Chapter III

A HISTORY OF POLLUTION OF THE ABERJONA RIVER

Introduction

The Aberjona River is part of the Mystic River system, one of the three major river systems which discharge their waters to Boston Harbor. It is the source of the Mystic and has its origins in a marshy area to the north of Reading, Massachusetts. It flows south through the towns of Woburn and Winchester and then discharges into the upper Mystic Lake. Along its route to the lake, the river travels through wetlands and boggy areas as well as undergoing several impoundments. Its major tributaries are Hall's Brook, Sweetwater Brook, and Horn Pond Brook; there are also other minor tributaries. Much of the Aberjona watershed lies in the buried preglacial valley of the Merrimack River and is underlain with deposits of permeable material. In 1973, the Massachusetts Division of Water Pollution control described the Aberjona as, "somewhat unique in that by nature it is a 'leaky' river." That is, because the groundwater and surface water hydrologic systems are closely related, groundwater withdrawals for industrial and municipal use actually cause the river to experience losses of flow during its travel downstream.[1]

The Aberjona River traverses an area that has historically been characterized by industrial development, most extensively in the town of Woburn. The various Woburn industries, especially the tanning industry and different branches of the chemical industry, have made use of the Aberjona for both process water and for pollution discharge. The use of the river as a discharge point has resulted in a long historical record of pollution. In most cases, the loudest complaints about river pollution have derived from the immediate downstream community of Winchester. The various Woburn industries have been identified as the chief polluters of the Aberjona by various state bodies, by academic investigators, by engineering consulting groups, by the press, and by various citizens groups, especially from Winchester. This chapter will discuss these reports and complaints concerning the pollution of the Aberjona for over a century.

The First Pollution Investigations and the Passage of Aberjona River Pollution Control Legislation: 1871-1911

The Massachusetts State Board of Health (MSBH) was founded in 1869 in order to develop a comprehensive program "to

prevent unnecessary mortality from all causes."[2] It was the first state board of health established in the nation. Early in its history it became concerned with the pollution of municipal water supplies by industrial and municipal wastes. One of the first studies it conducted in this regard involved the pollution of Mystic Pond and its sources (eg. the Aberjona River) by Woburn industries. From 1871 through 1911, the state investigated the growing pollution of the Aberjona a number of times. These investigations culminated, as will be discussed, in the legislation of 1911.

The prime sources of pollution in the Aberjona and its tributaries during this period were the tanneries and leather-related industries in Woburn and the chemical works. In addition, wastes from the Woburn Gas Works were also a problem. These pollution conditions were described in the annual reports of the MSBH and in special state investigations. The tanneries were located on tributary streams to the Aberjona such as Russell Brook, Town Meadow Brook, Willow Brook, on the Aberjona itself, and on Horn Pond. The large chemical works, Merrimac Chemical, was located near Willow Brook. The concentration of industries discharging into the relatively small streams greatly increased the scope of the pollution problem.[3]

Among the conditions noted in the investigations during this period were discoloration of water ("the color and opacity of very foul sink-wash" near one factory), offensive odors, and high chlorine counts. In addition, ammonia water and some tar were disposed of by the Woburn Gas Company into Russell Brook. Extensive fish kills were common and one report observed that, "cattle have refused to drink the water of the Aberjona River."[4] The material dispensed of by the tanneries that appeared most dangerous to the investigators in the 1870's and 1880's was spent bark liquor containing gallate of iron that was injurious to vegetation "and renders the stream useless for domestic purposes," and "water-washings, lime, hen-manure and fleshings," which caused problems of smell.[5] Some of the tanneries disposed of their "liquor refuse" by allowing it "to flow into pits and thence to soak slowly into the gravely subsoil....," a procedure disapproved of by the MSBH.[6]

