1E+04	2.8E+04
Non-point sources	2.3E+03	4.4E+03	7.6E+03	3.0E+03	6.6E+03	1.1E+04
Watershed total	7.2E+03	1.5E+04	3.6E+04	7.9E+03	1.7E+04	3.9E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Manchester WWTP	4.8E+03	1.1E+04	2.8E+04
Point source total	4.8E+03	1.1E+04	2.8E+04

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	2.4	0.1	11.2	16.0	21.3	2.7E+01	3.8E+01	5.1E+01
Pasture	6.1	0.4	5.8	8.3	11.3	3.5E+01	5.1E+01	6.9E+01
Forest	1089.5	66.6	0.3	0.5	1.1	3.3E+02	5.4E+02	1.2E+03
Non-forested wetland	24.6	1.5	0.0	1.3	10.8	0.0E+00	3.2E+01	2.7E+02
Mining	14.7	0.9	0.9	1.4	3.2	1.3E+01	2.1E+01	4.7E+01
Open land	10.7	0.7	0.3	0.5	1.1	3.2E+00	5.3E+00	1.2E+01
Participatory recreation	37.2	2.3	17.9	19.3	22.2	6.7E+02	7.2E+02	8.3E+02
Spectator recreation	5.9	0.4	17.9	19.3	22.2	1.1E+02	1.1E+02	1.3E+02
Water-based recreation	6.3	0.4	3.7	5.7	12.6	2.3E+01	3.6E+01	7.9E+01
Residential, multi-family	0.0	0.0	4.3	12.1	16.4	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	86.2	5.3	3.4	9.6	13.7	2.9E+02	8.3E+02	1.2E+03
Residential, ¼ to ½ acre lots	107.0	6.5	2.2	6.5	10.1	2.4E+02	6.9E+02	1.1E+03
Residential, > ½ acre lots	161.8	9.9	1.5	4.6	8.0	2.4E+02	7.4E+02	1.3E+03
Salt marsh	2.4	0.1	0.0	1.3	10.8	0.0E+00	3.2E+00	2.6E+01
Commercial	5.3	0.3	0.9	1.4	3.2	4.8E+00	7.5E+00	1.7E+01
Industrial	2.3	0.1	0.9	1.4	3.2	2.1E+00	3.2E+00	7.3E+00
Urban open	24.5	1.5	0.3	0.5	1.1	7.4E+00	1.2E+01	2.7E+01
Transportation	41.8	2.6	0.9	1.4	3.2	3.8E+01	5.9E+01	1.3E+02
Waste disposal	0.6	0.0	0.9	1.4	3.2	5.6E-01	8.7E-01	2.0E+00
Open water	5.5	0.3	0.0	2.5	10.8	0.0E+00	1.4E+01	5.9E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	1634.9	100.0				2.0E+03	3.9E+03	6.5E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	84.8	3.7	5.7	12.6	3.1E+02	4.8E+02	1.1E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					2.3E+03	4.4E+03	7.6E+03

Table B-47. Nitrogen loading analysis for the Marblehead Harbor 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	7.3E+02	1.3E+03	2.7E+03	7.3E+02	1.3E+03	2.7E+03
Watershed total	7.3E+02	1.3E+03	2.7E+03	7.3E+02	1.3E+03	2.7E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	13.6	9.1	0.3	0.5	1.1	4.1E+00	6.8E+00	1.5E+01
Non-forested wetland	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	0.0	0.0	0.3	0.5	1.1	0.0E+00	0.0E+00	0.0E+00
Participatory recreation	0.6	0.4	17.9	19.3	22.2	1.1E+01	1.2E+01	1.4E+01
Spectator recreation	3.2	2.1	17.9	19.3	22.2	5.7E+01	6.2E+01	7.1E+01
Water-based recreation	8.1	5.4	3.7	5.7	12.6	3.0E+01	4.6E+01	1.0E+02
Residential, multi-family	0.4	0.3	0.8	2.7	5.9	3.1E-01	1.0E+00	2.3E+00
Residential, < ¼ acre lots	56.9	38.0	0.8	2.7	5.9	4.6E+01	1.5E+02	3.4E+02
Residential, ¼ to ½ acre lots	29.9	20.0	0.8	2.7	5.9	2.4E+01	8.1E+01	1.8E+02
Residential, > ½ acre lots	19.8	13.2	0.8	2.7	5.9	1.6E+01	5.3E+01	1.2E+02
Salt marsh	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Commercial	14.3	9.5	0.9	1.4	3.2	1.3E+01	2.0E+01	4.6E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	2.8	1.9	0.3	0.5	1.1	8.5E-01	1.4E+00	3.1E+00
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	0.0	0.0	0.0	2.5	10.8	0.0E+00	0.0E+00	0.0E+00
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	149.6	100.0				2.0E+02	4.4E+02	8.8E+02

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	143.1	3.7	5.7	12.6	5.3E+02	8.2E+02	1.8E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					7.3E+02	1.3E+03	2.7E+03

Table B-48. Nitrogen loading analysis for the Marblehead Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	7.3E+02	1.3E+03	2.7E+03	7.3E+02	1.3E+03	2.7E+03
Watershed total	7.3E+02	1.3E+03	2.7E+03	7.3E+02	1.3E+03	2.7E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	13.6	9.1	0.3	0.5	1.1	4.1E+00	6.8E+00	1.5E+01
Non-forested wetland	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	0.0	0.0	0.3	0.5	1.1	0.0E+00	0.0E+00	0.0E+00
Participatory recreation	0.6	0.4	17.9	19.3	22.2	1.1E+01	1.2E+01	1.4E+01
Spectator recreation	3.2	2.1	17.9	19.3	22.2	5.7E+01	6.2E+01	7.1E+01
Water-based recreation	8.1	5.4	3.7	5.7	12.6	3.0E+01	4.6E+01	1.0E+02
Residential, multi-family	0.4	0.3	0.8	2.7	5.9	3.1E-01	1.0E+00	2.3E+00
Residential, < ¼ acre lots	56.9	38.0	0.8	2.7	5.9	4.6E+01	1.5E+02	3.4E+02
Residential, ¼ to ½ acre lots	29.9	20.0	0.8	2.7	5.9	2.4E+01	8.1E+01	1.8E+02
Residential, > ½ acre lots	19.8	13.2	0.8	2.7	5.9	1.6E+01	5.3E+01	1.2E+02
Salt marsh	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Commercial	14.3	9.5	0.9	1.4	3.2	1.3E+01	2.0E+01	4.6E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	2.8	1.9	0.3	0.5	1.1	8.5E-01	1.4E+00	3.1E+00
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	0.0	0.0	0.0	2.5	10.8	0.0E+00	0.0E+00	0.0E+00
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	149.6	100.0				2.0E+02	4.4E+02	8.8E+02

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	143.1	3.7	5.7	12.6	5.3E+02	8.2E+02	1.8E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					7.3E+02	1.3E+03	2.7E+03

Table B-49. Nitrogen loading analysis for the Nahant Bay 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	5.5E+03	9.0E+03	2.0E+04	5.5E+03	9.0E+03	2.0E+04
Watershed total	5.5E+03	9.0E+03	2.0E+04	5.5E+03	9.0E+03	2.0E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	21.7	4.3	0.3	0.5	1.1	6.5E+00	1.1E+01	2.4E+01
Non-forested wetland	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	2.5	0.5	0.3	0.5	1.1	7.4E-01	1.2E+00	2.7E+00
Participatory recreation	0.9	0.2	17.9	19.3	22.2	1.6E+01	1.7E+01	1.9E+01
Spectator recreation	11.1	2.2	17.9	19.3	22.2	2.0E+02	2.1E+02	2.5E+02
Water-based recreation	26.3	5.2	3.7	5.7	12.6	9.7E+01	1.5E+02	3.3E+02
Residential, multi-family	88.4	17.6	0.8	2.7	5.9	7.1E+01	2.4E+02	5.2E+02
Residential, < ¼ acre lots	172.6	34.4	0.8	2.7	5.9	1.4E+02	4.7E+02	1.0E+03
Residential, ¼ to ½ acre lots	104.0	20.7	0.8	2.7	5.9	8.3E+01	2.8E+02	6.1E+02
Residential, > ½ acre lots	22.5	4.5	0.8	2.7	5.9	1.8E+01	6.1E+01	1.3E+02
Salt marsh	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Commercial	18.8	3.7	0.9	1.4	3.2	1.7E+01	2.6E+01	6.0E+01
Industrial	4.3	0.9	0.9	1.4	3.2	3.9E+00	6.1E+00	1.4E+01
Urban open	18.8	3.7	0.3	0.5	1.1	5.6E+00	9.4E+00	2.1E+01
Transportation	9.9	2.0	0.9	1.4	3.2	8.9E+00	1.4E+01	3.2E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	0.4	0.1	0.0	2.5	10.8	0.0E+00	9.4E-01	4.1E+00
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	502.2	100.0				6.6E+02	1.5E+03	3.0E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	1314.6	3.7	5.7	12.6	4.9E+03	7.5E+03	1.7E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					5.5E+03	9.0E+03	2.0E+04

Table B-50. Nitrogen loading analysis for the Nahant Bay Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	5.9E+03	9.9E+03	2.2E+04	6.0E+03	1.0E+04	2.2E+04
Watershed total	5.9E+03	9.9E+03	2.2E+04	6.0E+03	1.0E+04	2.2E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	144.1	15.7	0.3	0.5	1.1	4.3E+01	7.2E+01	1.6E+02
Non-forested wetland	7.5	0.8	0.0	1.3	10.8	0.0E+00	9.7E+00	8.1E+01
Mining	16.4	1.8	0.9	1.4	3.2	1.5E+01	2.3E+01	5.2E+01
Open land	9.2	1.0	0.3	0.5	1.1	2.7E+00	4.6E+00	1.0E+01
Participatory recreation	4.7	0.5	17.9	19.3	22.2	8.4E+01	9.1E+01	1.0E+02
Spectator recreation	15.2	1.7	17.9	19.3	22.2	2.7E+02	2.9E+02	3.4E+02
Water-based recreation	26.3	2.9	3.7	5.7	12.6	9.7E+01	1.5E+02	3.3E+02
Residential, multi-family	93.6	10.2	0.8	2.7	5.9	7.6E+01	2.6E+02	5.6E+02
Residential, < ¼ acre lots	333.9	36.3	0.8	2.7	5.9	2.7E+02	9.1E+02	2.0E+03
Residential, ¼ to ½ acre lots	144.6	15.7	0.8	2.7	5.9	1.2E+02	3.9E+02	8.6E+02
Residential, > ½ acre lots	44.3	4.8	0.8	2.7	5.9	3.6E+01	1.2E+02	2.6E+02
Salt marsh	0.0	0.0	0.0	1.3	10.8	0.0E+00	0.0E+00	0.0E+00
Commercial	25.0	2.7	0.9	1.4	3.2	2.2E+01	3.5E+01	8.0E+01
Industrial	5.4	0.6	0.9	1.4	3.2	4.9E+00	7.6E+00	1.7E+01
Urban open	28.9	3.1	0.3	0.5	1.1	8.7E+00	1.4E+01	3.2E+01
Transportation	10.1	1.1	0.9	1.4	3.2	9.1E+00	1.4E+01	3.2E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	3.4E-02	5.3E-02	1.2E-01
Open water	10.6	1.2	0.0	2.5	10.8	0.0E+00	2.7E+01	1.1E+02
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	920.0	100.0				1.1E+03	2.4E+03	5.0E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	1314.1	3.7	5.7	12.6	4.9E+03	7.5E+03	1.7E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					5.9E+03	9.9E+03	2.2E+04

Table B-51. Nitrogen loading analysis for the Lynn Harbor 1000 m Boundary Delineation
Includes Saugus River and Pines River

➢ Summary

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	4.9E+05	6.7E+05	1.5E+06	4.9E+05	6.7E+05	1.5E+06
Non-point sources	4.5E+03	8.7E+03	2.2E+04	4.5E+03	8.9E+03	2.2E+04
Watershed total	4.9E+05	6.8E+05	1.5E+06	4.9E+05	6.8E+05	1.5E+06

➢ Point sources

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Lynn Regional WPCF - 001A	4.1E+05	5.7E+05	1.2E+06
Lynn Regional WPCF - 001B	7.4E+04	1.0E+05	3.5E+05
Point source total	4.9E+05	6.7E+05	1.5E+06

➢ Non-point sources

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	137.8	5.6	0.3	0.5	1.1	4.1E+01	6.9E+01	1.5E+02
Non-forested wetland	49.6	2.0	0.0	1.3	10.8	0.0E+00	6.4E+01	5.4E+02
Mining	19.1	0.8	0.9	1.4	3.2	1.7E+01	2.7E+01	6.1E+01
Open land	38.0	1.5	0.3	0.5	1.1	1.1E+01	1.9E+01	4.2E+01
Participatory recreation	3.0	0.1	17.9	19.3	22.2	5.4E+01	5.9E+01	6.8E+01
Spectator recreation	59.2	2.4	17.9	19.3	22.2	1.1E+03	1.1E+03	1.3E+03
Water-based recreation	11.7	0.5	3.7	5.7	12.6	4.3E+01	6.7E+01	1.5E+02
Residential, multi-family	134.0	5.5	1.0	3.3	6.5	1.4E+02	4.4E+02	8.8E+02
Residential, < ¼ acre lots	726.2	29.6	1.0	3.1	6.4	7.0E+02	2.3E+03	4.6E+03
Residential, ¼ to ½ acre lots	57.3	2.3	0.9	2.9	6.2	5.1E+01	1.7E+02	3.5E+02
Residential, > ½ acre lots	21.5	0.9	0.8	2.8	6.0	1.8E+01	6.1E+01	1.3E+02
Salt marsh	466.4	19.0	0.0	1.3	10.8	0.0E+00	6.1E+02	5.0E+03
Commercial	204.1	8.3	0.9	1.4	3.2	1.8E+02	2.9E+02	6.5E+02
Industrial	177.7	7.2	0.9	1.4	3.2	1.6E+02	2.5E+02	5.7E+02
Urban open	85.4	3.5	0.3	0.5	1.1	2.6E+01	4.3E+01	9.4E+01
Transportation	130.4	5.3	0.9	1.4	3.2	1.2E+02	1.8E+02	4.2E+02
Waste disposal	96.1	3.9	0.9	1.4	3.2	8.7E+01	1.3E+02	3.1E+02
Open water	39.0	1.6	0.0	2.5	10.8	0.0E+00	9.8E+01	4.2E+02
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	2456.4	100.0				2.7E+03	6.0E+03	1.6E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	482.9	3.7	5.7	12.6	1.8E+03	2.8E+03	6.1E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					4.5E+03	8.7E+03	2.2E+04

