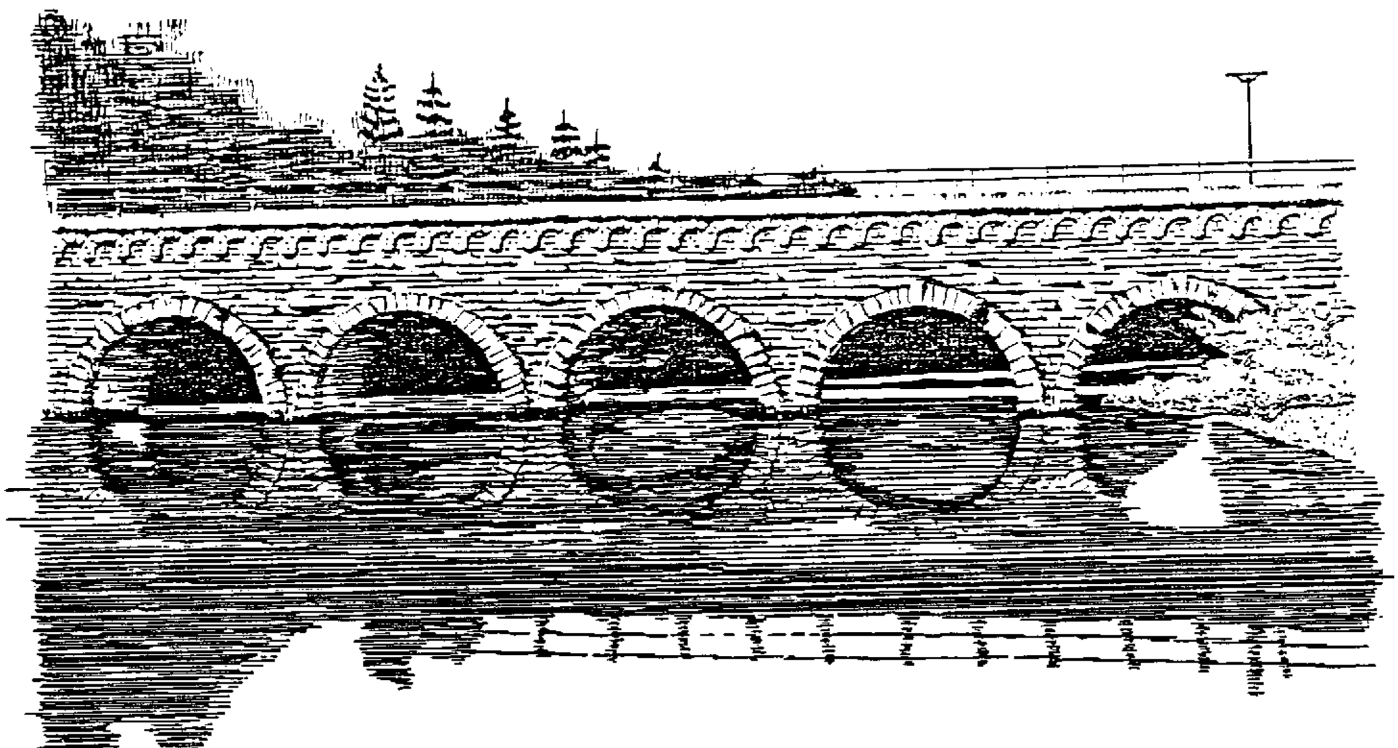
ASSABET RIVER

1989



D. WATER QUALITY MANAGEMENT PLAN

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING

DANIEL S. GREENBAUM, COMMISSIONER

Division of Water Pollution Control

C. J. O'Leary, Acting Director

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ASSABET RIVER BASIN

1989

WATER QUALITY MANAGEMENT PLAN

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FOREWORD

The Massachusetts Division of Water Pollution Control was established by the Massachusetts Clean Water Act, Chapter 21 of the General Laws as amended by Chapter 685 of the Acts of 1966. Included in the duties and responsibilities of the Division is the periodic examination of the water quality of various coastal waters, rivers, streams and ponds of the Commonwealth, as stated in Section 27, Paragraph 5 of the Acts. This section further directs the Division to publish the results of such examination together with the standards of water quality established for the various waters. The Technical Services Branch of the Division of Water Pollution Control has, among its responsibilities, the execution of this directive. This report is published under the Authority of the Acts and is among a continuing series of reports issued by the Division presenting water quality data and analyses, water quality management plans, baseline and intensive limnological studies and various special studies.

ACKNOWLEDGMENTS

The Technical Services Branch of the Division of Water Pollution Control extends its thanks to the following groups and individuals who helped in the report:

- The staff at the Lawrence Experiment Station, who perform the laboratory analyses.

- Michelle Monjeau of the Massachusetts Department of Fisheries, Wildlife and Environmental Law Enforcement, whose assistance was invaluable in setting up the public participation aspects of this project.

- Dolores Matys of the Technical Services Branch who typed the report.

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INTRODUCTION

The Assabet River Basin and its water quality problems are a microcosm of recent conditions in the Commonwealth of Massachusetts in general. The basin is home to several of the State's major computer companies, as well as to numerous smaller "high tech" ventures. Heavy demands are being placed on local communities for further rapid economic and residential development. Coupled with this growth, of course, come the environmental consequences - the need to dispose of increasing amounts of municipal wastewater at the four major Assabet Wastewater Treatment Plants (WWTP's), to provide clean drinking water, to manage the use and disposal of hazardous waste, and to guard ever-diminishing wetland areas.

In the past several years the Assabet River has been the focus of much public controversy. Inadequately treated municipal effluents caused severe dissolved oxygen depletion and odor problems in the river, particularly in the Upper Assabet River near Northborough. Consequently, the Division of Water Pollution Control (DWPC) has expended considerable effort to document and remedy the problem. Water quality sampling programs were conducted in 1965, 1969, 1974, 1979, 1985 and 1987. Additionally, all WWTP's on the river have been either recently upgraded or are in the process of upgrading. The cost of the Assabet River WWTP expenditures to EPA, and DEQE has been over $50M since 1972. Dissolved oxygen levels have improved, but excess nutrients instream will continue to pose problems in water quality management.

A water quality management plan, such as this, is meant to identify existing water quality conditions, to state water use goals, to provide a vehicle to list direct discharges by National Pollutant Discharge Elimination System (NPDES) permittees, to recommend actions necessary to achieve and maintain water quality goals, and to document other information of particular relevance to water quality in an individual river drainage basin. Basin water quality management plans are required and written in accordance with the United States Environmental Protection Agency's (U.S. EPA) guidelines for Section 303(e) of the Federal Water Pollution Control Act as amended and by the Massachusetts Clean Water Act Amendment of 1966 (Chapter 21 and 685 of the General Laws).

A water quality management plan for the Assabet River was last published in 1982 in a report entitled The SuAsCo River Basin Water Quality Management Plan - 1981. The present management plan updates portions of the 1981 report, provides a recommended future water quality monitoring program, and outlines other issues of importance concerning water quality in the basin.

A public participation program was conducted as a part of this basin plan, details of which are described in Appendix F.

SUMMARY AND RECOMMENDATIONS

The Assabet River Basin Water Quality Management Plan is intended to be a dynamic planning document, i.e., as new information is obtained, or as changes occur in the Assabet River system, then updating and reevaluation of this plan is in order. As it stands, this report summarizes the most important water quality issues facing the Assabet River Basin today - present water quality, wastewater management, water quality mathematical modeling, wasteload allocations, nonpoint source considerations, water supply considerations, and wetlands protection.

Much of our effort to date, has been concentrated on water quality management of the Assabet River proper, and so consequently, much of this report also focusses on the river itself. Future management plans will likely include more detailed information on the other aspects involved in a basin-wide water quality assessment.

The following paragraphs constitute our basic thoughts and recommendations for improved water quality in the Assabet River Basin. For ease of use, these recommendations have been grouped according to where the activity should probably occur at the state, local, or individual level.

DEQE (State) Activities

1. **Develop more realistic guidelines for inclusion in NPDES permits state-wide for deciding when a WWTP is approaching its design capacity. The trigger point, which has yet to be determined, will prevent future water quality problems in receiving waters by mandating that specific plans be in place for a WWTP upgrade or alternate wastewater disposal.**

   Currently, a WWTP must begin facilities planning when effluent flow exceeds eighty percent of design flow for ninety consecutive days. This current initiation point has been historically unsatisfactory for two major reasons. The "consecutive day" clause works to wrongly eliminate many plants from consideration early enough to prevent water quality problems. Also, the facilities planning process takes so long (many years) that WWTP overloading in the meantime often occurs.

2. Nutrient Studies

   a. **Initiate a special nutrient and plant growth study on the Assabet River.**

      The more immediate problem of high biochemical oxygen demanding effluents, which lead to low dissolved oxygen levels in-stream, has been effectively solved by upgradings at the WWTP's on the river. However, the effluents still contain high nutrient (nitrogen and phosphorus compound) levels. Plant and algae growth in-stream is prolific and at nuisance proportions in slow-moving stretches. Further data is needed to answer the following questions. Will nutrient removal at the WWTP's result in noticeable improvements in-stream? Are there other possible remedies?

   b. **Study selected impoundments of the Assabet River with odor and/or aquatic growth problems to ascertain whether short or long-term restoration is desirable and plausible.**

Are restoration techniques such as weed harvesting, dredging, or draw-down potentially cost-effective ways to improve the recreational qualities of these areas? Is there enough public support for these improvements?

c. **During up-comming water quality surveys, assess the in-stream impact of the Powdermill Impoundment sediments.**

3. **Continue periodic Assabet River water and sediment quality monitoring to assess effectiveness of abatement projects and to provide a data-base for future water quality management planning. Collect other surface or ground-water water qualilty information on the Assabet River Basin as the need arises.**

4. **Strictly enforce NPDES permitted flows and parameter limits at all Assabet River WWTP's.**

5. **Review the need for pretreatment of industrial wastewater at the Hudson and Maynard WWTP's in light of rapid growth in these communities. (Westborough and Marlborough will have NPDES pretreatment requirements).**

6. **Develop a warning system for the Billerica Water Treatment Plant in the event of WWTP malfunction, toxic pass-through, or if a hazardous spill is known to have occurred upstream. Consider incorporating provisions for this in Assabet River NPDES permitting.**

   The town of Billerica withdraws drinking water directly from the Concord River, which is formed by the confluence of the Assabet and Sudbury Rivers. Thus, the Assabet River is, in reality, a water supply.

7. **Study the need for dechlorination or alternate disinfection systems at Assabet WWTPs.**

   Since the Assabet River provides relatively low dilution of WWTP effluents, the possibility of deleterious effects on in-stream aquatic organisms due to effluent chlorine toxicity is possible. Information from the WWTP bioassays should be analyzed to evaluate this topic.

8. **Toxicity-related issues (other than chlorine toxicity).**

   a. **Continue to monitor WWTP bioassay toxicity testing results. Incorporate these results in a basin-wide WWTP effluent toxicity evaluation.**

   b. **Standardize WWTP bioassay toxicity testing.**

9. **Provide water quality information necessary for fishery restoration in the Assabet River to the Massachusetts Division of Fisheries and Wildlife.**

   With the upgrading of the Assabet River WWTPs, improvements in water quality will ensue. Thus, the Department of Fisheries and Wildlife should be kept up to date with water quality improvements and on-going abatement projects so that Division personnel can make valid fisheries restoration decisions.

10. **Complete the upgrade of the Concord MCI WWTP. (Massachusetts Division of Capital Planning and Operations).**

Short-term upgrading has been funded and is expected to be completed in mid to late 1989. This work includes adding a third clarifier, removing some of the sludge inventory, and improving the chlorination system. The long-term work, which is a high priority in the state budget, will probably also be funded. Some of these improvements will be sludge management (composting), a fourth clarifier, and a new chlorine contact tank.

<u>Town Activities</u>

11. **Towns with WWTPs should recognize that DEQE approval of flow expansion (other than for process improvements) at these WWTPs is unlikely. Alternate strategies for dealing with municipal growth should be sought.**

The Assabet River is now receiving close to its maximum loading of municipal effluent. (See the chapter on "Water Quality Modeling and Wasteload Allocations," for a more detailed discussion.)

12. **Ensure that WWTP's have adequate operation and maintenance budgets and that the plant operators have competitive salaries and training.**

It should be acknowledged and publicized within the towns, that modern WWTP's are complex utilities requiring skillful upkeep and a well-trained staff.

13. **Enforce pretreatment standards.**

The enforcement of pretreatment standards for industrial waste entering municipal sewer systems is the responsibility of the individual wastewater plants. Inadequately treated industrial waste could cause the municipal WWTPs to have operational upsets, or to pass pollutants through their processes without adequate treatment.

14. **Protect a wetland buffer zone along the Assabet River.**

The buffer area will offer scenic beauty, reduce runoff, and filter contaminants. Land protection can be in the form of acquisition, zoning bylaws, and conservation easements, among other techniques.

15. **Investigate the desirability of regional sludge management.**

With the increasing cost and regulatory difficulty of landfilling and composting, a regional solution to the sludge disposal problem may be beneficial to many towns in the Basin.

16. **Initiate water conservation in the towns. Residential water conservation can be encouraged through community education programs in the region. Devices such as low-flow shower heads, toilet dams, and faucet aerators have been shown to reduce residential water use significantly and should be encouraged.**

Water supplies in the region are generally adequate, but may be stressed during drought conditions. Conservation, though, makes sense for many important environmental reasons. Of course, water conservation helps to ensure that valuable water supplies will remain adequate for a community's needs. In addition, if somewhat less water is transported through the sewer systems to the WWTPs, then theoretically, the wastewater plants can process the remaining wastewater more efficiently. Finally, it is important to note that economically, the less water used, the less that must be treated both as water supply water, and as wastewater.

Individual Activities

17. **Work with state environmental officials, and town elected representatives to encourage that prompt actions be taken on the issues presented above.**

18. **Use low phosphate detergents and non-toxic cleaners in the home.**

    The Assabet River has an over-abundant nutrient supply. Although we have not yet proven that lowering phosphate inputs to the river can cause water quality improvements, doing so is a step in the right direction. In areas with septic systems, non-phosphate detergents are often useful in groundwater protection or in lake watershed protection. DEQE, Division of Water Pollution Control, Westborough, Massachusetts Audubon, Lincoln and the Massachusetts Department of Environmental Management, Bureau of Solid Waste Disposal, Boston, have information available concerning detergents, fertilizer, and alternatives for household chemicals.

PHYSICAL CHARACTERISTICS OF THE ASSABET RIVER

The Assabet River, originating in impounded swamplike land in southwestern Westborough, flows through several highly populated areas including Westborough, Northborough, Hudson, Maynard, and Concord, until it joins with the Sudbury River in Concord to form the Concord River. It currently receives major discharges from four municipal wastewater treatment plants and a state prison treatment plant.

The varying physical characteristics of the Assabet River play a critical role in the chemical and biological activities which occur in the river. The re-occurring presence of dams and the slow moving, swampy impoundments they create are vital factors in the water quality of the Assabet River. Figure 1 shows the drainage basin and the assigned water use classification (see Table 1) of the Assabet River and its tributaries. Figure 2 shows the Assabet profile, with changes in elevation, and location of dams and wastewater treatment plant discharges. In the following description, the mile point from the confluence with the Sudbury River is shown in parentheses.

The Assabet River begins at the outlet of the George H. Nichols Multiple-Purpose Dam in the southwest section of Westborough. The dam creates a small impoundment of about 0.6 sq. mi. which collects water drainage from an area of about 7 sq. mi., much of which is swampland. The dam was intended to provide fish and wildlife habitat and low flow augmentation for pollution abatement. Decaying organic matter formed by the insufficient removal of trees and roots when the area was flooded produces inferior water quality within the impoundment. In addition, proper flow regulation is absent. Water which does flow through the dam, however, is aerated, and the resulting water quality in the newly emerging Assabet is good as far as dissolved oxygen and bacteriological parameters are concerned.

After a short, fast flowing stretch, the river begins its characteristic sluggish flow. "Hocomonco Stream" joins the river just above where the first of five wastewater treatment plants discharges into the Assabet - the town of Westborough Wastewater Treatment Plant (WWTP) (river mile 30.2). Shortly downstream the Shrewsbury WWTP discharged to the river until the spring of 1987, when its flows were tied in to the Westborough WWTP. The Assabet meanders its way through swamplike lands and flows by a golf course before reaching the next impounded area and dam on Route 20 in Northborough (river mile 26.5). Soon, another relatively steep gradient causes the river to accelerate through a small industrial complex. Then, taking a 90° turn, the Assabet enters the "headwater" pool of the Allen Road dam impoundment (river mile 25.4). After flowing through pasture lands, the basic pattern of the river is repeated - the Marlborough West WWTP (river mile 24.1) coincides with the slowing of the river flow. The river flows through swamplands until the dam at Route 85 in Hudson (river mile 18.2). Through Hudson center the flow is constricted by industrial developments on both banks. Passing out of Hudson center the pattern is again repeated - the Hudson WWTP discharges into the Assabet just above the swampland impoundment created by the Gleasondale dam (river mile 14.4). Following a short rapid section, the river flows in its characteristic slow meandering style for 4.5 miles through the town of Stow.