In the first decade of the twentieth century conditions in the Aberjona and its tributaries continued to deteriorate. Complaints were heard most frequently from residents of Winchester concerning nuisances created by Woburn firms and the destruction of fish in the streams. The water in Russell Brook, where a number of tanneries were located, was particularly polluted. Refuse from a glue factory was also

found to be causing serious pollution in the Aberjona.[7] Protests over this pollution resulted in passage of two pieces of pollution control legislation by the Massachusetts General Court, one in 1907 (chapter 235) relating to Russell Brook or its tributaries and the other to the Aberjona River and its tributaries. The 1911 act was intended to prohibit "the entrance or discharge of sewage into any part of Aberjona River, or its tributaries, and to prevent the entrance of discharge therein of any other substance which might be injurious to public health or might tend to create a public nuisance." A fine of not more than $500 was established for each offense and the MSBH instructed to give advice on pollution reduction to any factory owner on the Aberjona or its tributaries.[8]

Chemical Wastes, Tannery Pollution, and Sewers: 1911-1956

During the years just before World War 1, and during and after the war itself, complaints about the discharge of oil and acid from North Woburn Chemical Works were added to those about tannery pollution and house wastes. In 1916 the Merrimac Chemical Company and its subsidiary, The New England Manufacturing Company, a manufacturer of picric acid, trinitrotoluol and trinitrophenol (TNT), were accused by the MSBH of polluting the river with acid and oil, killing the fish and giving it a green color. The MSDH, however, argued that while the acid drainage was "objectionable for certain reasons," it was not "injurious to the public health" nor did it "create a public nuisance."[9] By 1917 the chemical firms had taken action to reduce the acid discharge. Leachate from tannery wastes, effluent from a gelatine factory, and from piggeries, however, still polluted the river.[10]

In the post-war years, river pollution continued from firms in North Woburn. One source of pollution derived from chemical company wastes ("salts of iron") that imparted a reddish color to the river while another was gelatine factory effluent that created a scum on the river. The greatest concern, however, was with tannery wastes.[11] According to the MSDH, the problem resulted from the reluctance of tanneries to build individual treatment works because of the possibility that a sewer might be constructed. Even those tanneries that attempted to treat their wastes were not especially successful. Several of the Woburn tanneries were connected to the Boston Water Board's Mystic Valley sewer, but others discharged their wastes to the river with minimal treatment.[12] As pollution increased, demands for construction of a sewer to

North Woburn, especially stemming from Winchester groups, grew.[13] (There were also many complaints from Woburn residents about tannery odors.) In the legislative sessions from 1921-23, several bills were introduced providing for sewer construction in the Aberjona River Valley as part of the Metropolitan District Commission (MDC) system. In each case, however, the bills were defeated because other communities viewed the legislation as an attempt by Woburn to shift the costs of a sewer it should be providing itself to the MDC.

While the State Attorney General had maintained early in 1923 that the industrial pollution of the Aberjona did not constitute a violation of the 1911 act, by the end of the year he had changed his position. On November 27, Attorney General Jay R. Benton informed the Commissioner of Public Health that the word "sewage" in the 1911 bill was "not limited to household wastes and human excreta, but includes filth and refuse from manufactories as well as from dwellings."[14] In July, 1924, the MSDH took action to prosecute five tanneries under the formerly dormant 1911 statute.[15] The Woburn Times warned that this action "seriously menaced" the Woburn tanning industry since the manufacture of leather required water and inevitably produced wastes.[16]

The MSDH believed that the ultimate solution to the Aberjona pollution problem was construction of a sewer connecting North Woburn industries to the MDC system rather than prosecution.[17] Faced with a difficult situation, the legislature finally approved an allocation to share the costs of the construction of an additional main sewer in the Aberjona Valley as part of the MDC system. Passage of the bill, however, did not guarantee expedient action and there were numerous delays and problems in construction. Throughout the late 1920s the Aberjona remained extremely polluted from tannery wastes. In 1927, a boom year for tanneries, more organic wastes entered the river than at any previous year for which there were records.[18] In 1929, with the sewer still not in operation, the State Board of Health brought injunction proceedings against two Woburn firms, charging them with polluting the Aberjona.[19] The injunction, however, appeared to be more a means to compel the city of Woburn to reconstruct a leaky section of the sewer it had constructed in 1927 than a serious move against the tanneries.