Table B-52. Nitrogen loading analysis for the Lynn Harbor Watershed Delineation
Includes Saugus River and Pines River

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	4.9E+05	6.7E+05	1.5E+06	4.9E+05	6.7E+05	1.5E+06
Non-point sources	9.1E+03	1.8E+04	3.9E+04	9.3E+03	1.8E+04	4.0E+04
Watershed total	5.0E+05	6.9E+05	1.6E+06	5.0E+05	6.9E+05	1.6E+06

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Lynn Regional WPCF - 001A	4.1E+05	5.7E+05	1.2E+06
Lynn Regional WPCF - 001B	7.4E+04	1.0E+05	3.5E+05
Point source total	4.9E+05	6.7E+05	1.5E+06

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	7.5	0.1	11.2	16.0	21.3	8.4E+01	1.2E+02	1.6E+02
Pasture	2.8	0.1	5.8	8.3	11.3	1.6E+01	2.3E+01	3.2E+01
Forest	773.1	13.8	0.3	0.5	1.1	2.3E+02	3.9E+02	8.5E+02
Non-forested wetland	78.3	1.4	0.0	1.3	10.8	0.0E+00	1.0E+02	8.5E+02
Mining	48.8	0.9	0.9	1.4	3.2	4.4E+01	6.8E+01	1.6E+02
Open land	98.3	1.7	0.3	0.5	1.1	2.9E+01	4.9E+01	1.1E+02
Participatory recreation	84.6	1.5	17.9	19.3	22.2	1.5E+03	1.6E+03	1.9E+03
Spectator recreation	108.6	1.9	17.9	19.3	22.2	1.9E+03	2.1E+03	2.4E+03
Water-based recreation	11.7	0.2	3.7	5.7	12.6	4.3E+01	6.7E+01	1.5E+02
Residential, multi-family	380.4	6.8	1.0	3.2	6.5	3.8E+02	1.2E+03	2.5E+03
Residential, < ¼ acre lots	1761.7	31.4	0.9	3.1	6.3	1.7E+03	5.4E+03	1.1E+04
Residential, ¼ to ½ acre lots	398.5	7.1	0.9	2.9	6.1	3.5E+02	1.2E+03	2.4E+03
Residential, > ½ acre lots	133.5	2.4	0.8	2.8	6.0	1.1E+02	3.7E+02	8.0E+02
Salt marsh	466.4	8.3	0.0	1.3	10.8	0.0E+00	6.1E+02	5.0E+03
Commercial	409.7	7.3	0.9	1.4	3.2	3.7E+02	5.7E+02	1.3E+03
Industrial	202.8	3.6	0.9	1.4	3.2	1.8E+02	2.8E+02	6.5E+02
Urban open	298.8	5.3	0.3	0.5	1.1	9.0E+01	1.5E+02	3.3E+02
Transportation	175.8	3.1	0.9	1.4	3.2	1.6E+02	2.5E+02	5.6E+02
Waste disposal	107.5	1.9	0.9	1.4	3.2	9.7E+01	1.5E+02	3.4E+02
Open water	68.3	1.2	0.0	2.5	10.8	0.0E+00	1.7E+02	7.4E+02
Woody perennial	0.6	0.0	5.4	14.8	21.0	3.3E+00	8.9E+00	1.3E+01
Land use total	5617.6	100.0				7.3E+03	1.5E+04	3.2E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	483.1	3.7	5.7	12.6	1.8E+03	2.8E+03	6.1E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					9.1E+03	1.8E+04	3.9E+04

Table B-53. Nitrogen loading analysis for the Saugus River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.5E+03	3.1E+03	7.0E+03	1.5E+03	3.2E+03	7.2E+03
Watershed total	1.5E+03	3.1E+03	7.0E+03	1.5E+03	3.2E+03	7.2E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	94.3	8.5	0.3	0.5	1.1	2.8E+01	4.7E+01	1.0E+02
Non-forested wetland	36.2	3.3	0.0	1.3	10.8	0.0E+00	4.7E+01	3.9E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	12.9	1.2	0.3	0.5	1.1	3.9E+00	6.5E+00	1.4E+01
Participatory recreation	2.6	0.2	17.9	19.3	22.2	4.6E+01	5.0E+01	5.7E+01
Spectator recreation	19.0	1.7	17.9	19.3	22.2	3.4E+02	3.7E+02	4.2E+02
Water-based recreation	3.4	0.3	3.7	5.7	12.6	1.2E+01	1.9E+01	4.3E+01
Residential, multi-family	88.9	8.0	1.0	3.1	6.4	8.5E+01	2.8E+02	5.7E+02
Residential, < ¼ acre lots	429.5	38.7	0.9	3.0	6.3	3.9E+02	1.3E+03	2.7E+03
Residential, ¼ to ½ acre lots	20.7	1.9	0.9	2.9	6.1	1.8E+01	5.9E+01	1.3E+02
Residential, > ½ acre lots	2.2	0.2	0.8	2.8	6.0	1.8E+00	6.2E+00	1.3E+01
Salt marsh	45.5	4.1	0.0	1.3	10.8	0.0E+00	5.9E+01	4.9E+02
Commercial	70.7	6.4	0.9	1.4	3.2	6.4E+01	9.9E+01	2.3E+02
Industrial	138.8	12.5	0.9	1.4	3.2	1.2E+02	1.9E+02	4.4E+02
Urban open	49.8	4.5	0.3	0.5	1.1	1.5E+01	2.5E+01	5.5E+01
Transportation	48.0	4.3	0.9	1.4	3.2	4.3E+01	6.7E+01	1.5E+02
Waste disposal	17.1	1.5	0.9	1.4	3.2	1.5E+01	2.4E+01	5.5E+01
Open water	29.7	2.7	0.0	2.5	10.8	0.0E+00	7.4E+01	3.2E+02
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	1109.4	100.0				1.2E+03	2.7E+03	6.2E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	69.7	3.7	5.7	12.6	2.6E+02	4.0E+02	8.8E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.5E+03	3.1E+03	7.0E+03

Table B-54. Nitrogen loading analysis for the Saugus River Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	4.1E+03	8.0E+03	1.6E+04	4.2E+03	8.6E+03	1.7E+04
Watershed total	4.1E+03	8.0E+03	1.6E+04	4.2E+03	8.6E+03	1.7E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	7.5	0.3	11.2	16.0	21.3	8.4E+01	1.2E+02	1.6E+02
Pasture	2.8	0.1	5.8	8.3	11.3	1.6E+01	2.3E+01	3.2E+01
Forest	581.4	20.8	0.3	0.5	1.1	1.7E+02	2.9E+02	6.4E+02
Non-forested wetland	61.6	2.2	0.0	1.3	10.8	0.0E+00	8.0E+01	6.7E+02
Mining	29.7	1.1	0.9	1.4	3.2	2.7E+01	4.2E+01	9.5E+01
Open land	52.7	1.9	0.3	0.5	1.1	1.6E+01	2.6E+01	5.8E+01
Participatory recreation	59.9	2.1	17.9	19.3	22.2	1.1E+03	1.2E+03	1.3E+03
Spectator recreation	32.6	1.2	17.9	19.3	22.2	5.8E+02	6.3E+02	7.2E+02
Water-based recreation	3.4	0.1	3.7	5.7	12.6	1.2E+01	1.9E+01	4.3E+01
Residential, multi-family	157.1	5.6	1.2	3.7	7.0	1.8E+02	5.8E+02	1.1E+03
Residential, < ¼ acre lots	778.0	27.8	1.1	3.4	6.7	8.3E+02	2.7E+03	5.2E+03
Residential, ¼ to ½ acre lots	263.8	9.4	0.9	3.1	6.3	2.5E+02	8.2E+02	1.7E+03
Residential, > ½ acre lots	104.5	3.7	0.9	2.9	6.1	9.1E+01	3.0E+02	6.4E+02
Salt marsh	45.5	1.6	0.0	1.3	10.8	0.0E+00	5.9E+01	4.9E+02
Commercial	213.1	7.6	0.9	1.4	3.2	1.9E+02	3.0E+02	6.8E+02
Industrial	148.2	5.3	0.9	1.4	3.2	1.3E+02	2.1E+02	4.7E+02
Urban open	90.1	3.2	0.3	0.5	1.1	2.7E+01	4.5E+01	9.9E+01
Transportation	88.0	3.1	0.9	1.4	3.2	7.9E+01	1.2E+02	2.8E+02
Waste disposal	28.4	1.0	0.9	1.4	3.2	2.6E+01	4.0E+01	9.1E+01
Open water	50.2	1.8	0.0	2.5	10.8	0.0E+00	1.3E+02	5.4E+02
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	2798.5	100.0				3.8E+03	7.6E+03	1.5E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	69.7	3.7	5.7	12.6	2.6E+02	4.0E+02	8.8E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					4.1E+03	8.0E+03	1.6E+04

Table B-55. Nitrogen loading analysis for the Pines River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.9E+03	3.8E+03	1.1E+04	1.9E+03	3.9E+03	1.1E+04
Watershed total	1.9E+03	3.8E+03	1.1E+04	1.9E+03	3.9E+03	1.1E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	43.5	3.7	0.3	0.5	1.1	1.3E+01	2.2E+01	4.8E+01
Non-forested wetland	13.4	1.1	0.0	1.3	10.8	0.0E+00	1.7E+01	1.4E+02
Mining	19.1	1.6	0.9	1.4	3.2	1.7E+01	2.7E+01	6.1E+01
Open land	25.1	2.2	0.3	0.5	1.1	7.5E+00	1.3E+01	2.8E+01
Participatory recreation	0.5	0.0	17.9	19.3	22.2	8.2E+00	8.9E+00	1.0E+01
Spectator recreation	37.5	3.2	17.9	19.3	22.2	6.7E+02	7.2E+02	8.3E+02
Water-based recreation	2.0	0.2	3.7	5.7	12.6	7.3E+00	1.1E+01	2.5E+01
Residential, multi-family	12.7	1.1	1.1	3.4	6.7	1.4E+01	4.3E+01	8.5E+01
Residential, < ¼ acre lots	288.7	24.8	1.0	3.2	6.5	2.9E+02	9.3E+02	1.9E+03
Residential, ¼ to ½ acre lots	30.1	2.6	0.9	3.0	6.2	2.7E+01	9.0E+01	1.9E+02
Residential, > ½ acre lots	19.3	1.7	0.9	2.8	6.1	1.6E+01	5.5E+01	1.2E+02
Salt marsh	411.6	35.4	0.0	1.3	10.8	0.0E+00	5.4E+02	4.4E+03
Commercial	80.8	6.9	0.9	1.4	3.2	7.3E+01	1.1E+02	2.6E+02
Industrial	18.4	1.6	0.9	1.4	3.2	1.7E+01	2.6E+01	5.9E+01
Urban open	18.7	1.6	0.3	0.5	1.1	5.6E+00	9.4E+00	2.1E+01
Transportation	59.9	5.1	0.9	1.4	3.2	5.4E+01	8.4E+01	1.9E+02
Waste disposal	73.6	6.3	0.9	1.4	3.2	6.6E+01	1.0E+02	2.4E+02
Open water	9.4	0.8	0.0	2.5	10.8	0.0E+00	2.3E+01	1.0E+02
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	1164.0	100.0				1.3E+03	2.8E+03	8.7E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	171.7	3.7	5.7	12.6	6.4E+02	9.8E+02	2.2E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.9E+03	3.8E+03	1.1E+04

