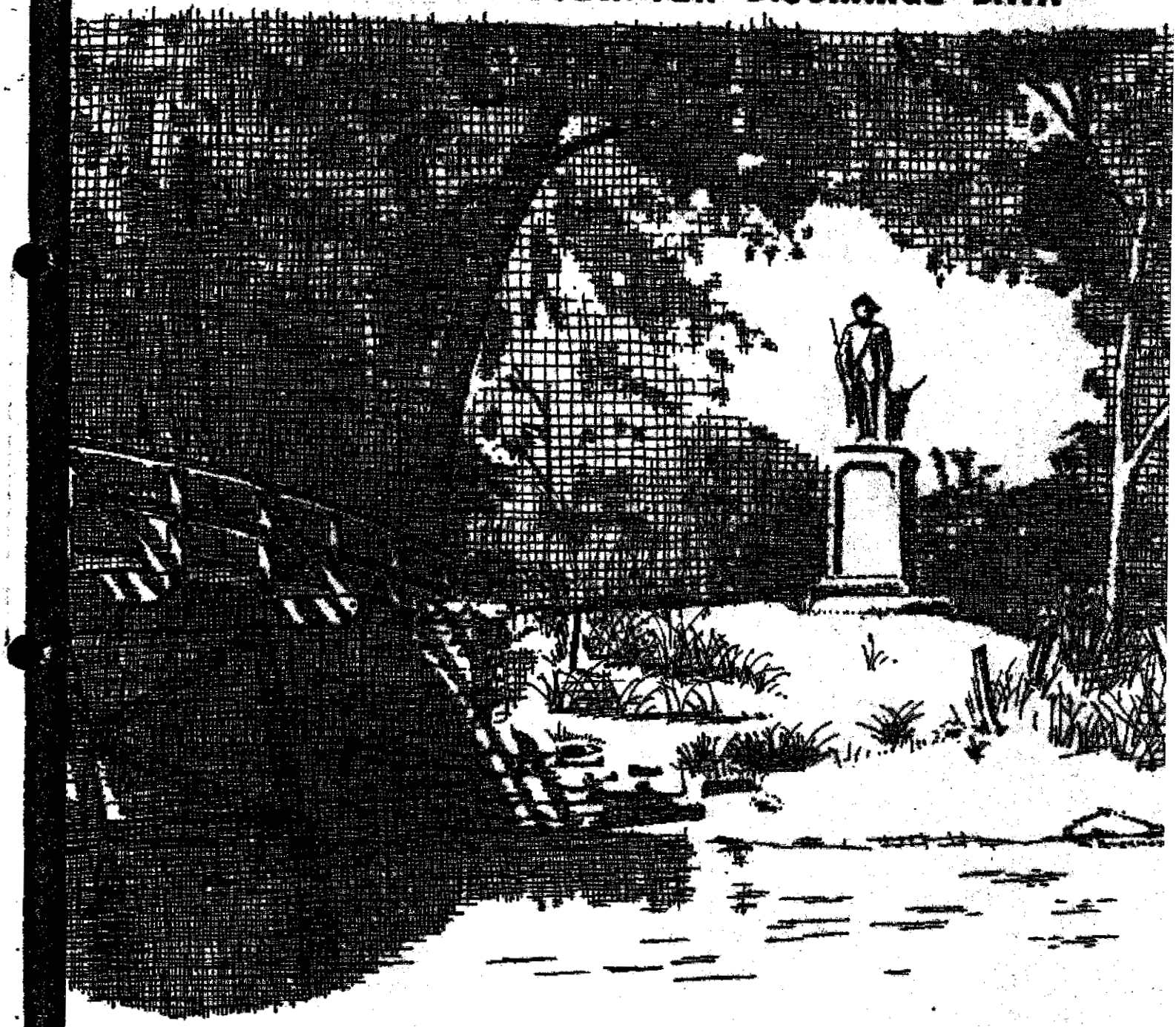
E SUASCO RIVER BASIN

PART B 1976 WASTEWATER DISCHARGE DATA



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DIVISION OF WATER POLLUTION CONTROL

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SUASCO RIVER BASIN

1976

WASTEWATER DISCHARGE SURVEY DATA

PREPARED BY

WATER QUALITY AND RESEARCH SECTION

MASSACHUSETTS DIVISION OF WATER POLLUTION CONTROL

WESTBOROUGH, MASSACHUSETTS

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INTRODUCTION

This report is a compilation of the analyses of two wastewater discharge surveys of the SUASCO River Basin conducted in 1976. The report presents a brief description of the discharges including the location, the method of treatment (if any), the dates of sampling, the flow, and the results of the laboratory analyses performed on the samples. The surveys were conducted by personnel of the Water Quality Section of the Massachusetts Division of Water Pollution Control in coordination with numerous personnel of the respective industries and treatment facilities.

The wastewater discharges were sampled for various periods of time, ranging from 24-hour composite samples to a grab sample. The sampling period was determined according to regulations established by the United States Environmental Protection Agency. The hourly samples were composited according to flow ratios.

The samples were analyzed at the Lawrence Experiment Station of the Department of Environmental Quality Engineering. All analyses were performed according to procedures of the APHA's Standard Methods for the Analysis of Water and Wastewater (13th edition, 1971, New York). Data were compiled and placed in tabular form by personnel of the Massachusetts Division of Water Pollution Control.