Throughout the first half of the 1930s, the attention of the MSDH shifted to discoloration of the Aberjona caused by seepage from chemical deposits at the now inactive plant of the Merrimac Chemical Company, (On Nov. 15, 1929, the Monsanto

Chemical Works purchased the Merrimac Company. From 1931-1934, no operations were conducted at the plant site. The New England Chemical Company purchased a large part of the site in 1934 and began construction of an animal hide glue manufacturing plant in 1934. The plant was started up in March 1935.)[21] The MSDH originally identified this seepage as coming from deposits of iron pyrites, but later suggested that other "partially-spent chemicals" were involved in polluting the river.[22] In its 1928 catalog, the Merrimac Chemical Company noted that it deliberately accumulated piles of chemical by-products ("industrial wastes"), in the expectation that a use for the by-product would eventually be discovered. It identified these by-product materials as calcium sulphate, oxide of iron, pyrites cinder, sulphate of lead, calcium carbonate, bauxite waste mud, "and others."[23] Merrimac was a producer of a wide range of chemicals, including arsenate of soda (used for insecticides), various acids, alumina compounds, sulphur compounds, sodium salts, and ammonias.

By the last half of the 1930s, the MSDH was again concerned with the problems caused by sewage overflow from the newly constructed but inadequate North Metropolitan Sewerage System. In addition to sewage flowing into the river from the surcharged sewer, industrial wastes from the tanneries, from a manufacturer of poultry feed, a maker of gelatine, and from a glue works were identified as polluting the river.[24] Conditions were so bad in 1937 that it was necessary to treat the river and part of the Upper Mystic Lake with chlorine. In addition, oil was sprayed on the river surface to prevent the emergence of insects because of the pollution.[25]

Correction of the Aberjona River sewer problems were the responsibility of the City of Woburn. The sewer overflowed in 1939 and 1940, and the MSDH called it a "menace to the purity of the water of the Aberjona River."[26] It warned that unless the city provided more adequate pre-treatment works for industrial wastes, kept the sewer clean, and provided a "more adequate" sewer, it would proceed against it under the 1911 act concerning pollution of the Aberjona.[27] While the war delayed any such legal action, in 1947 the Attorney General brought an action against Woburn to prevent it from polluting the Aberjona with human and industrial wastes that "created a condition injurious to the public health" and caused an odor. The city protested that the statute did not apply to a municipality, but the Massachusetts Supreme Judicial Court held otherwise.[28]

Forced to act, the city hired the Boston engineering firm of Metcalf & Eddy to study their sewer problems. Metcalf & Eddy found that the problems with the sewer derived from

inadequate maintenance by the city and the volume and composition of the wastes contributed to the sewer by the glue works of the Consolidated Chemical Industries and the John J. Riley Tannery. The engineering consultants recommended that the city institute a policy of regular cleaning of its trunk sewer and important branches and also regulate the discharge of industrial wastes in regard to quantity and quality. It also made certain technical recommendations to the Consolidated Chemical Industries and the John J. Riley Co. in order to reduce the flow of their wastes.[29]

The city thereupon began a program of regular sewer maintenance in regard to the Aberjona Valley trunk sewer, eliminating the periodic overflows that had plagued it since its construction.[30] Unfortunately, the material removed from the sewers was often left on the ground near the manholes, furnishing a pollution potential when rainfall occurred.[31]