Table B-56. Nitrogen loading analysis for the Pines River Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	3.7E+03	7.4E+03	1.8E+04	3.8E+03	7.6E+03	1.8E+04
Watershed total	3.7E+03	7.4E+03	1.8E+04	3.8E+03	7.6E+03	1.8E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	185.0	7.7	0.3	0.5	1.1	5.6E+01	9.3E+01	2.0E+02
Non-forested wetland	16.7	0.7	0.0	1.3	10.8	0.0E+00	2.2E+01	1.8E+02
Mining	19.1	0.8	0.9	1.4	3.2	1.7E+01	2.7E+01	6.1E+01
Open land	44.4	1.8	0.3	0.5	1.1	1.3E+01	2.2E+01	4.9E+01
Participatory recreation	24.7	1.0	17.9	19.3	22.2	4.4E+02	4.8E+02	5.5E+02
Spectator recreation	66.3	2.8	17.9	19.3	22.2	1.2E+03	1.3E+03	1.5E+03
Water-based recreation	2.0	0.1	3.7	5.7	12.6	7.3E+00	1.1E+01	2.5E+01
Residential, multi-family	171.9	7.1	0.9	3.1	6.3	1.6E+02	5.3E+02	1.1E+03
Residential, < ¼ acre lots	799.5	33.2	0.9	3.0	6.2	7.3E+02	2.4E+03	5.0E+03
Residential, ¼ to ½ acre lots	128.2	5.3	0.9	2.9	6.1	1.1E+02	3.7E+02	7.8E+02
Residential, > ½ acre lots	28.5	1.2	0.8	2.8	6.0	2.4E+01	7.9E+01	1.7E+02
Salt marsh	411.6	17.1	0.0	1.3	10.8	0.0E+00	5.4E+02	4.4E+03
Commercial	139.9	5.8	0.9	1.4	3.2	1.3E+02	2.0E+02	4.5E+02
Industrial	33.9	1.4	0.9	1.4	3.2	3.1E+01	4.7E+01	1.1E+02
Urban open	179.9	7.5	0.3	0.5	1.1	5.4E+01	9.0E+01	2.0E+02
Transportation	65.3	2.7	0.9	1.4	3.2	5.9E+01	9.1E+01	2.1E+02
Waste disposal	73.6	3.1	0.9	1.4	3.2	6.6E+01	1.0E+02	2.4E+02
Open water	18.2	0.8	0.0	2.5	10.8	0.0E+00	4.5E+01	2.0E+02
Woody perennial	0.6	0.0	5.4	14.8	21.0	3.3E+00	8.9E+00	1.3E+01
Land use total	2409.1	100.0				3.1E+03	6.4E+03	1.5E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	171.7	3.7	5.7	12.6	6.4E+02	9.8E+02	2.2E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					3.7E+03	7.4E+03	1.8E+04

Table B-57. Nitrogen loading analysis for the Cohasset Harbor 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	9.4E+00	9.7E+01	3.5E+02	9.4E+00	9.7E+01	3.5E+02
Non-point sources	4.1E+03	9.2E+03	1.6E+04	4.7E+03	1.1E+04	1.9E+04
Watershed total	4.1E+03	9.3E+03	1.7E+04	4.7E+03	1.1E+04	1.9E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Cohasset WWTP	9.4E+00	9.7E+01	3.5E+02
Point source total	9.4E+00	9.7E+01	3.5E+02

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.4	0.0	11.2	16.0	21.3	4.6E+00	6.6E+00	8.8E+00
Pasture	6.6	0.5	5.8	8.3	11.3	3.8E+01	5.5E+01	7.4E+01
Forest	399.5	30.0	0.3	0.5	1.1	1.2E+02	2.0E+02	4.4E+02
Non-forested wetland	2.6	0.2	0.0	1.3	10.8	0.0E+00	3.4E+00	2.8E+01
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	9.2	0.7	0.3	0.5	1.1	2.7E+00	4.6E+00	1.0E+01
Participatory recreation	40.6	3.0	17.9	19.3	22.2	7.3E+02	7.8E+02	9.0E+02
Spectator recreation	1.2	0.1	17.9	19.3	22.2	2.2E+01	2.4E+01	2.7E+01
Water-based recreation	7.1	0.5	3.7	5.7	12.6	2.6E+01	4.0E+01	8.9E+01
Residential, multi-family	2.2	0.2	11.0	30.0	36.6	2.4E+01	6.5E+01	7.9E+01
Residential, < ¼ acre lots	45.2	3.4	8.4	23.0	28.7	3.8E+02	1.0E+03	1.3E+03
Residential, ¼ to ½ acre lots	206.4	15.5	4.9	13.7	18.3	1.0E+03	2.8E+03	3.8E+03
Residential, > ½ acre lots	293.2	22.0	2.9	8.2	12.1	8.4E+02	2.4E+03	3.5E+03
Salt marsh	247.5	18.6	0.0	1.3	10.8	0.0E+00	3.2E+02	2.7E+03
Commercial	23.4	1.8	0.9	1.4	3.2	2.1E+01	3.3E+01	7.5E+01
Industrial	1.8	0.1	0.9	1.4	3.2	1.6E+00	2.5E+00	5.8E+00
Urban open	16.9	1.3	0.3	0.5	1.1	5.1E+00	8.4E+00	1.9E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	28.9	2.2	0.0	2.5	10.8	0.0E+00	7.2E+01	3.1E+02
Woody perennial	0.8	0.1	5.4	14.8	21.0	4.2E+00	1.1E+01	1.6E+01
Land use total	1333.4	100.0				3.2E+03	7.9E+03	1.3E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	232.7	3.7	5.7	12.6	8.6E+02	1.3E+03	2.9E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					4.1E+03	9.2E+03	1.6E+04

Table B-58. Nitrogen loading analysis for the Cohasset Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	9.4E+00	9.7E+01	3.5E+02	9.4E+00	9.7E+01	3.5E+02
Non-point sources	6.2E+03	1.5E+04	2.5E+04	9.0E+03	2.3E+04	3.6E+04
Watershed total	6.3E+03	1.5E+04	2.6E+04	9.0E+03	2.3E+04	3.7E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Cohasset WWTP	9.4E+00	9.7E+01	3.5E+02
Point source total	9.4E+00	9.7E+01	3.5E+02

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	10.4	0.3	11.2	16.0	21.3	1.2E+02	1.7E+02	2.2E+02
Pasture	19.8	0.6	5.8	8.3	11.3	1.1E+02	1.6E+02	2.2E+02
Forest	1604.9	51.8	0.3	0.5	1.1	4.8E+02	8.0E+02	1.8E+03
Non-forested wetland	150.1	4.8	0.0	1.3	10.8	0.0E+00	2.0E+02	1.6E+03
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	22.8	0.7	0.3	0.5	1.1	6.8E+00	1.1E+01	2.5E+01
Participatory recreation	40.6	1.3	17.9	19.3	22.2	7.3E+02	7.8E+02	9.0E+02
Spectator recreation	7.5	0.2	17.9	19.3	22.2	1.3E+02	1.4E+02	1.7E+02
Water-based recreation	7.1	0.2	3.7	5.7	12.6	2.6E+01	4.0E+01	8.9E+01
Residential, multi-family	6.3	0.2	12.4	33.7	40.8	7.8E+01	2.1E+02	2.6E+02
Residential, < ¼ acre lots	45.2	1.5	9.4	25.7	31.8	4.3E+02	1.2E+03	1.4E+03
Residential, ¼ to ½ acre lots	310.2	10.0	5.5	15.2	20.0	1.7E+03	4.7E+03	6.2E+03
Residential, > ½ acre lots	478.8	15.5	3.1	9.0	12.9	1.5E+03	4.3E+03	6.2E+03
Salt marsh	247.5	8.0	0.0	1.3	10.8	0.0E+00	3.2E+02	2.7E+03
Commercial	44.9	1.5	0.9	1.4	3.2	4.0E+01	6.3E+01	1.4E+02
Industrial	8.0	0.3	0.9	1.4	3.2	7.2E+00	1.1E+01	2.6E+01
Urban open	40.1	1.3	0.3	0.5	1.1	1.2E+01	2.0E+01	4.4E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	51.7	1.7	0.0	2.5	10.8	0.0E+00	1.3E+02	5.6E+02
Woody perennial	0.8	0.0	5.4	14.8	21.0	4.2E+00	1.1E+01	1.6E+01
Land use total	3096.7	100.0				5.4E+03	1.3E+04	2.3E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	232.7	3.7	5.7	12.6	8.6E+02	1.3E+03	2.9E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					6.2E+03	1.5E+04	2.5E+04

Table B-59. Nitrogen loading analysis for the Scituate Harbor 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.2E+03	2.8E+03	4.9E+03	1.3E+03	3.0E+03	5.2E+03
Watershed total	1.2E+03	2.8E+03	4.9E+03	1.3E+03	3.0E+03	5.2E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	2.0	0.6	11.2	16.0	21.3	2.2E+01	3.2E+01	4.2E+01
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	47.5	13.9	0.3	0.5	1.1	1.4E+01	2.4E+01	5.2E+01
Non-forested wetland	8.5	2.5	0.0	1.3	10.8	0.0E+00	1.1E+01	9.2E+01
Mining	0.8	0.2	0.9	1.4	3.2	7.6E-01	1.2E+00	2.7E+00
Open land	0.9	0.3	0.3	0.5	1.1	2.8E-01	4.6E-01	1.0E+00
Participatory recreation	2.3	0.7	17.9	19.3	22.2	4.1E+01	4.4E+01	5.1E+01
Spectator recreation	2.5	0.7	17.9	19.3	22.2	4.4E+01	4.8E+01	5.5E+01
Water-based recreation	8.6	2.5	3.7	5.7	12.6	3.2E+01	4.9E+01	1.1E+02
Residential, multi-family	3.3	1.0	8.1	22.3	27.9	2.7E+01	7.5E+01	9.3E+01
Residential, < ¼ acre lots	24.1	7.1	6.2	17.2	22.2	1.5E+02	4.1E+02	5.4E+02
Residential, ¼ to ½ acre lots	122.4	35.9	3.8	10.6	14.8	4.6E+02	1.3E+03	1.8E+03
Residential, > ½ acre lots	36.9	10.8	2.3	6.6	10.3	8.4E+01	2.5E+02	3.8E+02
Salt marsh	46.3	13.6	0.0	1.3	10.8	0.0E+00	6.0E+01	5.0E+02
Commercial	11.8	3.5	0.9	1.4	3.2	1.1E+01	1.7E+01	3.8E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	20.8	6.1	0.3	0.5	1.1	6.2E+00	1.0E+01	2.3E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	1.0	0.3	0.9	1.4	3.2	8.8E-01	1.4E+00	3.1E+00
Open water	1.2	0.4	0.0	2.5	10.8	0.0E+00	3.0E+00	1.3E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	341.0	100.0				8.9E+02	2.3E+03	3.8E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	90.0	3.7	5.7	12.6	3.3E+02	5.1E+02	1.1E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.2E+03	2.8E+03	4.9E+03

Table B-60. Nitrogen loading analysis for the Scituate Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	2.4E+03	5.9E+03	9.4E+03	2.6E+03	6.6E+03	1.0E+04
Watershed total	2.4E+03	5.9E+03	9.4E+03	2.6E+03	6.6E+03	1.0E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	5.8	0.8	11.2	16.0	21.3	6.5E+01	9.2E+01	1.2E+02
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	141.8	20.2	0.3	0.5	1.1	4.3E+01	7.1E+01	1.6E+02
Non-forested wetland	48.1	6.8	0.0	1.3	10.8	0.0E+00	6.3E+01	5.2E+02
Mining	0.8	0.1	0.9	1.4	3.2	7.6E-01	1.2E+00	2.7E+00
Open land	3.1	0.4	0.3	0.5	1.1	9.4E-01	1.6E+00	3.4E+00
Participatory recreation	2.3	0.3	17.9	19.3	22.2	4.1E+01	4.4E+01	5.1E+01
Spectator recreation	9.4	1.3	17.9	19.3	22.2	1.7E+02	1.8E+02	2.1E+02
Water-based recreation	8.6	1.2	3.7	5.7	12.6	3.2E+01	4.9E+01	1.1E+02
Residential, multi-family	3.3	0.5	9.9	27.1	33.3	3.3E+01	9.1E+01	1.1E+02
Residential, < ¼ acre lots	29.1	4.1	7.6	20.8	26.2	2.2E+02	6.0E+02	7.6E+02
Residential, ¼ to ½ acre lots	279.4	39.7	4.5	12.5	16.9	1.3E+03	3.5E+03	4.7E+03
Residential, > ½ acre lots	77.0	10.9	2.6	7.6	11.4	2.0E+02	5.9E+02	8.8E+02
Salt marsh	46.3	6.6	0.0	1.3	10.8	0.0E+00	6.0E+01	5.0E+02
Commercial	14.0	2.0	0.9	1.4	3.2	1.3E+01	2.0E+01	4.5E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	32.1	4.6	0.3	0.5	1.1	9.6E+00	1.6E+01	3.5E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	1.0	0.1	0.9	1.4	3.2	8.8E-01	1.4E+00	3.1E+00
Open water	1.2	0.2	0.0	2.5	10.8	0.0E+00	3.0E+00	1.3E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	703.4	100.0				2.1E+03	5.4E+03	8.3E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	90.0	3.7	5.7	12.6	3.3E+02	5.1E+02	1.1E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					2.4E+03	5.9E+03	9.4E+03

Table B-61. Nitrogen loading analysis for the South River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	4.7E+03	1.2E+04	2.2E+04	5.4E+03	1.4E+04	2.5E+04
Watershed total	4.7E+03	1.2E+04	2.2E+04	5.4E+03	1.4E+04	2.5E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	10.7	0.6	11.2	16.0	21.3	1.2E+02	1.7E+02	2.3E+02
Pasture	16.7	0.9	5.8	8.3	11.3	9.7E+01	1.4E+02	1.9E+02
Forest	508.6	26.3	0.3	0.5	1.1	1.5E+02	2.5E+02	5.6E+02
Non-forested wetland	7.8	0.4	0.0	1.3	10.8	0.0E+00	1.0E+01	8.4E+01
Mining	21.9	1.1	0.9	1.4	3.2	2.0E+01	3.1E+01	7.0E+01
Open land	21.4	1.1	0.3	0.5	1.1	6.4E+00	1.1E+01	2.4E+01
Participatory recreation	4.2	0.2	17.9	19.3	22.2	7.5E+01	8.1E+01	9.3E+01
Spectator recreation	22.6	1.2	17.9	19.3	22.2	4.0E+02	4.4E+02	5.0E+02
Water-based recreation	8.3	0.4	3.7	5.7	12.6	3.1E+01	4.7E+01	1.0E+02
Residential, multi-family	14.1	0.7	9.7	26.4	32.6	1.4E+02	3.7E+02	4.6E+02
Residential, < ¼ acre lots	89.3	4.6	7.4	20.3	25.7	6.6E+02	1.8E+03	2.3E+03
Residential, ¼ to ½ acre lots	348.3	18.0	4.4	12.3	16.7	1.5E+03	4.3E+03	5.8E+03
Residential, > ½ acre lots	262.7	13.6	2.6	7.5	11.3	6.8E+02	2.0E+03	3.0E+03
Salt marsh	514.1	26.6	0.0	1.3	10.8	0.0E+00	6.7E+02	5.6E+03
Commercial	43.3	2.2	0.9	1.4	3.2	3.9E+01	6.1E+01	1.4E+02
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	17.6	0.9	0.3	0.5	1.1	5.3E+00	8.8E+00	1.9E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	8.3	0.4	0.0	2.5	10.8	0.0E+00	2.1E+01	9.0E+01
Woody perennial	14.4	0.7	5.4	14.8	21.0	7.8E+01	2.1E+02	3.0E+02
Land use total	1934.4	100.0				4.0E+03	1.1E+04	1.9E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	171.8	3.7	5.7	12.6	6.4E+02	9.8E+02	2.2E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					4.7E+03	1.2E+04	2.2E+04