Flowing over the American Woolen Dam (river mile 9.0) and into the town of Maynard, the river's gradient sharply increases and the flow is channeled through the center of Maynard. The Assabet, for the fourth time, repeats its pattern - flowing into the Powder Mill impoundment and receiving the discharge from the Maynard WWTP (river mile 6.3). From the Powder Mill dam to the confluence with the Sudbury River, the river's gradient is relatively uniform. The Assabet flows through West Concord receiving its final discharge from the Massachusetts Correctional Institution (MCI) at West Concord (river mile 2.4). The river slowly reaches the Sudbury River just north of the center of Concord. The confluence of the Assabet and Sudbury rivers produces one main stream - the Concord River.

The United States Geologic Survey has maintained a flow monitoring station on the Assabet River in Maynard since 1942. The average annual flow at this point is 195 cubic-feet per second, while the seven-day ten-year low flow is about 16 cubit-feet per second.

Figure 1

ASSABET RIVER BASIN CLASSIFICATION

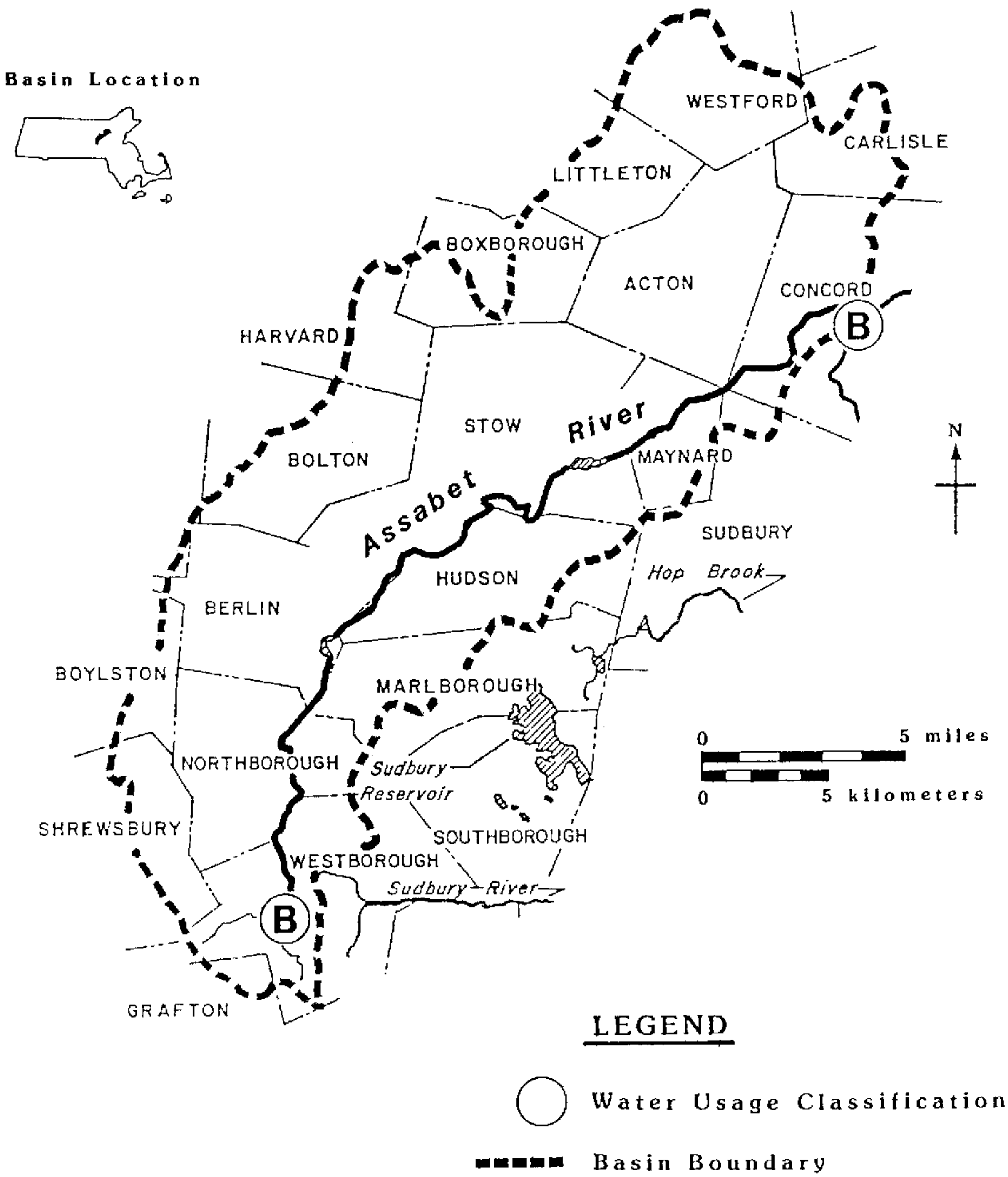
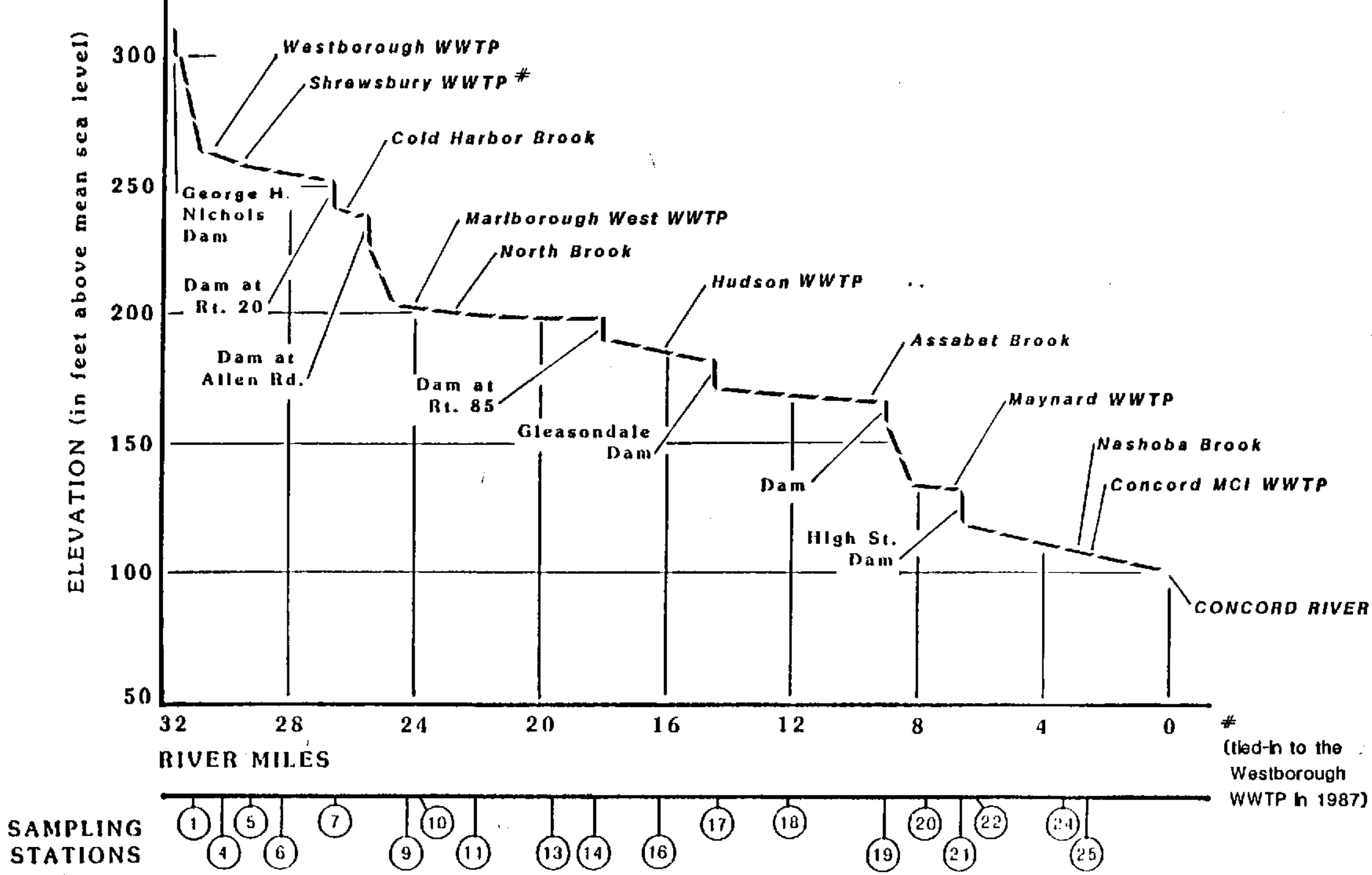


Figure 2 ASSABET RIVER ELEVATION PROFILE and LOCATION of SAMPLING STATIONS



WATER QUALITY OBJECTIVES

As indicated in Table 1, surface waters of the Assabet River carry a Class B Classification.[1] Waters assigned to this class are designated for the use of protection and propagation of fish, other aquatic life and wildlife; and for primary and secondary contact recreation. Tributaries to the Assabet River which are either inlets or outlets from water supply sources are specified as Class A. Waters assigned to this class are designated for use as a source of public water supply.

[1] Massachusetts Surface Water Quality Standards. Division of Water Pollution Control, Massachusetts Department of Environmental Quality Engineering. 1986.

TABLE 1

ASSABET RIVER BASIN

WATER QUALITY CLASSIFICATION[1]

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	DESIGNATED USE	OTHER RESTRICTIONS
Source to Westborough WWTP, Westborough	31.8-30.4	B	Aquatic Life Recreation (P&S)[2]	314 CMR 4.04(3)
Westborough WWTP to outlet of Boones Pond, Stow	30.4-12.4	B	Aquatic Life Recreation (P&S)	--
Outlet of Boones Pond to confluence with Sudbury River, Concord	12.4-0.0	B	Warm Water Fishery Recreation (P&S)	--
White Pond to its outlet in Stow and those tributaries thereto	--	A	Public Water Supply	MGL., Ch. 111
Gates Pond to the intake in Berlin and those tributaries thereto	--	A	Public Water Supply	MGL., Ch. 111
Unnamed Brook from its source to Gates Pond, Berlin	--	A	Public Water Supply	MGL., Ch. 111
Millham Brook Reservoir to its outlet in Marlborough and those tributaries thereto	--	A	Public Water Supply	MGL., Ch. 111
Lake Williams to its outlet in Marlborough and those tributaries thereto	--	A	Public Water Supply	MGL., Ch. 111

[1]Massachusetts Water Quality Standards, 1985.

[2](P&S): Primary and Secondary contact recreation.

TABLE 1 (Continued)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	DESIGNATED USE	OTHER RESTRICTIONS
Cold Brook Reservoir in Shrewsbury and those tributaries thereto	--	A	Public Water Supply	MGL., Ch. 111
Sandra Pond to its outlet in Westborough and those tributaries thereto	--	A	Public Water Supply	MGL., Ch. 111
Sudbury Reservoir in Westborough, Marlborough, Southborough, Framingham and those tributaries thereto	--	A	Public Water Supply	MGL., Ch. 111
Nagog Pond to its outlet in Acton and tributaries thereto	--	A	Public Water Supply	MGL., Ch. 111
Other surface waters of the Assabet River drainage area unless otherwise noted above	--	B	--	314 CMR 4.04(3)

EXISTING WATER QUALITY

The Assabet River has had relatively severe water quality problems in the recent past, mostly as a result of wastewater discharges from the six municipal WWTP's lining its banks. Today, the river still only partially meets its Class B Water Quality Classification. Past sampling programs in 1965, 1969, 1974, and 1985 all documented significant dissolved oxygen deficits and excessive fecal coliform bacteria counts. Data from the latest surveys in 1987 and 1988 shows that the river has improved considerably in these respects, but still has occasional dissolved oxygen violations. However, significant portions of the river still support dense populations of algae and macrophytes during the summer months. Decay of this excess vegetation and sediments in many slow moving parts of the Assabet River can cause local odor problems.

The studies done in 1987 had, as their goal, the preliminary determination of the effects on river water quality from recent WWTP upgradings at four of the river's facilities: the Westborough, Shrewsbury, Hudson, and Maynard WWTP's. Accordingly, the interaction of these discharges with river hydrology and chemistry will be explored in this report. Particular attention was focused on the Upper Assabet River in the vicinity of the Westborough and Shrewsbury WWTP discharges, since the most severe water quality problems on the Assabet have occurred in this vicinity.

For analytical purposes, this data analysis will be discussed in three sections - conventional pollutants in-stream, toxic pollutants in-stream and wastewater discharges.

For proper interpretation of water quality data, hydrographs of Assabet River flows as measured at the Maynard U.S.G.S. gage are presented in Figure 4 for the intensive September 1987 survey. Table 3 presents flow data for other past years' surveys. Ideally, river flows should be similar for direct comparison of parameters such as BOD and nutrients across months or years.

The conventional pollutant chemical and biological parameters of principal interest which will be examined as to source and effect are dissolved oxygen, five-day biochemical oxygen demand, ammonia-nitrogen, phosphorus, and fecal coliform bacteria. The water quality problems which occur, and which have occurred over ten years, are exacerbated in the summer, when river flows are at a minimum (yielding minimum dilution), and decay and vegetative growth processes are at a maximum.

The toxic pollutant problems which occur in the Assabet River are more elusive to quantify. However, the data which has been gathered will be discussed according to best professional judgment.

Finally, for future reference, data on fish species occurrence and heavy metal concentration in the edible flesh is listed in Appendix A for sampling done in 1985 at five Assabet locations.

TABLE 2

ASSABET RIVER BASIN SURVEYS

LOCATION OF SAMPLING STATIONS

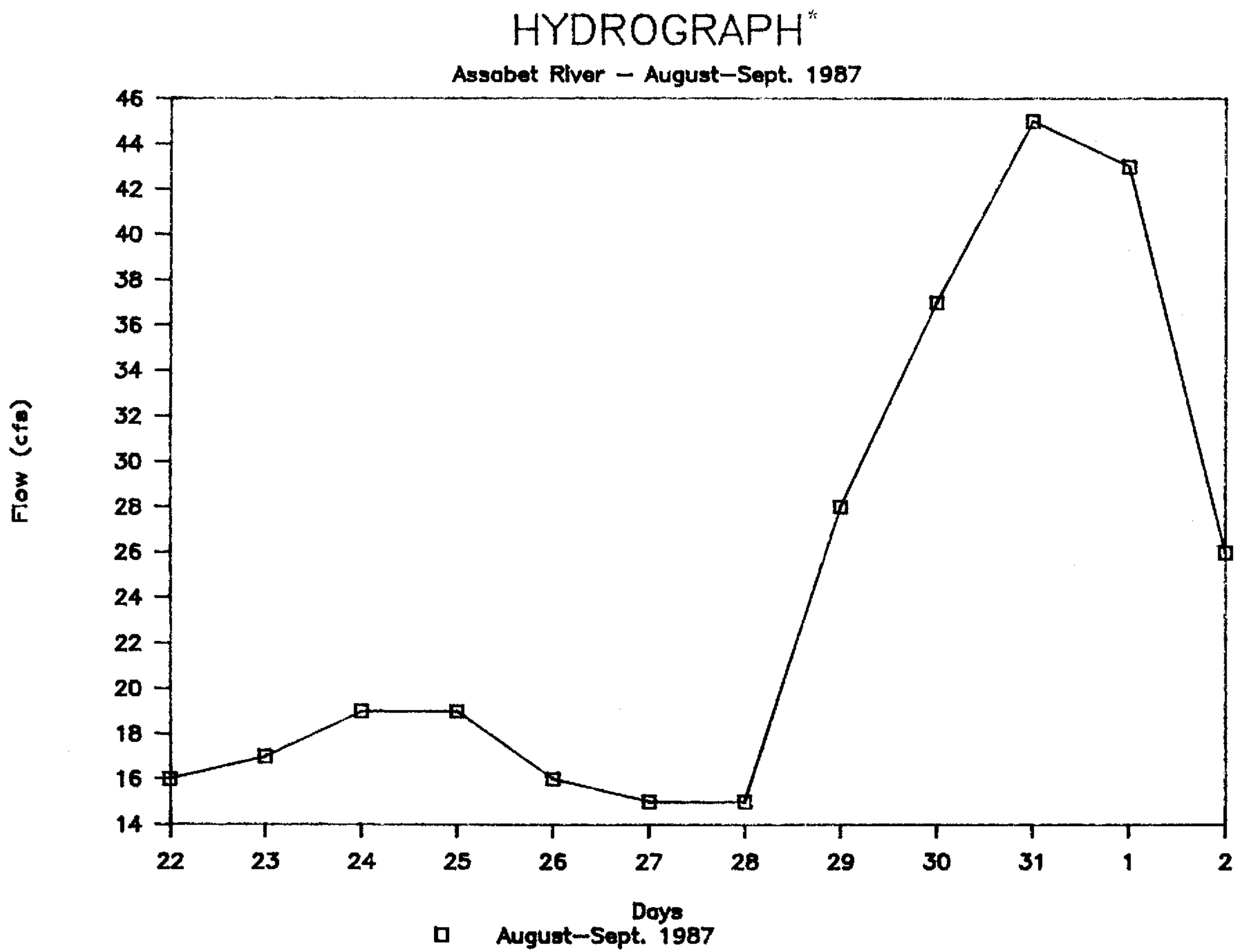
STATION NUMBER	LOCATION	RIVER MILE
AS01	Water Outlet, George H. Nichols Multi-Purpose Dam, Westborough	31.8
AS02	Maynard Street, Westborough	31.0
AS03 (T)	Outlet of Hocomonco Pond, Otis Street, Westborough	30.5, 0.5
AS04	Route 9, Westborough	30.1
AS05	Route 135, Westborough/Northborough Line	29.2
AS06	School Street, Northborough	28.3
AS07	Above Dam, Route 20, Northborough	26.5
AS09	Boundary Street, Northborough/Marlborough Line	24.2
AS10	Robin Hill Road, Marlborough	23.8
AS11	Bigelow Road, Berlin	22.0
AS13	Chapin Road, Hudson	19.6
AS14	Below dam, Route 85, Hudson	18.2
AS16	Cox Street, Hudson	16.2
AS17	Below dam, Route 62, Stow	14.4
AS18	Boon Road, Stow	12.1
AS19	Routes 62/117, above dam, Maynard	9.0
AS20	Routes 27/62 at USGS gage, Maynard	7.7
AS21	Above Powdermill dam, Acton	6.5
AS22	Route 62, first bridge, Concord	6.1
AS24	Route 62, third bridge, Concord	3.3
AS25	Routes 2/2A, Concord	2.6
SU15	Sudbury River, Nashawtuc Hill Road, Concord	0.0, -0.5
CO01	Concord River, Lowell Road, Concord	0.0, +0.1