The Development and Discovery of New Pollution Sources: 1956-1984

During the period before the 1950s, pollution investigations of the Aberjona focused primarily on tanneries, runnoff from waste piles on the old Merrimac Chemical Company site, and the sewer problem. The post-war years, however, saw a change, as was discussed in Chapter I, in the industrial mix present in the Woburn area, with a decline in the number of tanneries and a rise in the variety of firms conducting other forms of industrial activity. In addition, these years also witnessed a growing sensitivity to types of industrial effluents of relatively little concern in the past. What remained the same was that most protests about conditions in the river stemmed from Winchester groups. In June, 1956, for example, the Winchester Star published a front page article decrying conditions in the Aberjona. "This river of ours," editorialized the paper, "has to be seen and smelled to be believed." Later in the month a group of Winchester city officials and residents toured the river ("without benefit of gas masks") and then described the conditions they had found to MSDH and MDC officials. In places they found the river covered with "sort of a sludge" and discolored, while in others they found the banks covered with piles of industrial wastes and sewage. They visited a number of industrial plants and found conditions "that conceivably could contribute to the present condition of the river..."[32]

The result of the Winchester protest was an examination of "sanitary conditions" in the Aberjona by the MSDH. The engineers examining the river for the MSDH found that by the

criteria of dissolved oxygen standards, the river was of "good sanitary quality" at the time of examination, a period of high stream flow. They also noted that municipal and industrial water use probably added to low flow conditions in the summer and fall. While they found no sewers or industrial plants discharging directly to the river, they identified a drainage ditch at the Wilmington-Woburn line that "carried a small volume of chemical wastes into the pond just east of the Dehydrating Process Co." as requiring action. The source of this discharge was identified as National Polychemical. In addition, they found that there was a "constant, largely irreducible minor contamination...from surface drainage from farms, truck gardens, fertilized lawns and flower gardens, industrial establishments, and other sources inevitable in a heavily populated watershed." Among the "direct sources" of pollution identified, was drainage from North Woburn piggeries and from truck farms. In addition, the possibility existed of pollution through drainage from "stock piles of raw products used in the industries, spillage from trucks transporting these raw products and accidental overflow of industrial wastes. The piggeries and the Woburn municipal dump at the head of Mishawum Lake were identified as being a particular drain on the river's oxygen balance.

The report also discussed the principal industrial wastes that were discharged to sewers and existing pre-treatment works. It noted, for instance, that the Beggs & Cobb tannery had a pre-treatment plant of "excellent design," that produced a sludge that was hauled by truck to "a local dump." The Consolidated Chemicals Industries Division, Stauffer Chemical Company, which manufactured glue from hide and leather trimmings on the old Merrimac Chemical site, provided the largest waste flow of any plant to the Aberjona Valley Sewer. Sludge from the firm's pre-treatment facilities was placed in "basins and lagoons." In regard to the J.J. Riley plant, sludge from the basins was "pumped to a lagoon adjacent to the plant, while "buffing dust wastes...are discharged to a separate lagoon from which there is no outlet." All of the industrial waste pre-treatment plants except that of J. J. Riley showed varying degrees of neglect. The recommendations for improvements included more adequate collection and lagooning of piggery wastes, the collection and treatment of drainage from industrial stockpiles, and the removal of sewage cleanings from the river banks. No comment was made about the potential for groundwater pollution from the lagoons.[33]

One result of the renewed concern over pollution conditions in the Aberjona was a clean-up of the river bed and its banks by crews from the MDC. Booms were strung across the river to block the sludge that filled the river from floating down the stream and debris and sludge were removed from the water and the banks.[34] However, reports in the following years of river conditions suggest that the clean-up was only cosmetic and that the basic polluting problems remained. During the rest of the 1950s, and through the 1960s and early 1970s, several investigations reported the continuation of old pollution problems as well as a set of new ones. Wilmington groups sponsored two of these studies, while a third was conducted by a representative of the MSDH. Although the three reports differ somewhat in their conclusions and recommendations, they agree on the high degree of pollution from various industrial sources. Conditions in the river were exceedingly bad in the 1960s because of a combination of increased industrial development in the Woburn area and cycles of drought and flooding in the Aberjona River Valley, triggering concern by citizens groups. In 1955 and 1962, the region experienced damaging floods, while from 1963 through 1967, summer drought "caused objectionable conditions" along the river, including a massive fish kill of undetermined origin in 1963.[35]