Table B-62. Nitrogen loading analysis for the South River Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.1E+04	2.6E+04	4.4E+04	1.4E+04	3.7E+04	5.9E+04
Watershed total	1.1E+04	2.6E+04	4.4E+04	1.4E+04	3.7E+04	5.9E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	33.4	0.6	11.2	16.0	21.3	3.7E+02	5.3E+02	7.1E+02
Pasture	33.8	0.6	5.8	8.3	11.3	2.0E+02	2.8E+02	3.8E+02
Forest	2488.6	45.9	0.3	0.5	1.1	7.5E+02	1.2E+03	2.7E+03
Non-forested wetland	136.9	2.5	0.0	1.3	10.8	0.0E+00	1.8E+02	1.5E+03
Mining	76.3	1.4	0.9	1.4	3.2	6.9E+01	1.1E+02	2.4E+02
Open land	106.6	2.0	0.3	0.5	1.1	3.2E+01	5.3E+01	1.2E+02
Participatory recreation	26.1	0.5	17.9	19.3	22.2	4.7E+02	5.0E+02	5.8E+02
Spectator recreation	46.2	0.9	17.9	19.3	22.2	8.3E+02	8.9E+02	1.0E+03
Water-based recreation	8.8	0.2	3.7	5.7	12.6	3.3E+01	5.0E+01	1.1E+02
Residential, multi-family	14.1	0.3	11.9	32.3	39.3	1.7E+02	4.6E+02	5.5E+02
Residential, < ¼ acre lots	89.3	1.6	9.0	24.7	30.6	8.1E+02	2.2E+03	2.7E+03
Residential, ¼ to ½ acre lots	448.6	8.3	5.3	14.7	19.3	2.4E+03	6.6E+03	8.7E+03
Residential, > ½ acre lots	1045.1	19.3	3.0	8.7	12.6	3.2E+03	9.1E+03	1.3E+04
Salt marsh	514.1	9.5	0.0	1.3	10.8	0.0E+00	6.7E+02	5.6E+03
Commercial	63.9	1.2	0.9	1.4	3.2	5.8E+01	8.9E+01	2.0E+02
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	54.2	1.0	0.3	0.5	1.1	1.6E+01	2.7E+01	6.0E+01
Transportation	64.2	1.2	0.9	1.4	3.2	5.8E+01	9.0E+01	2.1E+02
Waste disposal	7.8	0.1	0.9	1.4	3.2	7.0E+00	1.1E+01	2.5E+01
Open water	74.7	1.4	0.0	2.5	10.8	0.0E+00	1.9E+02	8.1E+02
Woody perennial	92.3	1.7	5.4	14.8	21.0	5.0E+02	1.4E+03	1.9E+03
Land use total	5425.0	100.0				9.9E+03	2.5E+04	4.1E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	171.8	3.7	5.7	12.6	6.4E+02	9.8E+02	2.2E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.1E+04	2.6E+04	4.4E+04

Table B-63. Nitrogen loading analysis for the North River (South Shore) 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	2.1E+05	2.2E+05	2.3E+05	2.1E+05	2.2E+05	2.4E+05
Watershed total	2.1E+05	2.2E+05	2.3E+05	2.1E+05	2.2E+05	2.4E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	50.6	1.9	11.2	16.0	21.3	5.7E+02	8.1E+02	1.1E+03
Pasture	53.9	2.0	5.8	8.3	11.3	3.1E+02	4.5E+02	6.1E+02
Forest	1115.2	42.1	0.3	0.5	1.1	3.3E+02	5.6E+02	1.2E+03
Non-forested wetland	16.9	0.6	0.0	1.3	10.8	0.0E+00	2.2E+01	1.8E+02
Mining	31.8	1.2	0.9	1.4	3.2	2.9E+01	4.5E+01	1.0E+02
Open land	44.2	1.7	0.3	0.5	1.1	1.3E+01	2.2E+01	4.9E+01
Participatory recreation	16.1	0.6	17.9	19.3	22.2	2.9E+02	3.1E+02	3.6E+02
Spectator recreation	0.8	0.0	17.9	19.3	22.2	1.4E+01	1.5E+01	1.7E+01
Water-based recreation	2.4	0.1	3.7	5.7	12.6	9.0E+00	1.4E+01	3.1E+01
Residential, multi-family	0.4	0.0	15.0	40.7	48.6	5.7E+00	1.5E+01	1.8E+01
Residential, < ¼ acre lots	0.0	0.0	11.4	30.9	37.6	0.0E+00	0.0E+00	0.0E+00
Residential, ¼ to ½ acre lots	67.9	2.6	6.5	18.0	23.1	4.4E+02	1.2E+03	1.6E+03
Residential, > ½ acre lots	519.9	19.6	3.7	10.4	14.5	1.9E+03	5.4E+03	7.5E+03
Salt marsh	579.7	21.9	0.0	1.3	10.8	0.0E+00	7.5E+02	6.3E+03
Commercial	14.2	0.5	0.9	1.4	3.2	1.3E+01	2.0E+01	4.5E+01
Industrial	8.9	0.3	0.9	1.4	3.2	8.0E+00	1.2E+01	2.9E+01
Urban open	41.4	1.6	0.3	0.5	1.1	1.2E+01	2.1E+01	4.5E+01
Transportation	14.4	0.5	0.9	1.4	3.2	1.3E+01	2.0E+01	4.6E+01
Waste disposal	4.3	0.2	0.9	1.4	3.2	3.8E+00	6.0E+00	1.4E+01
Open water	67.7	2.6	0.0	2.5	10.8	0.0E+00	1.7E+02	7.3E+02
Woody perennial	1.0	0.0	5.4	14.8	21.0	5.2E+00	1.4E+01	2.0E+01
Land use total	2651.6	100.0				4.0E+03	9.9E+03	2.0E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	113.7	3.7	5.7	12.6	4.2E+02	6.5E+02	1.4E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	4.1	1.6	1.6	1.6	2.1E+05	2.1E+05	2.1E+05
Non-point source total					2.1E+05	2.2E+05	2.3E+05

Table B-64. Nitrogen loading analysis for the North River (South Shore) Watershed Delineation

Watershed delineation ends at the first upstream fish ladder

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.2E+05	1.5E+05	1.9E+05	1.3E+05	1.8E+05	2.3E+05
Watershed total	1.2E+05	1.5E+05	1.9E+05	1.3E+05	1.8E+05	2.3E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	138.5	1.2	11.2	16.0	21.3	1.6E+03	2.2E+03	3.0E+03
Pasture	152.6	1.3	5.8	8.3	11.3	8.9E+02	1.3E+03	1.7E+03
Forest	6101.7	51.7	0.3	0.5	1.1	1.8E+03	3.1E+03	6.7E+03
Non-forested wetland	451.4	3.8	0.0	1.3	10.8	0.0E+00	5.9E+02	4.9E+03
Mining	82.3	0.7	0.9	1.4	3.2	7.4E+01	1.2E+02	2.6E+02
Open land	179.3	1.5	0.3	0.5	1.1	5.4E+01	9.0E+01	2.0E+02
Participatory recreation	51.4	0.4	17.9	19.3	22.2	9.2E+02	9.9E+02	1.1E+03
Spectator recreation	45.5	0.4	17.9	19.3	22.2	8.1E+02	8.8E+02	1.0E+03
Water-based recreation	2.4	0.0	3.7	5.7	12.6	9.0E+00	1.4E+01	3.1E+01
Residential, multi-family	40.3	0.3	15.1	40.9	48.9	6.1E+02	1.7E+03	2.0E+03
Residential, < ¼ acre lots	9.9	0.1	11.4	31.1	37.8	1.1E+02	3.1E+02	3.7E+02
Residential, ¼ to ½ acre lots	724.4	6.1	6.6	18.1	23.2	4.8E+03	1.3E+04	1.7E+04
Residential, > ½ acre lots	2276.6	19.3	3.7	10.4	14.6	8.4E+03	2.4E+04	3.3E+04
Salt marsh	630.5	5.3	0.0	1.3	10.8	0.0E+00	8.2E+02	6.8E+03
Commercial	262.2	2.2	0.9	1.4	3.2	2.4E+02	3.7E+02	8.4E+02
Industrial	53.2	0.5	0.9	1.4	3.2	4.8E+01	7.4E+01	1.7E+02
Urban open	189.6	1.6	0.3	0.5	1.1	5.7E+01	9.5E+01	2.1E+02
Transportation	131.5	1.1	0.9	1.4	3.2	1.2E+02	1.8E+02	4.2E+02
Waste disposal	18.9	0.2	0.9	1.4	3.2	1.7E+01	2.7E+01	6.1E+01
Open water	201.1	1.7	0.0	2.5	10.8	0.0E+00	5.0E+02	2.2E+03
Woody perennial	63.1	0.5	5.4	14.8	21.0	3.4E+02	9.3E+02	1.3E+03
Land use total	11806.3	100.0				2.1E+04	5.1E+04	8.3E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	113.9	3.7	5.7	12.6	4.2E+02	6.5E+02	1.4E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	2.0	1.6	1.6	1.6	1.0E+05	1.0E+05	1.0E+05
Non-point source total					1.2E+05	1.5E+05	1.9E+05

Table B-65. Nitrogen loading analysis for the Green Harbor River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	7.8E+02	2.2E+03	5.0E+03	8.6E+02	2.5E+03	5.5E+03
Watershed total	7.8E+02	2.2E+03	5.0E+03	8.6E+02	2.5E+03	5.5E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	138.8	21.7	0.3	0.5	1.1	4.2E+01	6.9E+01	1.5E+02
Non-forested wetland	40.1	6.3	0.0	1.3	10.8	0.0E+00	5.2E+01	4.3E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	12.4	1.9	0.3	0.5	1.1	3.7E+00	6.2E+00	1.4E+01
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	3.4	0.5	17.9	19.3	22.2	6.0E+01	6.5E+01	7.5E+01
Water-based recreation	5.8	0.9	3.7	5.7	12.6	2.1E+01	3.3E+01	7.3E+01
Residential, multi-family	5.8	0.9	2.5	7.3	11.1	1.5E+01	4.2E+01	6.4E+01
Residential, < ¼ acre lots	196.1	30.6	2.1	6.1	9.7	4.1E+02	1.2E+03	1.9E+03
Residential, ¼ to ½ acre lots	90.2	14.1	1.5	4.5	8.0	1.3E+02	4.1E+02	7.2E+02
Residential, > ½ acre lots	1.2	0.2	1.1	3.6	6.9	1.3E+00	4.3E+00	8.2E+00
Salt marsh	97.6	15.2	0.0	1.3	10.8	0.0E+00	1.3E+02	1.1E+03
Commercial	15.9	2.5	0.9	1.4	3.2	1.4E+01	2.2E+01	5.1E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	7.9	1.2	0.3	0.5	1.1	2.4E+00	4.0E+00	8.7E+00
Transportation	3.9	0.6	0.9	1.4	3.2	3.5E+00	5.4E+00	1.2E+01
Waste disposal	4.5	0.7	0.9	1.4	3.2	4.1E+00	6.3E+00	1.4E+01
Open water	16.7	2.6	0.0	2.5	10.8	0.0E+00	4.2E+01	1.8E+02
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	640.3	100.0				7.1E+02	2.1E+03	4.8E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	19.2	3.7	5.7	12.6	7.1E+01	1.1E+02	2.4E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					7.8E+02	2.2E+03	5.0E+03