Figure 3

LOCATION of SAMPLING STATIONS

ASSABET RIVER BASIN

FIGURE 4



* FLOWS FROM U.S.G.S GAGE, MAYNARD

TABLE 3

ASSABET RIVER

U.S.G.S. Gage at Maynard

Flow Data[1]

DATE	DISCHARGE (cfs)
2/18/87	123
3/17/87	306
4/16/87	667
5/13/87	239
6/10/87	83
6/24/87	70
7/22/87	28
7/23/87	28
8/5/87	31
8/20/87	18
9/1/87	43
9/2/87	26
9/23/87	151
11/11/86	131
7/17/85	41
8/8/79	34
8/9/79	27

[1]Measurements made by U.S.G.S. at their automated gaging station.

CONVENTIONAL POLLUTANTS

The "conventional pollutants" of concern for the Assabet River are fecal coliform bacteria, biochemical oxygen demand, solids, and the various nutrient parameters in the form of dissolved nitrogen and phosphorus compounds. These parameters are considered "conventional" (as opposed to "toxic") in that they have, until the last several years, received most of the attention of water quality planners. For analytic purposes, the river will be divided into two segments - upper and lower.

Upper Assabet River

The upper segment, where extensive water quality data were collected in 1987, extends from the Assabet headwaters in Westborough, to Boundary Street, Marlborough. The actual data is compiled in another DEQE report.[1] Surveys were conducted in this area once per month through June 1987, whereupon they were conducted twice per month through September, 1987.

Water quality problems in this segment were due primarily to the Westborough and Shrewsbury WWTP discharges and were the most severe in the Assabet River. However, rapid improvements in water quality began to occur with the opening of the new Westborough Regional WWTP.

Prior to the opening of the new Westborough Regional WWTP, though, the upper Assabet River had been the focus of considerable public controversy and odor complaints over several years. The most severe odor problems along the river, in Northborough, were caused by sewage inputs high in BOD. These created very low dissolved oxygen conditions, i.e., anaerobic in-stream conditions, and anaerobically decaying organic sediments in and bordering the river. In order to respond to the public anxiety, the Technical Services Branch (TSB) instituted a project to study the odor problem in-depth and recommend possible short-term solutions.

The final report on the Upper Assabet River odor problem and possible short-term solutions was published by TSB, Westborough, in December, 1986.[2] This analysis outlined the issues and technical complexities involved in physical alteration of stream conditions, i.e., dredging, liming the river banks, in-stream aeration, and hydrogen peroxide addition. In addition, the report presented water quality predictions from mathematical stream modeling of dissolved oxygen for various possible scenarios. The conclusion of the study was that the short term solutions were very expensive and experimental in nature.

The mathematical modeling predicted greatly improved river conditions once the new Westborough WWTP came on line. Thus, the short term "remedial" measures were judged unnecessary.

[1] Hanley, Nora. Assabet River 1986-87, Water Quality Survey Data, Wastewater Discharge Data, and Analysis. DEQE-DWPC-TSB, April 1988.

[2] Internal Memo. Nora Hanley. "Assabet River - Mathematical Modeling and Odor Reduction Options." DEQE-DWPC-TSB, December 1986.

These suppositions were proven correct once the new Westborough WWTP was operational. Dissolved oxygen levels in the river were even higher and rose more quickly than predicted. The projected (via mathematical modeling) and actual oxygen levels in-stream are presented graphically in Figure 5. Odor problems due to low dissolved oxygen along the Assabet River were minimal to non-existent during the summer of 1987, as predicted. However, some violations of the dissolved oxygen standard did occur during 1987, and to a greater extent during the drier summer of 1988.

Examining the upper Assabet River survey data more closely, we also see that BOD_5 values have greatly decreased during September 1987 as compared to 1985 and even 1979 values. This is depicted graphically in Figure 6 for river miles 32 through 24. The steep decrease is directly attributable to improved wastewater treatment at the new Westborough facility. In turn, this sharp BOD_5 decrease has lead directly to the sharp dissolved oxygen increase described above.

Also of note are the improved fecal coliform bacteria levels in the upper Assabet River as pictured in Figure 8. Steep declines in bacteria densities have occurred since 1985, so that presently the levels are within the Class B water quality standard of 200 organisms/100 ml. Again, these declines are directly attributable to the new Westborough WWTP, where an improved chlorination system and reduced solids loadings in the effluent have allowed for improved disinfection.

Lastly however, as pictured in Figure 9, phosphorus levels in-stream in the upper Assabet (river miles 32 to 24) have not declined. This is reasonable in that the new Westborough WWTP does not have phosphorus removal capabilities; so, phosphorus loading to the upper Assabet is approximately the same as in previous years (but will increase with increased flows). In addition, phosphorus can settle in sediments and later be resuspended and recycled, as opposed to remaining dissolved and being flushed from the upper Assabet. The phosphorus levels in the upper river are very high, and are capable of fostering nuisance algae and weed growth in slow moving sections of the river. (A phosphorus level between 0.05 and 0.1 mg/l for a stream such as the Assabet is recommended by the EPA's water quality standards.)

Lower Assabet River

The lower Assabet River, from AS10 through the confluence with the Sudbury River, is beset with similar problems to those described on the upper Assabet but in less severe form. These problems range from occasional dissolved oxygen and fecal coliform standard violations to high nutrient levels. The entire Assabet River was intensively surveyed during the weeks of July 22 and September 1, 1987.

Dissolved oxygen during these times was, at some places, below the 5 mg/l standard for a Class B river, as can be seen in Figure 7. Generally, the reasons for this, as before, are due to the nature of the Assabet, a river which flows slowly through swampy areas with little aeration, as well as to WWTP's effluents and in-place sediments creating an oxygen demand. Since the 1985 water quality survey, dissolved oxygen has increased in the river downstream of the newly upgraded Hudson WWTP, located around river mile 16, as shown in Figure 7. In addition, BOD_5 values in-stream, as seen in Figure 6 have dropped throughout the Assabet River since 1985. These are positive signs and may be indications of the effect of improved treatment at the newly upgraded Hudson and Maynard WWTP's.

A remaining problem in this segment is an accumulation of wastewater solids behind the Powdermill Dam in Acton. The towns of Acton and Maynard have had a long-standing disagreement on a solution to this problem. DWPC water quality data in this area should be updated.

Nutrients, including ammonia, nitrates, and phosphorus, now present in river sediment, and ultimately of treatment plant origin, continue to be present at very high levels in this river segment, as well as in the upper river segment. This leads to prolific aquatic weed and algae growth in slow moving parts of the river. As shown in Figure 9, phosphorus levels in the upper Assabet have actually increased with time. This is reasonable in that none of the upstream WWTP's have phosphorus removal capabilities; so, phosphorus loading to the river is approximately the same as in previous years, and may increase with increased WWTP flows. The fact that phosphorus seems to have increased in-stream since 1979 may point to phosphorus recycling from the sediments. Much of the consequent algae growth is abundant enough, such as near AS14, AS19, and AS21, so as to potentially cause odor problems during the summer as the plants die and decay.

FIGURE 5

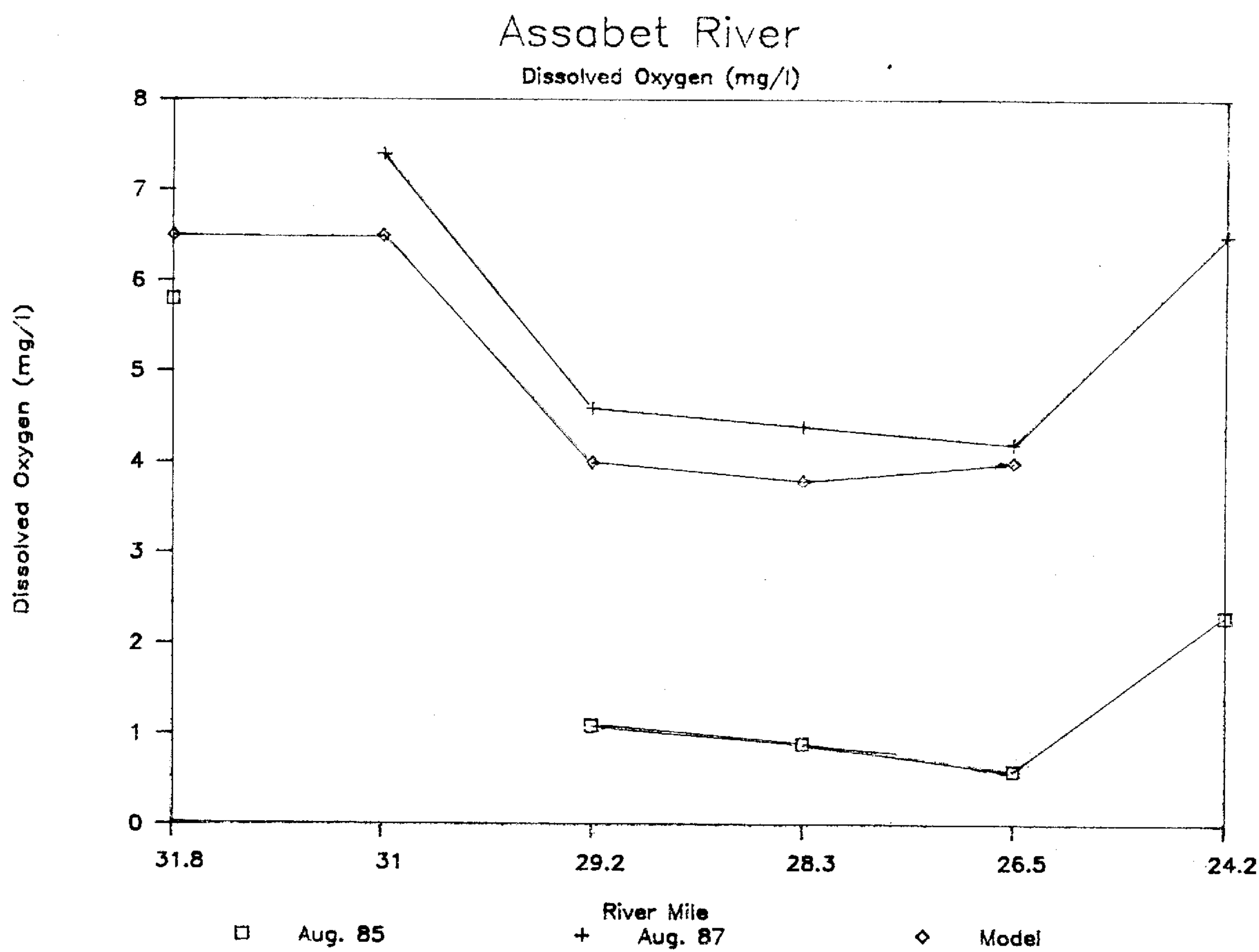
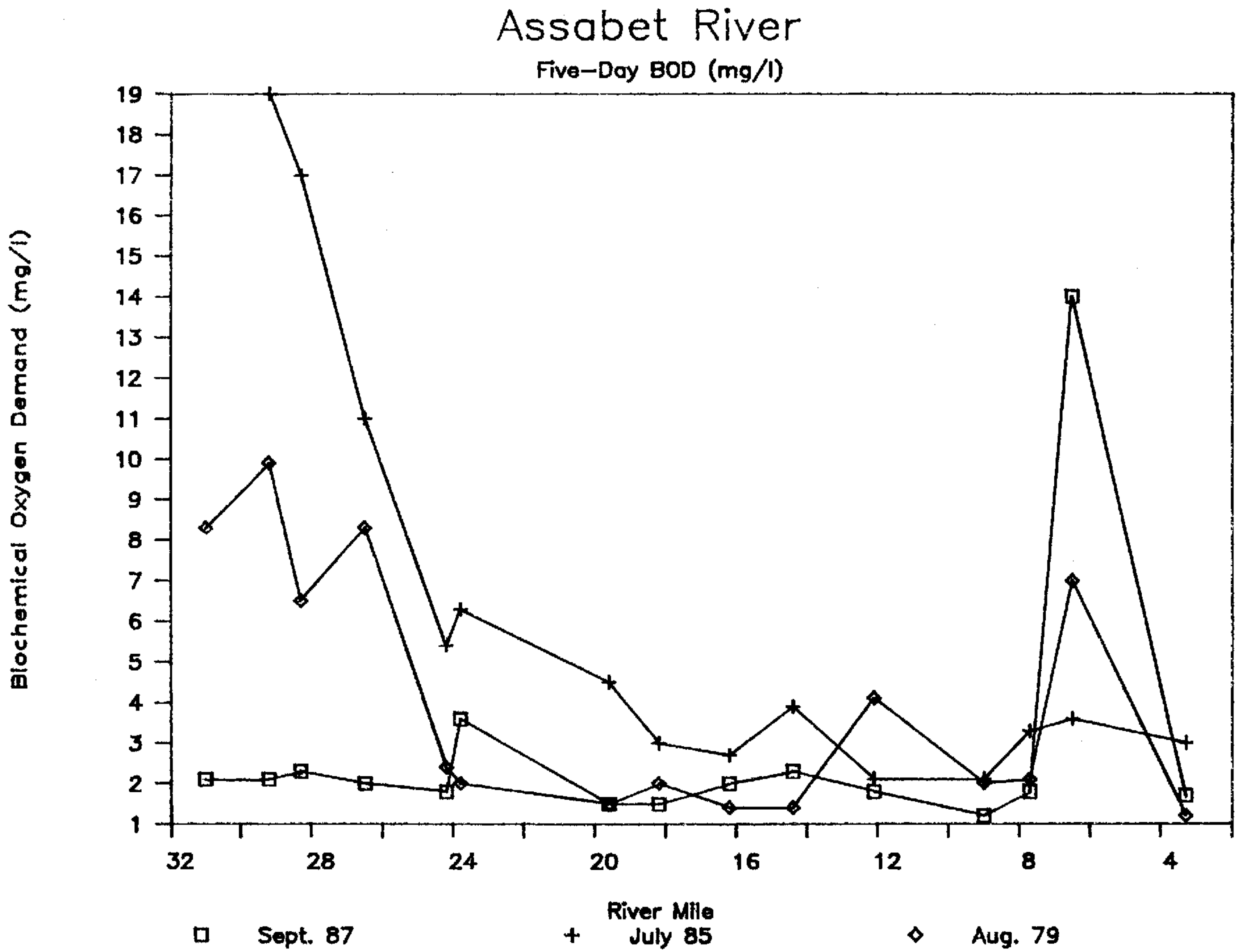

Assabet River
Dissolved Oxygen (mg/l)
Dissolved Oxygen (mg/l)
8
7
6
5
4
3
2
1
0
31.8
31
29.2
28.3
26.5
24.2
River Mile
Aug. 85
Aug. 87
Model