The Aberjona Watershed Committee of Winchester, reacting, as had previous Winchester groups, to conditions in the river, contracted with the Boston engineering firm of Camp, Dresser & McKee in July, 1967, to perform a study of the Aberjona. The report, issued in 1967, amplified many of the environmental problems noted by previous investigations as well as identifying some new pollutants not previously of concern to water quality investigators. Among these were wastewater overflow from National Polychemicals (a division of Stepan Chemicals) in Wilmington; high chloride content from street wash and from salt stock piles near the river; large stockpiles of inert material "with some form of sulfate on Stauffer Chemical property" that generated runoff that eventually reached the Aberjona; pollution of the river by Woburn piggeries that piled or buried their manure "wherever it is convenient to do so"; and odors from a gelatin plant. In addition, thermal pollution from two Woburn food plants was identified as a possible "factor in creating objectionable conditions during times of low flow." The report notes that the use of pesticides in the Aberjona rivershed was minimal, although larvacide spraying was carried on for mosquitoes and both Winchester and Woburn carried on "fogging operations...for insect control." These were not held to "cause any significant pesticide pollution to the water of the river." The report

recommended that a stream clearance project be undertaken; that pollution from the National Polychemical Plant, the Woburn piggeries, and the food plant thermal pollution be abated; and, that funds be obtained to install and operate pumps along the river to augment flow during dry summer months.[36] A 1969 study of the National Polychemicals site by a firm of consulting engineers noted that yard drainage, process area floor drainage, and all wastes except "the hydrazine scrubber liquor and the acid waste from the Kempore Process" were discharged into a creek tributary to the Aberjona.[37] Another study of the site performed by consulting engineers in 1980 found that all waste material from the plant eventually "either leached or drained into the ditch paralleling the Boston and Maine railroad tracks and proceeded ultimately to the Aberjona River."[38]

Articles appearing in the Winchester, Woburn and Boston papers concerning water quality in the Upper Mystic Lake stimulated Robert M. Cady of the Northeastern Office of the Massachusetts Division of Water Pollution Control to perform a sanitary survey of the Aberjona and its tributaries in the summer of 1970. While Cady did not agree with all of the pollution sources identified by Camp, Dresser, & McKee, he identified some new ones not previously noted. For instance, Cady found that the Woburn food companies were not sources of thermal pollution and that the largest piggery had been abandoned and was not actively polluting the river. The second piggery identified by Camp, Dresser & McKee, however, was in poor condition and provided a potential source of "organic and coliform pollutants...during a vigorous runoff or thaws, as were buried pig carcasses and pig excrement on the site of former piggeries." Camp, Dresser & McKee had described the Woburn Municipal Dump as "well operated" and "not a serious source of pollution to the river", but Cady found that drainage from the dump had a high BOD (Biochemical Oxygen Demand), and high fecal and total coliform bacteria counts. Drainage from the dump, he noted, "will be a constant source of pollution until abated or at least lessened."

Other specific Woburn or Wilmington industrial pollutant sources identified by Cady included a garage whose pits overflowed oil and grease into the Aberjona River; a barrel company that dumped fly ash and chemical residue onto the ground adjacent to a drainage ditch which drained into Lake Mishawum; a barrel company whose barrel cleaning operations spilled over into a railroad drainage ditch that eventually entered the river; and, piles of salt at a salt distribution center. In addition, the National Polychemicals Co. in Wilmington was identified as emitting drainage containing

salts, oils, formaldehyde, acids, and organic nitrogen compounds that polluted the "waters of the Commonwealth."[39]

Cady summarized his report by noting that Hall's Brook, a tributary to the Aberjona, gathered drainage from a number of the polluting industries on its way to the Aberjona. It also absorbed drainage from the abandoned pits and sludge on the Stauffer Chemical property. These pits contained wastewater with high levels of hexavalent chromium. Cady found that the drainage ditch from the Stauffer property into the Mishawum Lake "contained the same black wastewater as was observed in the settling lagoons." The ditch also received drainage from the abandoned animal hide dumps. Cady recommended that his department become involved with elimination of the latter as well as instituting a thorough program of water quality sampling to ascertain the full condition of the Aberjona.[40]