Table B-66. Nitrogen loading analysis for the Green Harbor River Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	4.6E+03	1.0E+04	1.8E+04	5.1E+03	1.2E+04	2.1E+04
Watershed total	4.6E+03	1.0E+04	1.8E+04	5.1E+03	1.2E+04	2.1E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	29.5	1.4	11.2	16.0	21.3	3.3E+02	4.7E+02	6.3E+02
Pasture	6.3	0.3	5.8	8.3	11.3	3.7E+01	5.3E+01	7.2E+01
Forest	675.8	32.5	0.3	0.5	1.1	2.0E+02	3.4E+02	7.4E+02
Non-forested wetland	219.8	10.6	0.0	1.3	10.8	0.0E+00	2.9E+02	2.4E+03
Mining	7.3	0.3	0.9	1.4	3.2	6.5E+00	1.0E+01	2.3E+01
Open land	58.9	2.8	0.3	0.5	1.1	1.8E+01	2.9E+01	6.5E+01
Participatory recreation	67.5	3.2	17.9	19.3	22.2	1.2E+03	1.3E+03	1.5E+03
Spectator recreation	6.5	0.3	17.9	19.3	22.2	1.2E+02	1.3E+02	1.4E+02
Water-based recreation	5.8	0.3	3.7	5.7	12.6	2.1E+01	3.3E+01	7.3E+01
Residential, multi-family	14.6	0.7	6.0	16.6	21.6	8.8E+01	2.4E+02	3.1E+02
Residential, < ¼ acre lots	197.3	9.5	4.7	13.0	17.5	9.2E+02	2.6E+03	3.5E+03
Residential, ¼ to ½ acre lots	255.1	12.3	2.9	8.3	12.2	7.4E+02	2.1E+03	3.1E+03
Residential, > ½ acre lots	246.3	11.8	1.9	5.5	9.1	4.6E+02	1.4E+03	2.2E+03
Salt marsh	100.9	4.8	0.0	1.3	10.8	0.0E+00	1.3E+02	1.1E+03
Commercial	17.9	0.9	0.9	1.4	3.2	1.6E+01	2.5E+01	5.7E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	10.2	0.5	0.3	0.5	1.1	3.0E+00	5.1E+00	1.1E+01
Transportation	25.9	1.2	0.9	1.4	3.2	2.3E+01	3.6E+01	8.3E+01
Waste disposal	4.5	0.2	0.9	1.4	3.2	4.1E+00	6.3E+00	1.4E+01
Open water	62.4	3.0	0.0	2.5	10.8	0.0E+00	1.6E+02	6.7E+02
Woody perennial	68.4	3.3	5.4	14.8	21.0	3.7E+02	1.0E+03	1.4E+03
Land use total	2080.9	100.0				4.6E+03	1.0E+04	1.8E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	19.2	3.7	5.7	12.6	7.1E+01	1.1E+02	2.4E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					4.6E+03	1.0E+04	1.8E+04

Table B-67. Nitrogen loading analysis for the Duxbury Bay 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.0E+04	1.9E+04	4.1E+04	1.1E+04	2.0E+04	4.2E+04
Watershed total	1.0E+04	1.9E+04	4.1E+04	1.1E+04	2.0E+04	4.2E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	5.9	0.4	11.2	16.0	21.3	6.6E+01	9.4E+01	1.2E+02
Pasture	3.8	0.3	5.8	8.3	11.3	2.2E+01	3.1E+01	4.3E+01
Forest	240.5	16.0	0.3	0.5	1.1	7.2E+01	1.2E+02	2.6E+02
Non-forested wetland	7.9	0.5	0.0	1.3	10.8	0.0E+00	1.0E+01	8.6E+01
Mining	2.2	0.1	0.9	1.4	3.2	2.0E+00	3.1E+00	7.1E+00
Open land	41.9	2.8	0.3	0.5	1.1	1.3E+01	2.1E+01	4.6E+01
Participatory recreation	36.0	2.4	17.9	19.3	22.2	6.4E+02	6.9E+02	8.0E+02
Spectator recreation	16.6	1.1	17.9	19.3	22.2	3.0E+02	3.2E+02	3.7E+02
Water-based recreation	11.8	0.8	3.7	5.7	12.6	4.4E+01	6.7E+01	1.5E+02
Residential, multi-family	5.0	0.3	10.8	29.4	35.9	5.4E+01	1.5E+02	1.8E+02
Residential, < ¼ acre lots	15.1	1.0	8.2	22.5	28.2	1.2E+02	3.4E+02	4.3E+02
Residential, ¼ to ½ acre lots	132.5	8.8	4.8	13.5	18.0	6.4E+02	1.8E+03	2.4E+03
Residential, > ½ acre lots	391.0	26.0	2.8	8.1	11.9	1.1E+03	3.2E+03	4.7E+03
Salt marsh	532.2	35.4	0.0	1.3	10.8	0.0E+00	6.9E+02	5.7E+03
Commercial	10.5	0.7	0.9	1.4	3.2	9.4E+00	1.5E+01	3.3E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	22.7	1.5	0.3	0.5	1.1	6.8E+00	1.1E+01	2.5E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	1.5	0.1	0.9	1.4	3.2	1.3E+00	2.1E+00	4.7E+00
Open water	23.3	1.6	0.0	2.5	10.8	0.0E+00	5.8E+01	2.5E+02
Woody perennial	1.8	0.1	5.4	14.8	21.0	9.9E+00	2.7E+01	3.9E+01
Land use total	1502.3	100.0				3.1E+03	7.6E+03	1.6E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	1988.2	3.7	5.7	12.6	7.4E+03	1.1E+04	2.5E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.0E+04	1.9E+04	4.1E+04

Table B-68. Nitrogen loading analysis for the Duxbury Bay Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.2E+04	2.2E+04	4.6E+04	1.3E+04	2.5E+04	4.9E+04
Watershed total	1.2E+04	2.2E+04	4.6E+04	1.3E+04	2.5E+04	4.9E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	11.8	0.5	11.2	16.0	21.3	1.3E+02	1.9E+02	2.5E+02
Pasture	12.4	0.6	5.8	8.3	11.3	7.2E+01	1.0E+02	1.4E+02
Forest	594.4	27.3	0.3	0.5	1.1	1.8E+02	3.0E+02	6.5E+02
Non-forested wetland	27.5	1.3	0.0	1.3	10.8	0.0E+00	3.6E+01	3.0E+02
Mining	4.8	0.2	0.9	1.4	3.2	4.4E+00	6.8E+00	1.5E+01
Open land	44.9	2.1	0.3	0.5	1.1	1.3E+01	2.2E+01	4.9E+01
Participatory recreation	76.7	3.5	17.9	19.3	22.2	1.4E+03	1.5E+03	1.7E+03
Spectator recreation	17.8	0.8	17.9	19.3	22.2	3.2E+02	3.4E+02	4.0E+02
Water-based recreation	11.8	0.5	3.7	5.7	12.6	4.4E+01	6.7E+01	1.5E+02
Residential, multi-family	5.9	0.3	11.3	30.6	37.3	6.7E+01	1.8E+02	2.2E+02
Residential, < ¼ acre lots	15.1	0.7	8.6	23.4	29.2	1.3E+02	3.5E+02	4.4E+02
Residential, ¼ to ½ acre lots	153.7	7.1	5.0	14.0	18.6	7.7E+02	2.1E+03	2.9E+03
Residential, > ½ acre lots	540.8	24.8	2.9	8.3	12.2	1.6E+03	4.5E+03	6.6E+03
Salt marsh	532.2	24.4	0.0	1.3	10.8	0.0E+00	6.9E+02	5.7E+03
Commercial	16.2	0.7	0.9	1.4	3.2	1.5E+01	2.3E+01	5.2E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	33.7	1.5	0.3	0.5	1.1	1.0E+01	1.7E+01	3.7E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	2.9	0.1	0.9	1.4	3.2	2.6E+00	4.0E+00	9.2E+00
Open water	61.9	2.8	0.0	2.5	10.8	0.0E+00	1.5E+02	6.7E+02
Woody perennial	13.3	0.6	5.4	14.8	21.0	7.2E+01	2.0E+02	2.8E+02
Land use total	2177.9	100.0				4.8E+03	1.1E+04	2.1E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	1988.2	3.7	5.7	12.6	7.4E+03	1.1E+04	2.5E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Non-point source total	1.2E+04	2.2E+04	4.6E+04

Table B-69. Nitrogen loading analysis for the Kingston Bay 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	4.9E+03	1.1E+04	1.8E+04	5.6E+03	1.3E+04	2.1E+04
Watershed total	4.9E+03	1.1E+04	1.8E+04	5.6E+03	1.3E+04	2.1E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	8.7	0.7	11.2	16.0	21.3	9.7E+01	1.4E+02	1.8E+02
Pasture	26.2	2.0	5.8	8.3	11.3	1.5E+02	2.2E+02	3.0E+02
Forest	390.8	30.1	0.3	0.5	1.1	1.2E+02	2.0E+02	4.3E+02
Non-forested wetland	21.2	1.6	0.0	1.3	10.8	0.0E+00	2.8E+01	2.3E+02
Mining	2.8	0.2	0.9	1.4	3.2	2.5E+00	4.0E+00	9.0E+00
Open land	64.0	4.9	0.3	0.5	1.1	1.9E+01	3.2E+01	7.0E+01
Participatory recreation	3.4	0.3	17.9	19.3	22.2	6.1E+01	6.6E+01	7.5E+01
Spectator recreation	9.5	0.7	17.9	19.3	22.2	1.7E+02	1.8E+02	2.1E+02
Water-based recreation	0.0	0.0	3.7	5.7	12.6	0.0E+00	0.0E+00	0.0E+00
Residential, multi-family	8.3	0.6	13.5	36.5	43.9	1.1E+02	3.0E+02	3.6E+02
Residential, < ¼ acre lots	34.2	2.6	10.2	27.8	34.1	3.5E+02	9.5E+02	1.2E+03
Residential, ¼ to ½ acre lots	223.8	17.2	5.9	16.3	21.2	1.3E+03	3.7E+03	4.7E+03
Residential, > ½ acre lots	311.4	24.0	3.4	9.5	13.6	1.0E+03	3.0E+03	4.2E+03
Salt marsh	87.0	6.7	0.0	1.3	10.8	0.0E+00	1.1E+02	9.4E+02
Commercial	20.0	1.5	0.9	1.4	3.2	1.8E+01	2.8E+01	6.4E+01
Industrial	11.8	0.9	0.9	1.4	3.2	1.1E+01	1.7E+01	3.8E+01
Urban open	30.7	2.4	0.3	0.5	1.1	9.2E+00	1.5E+01	3.4E+01
Transportation	23.0	1.8	0.9	1.4	3.2	2.1E+01	3.2E+01	7.4E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	12.4	1.0	0.0	2.5	10.8	0.0E+00	3.1E+01	1.3E+02
Woody perennial	10.1	0.8	5.4	14.8	21.0	5.5E+01	1.5E+02	2.1E+02
Land use total	1299.5	100.0				3.6E+03	9.1E+03	1.4E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	358.4	3.7	5.7	12.6	1.3E+03	2.0E+03	4.5E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					4.9E+03	1.1E+04	1.8E+04

Table B-70. Nitrogen loading analysis for the Kingston Bay Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	8.5E+03	2.0E+04	3.2E+04	1.1E+04	2.7E+04	4.1E+04
Watershed total	8.5E+03	2.0E+04	3.2E+04	1.1E+04	2.7E+04	4.1E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	34.7	1.0	11.2	16.0	21.3	3.9E+02	5.5E+02	7.4E+02
Pasture	48.0	1.4	5.8	8.3	11.3	2.8E+02	4.0E+02	5.4E+02
Forest	1460.1	42.9	0.3	0.5	1.1	4.4E+02	7.3E+02	1.6E+03
Non-forested wetland	81.2	2.4	0.0	1.3	10.8	0.0E+00	1.1E+02	8.8E+02
Mining	85.4	2.5	0.9	1.4	3.2	7.7E+01	1.2E+02	2.7E+02
Open land	129.8	3.8	0.3	0.5	1.1	3.9E+01	6.5E+01	1.4E+02
Participatory recreation	3.4	0.1	17.9	19.3	22.2	6.1E+01	6.6E+01	7.5E+01
Spectator recreation	16.6	0.5	17.9	19.3	22.2	3.0E+02	3.2E+02	3.7E+02
Water-based recreation	0.0	0.0	3.7	5.7	12.6	0.0E+00	0.0E+00	0.0E+00
Residential, multi-family	23.5	0.7	13.8	37.4	45.0	3.2E+02	8.8E+02	1.1E+03
Residential, < ¼ acre lots	54.8	1.6	10.5	28.5	34.9	5.7E+02	1.6E+03	1.9E+03
Residential, ¼ to ½ acre lots	271.7	8.0	6.0	16.7	21.6	1.6E+03	4.5E+03	5.9E+03
Residential, > ½ acre lots	693.0	20.4	3.4	9.7	13.8	2.4E+03	6.7E+03	9.5E+03
Salt marsh	87.0	2.6	0.0	1.3	10.8	0.0E+00	1.1E+02	9.4E+02
Commercial	95.9	2.8	0.9	1.4	3.2	8.6E+01	1.3E+02	3.1E+02
Industrial	33.8	1.0	0.9	1.4	3.2	3.0E+01	4.7E+01	1.1E+02
Urban open	51.2	1.5	0.3	0.5	1.1	1.5E+01	2.6E+01	5.6E+01
Transportation	66.1	1.9	0.9	1.4	3.2	6.0E+01	9.3E+01	2.1E+02
Waste disposal	6.0	0.2	0.9	1.4	3.2	5.4E+00	8.4E+00	1.9E+01
Open water	71.2	2.1	0.0	2.5	10.8	0.0E+00	1.8E+02	7.7E+02
Woody perennial	87.2	2.6	5.4	14.8	21.0	4.7E+02	1.3E+03	1.8E+03
Land use total	3400.5	100.0				7.2E+03	1.8E+04	2.7E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	358.6	3.7	5.7	12.6	1.3E+03	2.0E+03	4.5E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Non-point source total	8.5E+03	2.0E+04	3.2E+04

Table B-71. Nitrogen loading analysis for the Plymouth Harbor 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	2.9E+04	4.0E+04	6.7E+04	2.9E+04	4.0E+04	6.7E+04
Non-point sources	3.3E+03	5.7E+03	1.1E+04	3.4E+03	5.8E+03	1.2E+04
Watershed total	3.3E+04	4.6E+04	7.8E+04	3.3E+04	4.6E+04	7.8E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Plymouth WWTP	2.9E+04	4.0E+04	6.7E+04
Point source total	2.9E+04	4.0E+04	6.7E+04