FIGURE 6



Assabet River
Five-Day BOD (mg/l)
Biochemical Oxygen Demand (mg/l)
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
32
28
24
20
16
12
8
4
River Mile
Sept. 87
July 85
Aug. 79

FIGURE 7

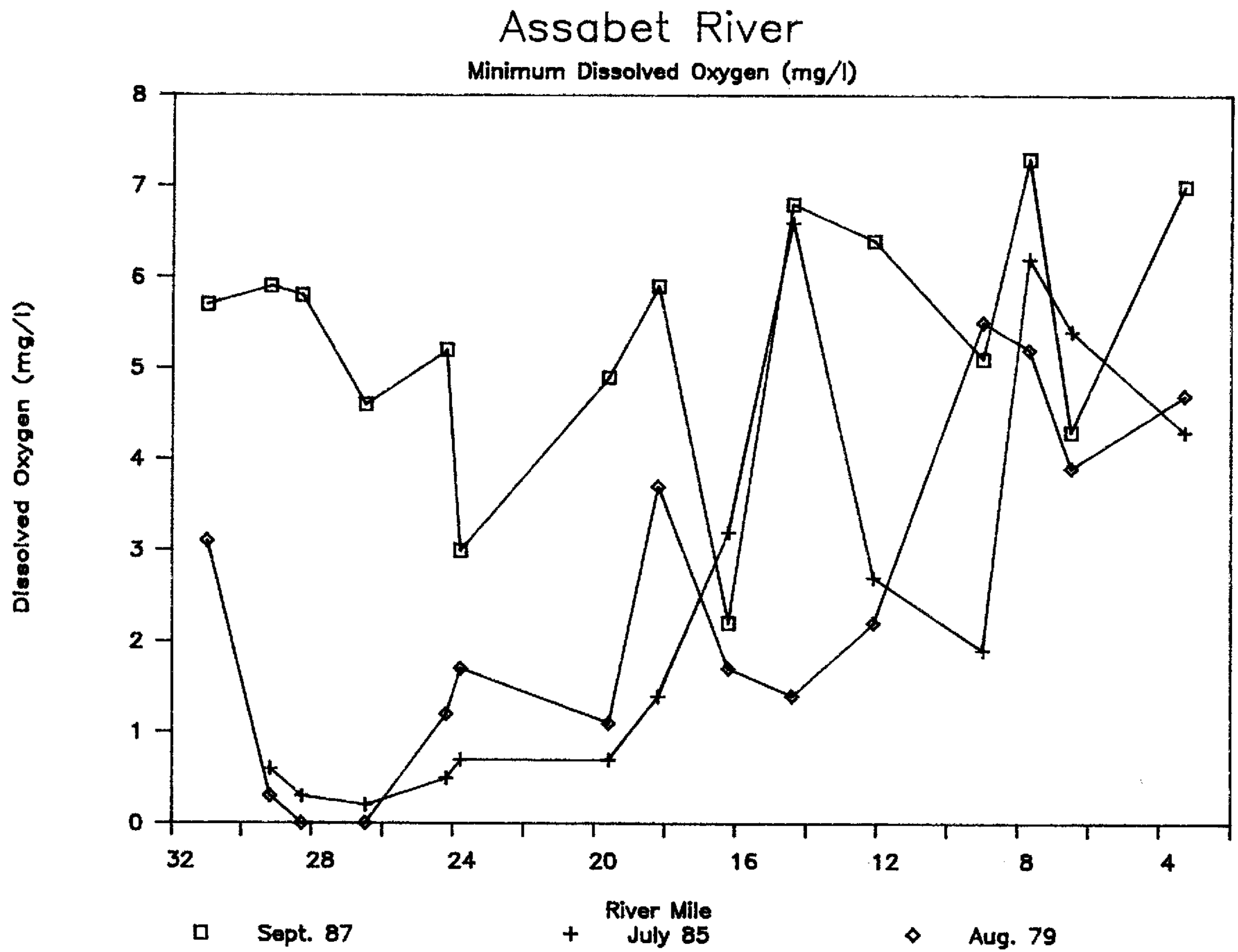

Assabet River
Minimum Dissolved Oxygen (mg/l)
Dissolved Oxygen (mg/l)
0
1
2
3
4
5
6
7
8
32
28
24
20
16
12
8
4
River Mile
Sept. 87
July 85
Aug. 79

FIGURE 8

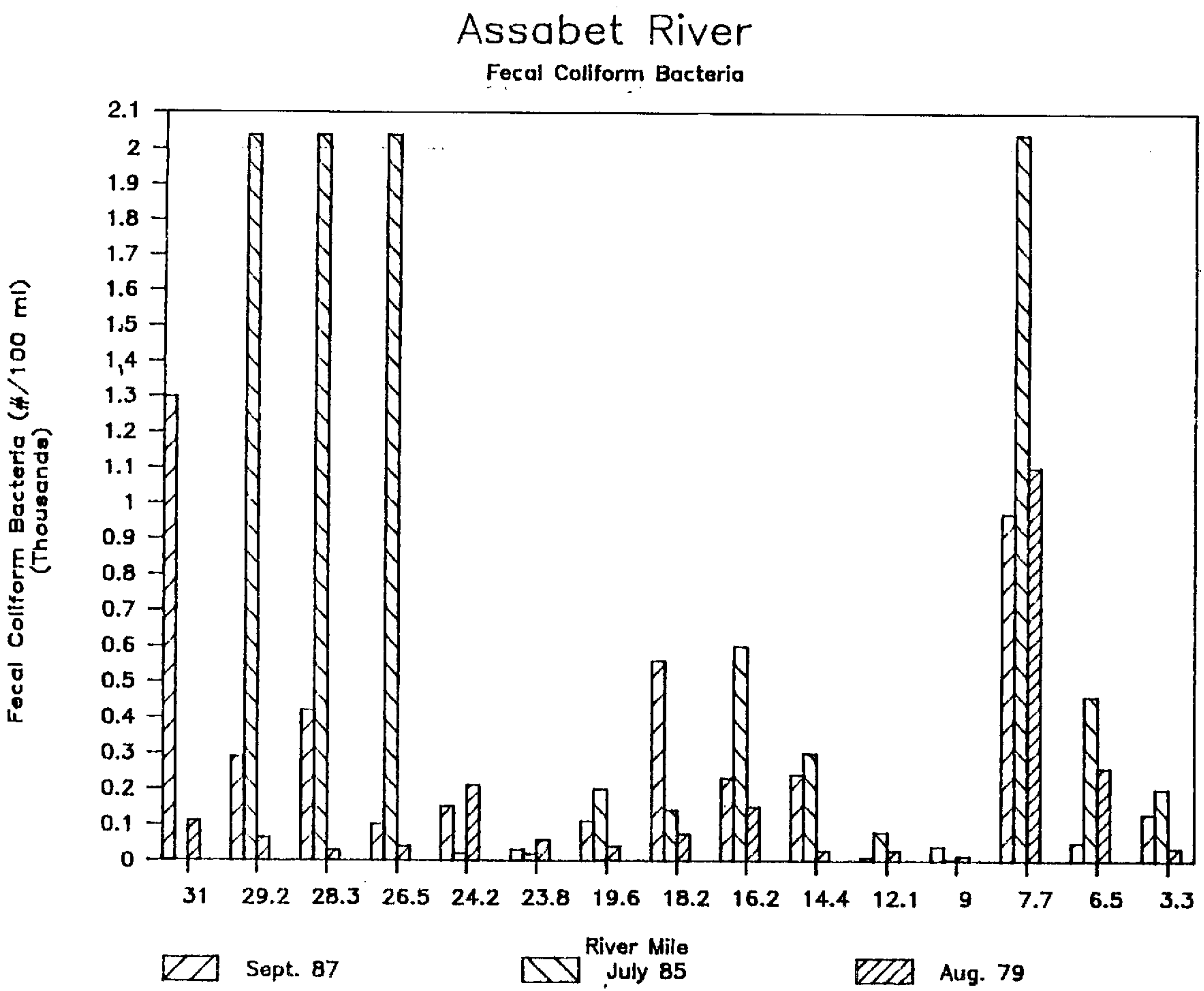
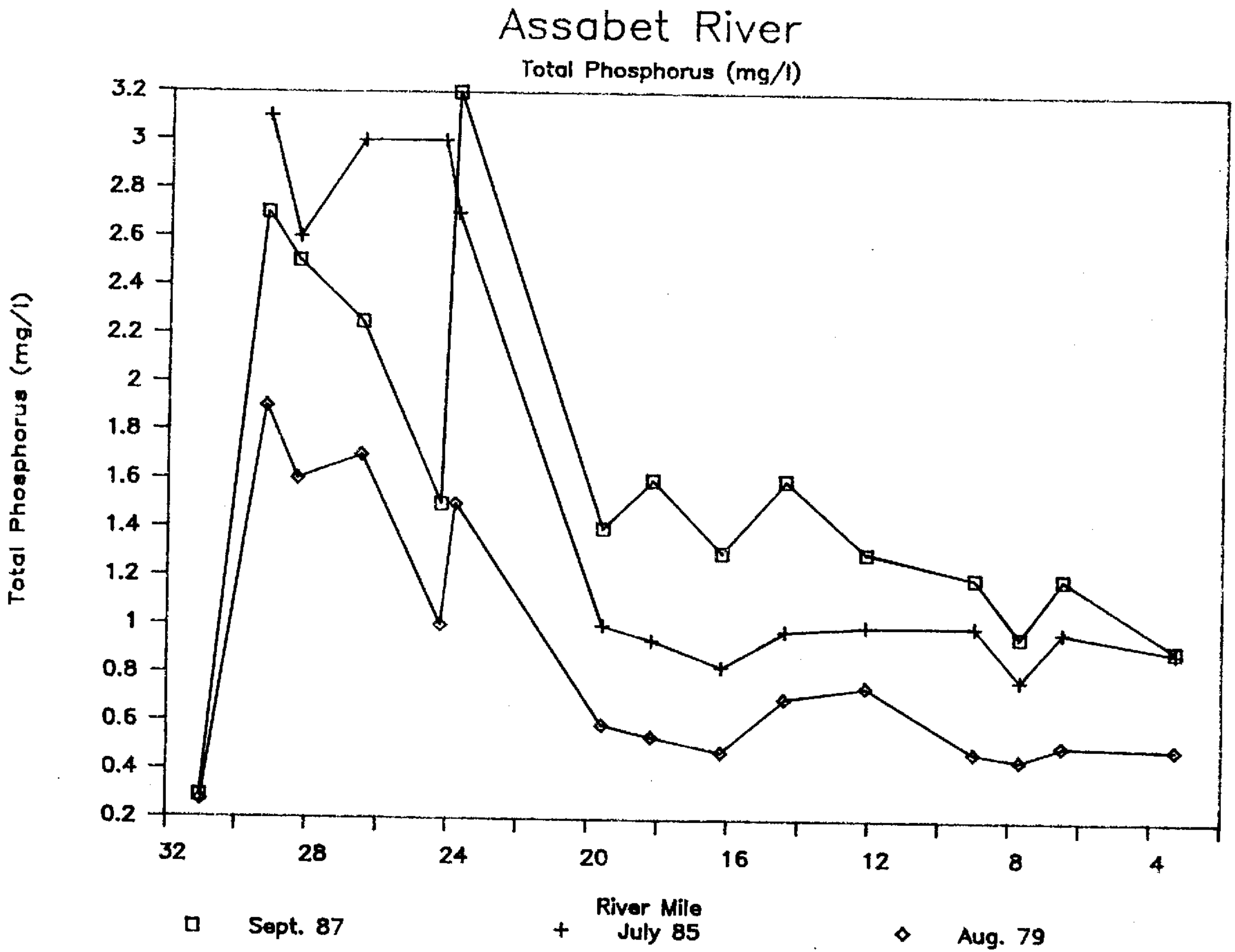

Assabet River
Fecal Coliform Bacteria
Fecal Coliform Bacteria (#/100 ml)
(Thousands)
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
31
29.2
28.3
26.5
24.2
23.8
19.6
18.2
16.2
14.4
12.1
9
7.7
6.5
3.3
River Mile
Sept. 87
July 85
Aug. 79

FIGURE 9



Assabet River
Total Phosphorus (mg/l)
Total Phosphorus (mg/l)
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
32
28
24
20
16
12
8
4
River Mile
Sept. 87
July 85
Aug. 79

TOXIC POLLUTANTS

The term "toxic pollutant" encompasses a wide range of literally thousands of substances ranging from metals to synthetic organic compounds. Surveys conducted during 1987 were designed to obtain baseline data on the prevalence of toxic substances in the sediments and water column of the Assabet River, and to provide preliminary toxicity testing.

Heavy metals were tested at selected times in the river water column and in the sediment (see Assabet River 1986-87 Water Quality Survey Data, Wastewater Discharge Data, and Analysis).

The US EPA recommends that water column metals be evaluated applying total recoverable metals to their water quality criteria in the absence of standard methods for acid-soluble metals analyses. Using total recoverable metals as a standard would tend to be, if anything, over-protective of aquatic life. The toxicity of most metals tested for in these surveys is highly dependent on hardness. Criteria for the Assabet River are given in Appendix B. These criteria are essentially first-cut numbers, i.e., overall toxicity testing via bioassays are required at all Assabet WWTPs, since the WWTPs are the probable source of any instream toxicity.

The bioassays will evaluate actual as opposed to theoretical effluent toxicity, but for only limited sample times (about four times per year for Assabet WWTP's). The bioassays are toxicity tests where test organisms such as *Daphnia pulex* are exposed to varying dilutions of effluent and river water. The numbers of survivors are a measure of the relative effluent toxicity to aquatic life. Data from Assabet bioassays is, at this point, limited.

Copper, lead, and mercury concentrations in the water column at some stations exceeded the criteria (see Appendix B) for four-day average concentrations. Mercury and lead appeared mainly in the river from Maynard to Concord. In addition, the four-day average criteria for nickel was exceeded at Station AS10, below the Marlborough West WWTP. Only copper at some stations exceeded the one-hour average criterion.

The laboratory levels of detection for cadmium and mercury, though, are higher than US EPA in-stream criteria; thus, it cannot be predicted from these data the extent to which these metals could, theoretically, pose problems in-stream at many places on the Assabet River.

In general, metals levels from the Assabet WWTP effluents seemed typical for similar plants throughout the state. Copper was found at fairly high levels in all effluents. The probable source of the WWTP copper is the drinking water used by municipalities, where copper piping is typically used. Finally, nickel was found in high concentrations in the Marlborough West WWTP effluent, which caused fairly high in-stream nickel concentrations both in 1987 and 1985.

As for levels of metals in sediments, since no "standards" exist by which to judge sediment quality for toxics, we will instead compare Assabet sediment metals concentrations to standards applied to sludge for land application which are listed in Appendix C. On this basis, the Assabet sediments generally have metals levels below even Class I (least contaminated) sludges, with some exceptions. Lead, at South Street in Hudson, and nickel at AS21 in Acton exceeded Class I limits.

Testing for the multiplicity of synthetic organic compounds was limited to those which might be reasonably expected to be present in a given media. For example, PCBs would most likely be detected only in the sediments, and not in the water column, and so these were tested for only in the sediment.

Table 4 lists the synthetic organic compounds found in the Assabet River water column in 1987. In general, the concentrations of these substances were very low, but many of them have no EPA in-stream water quality criteria for comparison. Station AS03T, which had a number of organics present, is located in a small tributary coming from Hocomonco Pond in Westborough, a Superfund Site contaminated chiefly with creosote. Halomethanes such as chloroform and bromodichloromethane are likely to be products of the chlorination disinfection processes at WWTP's. These compounds have a low vapor pressure, and so should not be persistent in the water column in high levels. The presence of isocyanatobenzene at several stations is unexplained.

Table 5 lists synthetic organic compounds found in the Assabet River sediments in 1987. Again, levels of the sediment synthetic organics was generally low. The South Street extension, Hudson sampling station, though, had considerable concentrations of many polycyclic aromatic hydrocarbons (PAHs). The river bottom near this point appeared to be covered in discarded shoe leather. At AS21 in Acton, many of these substances are also found, but in lower levels. PCBs were detected at several stations, but at relatively low levels.

Overall, the potential for toxic effects exists at some places in the Assabet, but actual effects are unknown, and possibly still masked by years of more conventionally recognized pollution problems such as low dissolved oxygen. For example, resident fish populations in areas of the Assabet may be low due to many years of inadequate oxygen in-stream. The effects of toxic substances in Assabet River sediments is, as yet, unknown. However, the PAH concentrations in the sediments found near the South Street extension in Hudson appear fairly high. As the body of knowledge and guidance by agencies such DEQE and US EPA increases concerning toxic substances in the environment, further evaluation of the Assabet will be possible.