An event not reported on by Cady but of possible importance in terms of its environmental impact was the draining of Mishawum Lake in December, 1969. The lake had originally been a swamp in the Aberjona system. It was first dammed in the seventeenth century with a mill dam to form the lake or pond originally called "Richardson's Pond."[41] The pond or lake furnished a water supply for North Woburn industries. Over the years it had become badly polluted by chemicals, was discolored (red), and emitted an odor. When the dam was breached in 1969, the lake's polluted contents flooded into the river system.[42]

In 1970, the year that the Cady investigation was made, the Massachusetts Division of Water Pollution Control and the MDC joined to sponsor formation of the Aberjona River Commission. The Commission proceeded to contract for a study of the river to be directed by Fred L. Defeo, a graduate student at Tufts University. Defeo and a group of Tuft's students conducted a careful study of the Aberjona watershed, identifying sources of pollution and potential trouble spots. To a large extent Defeo built on the previous Camp, Dresser & McKee and Cady studies, although providing a greater degree of detail. Defeo listed the sources of pollution by tributary. The variety noted indicates the extent to which many different types of firms in addition to chemical companies and tanneries were involved in pollution of the Aberjona. For instance, those identified as polluting Sweetwater Brook included a manufacturer of acids and solvents; a metal pipe and tool company; and a car wash and parking lot. Halls Brook was polluted from spillage from two barrel companies, the acidic wastes of a chemical company, the Woburn Dump, and by material

from the waste lagoons on the former Stauffer Chemical Company site. Some of the worst pollution entered from a drainage ditch that carried a variety of acids, oil and other chemicals from National Polychemicals, Inc., as well as from the Woburn Dump. In addition, the river and its tributaries were filled with a large amount of debris.[43]

Defeo also conducted analysis of the water quality, using the standard parameters of pH, alkalinity, suspended solids, chlorides, and coliform bacteria. He found that the river had a high acid content (blamed on National Polychemicals) for much of its upper length, high chlorides, and BOD. He also noted that the ground water in the area of the drainage ditch was highly polluted. Defeo recommended that the most important sources of pollution needing abatement were the Stauffer Chemical site, the Woburn Dump, and National Polychemicals. He noted that all three sources were on "implementation schedules" from the Division of Water Pollution Control, although problems were to continue into the future.[44]

In 1973, the Massachusetts Division of Water Pollution Control conducted a study of the Aberjona as part of a larger investigation of the Mystic River. The Division of Water Pollution Control observed that the Aberjona carried a much greater pollutional load in 1973 than in 1967, but higher flow conditions diluted the pollutant concentrations. It optimistically noted that reductions in ammonia-nitrogen, nitrate-nitrogen, and coliform bacteria as well as an increase in DO "shows the river is on its way to recovery." The report noted many of the same major polluters as had been observed in the 1967, 1970 and 1972 investigations. According to the Division investigators, the National Polychemical Company was no longer discharging its wastes directly into adjacent wetlands, but accumulations from past disposal practices as well as failures of its pollution control equipment continued to pollute the basin. In addition, leachate from the Woburn landfill continued to be a problem, draining into a ditch which entered Hall's Brook. Finally, the Industri-Plex Industrial Park construction was said to have provided a "temporary water quality problem on the Aberjona River", because of an increase in suspended solids. The report also noted that high concentrations of zinc, at levels "potentially lethal to game fish," had been recorded in Upper Mystic Lake, and that it appeared the zinc came from the Aberjona River. In its conclusions, the report was optimistic that the problems of the Mystic system and the Aberjona River would be solved by the end of the decade.[45]