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	3.2	0.5	11.2	16.0	21.3	3.5E+01	5.1E+01	6.7E+01
Pasture	2.8	0.4	5.8	8.3	11.3	1.6E+01	2.3E+01	3.2E+01
Forest	99.7	15.2	0.3	0.5	1.1	3.0E+01	5.0E+01	1.1E+02
Non-forested wetland	3.9	0.6	0.0	1.3	10.8	0.0E+00	5.1E+00	4.3E+01
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	35.2	5.4	0.3	0.5	1.1	1.1E+01	1.8E+01	3.9E+01
Participatory recreation	16.8	2.6	17.9	19.3	22.2	3.0E+02	3.2E+02	3.7E+02
Spectator recreation	11.8	1.8	17.9	19.3	22.2	2.1E+02	2.3E+02	2.6E+02
Water-based recreation	15.4	2.4	3.7	5.7	12.6	5.7E+01	8.8E+01	1.9E+02
Residential, multi-family	5.0	0.8	2.5	7.2	10.9	1.2E+01	3.6E+01	5.4E+01
Residential, < ¼ acre lots	0.0	0.0	2.0	6.0	9.6	0.0E+00	0.0E+00	0.0E+00
Residential, ¼ to ½ acre lots	269.3	41.2	1.5	4.5	7.9	4.0E+02	1.2E+03	2.1E+03
Residential, > ½ acre lots	60.0	9.2	1.1	3.6	6.9	6.8E+01	2.2E+02	4.1E+02
Salt marsh	10.7	1.6	0.0	1.3	10.8	0.0E+00	1.4E+01	1.2E+02
Commercial	61.0	9.3	0.9	1.4	3.2	5.5E+01	8.5E+01	2.0E+02
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	54.5	8.3	0.3	0.5	1.1	1.6E+01	2.7E+01	6.0E+01
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	1.4	0.2	0.9	1.4	3.2	1.3E+00	2.0E+00	4.5E+00
Open water	3.2	0.5	0.0	2.5	10.8	0.0E+00	8.0E+00	3.5E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	654.0	100.0				1.2E+03	2.4E+03	4.1E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	572.8	3.7	5.7	12.6	2.1E+03	3.3E+03	7.2E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Non-point source total	3.3E+03	5.7E+03	1.1E+04

Table B-72. Nitrogen loading analysis for the Plymouth Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	2.9E+04	4.0E+04	6.7E+04	2.9E+04	4.0E+04	6.7E+04
Non-point sources	9.2E+03	2.0E+04	3.4E+04	1.1E+04	2.5E+04	4.0E+04
Watershed total	3.8E+04	6.1E+04	1.0E+05	4.0E+04	6.5E+04	1.1E+05

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
Plymouth WWTP	2.9E+04	4.0E+04	6.7E+04
Point source total	2.9E+04	4.0E+04	6.7E+04

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	50.5	1.3	11.2	16.0	21.3	5.7E+02	8.1E+02	1.1E+03
Pasture	22.9	0.6	5.8	8.3	11.3	1.3E+02	1.9E+02	2.6E+02
Forest	1447.1	38.3	0.3	0.5	1.1	4.3E+02	7.2E+02	1.6E+03
Non-forested wetland	33.3	0.9	0.0	1.3	10.8	0.0E+00	4.3E+01	3.6E+02
Mining	23.5	0.6	0.9	1.4	3.2	2.1E+01	3.3E+01	7.5E+01
Open land	127.3	3.4	0.3	0.5	1.1	3.8E+01	6.4E+01	1.4E+02
Participatory recreation	28.2	0.7	17.9	19.3	22.2	5.0E+02	5.4E+02	6.3E+02
Spectator recreation	17.8	0.5	17.9	19.3	22.2	3.2E+02	3.4E+02	4.0E+02
Water-based recreation	15.4	0.4	3.7	5.7	12.6	5.7E+01	8.8E+01	1.9E+02
Residential, multi-family	35.8	0.9	7.6	20.8	26.2	2.7E+02	7.4E+02	9.4E+02
Residential, < ¼ acre lots	56.3	1.5	5.8	16.1	21.0	3.3E+02	9.1E+02	1.2E+03
Residential, ¼ to ½ acre lots	860.3	22.8	3.5	10.0	14.1	3.0E+03	8.6E+03	1.2E+04
Residential, > ½ acre lots	289.8	7.7	2.2	6.3	10.0	6.3E+02	1.8E+03	2.9E+03
Salt marsh	10.7	0.3	0.0	1.3	10.8	0.0E+00	1.4E+01	1.2E+02
Commercial	166.9	4.4	0.9	1.4	3.2	1.5E+02	2.3E+02	5.3E+02
Industrial	53.5	1.4	0.9	1.4	3.2	4.8E+01	7.5E+01	1.7E+02
Urban open	143.9	3.8	0.3	0.5	1.1	4.3E+01	7.2E+01	1.6E+02
Transportation	94.1	2.5	0.9	1.4	3.2	8.5E+01	1.3E+02	3.0E+02
Waste disposal	6.4	0.2	0.9	1.4	3.2	5.8E+00	9.0E+00	2.1E+01
Open water	224.2	5.9	0.0	2.5	10.8	0.0E+00	5.6E+02	2.4E+03
Woody perennial	71.4	1.9	5.4	14.8	21.0	3.9E+02	1.1E+03	1.5E+03
Land use total	3779.3	100.0				7.1E+03	1.7E+04	2.7E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	572.8	3.7	5.7	12.6	2.1E+03	3.3E+03	7.2E+03

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Non-point source total	9.2E+03	2.0E+04	3.4E+04

Table B-73. Nitrogen loading analysis for the Sandwich Harbor 1000 m Boundary Delineation

➢ Summary

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.8E+03	4.6E+03	8.6E+03	2.0E+03	5.3E+03	9.6E+03
Watershed total	1.8E+03	4.6E+03	8.6E+03	2.0E+03	5.3E+03	9.6E+03

➢ Point sources

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ Non-point sources

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	13.4	1.8	11.2	16.0	21.3	1.5E+02	2.1E+02	2.8E+02
Pasture	2.6	0.4	5.8	8.3	11.3	1.5E+01	2.2E+01	3.0E+01
Forest	150.4	20.8	0.3	0.5	1.1	4.5E+01	7.5E+01	1.7E+02
Non-forested wetland	17.4	2.4	0.0	1.3	10.8	0.0E+00	2.3E+01	1.9E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	31.2	4.3	0.3	0.5	1.1	9.4E+00	1.6E+01	3.4E+01
Participatory recreation	0.6	0.1	17.9	19.3	22.2	1.1E+01	1.2E+01	1.4E+01
Spectator recreation	8.1	1.1	17.9	19.3	22.2	1.5E+02	1.6E+02	1.8E+02
Water-based recreation	1.6	0.2	3.7	5.7	12.6	5.9E+00	9.0E+00	2.0E+01
Residential, multi-family	1.2	0.2	14.5	39.4	47.1	1.8E+01	4.8E+01	5.8E+01
Residential, < ¼ acre lots	45.1	6.2	11.0	29.9	36.5	5.0E+02	1.3E+03	1.6E+03
Residential, ¼ to ½ acre lots	40.2	5.5	6.3	17.5	22.5	2.6E+02	7.0E+02	9.1E+02
Residential, > ½ acre lots	118.4	16.3	3.6	10.1	14.2	4.2E+02	1.2E+03	1.7E+03
Salt marsh	238.9	33.0	0.0	1.3	10.8	0.0E+00	3.1E+02	2.6E+03
Commercial	19.5	2.7	0.9	1.4	3.2	1.8E+01	2.7E+01	6.2E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	10.1	1.4	0.3	0.5	1.1	3.0E+00	5.0E+00	1.1E+01
Transportation	0.6	0.1	0.9	1.4	3.2	5.0E-01	7.7E-01	1.8E+00
Waste disposal	2.2	0.3	0.9	1.4	3.2	2.0E+00	3.1E+00	7.2E+00
Open water	4.9	0.7	0.0	2.5	10.8	0.0E+00	1.2E+01	5.3E+01
Woody perennial	18.2	2.5	5.4	14.8	21.0	9.9E+01	2.7E+02	3.8E+02
Land use total	724.7	100.0				1.7E+03	4.4E+03	8.3E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	26.5	3.7	5.7	12.6	9.8E+01	1.5E+02	3.3E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.8E+03	4.6E+03	8.6E+03

Table B-74. Nitrogen loading analysis for the Sandwich Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	4.4E+03	1.1E+04	1.8E+04	7.4E+03	1.9E+04	2.9E+04
Watershed total	4.4E+03	1.1E+04	1.8E+04	7.4E+03	1.9E+04	2.9E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	24.6	0.9	11.2	16.0	21.3	2.8E+02	3.9E+02	5.2E+02
Pasture	7.3	0.3	5.8	8.3	11.3	4.2E+01	6.0E+01	8.2E+01
Forest	1524.6	57.3	0.3	0.5	1.1	4.6E+02	7.6E+02	1.7E+03
Non-forested wetland	25.2	0.9	0.0	1.3	10.8	0.0E+00	3.3E+01	2.7E+02
Mining	45.5	1.7	0.9	1.4	3.2	4.1E+01	6.4E+01	1.5E+02
Open land	112.6	4.2	0.3	0.5	1.1	3.4E+01	5.6E+01	1.2E+02
Participatory recreation	0.7	0.0	17.9	19.3	22.2	1.2E+01	1.3E+01	1.5E+01
Spectator recreation	14.6	0.5	17.9	19.3	22.2	2.6E+02	2.8E+02	3.2E+02
Water-based recreation	1.6	0.1	3.7	5.7	12.6	5.9E+00	9.0E+00	2.0E+01
Residential, multi-family	9.9	0.4	17.1	46.1	54.7	1.7E+02	4.6E+02	5.4E+02
Residential, < ¼ acre lots	45.1	1.7	12.9	34.9	42.1	5.8E+02	1.6E+03	1.9E+03
Residential, ¼ to ½ acre lots	140.7	5.3	7.4	20.2	25.6	1.0E+03	2.8E+03	3.6E+03
Residential, > ½ acre lots	269.1	10.1	4.1	11.4	15.7	1.1E+03	3.1E+03	4.2E+03
Salt marsh	238.9	9.0	0.0	1.3	10.8	0.0E+00	3.1E+02	2.6E+03
Commercial	38.1	1.4	0.9	1.4	3.2	3.4E+01	5.3E+01	1.2E+02
Industrial	23.3	0.9	0.9	1.4	3.2	2.1E+01	3.3E+01	7.5E+01
Urban open	31.2	1.2	0.3	0.5	1.1	9.4E+00	1.6E+01	3.4E+01
Transportation	49.2	1.8	0.9	1.4	3.2	4.4E+01	6.9E+01	1.6E+02
Waste disposal	10.6	0.4	0.9	1.4	3.2	9.5E+00	1.5E+01	3.4E+01
Open water	24.0	0.9	0.0	2.5	10.8	0.0E+00	6.0E+01	2.6E+02
Woody perennial	25.8	1.0	5.4	14.8	21.0	1.4E+02	3.8E+02	5.4E+02
Land use total	2662.5	100.0				4.3E+03	1.1E+04	1.7E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	26.5	3.7	5.7	12.6	9.8E+01	1.5E+02	3.3E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Non-point source total	4.4E+03	1.1E+04	1.8E+04

Table B-75. Nitrogen loading analysis for the Scorton Harbor 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.1E+03	3.3E+03	6.8E+03	1.6E+03	4.6E+03	8.6E+03
Watershed total	1.1E+03	3.3E+03	6.8E+03	1.6E+03	4.6E+03	8.6E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	2.5	0.3	11.2	16.0	21.3	2.8E+01	4.1E+01	5.4E+01
Pasture	1.6	0.2	5.8	8.3	11.3	9.5E+00	1.4E+01	1.8E+01
Forest	340.8	39.0	0.3	0.5	1.1	1.0E+02	1.7E+02	3.7E+02
Non-forested wetland	70.8	8.1	0.0	1.3	10.8	0.0E+00	9.2E+01	7.6E+02
Mining	1.3	0.1	0.9	1.4	3.2	1.1E+00	1.8E+00	4.0E+00
Open land	16.4	1.9	0.3	0.5	1.1	4.9E+00	8.2E+00	1.8E+01
Participatory recreation	0.2	0.0	17.9	19.3	22.2	3.8E+00	4.1E+00	4.7E+00
Spectator recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Water-based recreation	0.1	0.0	3.7	5.7	12.6	2.8E-01	4.3E-01	9.6E-01
Residential, multi-family	0.0	0.0	13.2	35.8	43.2	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	14.1	1.6	10.0	27.3	33.6	1.4E+02	3.8E+02	4.7E+02
Residential, ¼ to ½ acre lots	21.2	2.4	5.8	16.1	20.9	1.2E+02	3.4E+02	4.4E+02
Residential, > ½ acre lots	169.1	19.3	3.3	9.4	13.4	5.6E+02	1.6E+03	2.3E+03
Salt marsh	154.2	17.6	0.0	1.3	10.8	0.0E+00	2.0E+02	1.7E+03
Commercial	19.7	2.3	0.9	1.4	3.2	1.8E+01	2.8E+01	6.3E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	20.5	2.3	0.3	0.5	1.1	6.1E+00	1.0E+01	2.3E+01
Transportation	6.0	0.7	0.9	1.4	3.2	5.4E+00	8.3E+00	1.9E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	11.6	1.3	0.0	2.5	10.8	0.0E+00	2.9E+01	1.2E+02
Woody perennial	24.6	2.8	5.4	14.8	21.0	1.3E+02	3.6E+02	5.2E+02
Land use total	874.6	100.0				1.1E+03	3.3E+03	6.8E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	0.4	3.7	5.7	12.6	1.6E+00	2.5E+00	5.5E+00

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.1E+03	3.3E+03	6.8E+03

Table B-76. Nitrogen loading analysis for the Scorton Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading ($kg\ y^{-1}$)			Future nitrogen loading (buildout) ($kg\ y^{-1}$)		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	6.1E+03	1.4E+04	2.2E+04	9.7E+03	2.4E+04	3.4E+04
Watershed total	6.1E+03	1.4E+04	2.2E+04	9.7E+03	2.4E+04	3.4E+04