TABLE 4

ASSABET RIVER SURVEY

SYNTHETIC ORGANIC COMPOUNDS (ug/l)
WATER COLUMN

STATION NUMBER	COMPOUND	QUANTITY (ug/l)
	2/18/87	
AS04	Acid extractables	ND*
AS06	Phenol	17
	7/8/87	
AS05	Chloroform	1.2
	Bromodichloromethane	1.0
AS06	Chloroform	1.5
	Bromodichloromethane	1.0
	7/24/87	
AS03T	Acenapthene	<10
	Fluorene	3.6
	Trichlorotrifluoroethane	7.9
	1,1,1-Trichloroethane	14
	Trichloroethylene	<1.0
	Tetrachloroethylene	5.2
	Toluene	1.1
	Acetone	62
AS05	Isocyanatobenzene	**
	Chloroform	10
	Bromodichloromethane	4.9
	Dibromochloromethane	1.8
AS06	Base/Neutral Extractables	ND
	Chloroform	7.3
	Bromodichloromethane	3.3
	Dibromochloromethane	1.4
AS10	Isocyanatobenzene	**
	1,1,1-trichloroethane	4.5
AS17	Isocyanatobenzene	**
	Volatile Organics	ND
AS22	Isocyanatobenzene	**
	Volatile Organics	ND

* None detected.

** No standard available for quantitation. The mass spectrum was compared to a mass spectral database for identification.

TABLE 5

ASSABET RIVER SURVEY

SYNTHETIC ORGANIC COMPOUNDS

SEDIMENT

8/5/87

STATION NUMBER	COMPOUND	QUANTITY (ug/g)
AS01	Caryphyllene	*
	Nonadecane (small peak)	*
	Acid Extractables	ND**
	PCB 1242	ND
	PCB 1260	<0.17
	Pesticides	***
AS04	Acid Extractables	ND
	Base/Neutral Extractables	ND
	PCB 1242	<0.16
	PCB 1260	<0.17
	Pesticides	***
AS05 (Left bank)	Acid Extractables	ND
	Base/Neutral Extractables	ND
	PCB 1242	ND
	PCB 1260	0.21
	Pesticides	***
AS05 (Right bank)	Acid Extractables	ND
	Ethylhexanol (large peak)	*
	Nonanol	*
	Methylcyclodecane	*
	PCB 1242	<0.16
	PCB 1260	0.30
	Pesticides	***
AS07	Acid Extractables	ND
	Base/Neutral Extractables	ND
	PCB 1242	<0.16
	PCB 1260	<0.17
	Pesticides	***

* No standard available for quantitation. The mass spectrum was compared to a mass spectral database for identification.

** None detected.

*** Unable to determine due to the presence of PCB's.

TABLE 5 (Continued)

8/5/87

STATION NUMBER	COMPOUND	QUANTITY (ug/g)
AS10	Acid Extractables	ND**
	Base/Neutral Extractables	ND
	PCB 1260	0.22
	Pesticides	***
South St. ext., Hudson	Naphthalene	1.8
	Acenapthylene	0.86
	Acenapthene	1.1
	Fluorene	1.7
	Phenanthrene	41
	Anthracene	4.6
	Fluoranthene	80
	Pyrene	70
	Chrysene	27
	Benzo-a-anthracene	44
	Benzo-(k)-fluoranthene	35
	Benzo-a-pyrene	34
	Benzo-(ghi)-perylene	26
	Methylnaphthalene	*
	Dimethylnaphthalene (small peak)	*
	Methylphenanthrene (small peak)	*
	Methylpyrene (small peak)	*
	Cresol (small peak)	*
	Hexanol (small peak)	*
	PCB's	ND
	Pesticides	ND
AS21	Acenapthylene	0.83
	Fluorene	1.1
	Phenanthrene	8.1
	Fluorianthene	18
	Pyrene	15
	Chrysene	10
	Benzo-a-anthracene	17
	Benzo-(k)-fluoranthene	9.3
	Dimethylnaphthalene (small peak)	*
	Acid Extractables	ND
	PCB 1260	0.26
	Pesticides	***

* No standard available for quantitation. The mass spectrum was compared to a mass spectral database for identification.

** None detected.

*** Unable to determine due to the presence of PCB's.

WASTEWATER DISCHARGES

Wastewater Treatment Plants (WWTPs) are the primary pollution sources on the Assabet River. The wastewater discharges of primary interest are the four municipal sewage treatment plants, the Westborough Regional, Marlborough West, Hudson, and Maynard WWTP's, as well as a plant that serves the Massachusetts Correctional Institute at Concord (see Figure 1). Major upgradings were on-line at three of these facilities for the 1987 surveys: the Westborough Regional, Hudson, and Maynard WWTPs. Upgradings at the remaining two are also in the planning stage. Thus, the summer of 1987 was an opportune time to first document the effects of major improvements in effluent quality on Assabet River water quality.

Wastewater discharges to surface waters in the Assabet River Basin are governed by permits which are co-issued by the United States Environmental Protection Agency (EPA) and the Massachusetts Division of Water Pollution Control (MDWPC) in accordance with the guidelines of the National Pollutant Discharge Elimination System (NPDES) (See Tables 6 and 7). This system establishes levels of effluent quality to be maintained at existing treatment facilities and sets forth implementation schedules for discharges which contribute to water quality standards violations.

Population and industrial/commercial growth in a community places increasing demands on a WWTP and the river into which it discharges, particularly a river under stress like the Assabet. It is the town's legal responsibility to maintain WWTP flow rates within NPDES limits. Appendix D, Tables D1, D2, and D3 list statistics on population projections for communities in the Assabet River Basin, employment by community, and building permits issued, which, taken together, indicate growth in the region. Town leaders must play an active role in ensuring that expansion within their community does not overwhelm their WWTP's ability to handle that growth.

The Compliance Monitoring Section of the Division of Water Pollution Control (DWPC) surveyed all of these WWTPs concurrently with the 1987 river water quality surveys. The following section is a brief description of each discharge and its effect on the Assabet River.

Westborough WWTP

During the late spring of 1987 the new $29 million Westborough Regional WWTP, built to replace both the Shrewsbury and older Westborough WWTPs, and located adjacent to the former Westborough plant, came fully on-line. The Westborough Regional WWTP is the most upstream discharge on the Assabet River, very near the headwaters. This plant serves the communities of Westborough and Shrewsbury, as well as a small section of Hopkinton. Since the most severe water quality problems on the Assabet River have, in the past, occurred in the Westborough/ Northborough vicinity, the new WWTP was of vital importance to the area.

The facility is an advanced treatment plant with ammonia oxidation capability. It employs a multi-channel oxidation system where wastewater is aerated through three concentric channels to achieve biological treatment. The effluent passes through sand filters before chlorination. Extra oxygen is added to the effluent while it cascades down a channel before release to the Assabet River. The plant was designed to produce a high quality effluent, as evinced by its NPDES permit limits of flow, 7.68 MGD; summer daily maximum BOD_5, 15 mg/l; dissolved oxygen, 6 mg/l; and ammonia, 1.5 mg/l. However, since coming on-line the plant's flows have been below design limits, and so it has frequently produced effluents of much better quality than its NPDES permit requires. Sludge will be disposed of via composting.

The initial effect on the Assabet River of replacing the older Westborough and Shrewsbury WWTP's with the new advanced Westborough Regional WWTP has been substantial. Within a few months, and under worst case stream dilution (i.e., extreme summer low stream flows), the dissolved oxygen in the Assabet increased to nearly Class B water quality standards, and other parameters such as fecal coliform bacteria and solids decreased quickly and drastically. Thus, due to the improvement in effluent quality, the Assabet River seems well on its way to recovery as far as many important measurements of pollution are concerned. Low dissolved oxygen during very dry weather, and super-abundant vegetation will continue to be of concern along the upper river.

Shrewsbury WWTP

The Shrewsbury WWTP tied its flows into the new Westborough Regional WWTP in early June 1987. (For further information, refer to the Westborough WWTP section.) Prior to this, the Shrewsbury plant was performing very poorly. NPDES permit violations were noted in BOD_5, flow, suspended solids, and fecal coliform bacteria.

Marlborough West WWTP

About six miles downstream from the Westborough WWTP, the Marlborough West WWTP discharges about 1.9 MGD into the Assabet River. The industrial input to the plant explains the high nickel concentration in the effluent during the monitoring of the plant during both 1985 and 1987. Planning is well underway for upgrading the plant to accomodate increased flows and to provide ammonia oxidation. Expected completion is in 1989. High nutrients and accompanying excessive algae populations probably will continue to some extent, though, downstream of the upgraded facility.

Hudson WWTP

At river mile point 16.0, effluent from the newly upgraded Hudson WWTP, with a design flow of 2.63 MGD, enters the Assabet River. The upgraded plant has advanced treatment and includes ammonia oxidation and post aeration. Sludge has been disposed of on-site, but plans are underway to use a new location.

Improvements in water quality, especially dissolved oxygen, have occurred downstream, but further monitoring will be necessary to confirm that these are permanent improvements and a result of the Hudson WWTP upgrade. However, due to excessive nutrients, many of the slow moving parts of the river downstream from the WWTP support nuisance algae populations.

Maynard WWTP

Effluent from the newly upgraded Maynard WWTP, with a design flow of 1.43 MGD, enters the Assabet River at mile point 6.8. The plant has remained secondary, but now includes an innovative technology - rotating biological contactors, followed by post aeration. The plant performed very well during monitoring in 1987. However, high nutrients and consequent excessive algae populations are expected to continue in the river in the vicinity of the discharge.

Concord MCI WWTP

The Concord Correctional Institute WWTP (mile point 2.4) is a small discharge to the Assabet River with a design capacity of 0.162 MGD and an average flow which is usually substantially higher. In addition, the prison has plans to expand by several hundred beds; thus, a WWTP upgrade will be needed.

The Massachusetts Division of Capital Planning has had a study performed to evaluate short and long term upgrading alternatives for the facility. Short term priorities are to bring down the sludge inventory and improve the final sand filtration process. The latter should bring some immediate improvement in effluent quality. Long term, a new sludge handling system is needed; composting is being considered.

Although the discharge frequently violates its NPDES permit limits, its impact on the Assabet River is low, since the ratio of river flow to WWTP flow in Concord is large (at least 125:1).

TABLE 6

ASSABET RIVER BASIN NPDES PERMITS

PERMITTEE	TOWN	PERMIT NO.	RECEIVING WATER	STATUS (MAJ/MIN)
Astra Pharmaceutical	Westborough	MA0027189	Hocomonco P.	Minor
Digital Equipment	Maynard	MA0022144	Assabet R	Minor
Hudson WWTP	Hudson	MA0101788	Assabet R.	Major
Independent Cable	Hudson	MA0026999	Assabet R.	Minor
J. Melone & Sons	Stow	MA0025984	Stow Brook	Minor
Marlborough West WWTP	Marlborough	MA0100480	Assabet R.	Major
Mass. Microelec.	Westborough	MA0030465	Assabet R.	Minor
Maynard WWTP	Maynard	MA0101001	Assabet R.	Major
River Road Ind. Park	Hudson	MA0030198	Assabet R.	Minor
State Properties of N.E	Acton	MA0028835	Assabet R.	Minor
W.R. Grace, Inc.	Acton	MA0027421	Assabet R.	Minor
Westborough WWTP	Westborough	MA0100412	Assabet R.	Major

TABLE 7A

NPDES PERMIT LIMITS

MAJOR WASTEWATER DISCHARGES
(Limits are Monthly Averages in mg/l Unless Otherwise Noted)

October 16-March 31[a]

PARAMETER	WESTBOROUGH WWTP	MARLBOROUGH W. WWTP	HUDSON WWTP	MAYNARD WWTP
Flow (MGD)	7.68	2.89	2.6	1.45
BOD_5	30	30	30	30
TSS	30	30	30	30
pH (Standard Units)	6.0-9.0	6.5-8.0	6.5-8.0	6.5-8.0
Fecal Coliform Bacteria (#/100ml)	200	200	200	200
Chlorine Residual[b]	0.025[c]	0.09	0.13	0.05[d]
Ammonia-N	-	-	-	-
Dissolved Oxygen	-	5.0	-	-
Bioassay	Monitor	Monitor	Monitor	Monitor

[a]November 1 for Marlborough WWTP, April 15 for Hudson WWTP.

[b]Subject to modification when toxicity data is taken and evaluated.

[c]Effective date April 1, 1990. Until that time the maximum chlorine residual shall be <0.5 mg/l.

[d]Subject to change.

TABLE 7

NPDES PERMIT LIMITS

MAJOR WASTEWATER DISCHARGES
(Limits are Monthly Averages in mg/l Unless Otherwise Noted)

April 1-October 15[a]

PARAMETER	WESTBOROUGH WWTP	MARLBOROUGH W. WWTP	HUDSON WWTP	MAYNARD WWTP
Flow (MGD)	7.68	2.89	2.6	1.45
BOD_5	10	15	15	30
TSS	15	15	15	30
pH (Standard Units)	6.0-9.0	6.5-8.0	6.5-8.0	6.5-8.0
Fecal Coliform Bacteria (#/100ml)	200	200	200	200
Chlorine Residual[b] (Max. Daily)	0.025[c]	0.09	0.13	0.05[d]
Ammonia-N	10.0 (4/1-30) 5.0 (5/1-31) 1.0 (6/1-15)	8.0 (4/1-30) 4.0 (5/1-31) 2.0 (6/1-10/31)	8.0 (5/1-30) 3.0 (5/1-10/15) -	- - -
Dissolved Oxygen	6.0	5.0	6.0	-
Bioassay	Monitor	Monitor	Monitor	Monitor

[a]October 31 for Marlborough W. WWTP, April 16 for Hudson WWTP.

[b]Subject to modification when toxicity data is taken and evaluated.

[c]Effective date April 1, 1990. Until that time the maximum chlorine residual shall be <0.5 mg/l.

[d]Subject to change.

MUNICIPAL WASTEWATER MANAGEMENT

Acton

At the present time, wastewater management in the town of Acton is based entirely on the use of subsurface disposal systems. Some areas of town reportedly have problems with their septic systems including the S. Acton and Kelley Corner areas. In addition to single family on-lot septic systems, seven package wastewater treatment plants, the largest being 150,000 gal/day, discharge to the ground. Septage is taken to the Upper Blackstone WWTP.

Acton has been considering sewering portions of town since at least 1966, when Metcalf and Eddy, Inc., in a comprehensive wastewater study for the town, recommended construction of a town-wide wastewater collection system. Another study, a Step I Facility Plan, was completed in 1980 to identify the most cost-effective solution for Acton's wastewater management needs. This plan recommended continued use of on-site wastewater disposal. Another study, completed in 1985 by SEA Consultants, recommended sewering the part of town with the most severe on-site wastewater disposal problems, S. Acton. During much of this time, tie-in to the Maynard WWTP has also been under consideration. The Maynard WWTP tie-in is still the preferred alternative with DEQE.

Currently, the town has applied to DEQE for a design grant for a WWTP. Discussions, though, are on-going as to the eventual future of sewering in-town. If the town is granted an NPDES permit to discharge to the Assabet, the limits will probably be for advanced wastewater treatment with phosphorus removal.

Berlin

The town of Berlin has retained much of its rural character, but like other communities in the Assabet River Basin, development pressure is high. Wastewater management in Berlin is based entirely upon the use of on-lot subsurface systems. Septic tank installation and maintenance are tightly controlled. Some septic system problem areas exist in the center of town, where lots are small. The town has no plans to attempt sewering.

Concord

The town of Concord is roughly 20 percent sewered to the Concord WWTP on the Concord River. Plans exist for phasing-in the connecting of more homes to the system, but new development will not necessarily be sewered. Isolated septic system problem areas exist near the Assabet River, and these areas will probably be sewered over the next few years, according to the town engineer.

Hudson

About 80 percent of the households in Hudson are sewered to the Hudson WWTP, but several industrial establishments are not. The eastern one-third of town is not presently sewered, but a large new residential development in that area will be built with sewer lines, which will open the possibility of even more sewer tie-ins in that area in the future. The Hudson WWTP is a newly upgraded advanced facility which includes ammonia oxidation and post aeration.

Several septic system problems have been corrected via sewering over the years. According to town officials, one major septic problem area remains "Hearthstone" -

but the town is investigating funding for a sewer extension. Septage is disposed of at the Hudson WWTP.

Marlborough

The western part of Marlborough (the section in the Assabet River Basin) is about 95 percent sewered, according to an estimate made by town officials. Any new development in Western Marlborough will probably be sewered. Much of the development in this area is commercial. Septage is taken to the Marlborough East plant.

When upgrades are completed at the Marlborough West WWTP, the plant's new flow limit will increase to 2.89 MGD. Northborough will retain control of 0.8 MGD under an agreement between the two towns. The Marlborough West WWTP when upgraded in the next few years, will have advanced treatment.

Maynard

The city of Maynard is about 95 percent sewered to the Maynard WWTP. This facility, which was recently upgraded and is performing well, uses rotating biological contactors and post aeration to meet its secondary effluent limits. Since not much land is left for development in Maynard, town officials don't expect many new demands for sewer tie-ins, but any growth will be sewered. Studies funded by the city have shown that seven homes have raw wastewater discharges to the Assabet River. The homes will be tied-in to the sewer system pending adequate funding.