The 1973 report, however, over-estimated the extent to which pollutors of the Aberjona were controlling their waste flows. Several investigations during the 1970s noted, for instance, that direct pollution of the Aberjona from the National Polychemicals site (the Stepan Chemical Corporation after 1971) was continuing. In 1974, Robert Cady of the Massachusetts Division of Water Pollution Control reported that "the firm is still polluting the waters of the Commonwealth." Samples collected by Cady showed large amounts of ammonia and chloride, as well as other pollutants in the drainage ditch and in storm waters.[46] A 1976 study by the EPA showed a continuation of runoff with high nitrogen concentration and high BOD that affected the Aberjona and the Mystic Lakes. The nitrogen concentrations were at a level "toxic to fish," while the high BOD caused dissolved oxygen (DO) depletion in the Upper Mystic Lake.[47] A further study of this site conducted for the EPA in 1980 found that seepage from the property of "at least one priority pollutant (dioctylphthalate)" into the Aberjona was probably occuring "by way of Halls' Brook Storage Area".[48]

In addition to the continued pollution of the river and its tributaries from the National Polychemicals (Stepan site and later Olin), other pollution sources lowered water quality in the Aberjona. When the Metropolitan Area Planning Council issued its preliminary report for the Mystic River Basin in October, 1977, it found the entire length of the Aberjona in violation of its assigned water quality classification of Class B water ("suitable for bathing and recreation purposes, water contact activities, acceptable for public water supply with treatment and disinfection, are an excellent fish and wildlife habitat, has excellent aesthetic values and suitable for certain agricultural and industrial users.") The river exceeded the EPA ammonia limit, with the Stepan Chemical Company suspected as the chief source of the contamination. Other named sources of pollution included the Woburn landfill; wastes from barrel companies; "drying beds" on the former Stauffer Chemical Co. site; and, discharges of metals and "possibly organic chemicals" from past and present industrial sites.[49]

Throughout the decade of the 1970s, newspapers in both Winchester and Woburn periodically featured stories concerning cleanups of the river by troops of boy scouts and other groups of citizens as well as warnings of various types of pollutants.[50] In addition, the records of both the DEQE and the EPA contain a number of letters concerning polluting acts committed by various firms in the river and its tributaries.

These included spills of oil and various hazardous chemicals and acids on the ground (and in the sewers also), and the improper storage of barrels with hazardous wastes, all of which had the potential of entering the river.

In spite of heightened enforcement procedures by both the DEQE and the EPA during the latter part of the decade and into the 1980s, the river and its tributaries remained in violation of Class B standards. The worst conditions were in two of the Aberjona's tributaries, Sweetwater Brook and Hall's Brook. According to a study performed by Camp, Dresser & McKee in 1981, the "quality of Sweetwater Brook is often roughly equivalent to that of treated sewage in terms of BOD and fecal coliforms." Hall's Brook contained very high ammonia-nitrogen concentrations which remained elevated when the stream entered the Aberjona. Pollution conditions were especially acute during periods of low flow.[51] In its latest survey of state water quality (1984), the Massachusetts Division of Water Pollution Control found neither the Aberjona nor the Mystic River as meeting its assigned Class B standard.[52]

FOOTNOTES

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1. Massachusetts Water Resources Commission, Division of Water Pollution Control, The Mystic River: Part C (Boston: 1973), pp. 12-14, 29.

2. Barbara Gutmann Rosenkrantz, Public Health and the State: Changing Views in Massachusetts, 1842-1936 (Cambridge: Havard University Press, 1972), p. 1.

3. Annual Report MSBH, 1874, pp. 127-129.

4. Annual Report MSBH, 1871, 387-389; 1874, 128; 1875, 357; 1876, pp. 242-244; and, Report of a Commission Appointed to Consider a General System of Drainage for the Valleys of Mystic, Blackstone, and Charles River, (Boston, 1886), pp. 14, 17-21.

5. Annual Report MSBH, 1875, p. 357.

6. Annual Report MSBH, 1874, pp. 127-129.

7. Annual Report MSBH, 1904, 106; Report of MSBH on the Purification of Mystic River.... 1906, pp. 5-6 Winchester Star, Sept. 30, 1910.