➢ **Point sources**

	Nitrogen loading ($kg\ y^{-1}$)		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	5.2	0.2	11.2	16.0	21.3	5.8E+01	8.3E+01	1.1E+02
Pasture	3.6	0.1	5.8	8.3	11.3	2.1E+01	3.0E+01	4.1E+01
Forest	1552.1	55.5	0.3	0.5	1.1	4.7E+02	7.8E+02	1.7E+03
Non-forested wetland	76.0	2.7	0.0	1.3	10.8	0.0E+00	9.9E+01	8.2E+02
Mining	3.9	0.1	0.9	1.4	3.2	3.5E+00	5.5E+00	1.3E+01
Open land	45.0	1.6	0.3	0.5	1.1	1.4E+01	2.3E+01	5.0E+01
Participatory recreation	76.0	2.7	17.9	19.3	22.2	1.4E+03	1.5E+03	1.7E+03
Spectator recreation	8.1	0.3	17.9	19.3	22.2	1.5E+02	1.6E+02	1.8E+02
Water-based recreation	1.7	0.1	3.7	5.7	12.6	6.2E+00	9.5E+00	2.1E+01
Residential, multi-family	6.2	0.2	18.8	50.8	60.0	1.2E+02	3.1E+02	3.7E+02
Residential, < ¼ acre lots	14.1	0.5	14.2	38.4	46.0	2.0E+02	5.4E+02	6.5E+02
Residential, ¼ to ½ acre lots	218.2	7.8	8.1	22.1	27.7	1.8E+03	4.8E+03	6.0E+03
Residential, > ½ acre lots	383.4	13.7	4.4	12.4	16.8	1.7E+03	4.8E+03	6.4E+03
Salt marsh	154.2	5.5	0.0	1.3	10.8	0.0E+00	2.0E+02	1.7E+03
Commercial	39.7	1.4	0.9	1.4	3.2	3.6E+01	5.6E+01	1.3E+02
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	51.2	1.8	0.3	0.5	1.1	1.5E+01	2.6E+01	5.6E+01
Transportation	54.5	1.9	0.9	1.4	3.2	4.9E+01	7.6E+01	1.7E+02
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	71.3	2.5	0.0	2.5	10.8	0.0E+00	1.8E+02	7.7E+02
Woody perennial	31.7	1.1	5.4	14.8	21.0	1.7E+02	4.7E+02	6.7E+02
Land use total	2796.1	100.0				6.1E+03	1.4E+04	2.2E+04

	Embayment area (ha)	Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	0.4	3.7	5.7	12.6	1.6E+00	2.5E+00	5.5E+00

	River flow ($m^3\ s^{-1}$)	Nitrogen concentration (mg/L)			Nitrogen loading ($kg\ y^{-1}$)		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Non-point source total	6.1E+03	1.4E+04	2.2E+04

Table B-77. Nitrogen loading analysis for the Barnstable Harbor 1000 m Boundary Delineation

➢ Summary

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.0E+04	2.2E+04	5.6E+04	1.1E+04	2.6E+04	6.1E+04
Watershed total	1.0E+04	2.2E+04	5.6E+04	1.1E+04	2.6E+04	6.1E+04

➢ Point sources

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ Non-point sources

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	56.1	1.3	11.2	16.0	21.3	6.3E+02	9.0E+02	1.2E+03
Pasture	31.4	0.7	5.8	8.3	11.3	1.8E+02	2.6E+02	3.6E+02
Forest	926.4	21.0	0.3	0.5	1.1	2.8E+02	4.6E+02	1.0E+03
Non-forested wetland	53.5	1.2	0.0	1.3	10.8	0.0E+00	7.0E+01	5.8E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	409.5	9.3	0.3	0.5	1.1	1.2E+02	2.0E+02	4.5E+02
Participatory recreation	39.4	0.9	17.9	19.3	22.2	7.1E+02	7.6E+02	8.7E+02
Spectator recreation	2.6	0.1	17.9	19.3	22.2	4.7E+01	5.1E+01	5.9E+01
Water-based recreation	10.9	0.2	3.7	5.7	12.6	4.0E+01	6.2E+01	1.4E+02
Residential, multi-family	13.7	0.3	11.4	31.1	37.8	1.6E+02	4.3E+02	5.2E+02
Residential, < ¼ acre lots	52.6	1.2	8.7	23.8	29.6	4.6E+02	1.2E+03	1.6E+03
Residential, ¼ to ½ acre lots	188.6	4.3	5.1	14.1	18.8	9.6E+02	2.7E+03	3.5E+03
Residential, > ½ acre lots	600.9	13.6	2.9	8.4	12.3	1.8E+03	5.1E+03	7.4E+03
Salt marsh	1922.4	43.5	0.0	1.3	10.8	0.0E+00	2.5E+03	2.1E+04
Commercial	35.0	0.8	0.9	1.4	3.2	3.2E+01	4.9E+01	1.1E+02
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	36.8	0.8	0.3	0.5	1.1	1.1E+01	1.8E+01	4.1E+01
Transportation	3.3	0.1	0.9	1.4	3.2	2.9E+00	4.6E+00	1.0E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	31.0	0.7	0.0	2.5	10.8	0.0E+00	7.7E+01	3.3E+02
Woody perennial	5.5	0.1	5.4	14.8	21.0	3.0E+01	8.1E+01	1.1E+02
Land use total	4419.7	100.0				5.4E+03	1.5E+04	3.9E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	1328.6	3.7	5.7	12.6	4.9E+03	7.6E+03	1.7E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.0E+04	2.2E+04	5.6E+04

Table B-78. Nitrogen loading analysis for the Barnstable Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	1.8E+04	4.0E+04	8.2E+04	2.2E+04	5.2E+04	9.8E+04
Watershed total	1.8E+04	4.0E+04	8.2E+04	2.2E+04	5.2E+04	9.8E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	81.6	1.0	11.2	16.0	21.3	9.1E+02	1.3E+03	1.7E+03
Pasture	55.7	0.7	5.8	8.3	11.3	3.2E+02	4.6E+02	6.3E+02
Forest	2880.9	35.3	0.3	0.5	1.1	8.6E+02	1.4E+03	3.2E+03
Non-forested wetland	110.8	1.4	0.0	1.3	10.8	0.0E+00	1.4E+02	1.2E+03
Mining	45.8	0.6	0.9	1.4	3.2	4.1E+01	6.4E+01	1.5E+02
Open land	531.0	6.5	0.3	0.5	1.1	1.6E+02	2.7E+02	5.8E+02
Participatory recreation	127.4	1.6	17.9	19.3	22.2	2.3E+03	2.5E+03	2.8E+03
Spectator recreation	12.4	0.2	17.9	19.3	22.2	2.2E+02	2.4E+02	2.8E+02
Water-based recreation	12.9	0.2	3.7	5.7	12.6	4.8E+01	7.3E+01	1.6E+02
Residential, multi-family	28.2	0.3	13.2	35.9	43.2	3.7E+02	1.0E+03	1.2E+03
Residential, < ¼ acre lots	111.7	1.4	10.0	27.3	33.6	1.1E+03	3.1E+03	3.8E+03
Residential, ¼ to ½ acre lots	355.3	4.4	5.8	16.1	21.0	2.1E+03	5.7E+03	7.4E+03
Residential, > ½ acre lots	1272.9	15.6	3.3	9.4	13.4	4.2E+03	1.2E+04	1.7E+04
Salt marsh	1938.6	23.8	0.0	1.3	10.8	0.0E+00	2.5E+03	2.1E+04
Commercial	77.7	1.0	0.9	1.4	3.2	7.0E+01	1.1E+02	2.5E+02
Industrial	21.7	0.3	0.9	1.4	3.2	1.9E+01	3.0E+01	6.9E+01
Urban open	121.4	1.5	0.3	0.5	1.1	3.6E+01	6.1E+01	1.3E+02
Transportation	190.3	2.3	0.9	1.4	3.2	1.7E+02	2.7E+02	6.1E+02
Waste disposal	3.3	0.0	0.9	1.4	3.2	3.0E+00	4.6E+00	1.1E+01
Open water	114.3	1.4	0.0	2.5	10.8	0.0E+00	2.9E+02	1.2E+03
Woody perennial	61.6	0.8	5.4	14.8	21.0	3.3E+02	9.1E+02	1.3E+03
Land use total	8155.5	100.0				1.3E+04	3.2E+04	6.5E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	1329.9	3.7	5.7	12.6	4.9E+03	7.6E+03	1.7E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					1.8E+04	4.0E+04	8.2E+04

Table B-79. Nitrogen loading analysis for the Sesuit Harbor 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	9.3E+02	2.2E+03	3.8E+03	1.0E+03	2.7E+03	4.3E+03
Watershed total	9.3E+02	2.2E+03	3.8E+03	1.0E+03	2.7E+03	4.3E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	17.8	5.1	11.2	16.0	21.3	2.0E+02	2.9E+02	3.8E+02
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	87.2	25.1	0.3	0.5	1.1	2.6E+01	4.4E+01	9.6E+01
Non-forested wetland	5.6	1.6	0.0	1.3	10.8	0.0E+00	7.2E+00	6.0E+01
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	16.1	4.6	0.3	0.5	1.1	4.8E+00	8.0E+00	1.8E+01
Participatory recreation	1.5	0.4	17.9	19.3	22.2	2.6E+01	2.8E+01	3.3E+01
Spectator recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Water-based recreation	6.2	1.8	3.7	5.7	12.6	2.3E+01	3.6E+01	7.9E+01
Residential, multi-family	1.0	0.3	10.4	28.3	34.7	1.1E+01	2.9E+01	3.5E+01
Residential, < ¼ acre lots	0.0	0.0	7.9	21.7	27.3	0.0E+00	0.0E+00	0.0E+00
Residential, ¼ to ½ acre lots	101.0	29.1	4.7	13.0	17.5	4.7E+02	1.3E+03	1.8E+03
Residential, > ½ acre lots	42.5	12.2	2.7	7.9	11.7	1.2E+02	3.3E+02	5.0E+02
Salt marsh	51.6	14.9	0.0	1.3	10.8	0.0E+00	6.7E+01	5.6E+02
Commercial	10.2	2.9	0.9	1.4	3.2	9.2E+00	1.4E+01	3.3E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	1.5	0.4	0.3	0.5	1.1	4.5E-01	7.5E-01	1.7E+00
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	5.2	1.5	0.0	2.5	10.8	0.0E+00	1.3E+01	5.6E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	347.4	100.0				8.9E+02	2.2E+03	3.6E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	11.8	3.7	5.7	12.6	4.4E+01	6.7E+01	1.5E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					9.3E+02	2.2E+03	3.8E+03

Table B-80. Nitrogen loading analysis for the Sesuit Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	2.6E+03	5.6E+03	8.1E+03	3.0E+03	6.8E+03	9.8E+03
Watershed total	2.6E+03	5.6E+03	8.1E+03	3.0E+03	6.8E+03	9.8E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	20.8	2.9	11.2	16.0	21.3	2.3E+02	3.3E+02	4.4E+02
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	220.6	31.1	0.3	0.5	1.1	6.6E+01	1.1E+02	2.4E+02
Non-forested wetland	6.5	0.9	0.0	1.3	10.8	0.0E+00	8.4E+00	7.0E+01
Mining	17.7	2.5	0.9	1.4	3.2	1.6E+01	2.5E+01	5.7E+01
Open land	16.1	2.3	0.3	0.5	1.1	4.8E+00	8.0E+00	1.8E+01
Participatory recreation	38.7	5.5	17.9	19.3	22.2	6.9E+02	7.5E+02	8.6E+02
Spectator recreation	3.5	0.5	17.9	19.3	22.2	6.3E+01	6.8E+01	7.9E+01
Water-based recreation	6.2	0.9	3.7	5.7	12.6	2.3E+01	3.6E+01	7.9E+01
Residential, multi-family	1.0	0.1	12.3	33.3	40.4	1.2E+01	3.4E+01	4.1E+01
Residential, < ¼ acre lots	20.9	3.0	9.3	25.4	31.5	1.9E+02	5.3E+02	6.6E+02
Residential, ¼ to ½ acre lots	173.4	24.5	5.4	15.0	19.8	9.4E+02	2.6E+03	3.4E+03
Residential, > ½ acre lots	95.2	13.4	3.1	8.9	12.8	3.0E+02	8.4E+02	1.2E+03
Salt marsh	51.6	7.3	0.0	1.3	10.8	0.0E+00	6.7E+01	5.6E+02
Commercial	11.8	1.7	0.9	1.4	3.2	1.1E+01	1.7E+01	3.8E+01
Industrial	4.9	0.7	0.9	1.4	3.2	4.4E+00	6.9E+00	1.6E+01
Urban open	5.5	0.8	0.3	0.5	1.1	1.7E+00	2.8E+00	6.1E+00
Transportation	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	14.3	2.0	0.0	2.5	10.8	0.0E+00	3.6E+01	1.5E+02
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	708.8	100.0				2.6E+03	5.5E+03	8.0E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	11.8	3.7	5.7	12.6	4.4E+01	6.7E+01	1.5E+02

	River flow (m^3 s^{-1}) mean	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					2.6E+03	5.6E+03	8.1E+03

Table B-81. Nitrogen loading analysis for the Rock Harbor 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading ($kg\ y^{-1}$)			Future nitrogen loading (buildout) ($kg\ y^{-1}$)		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	3.0E+02	8.2E+02	1.4E+03	3.4E+02	9.4E+02	1.6E+03
Watershed total	3.0E+02	8.2E+02	1.4E+03	3.4E+02	9.4E+02	1.6E+03