Northborough

The town of Northborough is about 90 percent dependent on subsurface disposal for wastewater management. The remaining ten percent of town is sewered to the Marlborough West WWTP. Current plans exist for sewering about 125 more homes to the WWTP in the Northgate farms district, an area of town where failing septic systems have caused problems. Another area of town with subsurface disposal problems is the Bartlett Pond area, where excessive nutrient influxes to the pond have caused weed problems.

Under agreement with the town of Marlborough, Northborough has been allotted 0.8 MGD of the Marlborough West WWTP's capacity. The consulting firm, Camp Dresser and McKee, Inc., is examining the town's water supply and sewer extension plans. Until their report is completed toward the end of 1988, the town is holding off new sewering.

Stow

Wastewater management in Stow is based entirely upon the use of on-lot subsurface disposal systems. The town has no long-term sewering plans. Stow maintains vigorous control over septic system installation and maintenance. Septage is taken by licensed hauler to the Hudson WWTP.

Westborough

The town of Westborough is about 75 percent sewered to the new Westborough Regional WWTP which serves the towns of Westborough, Shrewsbury, and a small portion of Hopkinton. The facility, located near the headwaters of the Assabet River, is an advanced treatment plant with ammonia oxidation capability. It has produced a very good quality effluent consistently during any DEQE testing.

Westborough is requiring new subdivisions to be sewered, and quite a lot of growth is expected in town. Currently, the town and treatment plant board are under Administrative Order to inform DEQE when the WWTP reaches 60 and then 80 percent capacity. The plant is, as of this writing, close to 60 percent capacity.

WATER QUALITY MODELING AND WASTELOAD ALLOCATIONS

The major sources of pollutant input to the Assabet River are the discharges from the four municipal and Concord MCI Wastewater Treatment Plants. These facilities have been granted National Pollutant Discharge Elimination System (NPDES) permits by the U.S. EPA and the Massachusetts Division of Water Pollution Control. These plants can legally discharge to the Assabet River to the extent that Class B water quality can be maintained in-stream (see Table 7).

The method by which the Assabet Wastewater facilities have been granted numerical discharge limits for major components of sewage, Biochemical Oxygen Demanding substances (BOD) and ammonia, is via a computer-aided mathematical simulation model of river conditions. The particular model employed for these wastewater treatment plants is called Stream 7A. Basically, the model assumes steady-state conditions and calculates dissolved oxygen (D.O.) profiles based on a number of recognized sources and sinks of D.O. in streams. Carbonaceous BOD, nitrogenous BOD, benthal uptake, and plant respiration constitute the D.O. sinks. D.O. sources include reaeration and photosynthetic oxygen production. The river flow used for the load allocation is the seven-day ten-year low flow (7Q10). Using so low a river dilution in the model enables us to evaluate nearly worst case conditions in-stream.

Loading (in pounds per day) of BOD waste input to a river is essentially the product of volumetric flow and concentration. Thus, the apparent anomaly of the upgraded WWTP's being granted increases in volumetric flow of effluent to the Assabet River is explained by the mandated lower concentrations of BOD and ammonia. Note that as shown in Table 7, that the Westborough, Marlborough West, and Hudson WWTP's have advanced treatment limits, i.e., BOD's below 30 mg/l and restrictions on ammonia.

None of the Assabet WWTPs currently remove phosphorus. This is because it is questionable whether phosphorus loadings could be reduced sufficiently to cause noticeable improvements in-stream. Existing river sediments are also phosphorus-rich and serve to recycle the element. Thus, further study of the nutrient issue is needed before wasteload allocations can be made.

The allowable loadings of other substances such as chlorine or bacteria are calculated differently. Chlorine and chlorination products resulting from wastewater disinfection can be toxic to aquatic life. Chlorine residual limits are set using simple dilution calculations at the 7Q10 river flow such that the combination of effluent and river water results in an in-stream chlorine concentration of not more than 19 ug/l (the EPA acute toxicity national in-stream criterion). The WWTP's are also required to run bioassays with actual Assabet River water, since the chlorine limits to protect aquatic life in a given stream may differ from the national criterion due to effluent or receiving water characteristics. The general topic of chlorination is still under investigation by DEQE and the EPA. Fecal coliform limits, on the other hand, are set to match the Massachusetts water quality standard of 200 organisms/100ml, which was chosen to protect public health.

Future Wasteload Allocations

Can present WWTPs expand? Will any new WWTPs (such as in Acton) be granted NPDES permits? These questions actually are on the scientific/social borderline.

The simple answer is that at current loadings, and under current regulations, the Assabet River's assimilative capacity is being almost fully utilized. Increases in flow at the WWTPs, beyond their current design capacities and currently permitted BOD concentrations, can be allowed only to a very small extent. Moreover, we are still evaluating the Assabet River's response to the updated WWTP's. Presently, excessive algae growth in the summer may be an indication that nutrient removal (phosphorus or nitrogen) may be necessary at the current WWTP's.

On the other hand, the technology exists to improve BOD removals to a range around 10 mg/l. Upgrading existing WWTP's, though, is expensive, and state and federal grants are increasingly difficult to obtain. Thus, the question of continued WWTP expansion becomes not only a question of technical feasibility, but of economics. (Of course, as mentioned previously the river's response to the present WWTP's has not been fully evaluated; thus, discussion of even further upgrades is hypothetical.)

With increased reliance on wastewater treatment plant technology comes increased possibilities for the unintentional release of pollutants to the Assabet River during very heavy rains or mechanical malfunctions. Ultimately, the question raised is as rhetorical as practical - "How high a price are we willing to pay for growth?"

NONPOINT SOURCE CONSIDERATIONS

Nonpoint source pollution refers to discharges of polluting substances to surface or groundwaters from diffuse or nonpoint sources such as road runoff as opposed to discreet or point sources such as WWTP discharges. Sources of nonpoint pollutant loadings include subsurface disposal systems, improper hazardous substance management, landfill leachate, in-place sediments, winter road salt runoff from roads and storage areas, soil erosion and sedimentation, leaky underground petroleum storage tanks, and urban stormwater runoff.

It is difficult to quantify the effect of nonpoint source pollutant loading to the Assabet River and environs, but it seems fairly low compared to point source influences. This is primarily because the WWTP point sources contribute proportionately large loadings, to the Assabet River of most conventional pollutants such as BOD and nutrients. This is not to say that local and possibly significant problems may occur at certain times and places, e.g., during events such as rainstorms, and at locations such as impoundments (where in-place sediments exist). In addition, evaluation is difficult since there is a very large array of possible nonpoint contaminant sources, and these sources often vary with time.

Landfills

A number of abandoned and current landfills in the Assabet River Basin are potentially the source of solids, nutrients, heavy metals and other polluting substances. A listing of past and current solid waste disposal sites in the basin is given in Table 8. Pollutant control at the inactive sites is best achieved by capping with an impermeable cover to prevent water seepage and leachete production. More detailed information concerning these landfills is available from the DEQE, Division of Solid Waste Management.

Urban Runoff

Urban runoff conveys dirt, dust, animal waste, oil and grease, and lead from impervious surfaces where they accumulate during dry weather. Storms can wash these substances into the Assabet River and tributaries. Effective control measures include street sweeping, catch basin cleaning, and general improved road maintenance. Although NPDES permits have generally been applied to point source discharges, the 1987 amendments to the Federal Clean Water Act indicate that significant municipal or industrial storm water discharges will need permits in the near future.

Road Salt

Road salt and salt storage can cause problems in the Assabet River Basin as far as contamination of the river itself, or of the groundwater. Salt used by several area towns are compiled in Table 9. Relevant Best Management Practices for the minimization of salt contamination, including information useful for municipal level officials, have been compiled by DEQE.[1]

[1] Roy, Steve P. and Gayle Birck, Road Salts and Water Supplies Best Management Practices, DEQE, Office of Planning and Program Management, August 1981

Hazardous Waste Sites

Table 10 is a list of hazardous waste disposal sites in the Assabet River Basin which have been confirmed as of July 1988 by DEQE. Two sites in the basin are on the federal "Superfund" listing as well - Hocomonco Pond in Westborough, and the W.R. Grace site in Acton. In general, these sites pose problems to groundwater. Most need further investigation by the DEQE, Division of Hazardous Waste.

In-place Sediments

In-place sediments in the Assabet River are presently a nonpoint source of concern. Since the Assabet is, at many places, a slow moving river, organic sediments of wastewater treatment plant origin have accumulated at these points over the years. Of particular note are areas of the river in Northborough, and the Powdermill Dam area in Maynard. The sediments exert an oxygen demand and are sources of nutrients and possible toxics.

With time, the top layer of sediment cover should oxidize, reducing its oxygen demand. In addition, since WWTP's have been upgraded on the river, discharge of solids has been greatly reduced. Reevaluation of sediment impacts will be possible in the next several years once a new equilbrium has been established instream with the upgraded WWTP's.

TABLE 8

ASSABET RIVER BASIN

SOLID WASTE DISPOSAL SITES[1]

TOWN/CITY[2]	LOCATION	STATUS	CATEGORY[3]
Acton	Route 2/Minot Ave.	Active	WWTP
Acton	Stow St./S. Acton Rd.	Inactive	Epic/Dump
Acton	14 Forest Rd./Route 2	Closed	SLF
Acton	Lawsbrook Rd.	Inactive	Epic/Dump
Berlin	Gates Pond Rd.	Inactive	SLF
Berlin	Gates Pond Rd.	Inactive	LF
Berlin	Jones Rd.	Inactive	SLF
Bolton	Forbush Mill Rd.	Active	SLF
Bolton	114 Old Bay Rd.	Inactive	SLF
Boxborough	Codman Hill Rd.	Inactive	SLF
Boxborough	South of Route 111	Inactive	Epic/Dump
Harvard	Depot Rd.	Inactive	SLF
Hudson	Cox St./Old Stow Rd. (Melone)	Active	SLF
Hudson	Cemetery Rd./Hudson Rd. (Melone)	Active	SLF
Hudson	1 Municipal Drive	Active	WWTP
Littleton	Spectacle Pond Rd.	Active	SLF
Marlborough	Bolton St./Route 85	Closed	SLF
Marlborough	Route 85	Inactive	Epic/Dump
Marlborough	785 Boston Post Road	Active	WWTP/DOS
Marlborough	Boundary St.	Active	WWTP/DOS
Maynard	Waltham St.	Closed	SLF
Maynard	Vine Hill Rd.	Active	WWTP
Northborough	Route 20/Route 9	Inactive	LF
Northborough	Boundary St./Church St.	Inactive	SLF
Shrewsbury	Route 20	Active	SLF
Shrewsbury	Route 20	Inactive	SLF
Shrewsbury	Route 20 (Signal)	Active	ALF
Shrewsbury	N. Quinsigamond Ave.	Inactive	LF
Shrewsbury	100 Main St.	Active	WWTP
Stow	South Acton Rd.	Inactive	LF
Stow	Harvard Rd.	Active	SLF
Westborough	Hopkinton Rd./Route 135	Active	SLF
Westborough	Milk St./Maynard St.	Inactive	WWTP
Westborough	Meadow Rd.	Active	WWTP/DOS
Westborough	Union St.	Inactive	LF

[1]Data from DEQE, Division of Solid Waste Management.
[2]When a town lies partially in the Assabet Basin, data for the whole town is included.
[3]Category of landfills:
- SLF: Sanitary landfill
- Epic/Dump: Open space, possible dumping site
- WWTP: Wastewater Treatment Plant
- WWTP/DOS: Wastewater Treatment Plant where sludge is deposited on site.
- ALF: Ash landfill

TABLE 9

SALT USE BY AREA TOWNS[1]

TOWN	YEARLY SALT USE Tons/Road Miles	SAND/SALT MIXTURE	NO SALT AREAS	LESS SALT AREAS
Acton	1,000/110	5-1	No	Yes
Bolton	280/56	8-1	No	No
Boxborough	500/30	3-1	No	Yes
Concord	2,600/100	5-1	No	Yes
Hudson	2,300/90	4-1	No	No
Littleton	800/60	9-1	No	No
Marlborough	3,000/140	5-1	No	No
Maynard	600/44	2-1	Yes	Yes
Stow	500/60	4-1	Yes	Yes
Westford	2,000/140	3-1	No	No

[1]Acton Beacon Accent, Beacon Communication Corp., 20 Main St., Acton, MA

TABLE 10

LIST OF CONFIRMED HAZARDOUS WASTE

DISPOSAL SITES[1]

TOWN/SITE	STATUS[2]/ACTION BY
ACTON	
Federal Superfund Site	
1) W.R. Grace, 50 Independence Rd.	Phase 3/State and Responsible Party
Hazardous Material Releases	
2) Agway, Inc./Kress Property, Knox Trail	Phase 2/State and Responsible Party
3) Daramic Plant, W.R. Grace, 51 Independence Rd.	Phase 2/State and Responsible Party
CONCORD	
Hazardous Material Releases	
4) Nuclear Metals Inc., 2229 Main St.	Phase 2/Responsible Party
5) Smith Associates, 50 Beharrell St.	Remedial Action Complete-Responsible Party
HUDSON	
Hazardous Material Releases	
6) Arrow Automotive Ind., Inc., 555 Main St.	Phase 4/Responsible Party
7) Boyd Coating Research Co., 51 Parmenter Rd.	Phase 2/Responsible Party
8) Creative Home Furnishings, 32 Washington St.	Phase 1/Responsible Party
9) James Gorin Realty Trust, 577 Main St.	Phase 2/Responsible Party
10) M & M Drilling/Kane Perkins, 560 Main St.	Phase 1/Responsible Party
MARLBOROUGH	
Hazardous Material Releases	
11) Deering and Cote Realty, 270 Main St.	Phase 4/Responsible Party
12) Old Colony Gas Station, 247 Maple St.	Phase 2/Responsible Party

TABLE 10

DISPOSAL SITES[1] (Continued)

TOWN/SITE	STATUS[2]/ACTION BY
MAYNARD	
Hazardous Material Releases	
13) Digital Equip. Corp., 146 Main St.	Phase 4/Responsible Party
Petroleum Releases	
14) Rexnord-Knife Division, 4 Powdermill Rd.	Phase 3/Responsible Party
STOW	
Hazardous Material Releases	
15) Amoco Service Station 1106 124 Great Rd.	Phase 1/Responsible Party
16) Stow Shopping Center, 147 Great Rd.	Phase 1/Responsible Party
WESTBOROUGH	
Federal Superfund Site	
17) Hocomonco Pond, Fisher St.	Phase 3/State and Responsible Party
Hazardous Material Releases	
18) Bay State Abras./Dresser, Union St.	Phase 3/Responsible Party
19) B.P. Gas Station, 49 Milk St.	Phase 4/Responsible Party
20) Westborough Speedway, Rte. 9	Phase 3/State and Responsible Party
21) Doering Equipment Co., 176 E. Main St.	Remedial Action Complete-Responsible Party

[1]List of Confirmed Disposal Sites and Locations to be Investigated, DEQE, Division of Hazardous Waste, July 15, 1988.

[2]Status Codes:

PHASE	ACTIVITY
1	Problem Identification
2	Problem Evaluation
3	Feasibility Study of Remedial Action Alternatives
4	Design/Implementation of Remedial Action
5	Operation/Maintenance

WATER SUPPLY CONSIDERATIONS

Communities within and adjacent to the Assabet River Basin rely on it as a water supply via surface or groundwater sources. Table 11 lists Assabet River Basin communities, some surrounding communities, their water supply sources, and 1985 average-day demands.

Municipal water supplies closed due to contamination are listed in Table 12.

The Division of Water Resources of the Department of Environmental Management (DEM) is currently preparing a comprehensive Water Supply Management Plan for the Concord River Basin (which includes the Assabet River as a sub-basin). DEM has compiled a complete inventory of current and projected water use within the basin and will analyze this information to develop alternatives to meet projected water demand. So far, an interesting finding of the DEM analysis is that the Concord River Basin is a net importer of water, i.e., all water withdrawn from the basin for water supply, plus an additional seven percent from other basins is returned to the basin as wastewater.

Towns and cities have primary responsibility for groundwater quality because they are the primary government entities with authority to control land use. Thus, the continuation of good quality drinking water on much of the Assabet River Basin is under town jurisdiction. The state, however, has regulatory control over public water supplies, and potential pollutant sources such as landfills, hazardous waste site, underground tanks, and most large municipal and all industrial wastewaters.

Finally, it is of particular importance that Billerica withdraws its water supply for over 36,000 people directly from the Concord River. (The Concord River is formed at the confluence of the Assabet and Sudbury Rivers.) Thus, the Assabet River is, in reality, a water supply source. This fact alone reinforces the importance of water quality management of the Assabet River.