8. "An Act to Provide for the Protection of the Public Health in the Vicinity of the Towns of Winchester and Stoneham and the City of Woburn," Chap. 291, Acts, 1911, p. 252.

9. Annual Report MSDH, 1915, 249-250.

10. Annual Report Massachusetts State Department of Health (MSDH), 1915, p. 250, and ibid. 1916, p. 30, 286; Winchester Star, Jan. 14, July 14, Aug. 4, 1916; and Report of the Joint Board on the Protection of Mystic Lakes, House Doc. No. 10, Jan., 1918.

11. Annual Report MSDH, 1923, p. 46.

12. Annual Report MSDH, 1922, pp. 43-44.

13. See, for instance, Winchester Star, Aug. 22, 1924; Woburn Times, Sept. 18, 1924.

14. Jay R. Benton, Attorney General, to Dr. Eugene R. Kelley, Nov. 27, 1923, Henry Lee Shattuck Collection. Mass. Historical Society.

15. Woburn Times, July 19, 1924.

16. Woburn Times, Sept. 18, 1924.

17. Annual Report MSDH, 1924, p. 46; Report of the Department of Public Health Upon Certain Questions Affecting the Sanitary Condition of the Aberjona River and its Tributaries, House No. 238, Jan., 1926.

18. Annual Report MSDH, 1927, p. 30.

19. Woburn Times, Sept. 12, 1929.

20. See. for instance, Annual Report MSDH, 1929, pp. 32-33.

21. Stauffer Chemical Company, Woburn Environmental Studies: Part I Report 1985. I-6-11.

22. Annual Reports, MSDH, 1932, p. 131; 1933, p. 133; 1934, p. 141.

23. Merrimac Chemical Company, Boston, 1928, p. 79.

24. Report of the Special Commission on the Investigation of the Discharge of Sewage into Boston Harbor and its Tributaries, House No. 1600, Dec., 1936 (Boston, 1937).

25. Annual Report MSDH, 1936, pp. 185-186; 1937, p. 191; and, Winchester Star, Jan. 22, May 21, and June 25, 1937.

26. Annual Report MSDH, 1939, p. 169.

27. Annual Reports 1940, p. 207.

28. Attorney General vs. City of Woburn, 322 Mass., pp. 634-638.

29. Metcalf & Eddy, Engineers, "Report to Mayor William Kane, Woburn, upon Investigation of Aberjona River Valley Sewer and Industrial Wastes Discharged There", March 12, 1947.

30. "Engineer's Report: to MSDH, May 24, 1957," in accord with Chap. 139, Resolves, 1956.

31. "Report of the Dept. of Public Health Relative to an Investigation of the Sanitary Conditions of the Aberjona River and the Mystic Lakes," under Chap. 139, Resolves, 1956 (June, 1957), p. 8.

32. See, Winchester Star, June 22, 29, July 6, 13, 27, 1956.

33. The above discussion of the 1956 investigation is taken from the "Engineer's Report," to the MSDH, May 24, 1957, and "Report of the Dept. of Public Health Relative to An Investigation of the Sanitary Conditions of the Aberjona River and the Mystic Lakes," under chap. 139, resolves of 1956, June.

34. Winchester Star, July 17, 1956.

35. For the fish kill see Winchester Star, Aug. 15, 1963; for a report on flood conditions see Whitman & Howard, "Study of the Aberjona River in the City of Woburn to the Massachusetts Dept. of Public Works", June 30, 1965.

36. Camp, Dresser & McKee, Report on Aberjona River, to Aberjona River Watershed Committee, Nov. 1967. See, also, Frances VerPlanck, "Aberjona: A History of Pollution," Winchester Star, Oct. 12, 1967.

37. The Badger Co., "Pollution Control Study for National Polychemicals Inc.," Cambridge, Sept. 9, 1968, II-1; Ronald J. McBrien, National Polychemicals, to Woburn Oil Company, Aug. 25, 1971.

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