➢ **Point sources**

	Nitrogen loading ($kg\ y^{-1}$)		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	1.6	1.4	5.8	8.3	11.3	9.3E+00	1.3E+01	1.8E+01
Forest	17.5	14.7	0.3	0.5	1.1	5.2E+00	8.7E+00	1.9E+01
Non-forested wetland	3.4	2.8	0.0	1.3	10.8	0.0E+00	4.4E+00	3.6E+01
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	14.2	11.9	0.3	0.5	1.1	4.3E+00	7.1E+00	1.6E+01
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Water-based recreation	2.4	2.1	3.7	5.7	12.6	9.0E+00	1.4E+01	3.1E+01
Residential, multi-family	0.0	0.0	19.6	52.8	62.3	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	0.0	0.0	14.7	39.9	47.7	0.0E+00	0.0E+00	0.0E+00
Residential, ¼ to ½ acre lots	8.0	6.8	8.4	22.9	28.6	6.7E+01	1.8E+02	2.3E+02
Residential, > ½ acre lots	40.3	33.9	4.6	12.8	17.3	1.8E+02	5.2E+02	7.0E+02
Salt marsh	27.0	22.8	0.0	1.3	10.8	0.0E+00	3.5E+01	2.9E+02
Commercial	0.9	0.7	0.9	1.4	3.2	7.7E-01	1.2E+00	2.7E+00
Industrial	0.7	0.6	0.9	1.4	3.2	6.4E-01	9.9E-01	2.3E+00
Urban open	0.0	0.0	0.3	0.5	1.1	0.0E+00	0.0E+00	0.0E+00
Transportation	2.8	2.3	0.9	1.4	3.2	2.5E+00	3.9E+00	8.9E+00
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	0.0	0.0	0.0	2.5	10.8	0.0E+00	0.0E+00	0.0E+00
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	118.7	100.0				2.8E+02	7.9E+02	1.4E+03

	Embayment area (ha)	Nitrogen loading coefficient ($kg\ ha^{-1}\ y^{-1}$)			Nitrogen loading ($kg\ y^{-1}$)		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	5.7	3.7	5.7	12.6	2.1E+01	3.2E+01	7.2E+01

	River flow ($m^3\ s^{-1}$)	Nitrogen concentration (mg/L)			Nitrogen loading ($kg\ y^{-1}$)		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					3.0E+02	8.2E+02	1.4E+03

Table B-82. Nitrogen loading analysis for the Rock Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	3.8E+02	1.0E+03	1.9E+03	4.3E+02	1.2E+03	2.1E+03
Watershed total	3.8E+02	1.0E+03	1.9E+03	4.3E+02	1.2E+03	2.1E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	1.6	0.7	5.8	8.3	11.3	9.3E+00	1.3E+01	1.8E+01
Forest	44.8	20.1	0.3	0.5	1.1	1.3E+01	2.2E+01	4.9E+01
Non-forested wetland	4.4	2.0	0.0	1.3	10.8	0.0E+00	5.7E+00	4.7E+01
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	16.3	7.3	0.3	0.5	1.1	4.9E+00	8.2E+00	1.8E+01
Participatory recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Spectator recreation	0.0	0.0	17.9	19.3	22.2	0.0E+00	0.0E+00	0.0E+00
Water-based recreation	2.4	1.1	3.7	5.7	12.6	9.0E+00	1.4E+01	3.1E+01
Residential, multi-family	6.8	3.0	10.6	28.7	35.2	7.1E+01	1.9E+02	2.4E+02
Residential, < ¼ acre lots	0.0	0.0	8.0	22.0	27.6	0.0E+00	0.0E+00	0.0E+00
Residential, ¼ to ½ acre lots	10.8	4.8	4.7	13.2	17.7	5.1E+01	1.4E+02	1.9E+02
Residential, > ½ acre lots	59.9	26.9	2.8	7.9	11.8	1.7E+02	4.8E+02	7.1E+02
Salt marsh	27.0	12.1	0.0	1.3	10.8	0.0E+00	3.5E+01	2.9E+02
Commercial	35.0	15.7	0.9	1.4	3.2	3.2E+01	4.9E+01	1.1E+02
Industrial	0.8	0.4	0.9	1.4	3.2	7.6E-01	1.2E+00	2.7E+00
Urban open	1.8	0.8	0.3	0.5	1.1	5.3E-01	8.9E-01	2.0E+00
Transportation	4.8	2.1	0.9	1.4	3.2	4.3E+00	6.7E+00	1.5E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	6.7	3.0	0.0	2.5	10.8	0.0E+00	1.7E+01	7.3E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	223.1	100.0				3.6E+02	9.9E+02	1.8E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	5.7	3.7	5.7	12.6	2.1E+01	3.2E+01	7.2E+01

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					3.8E+02	1.0E+03	1.9E+03

Table B-83. Nitrogen loading analysis for the Pamet River 1000 m Boundary Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	6.0E+02	1.5E+03	3.5E+03	7.6E+02	2.0E+03	4.2E+03
Watershed total	6.0E+02	1.5E+03	3.5E+03	7.6E+02	2.0E+03	4.2E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within 1000 m boundary		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	1.5	0.3	5.8	8.3	11.3	8.9E+00	1.3E+01	1.7E+01
Forest	172.4	34.6	0.3	0.5	1.1	5.2E+01	8.6E+01	1.9E+02
Non-forested wetland	20.4	4.1	0.0	1.3	10.8	0.0E+00	2.7E+01	2.2E+02
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	45.3	9.1	0.3	0.5	1.1	1.4E+01	2.3E+01	5.0E+01
Participatory recreation	1.3	0.3	17.9	19.3	22.2	2.4E+01	2.5E+01	2.9E+01
Spectator recreation	1.4	0.3	17.9	19.3	22.2	2.6E+01	2.8E+01	3.2E+01
Water-based recreation	1.7	0.3	3.7	5.7	12.6	6.3E+00	9.7E+00	2.1E+01
Residential, multi-family	0.0	0.0	8.1	22.1	27.7	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	0.0	0.0	6.2	17.1	22.1	0.0E+00	0.0E+00	0.0E+00
Residential, ¼ to ½ acre lots	6.6	1.3	3.7	10.5	14.7	2.4E+01	6.9E+01	9.6E+01
Residential, > ½ acre lots	137.9	27.7	2.3	6.6	10.3	3.1E+02	9.1E+02	1.4E+03
Salt marsh	90.9	18.2	0.0	1.3	10.8	0.0E+00	1.2E+02	9.8E+02
Commercial	4.1	0.8	0.9	1.4	3.2	3.7E+00	5.8E+00	1.3E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	3.5	0.7	0.3	0.5	1.1	1.1E+00	1.8E+00	3.9E+00
Transportation	10.9	2.2	0.9	1.4	3.2	9.8E+00	1.5E+01	3.5E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	0.0	0.0	0.0	2.5	10.8	0.0E+00	0.0E+00	0.0E+00
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	497.9	100.0				4.8E+02	1.3E+03	3.1E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	31.7	3.7	5.7	12.6	1.2E+02	1.8E+02	4.0E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					6.0E+02	1.5E+03	3.5E+03

Table B-84. Nitrogen loading analysis for the Pamet River Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	9.0E+02	2.3E+03	5.4E+03	1.5E+03	4.0E+03	8.0E+03
Watershed total	9.0E+02	2.3E+03	5.4E+03	1.5E+03	4.0E+03	8.0E+03

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities			
	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	1.6	0.2	5.8	8.3	11.3	9.5E+00	1.4E+01	1.8E+01
Forest	584.4	55.2	0.3	0.5	1.1	1.8E+02	2.9E+02	6.4E+02
Non-forested wetland	85.3	8.1	0.0	1.3	10.8	0.0E+00	1.1E+02	9.2E+02
Mining	5.9	0.6	0.9	1.4	3.2	5.3E+00	8.2E+00	1.9E+01
Open land	50.5	4.8	0.3	0.5	1.1	1.5E+01	2.5E+01	5.6E+01
Participatory recreation	1.3	0.1	17.9	19.3	22.2	2.4E+01	2.5E+01	2.9E+01
Spectator recreation	1.4	0.1	17.9	19.3	22.2	2.6E+01	2.8E+01	3.2E+01
Water-based recreation	1.7	0.2	3.7	5.7	12.6	6.3E+00	9.7E+00	2.1E+01
Residential, multi-family	0.0	0.0	8.4	23.0	28.7	0.0E+00	0.0E+00	0.0E+00
Residential, < ¼ acre lots	0.0	0.0	6.4	17.7	22.8	0.0E+00	0.0E+00	0.0E+00
Residential, ¼ to ½ acre lots	6.7	0.6	3.9	10.9	15.1	2.6E+01	7.2E+01	1.0E+02
Residential, > ½ acre lots	202.4	19.1	2.3	6.8	10.5	4.7E+02	1.4E+03	2.1E+03
Salt marsh	90.9	8.6	0.0	1.3	10.8	0.0E+00	1.2E+02	9.8E+02
Commercial	5.2	0.5	0.9	1.4	3.2	4.7E+00	7.3E+00	1.7E+01
Industrial	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Urban open	3.5	0.3	0.3	0.5	1.1	1.1E+00	1.8E+00	3.9E+00
Transportation	16.6	1.6	0.9	1.4	3.2	1.5E+01	2.3E+01	5.3E+01
Waste disposal	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open water	0.9	0.1	0.0	2.5	10.8	0.0E+00	2.4E+00	1.0E+01
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	1058.4	100.0				7.8E+02	2.1E+03	5.0E+03

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	31.7	3.7	5.7	12.6	1.2E+02	1.8E+02	4.0E+02

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point source total					9.0E+02	2.3E+03	5.4E+03

Table B-88. Nitrogen loading analysis for the Provincetown Harbor Watershed Delineation

➢ **Summary**

	Present nitrogen loading (kg y^{-1})			Future nitrogen loading (buildout) (kg y^{-1})		
	low	mean	high	low	mean	high
Point sources	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Non-point sources	6.6E+03	1.2E+04	2.7E+04	7.1E+03	1.3E+04	2.9E+04
Watershed total	6.6E+03	1.2E+04	2.7E+04	7.1E+03	1.3E+04	2.9E+04

➢ **Point sources**

	Nitrogen loading (kg y^{-1})		
	low	mean	high
i. NPDES facilities	0.0E+00	0.0E+00	0.0E+00
Point source total	0.0E+00	0.0E+00	0.0E+00

➢ **Non-point sources**

	Area within watershed		Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
	(ha)	(% of total)	low	mean	high	low	mean	high
i. Land use								
Cropland	0.0	0.0	11.2	16.0	21.3	0.0E+00	0.0E+00	0.0E+00
Pasture	0.0	0.0	5.8	8.3	11.3	0.0E+00	0.0E+00	0.0E+00
Forest	467.3	28.2	0.3	0.5	1.1	1.4E+02	2.3E+02	5.1E+02
Non-forested wetland	160.5	9.7	0.0	1.3	10.8	0.0E+00	2.1E+02	1.7E+03
Mining	0.0	0.0	0.9	1.4	3.2	0.0E+00	0.0E+00	0.0E+00
Open land	383.4	23.1	0.3	0.5	1.1	1.2E+02	1.9E+02	4.2E+02
Participatory recreation	13.1	0.8	17.9	19.3	22.2	2.3E+02	2.5E+02	2.9E+02
Spectator recreation	2.7	0.2	17.9	19.3	22.2	4.9E+01	5.2E+01	6.0E+01
Water-based recreation	15.1	0.9	3.7	5.7	12.6	5.6E+01	8.6E+01	1.9E+02
Residential, multi-family	10.4	0.6	8.1	22.2	27.9	8.5E+01	2.3E+02	2.9E+02
Residential, < ¼ acre lots	107.2	6.5	6.2	17.2	22.2	6.7E+02	1.8E+03	2.4E+03
Residential, ¼ to ½ acre lots	37.4	2.3	3.8	10.6	14.8	1.4E+02	4.0E+02	5.5E+02
Residential, > ½ acre lots	32.1	1.9	2.3	6.6	10.3	7.3E+01	2.1E+02	3.3E+02
Salt marsh	105.9	6.4	0.0	1.3	10.8	0.0E+00	1.4E+02	1.1E+03
Commercial	82.5	5.0	0.9	1.4	3.2	7.4E+01	1.2E+02	2.6E+02
Industrial	0.8	0.0	0.9	1.4	3.2	7.2E-01	1.1E+00	2.6E+00
Urban open	22.8	1.4	0.3	0.5	1.1	6.8E+00	1.1E+01	2.5E+01
Transportation	43.8	2.6	0.9	1.4	3.2	3.9E+01	6.1E+01	1.4E+02
Waste disposal	8.6	0.5	0.9	1.4	3.2	7.8E+00	1.2E+01	2.8E+01
Open water	163.5	9.9	0.0	2.5	10.8	0.0E+00	4.1E+02	1.8E+03
Woody perennial	0.0	0.0	5.4	14.8	21.0	0.0E+00	0.0E+00	0.0E+00
Land use total	1657.4	100.0				1.7E+03	4.5E+03	1.0E+04

	Embayment area (ha)	Nitrogen loading coefficient (kg ha^{-1} y^{-1})			Nitrogen loading (kg y^{-1})		
		low	mean	high	low	mean	high
ii. Atmospheric deposition	1338.0	3.7	5.7	12.6	5.0E+03	7.6E+03	1.7E+04

	River flow (m^3 s^{-1})	Nitrogen concentration (mg/L)			Nitrogen loading (kg y^{-1})		
	mean	low	mean	high	low	mean	high
iii. River (upstream of delineation)	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Non-point source total	6.6E+03	1.2E+04	2.7E+04