TABLE 11

ASSABET RIVER BASIN

WATER SUPPLY SOURCES

MUNICIPALITY	SOURCE OF[1] SUPPLY	BASIN LOCATION[2] OF SOURCE AND AMOUNT (MGD)	1985 AVERAGE[2] DAY-DEMAND (MGD)
Acton	Four Wells	Assabet	1.53
Berlin	No Central Supply	-	-
Billerica	Concord River	Concord	4.48
Bolton	No Central Supply	-	-
Boxborough	No Central Supply	-	-
Concord	- Nagog Pond, Acton - Four Wells - One Emergency Well	Assabet/Concord	1.96
Hudson	- Gates Pond, Berlin - Three Wells	Assabet	1.89
Marlborough	- MWRA[3] - Millham Res. - Lake Williams	Assabet 1.32 MWRA-Chicopee, Nashua 2.85	4.17
Maynard	- White Pond Res., Stow/Hudson - Two Wells - One Emergency Well	Assabet	1.09
Northborough	- Three Wells - MWRA (as necessary)	Assabet 0.86 MWRA-Chicopee, Nashua 0.19	1.05
Shrewsbury	- Seven Wells	Blackstone 2.97 Assabet 0.15	3.12
Stow	One Well	Assabet	0.03
Westborough	Westborough Res. (Sandra Pond) Six Wells	Assabet/Sudbury	2.25

[1]Massachusetts Water Supply Systems, Department of Environmental Management, Division of Water Resources, 1982 (updated 1983).

[2]Concord River Basin, Inventory and Analysis of Current and Projected Water Use (Draft), Volume 1, Dept. of Environmental Management, Division of Water Resources, July 1988.

[3]Massachusetts Water Resources Authority.

TABLE 12

ASSABET RIVER BASIN

MUNICIPAL WATER SUPPLIES CLOSED DUE TO CONTAMINATION*

TOWN	WELL	COMTAMINANT	SOURCE	STATUS
Acton	5 Wells #1, 2	Various volatile organics, Total volatile organics 175 ppb	W.R. Grace Co.	On-line with treatment
	Clapp Well	Trichloroflurومethane 1,1,1 trichloroethylene Benzene	Unknown	On-line with treatment
	Scribners Well, Laws-brook Well	Organics exceeded 1 ppb	Unknown	On-line with treatment

*Public Water Supplies Which Have Been Closed due to Contamination, DEQE, Division of Water Supply, Summer 1986.

WETLAND PROTECTION

Wetlands play a role in the protection of both surface and groundwater quality in the Assabet River Basin. Wetlands can serve to filter out harsh contaminants and nutrients, to immobilize toxic chemicals, and to maintain the river's present rate of flow. Some wetlands feed directly into surface or groundwater sources. Determination of the hydrologic connection between the water systems is important in the protection scheme of the resources. In addition, wetlands provide the aesthetic richness so necessary to encourage public awareness and interest in river protection.

At the state level, the program most protective of wetland resources in the Assabet River Basin is the Wetlands Protection Act (310 CMR10). The Act is designed to protect the eight public interests related to wetlands (many of which, at the same time, promote surface or groundwater quality protection). These eight interests are: flood control, storm damage prevention, protection of public and private water supply, protection of groundwater supply, prevention of pollution, protection of fisheries, protection of land containing shellfish, and wildlife conservation.

Under the Wetlands Protection Act, local conservation commissions are the first-line administrators with DEQE involvement beginning with appeals from conservation commission rulings. A permit called an "Order of Conditions" must be obtained from the local Conservation Commission before any removing, dredging, filling, or other alterations can take place.

Town conservation commissions, therefore, have a great deal of authority to review and modify proposals impacting wetlands areas. This, in turn, places considerable responsibility on town residents to lend support to local wetland protection actions, which ultimately may help to provide invaluable water quality protection for both surface and groundwaters.

A detailed evaluation of wetlands protection efforts is beyond the scope of this report. The interested reader should refer to the <u>1986 Assabet Riverway Plan</u>.[2] It includes town-by-town mapping of wetland areas, and concrete protection suggestions about specific parcels of land. These suggestions range from outright town acquisition to the use of other available land protection tools such as conservation easement acquisition or the improvement of town bylaws.

An important and interesting by-product has resulted from the fairly recent poor water quality and reputation of the Assabet River. River-front land, in many places, is not regarded as particularly valuable real estate. Thus, with the improvement in water quality which is likely to result from the recent or soon to be upgrades at all Assabet WWTP's, it would seem that it is currently an economically opportune time for towns to act to protect their local river fronts and contiguous wetland area.

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[2] Ingulsrud, Faith and Bruce Stedman. <u>1986 Assabet Riverway Plan</u>. Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement. September 1986.

FUTURE MONITORING PROGRAM

A continuing water quality monitoring program for the Assabet River Basin is important to evaluate the effects of upgrades at the WWTP's, to identify other problems and sources of pollution (such as nonpoint), and to provide a historical record of water and sediment quality. The following program is a recommended monitoring scheme for the Assabet River Basin.

River Water Quality Surveys

These surveys assess the general water quality condition of a river. One intensive survey was conducted in 1985 by the DEQE, Technical Services Branch, just prior to any of the upgradings at the river's many WWTP's. Another survey was conducted in 1987, just after the Westborough/Shrewsbury, Hudson, and Maynard WWTP upgrades. Since the Marlborough West WWTP will have completed its upgrading by 1989, another survey of the Assabet River should be conducted in 1990 or 1991. The survey will assess the effectiveness of all of the WWTP upgrades on river water quality and help pinpoint remaining water quality problems.

Compliance Monitoring

Wastewater discharges in the Assabet River Basin will be sampled periodically by the DEQE Compliance Monitoring Section to assure compliance with the limits set forth in their NPDES permits. In addition, the plants will be sampled during river water quality surveys to accurately determine pollutant inputs and their impacts in-stream.

Biological Monitoring

Biological sampling by the Technical Services Branch, DEQE, in and around the Assabet River has consisted, recently, of fecal coliform bacteria sampling, chlorophyl a analyses, toxicity monitoring using Microtox™, macroinvertebrate rapid bioassessment, macrophyton surveys, and fish surveys. Future sampling efforts will probably include much of the same type of work.

In addtion, WWTP's on the Assabet River currently are required to perform bioassays to assess the toxicity of their effluents. Basically, the bioassays consist of exposing test organisms, such as, Daphia pulex or fathead minnow fry, to various ranges of effluent and Assabet River water mixtures. The number of survivor organisms in the various dilutions are then used to rank an effluent's toxicity.

Nonpoint Source Sampling

Most pollutant loading to the Assabet River itself is from point sources (wastewater treatment plants, to be specific). However, problems do exist with inplace sediments in many places on the river. Future effort during upcoming water quality surveys will include further documenting of the river's sediment quality. However, nonpoint source sampling to asssess, for example, the effect of storm water pollutants on the river would be very difficult to accomplish due to masking by point sources.

Localized sampling in the Assabet River Basin near landfills, hazardous waste sites, leaky underground storage tanks, and salt storage areas should continue to be done by the various groups with responsibilities over these areas, such as, the DEQE, Division of Solid and Hazardous Waste. Usually, surveys of this type are conducted as site-specific problems arise.

Special Studies

As necessary, special studies should be conducted to assess episodic or localized pollution problems. Examples include investigations of river nutrients, wet-weather related issues, odors, or hazardous waste or oil storage sites. In addition, supplemental data may necessary to evaluate NPDES permits, or to update wasteload allocations.

Lake (Impoundment) Surveys

Selected impoundments of the Assabet River with odor and/or aquatic growth problems should be studied to ascertain whether long or short-term restoration is desirable and plausible. Is there enough public support for improvement of the recreational aspects of these areas to make restoration techniques cost effective? The watershed association, the Organization for the Assabet (OAR), does have improved recreation on and along the Assabet as a key goal.

APPENDIX A

ASSABET RIVER FISH ANALYSES

MEMORANDUM

TO: Peter H. Oatis, Assistant Director of Fisheries, MDFW, Westborough

FROM: RJM Robert J. Maietta, Aquatic Biologist, MDWPC, Westborough

DATE: October 29, 1986

SUBJECT: Assabet River Fish Toxics Screening Survey 1985

Subsequent to the 1985 Toxics in Fish Committee meeting of April 29, the Massachusetts Division of Fisheries and Wildlife requested screening of metals in edible fillets of fish from the Assabet River. The survey was scheduled as part of the 1985 work plan and given a medium priority.

The project coordinator has since been re-assigned which helps to account for the extended period of time which has elapsed between sampling and final report.

Reconnaissance of the river for potential sampling station was performed in early July 1985 by MDWPC. Five stations were chosen as a result of the reconnaissance (see Table 1). Three impoundments and two stream reaches were sampled. These are also identified in Table 1. Stations are described by river name and mile point. Mile points for this survey are interpreted in an increasing manner. Mile point 0.0 is at the confluence of the Assabet and Sudbury rivers.

Sampling was performed by MDWPC and MDFW personnel on July 22 and 23, 1985. Experimental gill nets were set for 24 hours in each of the impoundments and a portable generator and barge were used in the two stream segments. Table 2 lists all fish species found during the survey. A breakdown of fish occurrence by station and collection method can be found in Table 3. A five fish composite was obtained easily at each station except Assabet River (25.4) in Northborough. A net was left for 48 hours at this station and no fish were collected. As the habitat at this station is ideal, one must suspect a dissolved oxygen problem as a result of heavy BOD loading from the Westborough treatment plant.

Water quality data from 1984 and 1985 show that dissolved oxygen concentration at this station occasionally drop below 2 ppm during July and August. With a new treatment facility scheduled to go on line soon, this problem should be rectified in the near future. Brook trout were collected at Assabet River (8.75) in Maynard; however, these were not analyzed due to the fact that they may have migrated from Assabet Brook in Stow which is about one mile upstream of this site and is stocked by the MDFW.

Five fish of one species, or in the case of Assabet River (31.8) one genus, were filleted, composited, and frozen before transport to Lawrence Experiment Station for metals analysis. Lengths and weights were recorded upon capture (see Table 4). Age determinations were made using scales for white suckers and redbreast sunfish and spines for bullheads.

Peter H. Oatis
October 29, 1986
Page 2

Analysis was performed for aluminum, copper, chromium, cadmium, iron, lead, zinc, and mercury. Results of the analysis are shown in Table 5. A preliminary review of the data shows what seem to be high concentrations of aluminum, copper, and iron in bullheads from Assabet River (6.5), however, due to the small sample size, this remains inconclusive. The ranges of concentration encountered remains consistent with other data we have generated over the past two years. As with all fish flesh data, a copy of this memo will be forwarded to Mike Murphy of the DEQE Office of Criteria and Standards for his review and comments.

RJM/ac
cc: Arthur Johnson
Richard Keller
Al Cooperman
Pete Jackson
Mike Murphy

APPENDIX A (Continued)

TABLE A1

1985 ASSABET RIVER FISH TOXICS SCREENING SURVEY

LOCATION OF SAMPLING STATIONS

RIVER (MILE POINT)	USGS QUAD	LOCATION
Assabet River (6.5)	Maynard, MA	Impoundment above dam off High Street in Acton
Assabet River (8.75)	Maynard, MA	Below the bridge ¼ mile downstream of Route 62/117 bridge
Assabet River (18.2)	Hudson, MA	Impoundment above dam Route 85 in Hudson
Assabet River (25.4)	Shrewsbury, MA	Impoundment above dam Allen Road, Northborough
Assabet River (31.8)	Shrewsbury, MA	Stream reach below George H. Nichols Multi-Purpose Dam, Westborough

APPENDIX A (Continued)

TABLE A2

1985 ASSABET RIVER FISH TOXICS SCREENING SURVEY

FISH SPECIES LIST

COMMON NAME	SCIENTIFIC NAME	SPECIES CODE
black crappie	Pomoxis nigromaculatus	BC
bluegill	Lepomis macrochirus	B
brown bullhead	Ictalurus nebulosus	BB
chain pickerel	Esox niger	CP
eastern brook trout	Salvelinus fontinalis	EBT
fallfish	Semotilus coporalis	FF
golden shiner	Notemigonus crysoleucas	GS
pumpkinseed	Lepomis gibbosus	P
redbreast sunfish	Lepomis auritus	YBS
white perch	Morone americana	WP
white sucker	Catostomus commersoni	WS
yellow bullhead	Ictalurus natalis	YB

APPENDIX A (Continued)

TABLE A3

1985 ASSABET RIVER FISH TOXICS SCREENING SURVEY

SPECIES OCCURRENCE BY STATION

RIVER (MILE POINT)	COLLECTION METHOD	SPECIES PRESENT
Assabet River (6.5)	Gill net (experimental)	YB, BB, CP, WS, WP, P, GS
Assabet River (8.75)	Electroshocking	YBS, WS, FF, EBT
Assabet River (18.2)	Gill net (experimental)	WS, WP, B, YB, BC
Assabet River (25.4)	Gill net 24-hour set	No fish collected
Assabet River (31.8)	Electroshocking	WS, YB, BB, B, P

APPENDIX A (Continued)

TABLE A4

1985 ASSABET RIVER FISH TOXICS SCREENING SURVEY

SAMPLE COMPOSITION

RIVER (MILE POINT)	SPECIES CODE	LENGTH (cm)	WEIGHT (g)	AGE (yrs)
Assabet River (6.5)	YB	20.7	100	3+
	YB	21.5	120	2+
	YB	22.0	160	5+
	YB	24.5	180	3+
	YB	22.0	160	5+
Assabet River (8.75)	YBS	18.0	120	5+
	YBS	18.2	140	4+
	YBS	18.5	140	5+
	YBS	17.0	120	5+
	YBS	17.0	100	4+
Assabet River (18.2)	WS	47.0	1000	4+
	WS	44.0	1020	4+
	WS	42.5	950	4+
	WS	46.2	1100	4+
	WS	45.0	1100	4+
Assabet River (25.4)	No fish collected			
Assabet River (31.8)	YB	22.5	140	(no spine)
	BB	21.2	90	3 or 4+
	BB	17.5	60	2+
	YB	17.0	80	2 or 3+
	BB	18.0	60	2+

APPENDIX A (Continued)

TABLE A5

1985 ASSABET RIVER FISH TOXICS SCREENING SURVEY

METALS DATA

RIVER (MILE POINT)	SAMPLE COMPOSITION	METALS CONCENTRATION (mg/kg)							
		Al	Cu	Cr	Cd	Fe	Pb	Zn	Hg
Assabet River (6.5)	5 yellow bullhead fillets	4.3	3.1	0.25	<0.25	38.0	<0.50	2.9	0.12
Assabet River (8.75)	5 redbreast sunfish fillets	<1.3	<0.25	<0.75	<0.75	<0.50	<0.50	3.1	0.15
Assabet River (18.2)	5 white sucker fillets	<1.3	<0.25	<0.25	<0.25	2.4	<0.50	3.9	0.30
Assabet River (25.4)	No fish collected	--	--	--	--	--	--	--	
Assabet River (31.8)	5 bullhead fillets	<1.3	0.03	0.25	<0.25	4.5	<0.50	4.0	0.26

APPENDIX B

U.S. EPA PROPOSED FRESHWATER CRITERIA FOR SELECTED

HEAVY METALS ADJUSTED FOR ASSABET RIVER HARDNESS
(50 mg/1 as $CaCo_3$)

METAL	4-DAY AVERAGE (mg/1)	ONE-HOUR AVERAGE (mg/1)
Cadmium	0.0007	0.0018
Chromium III	0.117	0.984
Copper	0.0065	0.0092
Lead	0.0013	0.0338
Mercury	0.00001	0.0024
	24-HOUR AVERAGE (mg/1)	AT ANY TIME NOT TO EXCEED (mg/1)
Nickel	0.056	1.09
Zinc	0.047	0.181

APPENDIX C

CLASSIFICATION OF SLUDGE FOR LAND APPLICATION

310 CMR 32.00

ALLOWABLE CONCENTRATIONS (mg/kg)

PARAMETER	CLASS I	CLASS II	CLASS III
Cadmium	2	2-25	>25
Lead	<300	300-1000	>1000
Nickel	<200	--	>200
Zinc	<2500	--	>2500
Copper	<1000	--	>1000
Chromium (Total)	<1000	--	>1000
Mercury	<10	--	>10
Molybdenum	<10	--	>10
Boron (water soluble)	<300	--	>300
PCBs in Class I sludge which is a commercial fertilizer	<2	2-10	>10
PCBs in Class I sludge which is a commercial soil conditioner	<1	1-10	>10

APPENDIX D

POPULATION RELATED STATISTICS

TABLE D1

ASSABET RIVER BASIN

POPULATION CENSUS AND PROJECTIONS

TOWNS	FEDERAL CENSUS DATA		PERCENT CHANGE	PROJECTIONS[1]		PERCENT CHANGE
	1980	1986		1990	1995	
Westborough	13619	13210	-3.0	12954	12701	-2.0
Shrewsbury	22674	22560	-0.5	22684	22792	0.5
Northborough	10569	11320	7.1	11378	11438	0.5
Berlin	2215	2220	0.3	2235	2239	0.2
Marlborough	30617	31180	1.8	31044	30716	-1.1
Hudson	16408	17550	7.0	17905	18263	2.0
Stow	5144	5470	6.4	5486	5441	-0.8
Maynard	9590	9900	3.3	9974	10017	0.4
Acton	17544	17350	-1.1	17280	17088	-1.1
Concord	16293	16470	1.1	16401	16228	-1.1
TOTAL	144672	147230	1.8	147341	146923	-0.3

[1]Projections calculated by the Massachusetts Institute for Social and Economic Research, University of Massachusetts, Amherst, Massachusetts.

APPENDIX D (Continued)

TABLE D2

ASABET RIVER BASIN

EMPLOYMENT BY COMMUNITY: 1985

TOWN	EMPLOYMENT
Westborough[1]	15,083
Shrewsbury[1]	7,007
Northborough[1]	3,429
Berlin[1]	378
Marlborough[2]	13,483
Hudson[2]	5,224
Stow[2]	805
Maynard[2]	15,926
Acton[2]	5,365
Concord[2]	9,827

[1]Data from the Central Massachusetts Regional Planning Commission.

[2]Data from the Metropolitan Area Planning Council.

APPENDIX D (Continued)

TABLE D3

ASSABET RIVER BASIN

RESIDENTIAL BUILDING PERMITS ISSUED: 1980-1986

TOWN	1980	1981	1982	1983	1984	1985	1986	TOTAL 1980-1986
Westborough[1]	28	38	42	46	40	77	91	362
Shrewsbury[1]	55	50	46	101	170	183	355	960
Northborough[1]	46	50	51	92	179	130	136	684
Berlin[1]	44	1	4	8	9	16	12	94
Marlborough[2]	-	-	-	-	-	-	-	898
Hudson[2]	-	-	-	-	-	-	-	800
Stow[2]	-	-	-	-	-	-	-	146
Maynard[2]	-	-	-	-	-	-	-	487
Acton[2]	-	-	-	-	-	-	-	420
Concord[2]	-	-	-	-	-	-	-	279

[1]Data from the Central Massachusetts Regional Planning Commission.

[2]Data from the Metropolitan Area Planning Council.

APPENDIX E

MODEL BYLAWS*

1. General Wetlands Protection Bylaw --

   Massachusetts Association of
   Conservation Commissions
   Lincoln Filene Center
   Tuft University
   Medford, Massachusetts 02155
   (617) 381-3457

2. General Wetland Bylaw --

   Conservation Law Foundation
   3 Joy Street
   Boston, Massachusetts 02108
   (617) 742-2540

3. Floodplain Zoning --

   Metropolitan Area Planning Council
   110 Tremont Street
   Boston, Massachusetts 02108
   (617) 451-2770

4. Aquifer Protection District for Inclusion in Zoning Bylaw --

   Metropolitan Area Planning Council

5. Hazardous Material Model Bylaw --

   Conservation Law Foundation

6. Massachusetts Prototype - Model Bylaw Ordinance for Regulating Underground Hazardous Material Storage --

   Conservation Law Foundation

*Ingulsrud, Faith and Bruce J. Stedman, "The Assabet Riverway Plan," Riverway Planning Program, Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement, September 1986.

APPENDIX F

PUBLIC PARTICIPATION

A public participation program was conducted as a part of the Assabet River Water Quality Management Plan, with the assistance of Michelle Monjeau of the Riverways progam of the Division of Fisheries, Wildlife and Environmental Law Enforcement.

First, a Draft Water Quality Management Plan was prepared and circulated within DEQE and EPA. It was made available to the public for comment before and after the public hearing.

Meeting announcements for the March 7, 1989 public review were sent to about forty people from a targetted group likely to be interested in river issues - wastewater treatment plant operators, local health departments, town engineers, conservation commissioners, members of the watershed organization OAR (Organization for the Assabet River), and the EPA. State legislators from towns along the Assabet were sent individualized invitations to attend the meeting. Finally, a press release and meeting announcement was sent to seven local newspapers. A period of one month was allowed for written comments on the management plan.

There were several results of opening the management plan to public review. First, there was an increased awareness on the part of all project participants of the interrelationship of state and local authorities and the general public in resource management. Second, an enthusiasm and interest seemed to be generated for river issues. Third, we found that the DEQE views of water quality management were generally acceptable to those of the public who participated in reviewing the Assabet plan.

Assabet River Public Meeting Attendees March 7, 1989

Diane Hodgman
Beacon Publications
20 Main Street
Acton, MA 01721
264-9200

Pat McNamara
State House, Rm 540
Boston, MA 02133
(for Rep. John H. Loring)
617-722-2090

Kevin Stockton
ACCENT/Beacon Comm.
20 Main Street
Acton, MA 01721
508-264-9270

Arthur Lambert
State House
Boston, MA 02133
(for Rep. Durand)
722-2250

Walter Carbone
Chr. Maynard C.C.
Conservation Commission
Maynard Town Hall
Maynard, MA 01754
897-8401

Kathie Kelly
Organization for Assabet River
Damonmill Square
West Concord, MA 01742
897-8934

Gary Crossman
91 Neil Street
Marlboro, MA 01752
481-1142

Kathy Velardi
State House, Rm 237
Boston, MA 02133
(for Rep. Patricia Walrath)
617-722-2380

Cynthia Hanson
24 Warner Street
Hudson, MA 01749
508-568-1864

Frank Consiglio, Selectman
Northboro Town Hall
Main Street
Northboro, MA 01532
393-2730

John Bolduc
Conservation Officer
Walker Building
255 Main Street, Rm 204
Marlboro, MA 01752
460-4678

Preston Turner
Berlin Conservation Comm
Berlin Town Hall
Berlin, MA 01549
838-2549

Alec Rabinowitz
76 Oakridge Drive
Maynard, MA 01754
897-3317

Dick Laurence
276 River Road
Hudson, MA 01749
508-568-8977

Jan Jones
25 Nick Lane
Maynard, MA 01754
508-897-6553

Sen. Paul Cellucci
State House
Boston, MA 02133
617-722-1120

Lawrence Roy
116 Pheasant Hill Road
Marlboro, MA 01752
481-1113

ASSABET RIVER

WATER QUALITY MANAGEMENT PLAN

PUBLIC MEETING TRANSCRIPT

March 7, 1989

The following notes are paraphrased from actual meeting comments:

Mr. Consiglio: I have concerns about conservation commissions. They need to foster cooperation in the towns. They must take the initiative to help the river by allowing tree removal, etc., if fallen trees obstruct the river. He notes, though, that Assabet water quality has improved greatly over the past two years. Many aquatic animals are back.

Mr. Lawrence: What will the DEQE response be to WWTP expansion request?

Mr. Hogan (DEQE): No increase in pollutant loadings will be allowed.

Mr. Lawrence and Mr. Rabinowitz: Can DEQE require phosphorus removal?

Ms. Hanley (DEQE): DEQE will not require the WWTPs to remove phosphorus unless we can demonstrate that this will have a noticeable effect on instream water quality. Even if the WWTPs remove some phosphorus, enough phosphorus may still remain in their effluents to cause problems instream.

Mr. Hogan (DEQE): There are no easy answers to the excessive nutrient levels in the Assabet. The river may continue to be greenish. The river sediments are rich in phosphorus. Also, the Assabet is naturally a wetlands oriented river. A certain amount of plant growth is to be expected.

Ms. Hanley (DEQE): Citizen use of non-phosphate detergents is a step in the right direction toward perhaps cutting down on excessive nutrient inputs to the river.

Mr. Lauzon: During a tour of the Westboro WWTP the plant operator noted that the WWTP had been designed for easy expansion.

Mr. Kimball (DEQE): The plant has been designed for 7.6 MGD. A DEQE Enforcement Action requires the Westboro WWTP to notify the DEQE Central Regional Office when the WWTP reaches 60% capacity. DEQE has not authorized any expansion.

Mr. Lauzon: More advanced treatment means more possibility for breakdown.

Ms. Monjeau (F&W): Three issues seem very important in the basin that should be discussed - the Concord MCI WWTP, the sludge pile in Maynard, and the direct sewage discharges in Maynard.

Sen. Cellucci: The Concord MCI WWTP feasibility study has been funded by the legislature. It has a high funding priority. Also, we are committed to clean up the the sludge pile.

Mr. Stockton: How can towns fund WWTP's effectively?

Mr. Kimball: Federal Funds are dwindling.

Sen. Cellucci: Towns have sewer user fees. Water and sewer bills can increase independent of Proposition 2½.

Mr. Lauzon: OAR thinks it's important that interested citizens attend sewer and water commission meetings to make the point that projects should be adequately funded.

Mr. Consiglio: Is fertilizer at golf courses an issue?

Mr. Hogan (DEQE): We can't monitor golf courses directly. They release "Nonpoint" pollution which is difficult to monitor.

Attendee: Maybe Town Conservation Commissions can get involved (general meeting agreement).

Mr. Consiglio: When was Westborough State Hospital last monitored? Is it up to snuff. Why hasn't the state done something about it?

Mr. Kimball (DEQE): Good point. Yes, it's a state discharge. We do inspect the discharge about once a year. We've increased the number of letters to them of non-compliance.

Mr. Roy: The Westborough Hospital discharges to the ground - near Little Chauncy.

Ms. Jones: Do you have a cost projection for maintaining future water quality in the Assabet River?

Mr. Hogan (DEQE): The Westboro/Shrewsbury WWTP operation and maintenance costs are about $700,000/year. So, roughly, maybe two million dollars per year for all of the plants on the river, just for operation and maintenance.

Mr. Roy: What if the 80 percent capacity is reached at the WWTPs?

Mr. Kimball: The town or the state must impose a sewer hook-up monitorium.

Mr. Roy: The water quality improvement in the Assabet River in Northborough has been tremendous in the last few years. Can we keep it this way?

MEMORANDUM FOR THE RECORD

FROM: Nora Hanley, Environmental Engineer, DWPC/TSB, Westborough

SUBJECT: Meeting Notes: Assabet Management Plan Public Review

DATE: March 8, 1989

On Tuesday evening, March 7, we conducted a public review of the Draft Assabet River Water Quality Management Plan. Panelists leading the discussion were Paul Hogan and Nora Hanley of TSB, Bob Kimball of the DEQE Central Regional Office, and Michelle Monjeau of the Department of Fisheries and Wildlife.

Highlights of the meeting included the consensus that Assabet River protection must be a cooperative effort between state and local authorities and the general public. The question and answer period was polite and fairly technical. Wastewater Treatment Plant issues, including the fact that it is unlikely that expansions will be approved by DEQE, were of particular concern.

The meeting was attended by about twenty-five (25) people including several representatives of the press, State Senator Cellucci, three legislative aides, a local cable T.V. producer, conservation commissioners, and members of the general public.

NH/cal
cc: Paul Hogan
Russell Isaac
Alan Cooperman
Corrine Kupstas, EPA, Boston
Robert Kimball, Central Regional Office, DEQE
Barry Fogel, Central Regional Office, DEQE
T. McMahon, DEQE,
P. Taurasi, DEQE
C.J. O'Leary, DEQE
W. Gaughan, DEQE

Comments on Draft Water Quality Management Plan
for Assabet River

7 March 1989

Introduction

In the third paragraph, please state that another purpose of the plan is to provide recommended actions that are necessary to achieve and maintain water quality goals.

Summary and Recommendations

DEQE Activities

3. Please change first sentence to read "...monitoring to assess effectiveness of abatement projects..."

4. Please list current penalties, and proposed increased penalties.

Physical Characteristics of Assabet River

Include in last paragraph a more detailed description of the River's flow characteristics. In particular, show relationship of flow due to WWTPs versus base flow for the 7Q10 low flow condition, such as in the attached figure. Use DEQE memo dated 28 April 1987, prepared by Nora Hanley, entitled "7Q10 Calculations-Ipswich, Merrimack, Blackstone and Assabet rivers." Since most of the River's flow at low flow conditions is due to WWTPs, indicate that the River is very susceptible to WWTP failures, power outages and hourly effluent flow variations.

Table 1

Was the Aquatic Life fisheries designation for miles 31.8-12.4 made in cooperation with DFWELE? What types of fish does this support? Are there any goals to improve this to Warm Water fisheries designation?

What are the restrictions defined under 314 CMR 4.04(3) and MGL., Ch. 111?

Figure 2

In title, change "SAMPLING STATIONS" to "DAMS AND WWTPS".

Change "Marlboro" to "Marlboro W. WWTP."

Delete sampling station identification along bottom.

Table 3

Indicate that high flow on 16 April 1987 was due to flood conditions.

Conventional Pollutants

Upper Assabet River

Discuss effects of '87 spring flood on pollutant levels.

Figure 5

Show Dissolved Oxygen limit of 5.0 mg/l on figure.

Figure 6

What caused the high (14 mg/l) BOD5 level at AS21 (Acton) in September '87? What is a reasonable limit for BOD5? Show this on figure.

Figure 8

Show the fecal coliform limit of 200/100 ml on figure.

Figure 9

Show a reasonable limit of total phosphorus on figure and discuss in text.

Wastewater Discharges

In first paragraph, please discuss the impact of the '87 flood on the evaluation of the effectiveness of WWTP upgrades conducted during the summer of '87.

Westboro WWTP

During our tour of this facility, the plant manager claimed that portions of the facility were already built to accommodate expansion to a flow twice that of the current amount. Has the DEQE already given approval for a 15.36 MGD facility at Westboro? If so, please explain this in succeeding sections of this report.

Table 6

What is Minor Status?

Municipal Wastewater Management

Acton

What is the largest design flow that would be granted for any eventual future sewering in-town?

Shrewsbury/Hopkinton

Please provide a discussion of wastewater management for each of these towns.

Water Quality Modeling and Wasteload Allocations

The Stream 7A model was used for the Assabet River but a supposedly improved Stream 7B model was used for the Blackstone. What are the differences in these models? Why was not Stream 7B used for the Assabet?

Future Wasteload Allocations

Would you please quantify "very small extent"? Could Westboro WWTP double in size? Could Acton build an "expandable" WWTP? How can you claim even a small allowance is possible when you are still evaluating the Assabet's response to current upgraded WWTPs?

What upgrades or flow limits are necessary to achieve a Warm Water fishery designation throughout?

Please note that increased reliance on WWTP technology also requires increased town expenditures for better maintenance and operator training and salaries.

Table 8

Acton's Sanitary Landfill at 14 Forest Road and Rt. 2 has been closed. The town now has a transfer station to collect solid waste for transport to N. Andover.

Table 12

All of the Acton wells cited are now in operation with carbon and/or aeration treatment.

Future Monitoring Programs

River Water Quality Surveys

There should be a series of periodic surveys to assess the effectiveness of WWTP upgrades.

Biological Monitoring

What is the status of the various surveys underway and when will results be available for review?

Lake (Impoundment) Surveys

You should add that one of the key goals of OAR is to promote and improve recreation on and along the Assabet.

Appendices

Please add the following appendices which are part of the Blackstone River Management Plan:

Massachusetts Surface Water Quality Standards (Appendix 1)

The Assessment of Water Pollution (Appendix 2)

submitted by,

Joseph H. Lauzon
13 Putter Drive
Acton, MA 01720

phone (508) 897-8150 home
(617) 377-6908 work

The Commonwealth of Massachusetts

HOUSE OF REPRESENTATIVES
STATE HOUSE, BOSTON 02133

REPUBLICAN CAUCUS CHAIRMAN

JOHN H. LORING
14TH MIDDLESEX DISTRICT
60 WILLOW ST.
ACTON, MA 01720
TEL. 263-4453

Committees on
Rules
Energy
State Administration
Ethics
Special Commission on
Indoor Air Pollution
ROOM 540, STATE HOUSE
TEL. 722-2090

March 30, 1989

Nora Hanley, Environmental Engineer
DEQE, Division of Water Pollution Control
Westview Building, Lyman School
Westborough, MA 01581

Dear Ms. Hanley:

Due to the budget debate, I was unable to attend your public meeting in Hudson to discuss the Assabet River Water Quality Management Plan.

However, my Aide, Pat McNamara, did attend and brought me a copy for review. I am very impressed with the amount of work that has been done on researching the water quality of the Assabet River Basin and with efforts to monitor, improve and protect the river.

I congratulate you for producing such a comprehensive report. It will be an invaluable resource for my office. Please know I will continue to be an advocate for the Assabet River cleanup, both as a member of the Legislative Environmental Committee and as a private person for whom this river held particular recreational pleasure during my youth.

Thank you for allowing me this opportunity to express my opinion of the water management plan.

Sincerely,

JOHN H. LORING
State Representative

JHL:eb

The Commonwealth of Massachusetts

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John H. Loring

JOHN H. LORING
State Representative

JHL:eb