WASTEWATER DISCHARGES

Number	Discharge
1	Billerica Sewage Treatment Plant
2	Concord Sewage Treatment Plant
3	Hudson Sewage Treatment Plant
4	Marlborough Easterly Sewage Treatment Plant
5	Marlborough Westerly Sewage Treatment Plant
6	Maynard Sewage Treatment Plant
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9	Bay State Abrasives
10	Carling Brewery
11	Commodore Foods
12	Corenco Corporation
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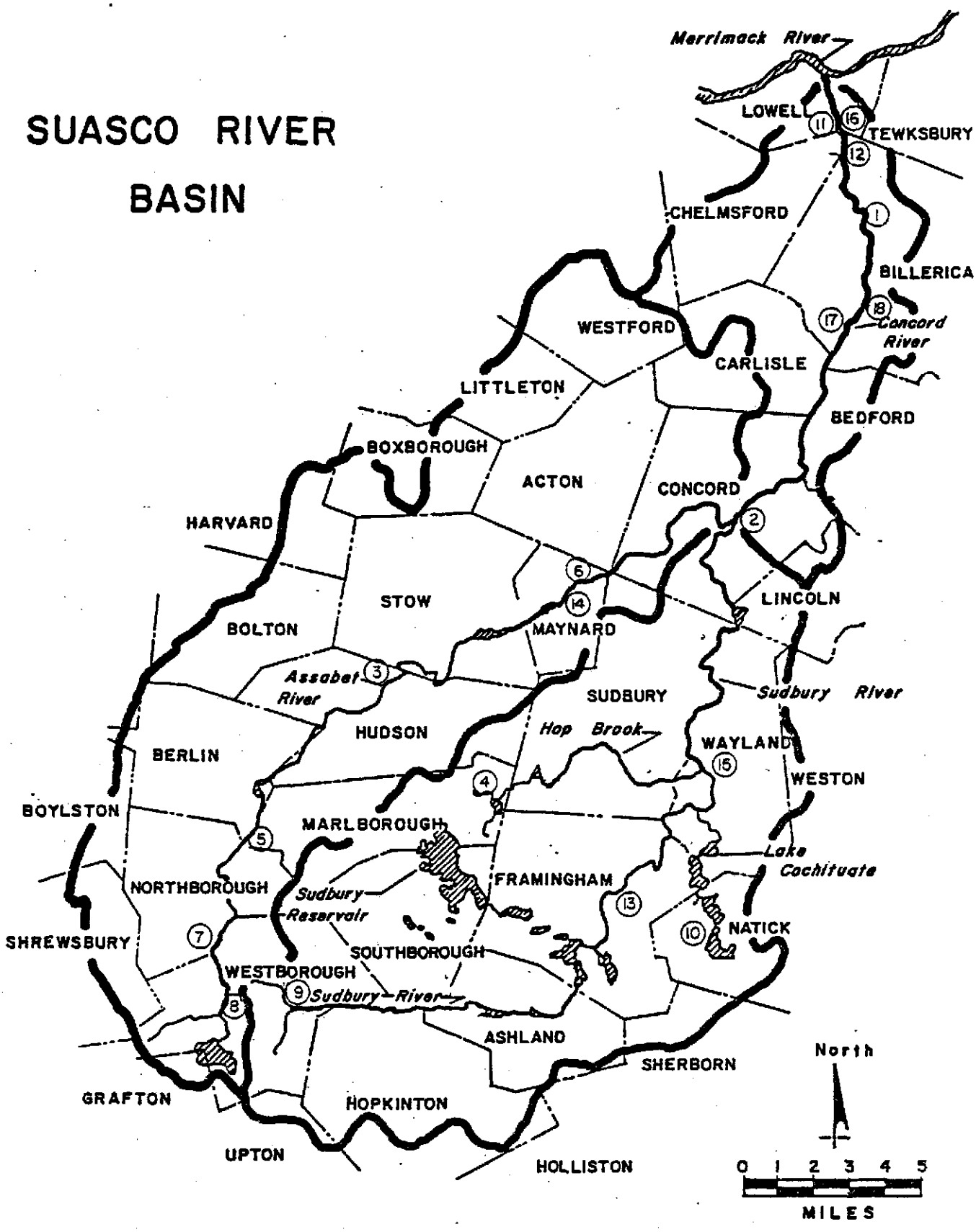
14	Digital Equipment Corporation
15	Raytheon Corporation, Wayland
16	Raytheon Missile Systems Division
17	Billerica House of Correction
18	Billerica Water Treatment Plant

SUASCO RIVER BASIN



LOCATION OF DISCHARGES

Billerica Sewage Treatment Plant

Location:	Letchworth Avenue, Billerica
Dates Sampled:	April 14-15, 1976; October 25-28, 1976
Receiving Water:	Concord River
Capacity:	1.6 MGD
Treatment Process:	Bar rack Comminutor Extended aeration tanks Final settling tanks Chlorination
Sludge Disposal:	Flotation thickeners Vacuum filter Landfill
Type of Samples:	April 14-15: One 24-hour composite sample of the effluent, one composite sample of the influent, one grab sample after chlorination for coliform bacteria. October 25-28: Three 24-hour composite samples of the effluent, one 24-hour composite sample of the influent, one grab sample after chlorination for coliform bacteria.

Billerica Sewage Treatment Plant

Laboratory Analyses (mg/l)

Parameter	Influent		Effluent			
	4/14-15	10/26-27	4/14-15	10/25-26	10/26-27	10/27-28
COD	290	490	72	--	--	--
BOD	132	250	15.0	18.0	27.0	72.0
pH (std. units)	7.5	7.5	6.2	6.8	6.9	6.3
Total alkalinity	125	188	9.0	19.0	23.0	18.0
Suspended solids	88	190	16	57.0	28.0	62.0
Total solids	420	770	370	500	520	610
Settleable solids (ml/l)	3.0	--	0.5	1.0	1.2	--
Total Kjeldahl-N	29	--	3.8	--	--	--
Ammonia-N	18	26	1.6	0.1	0.09	0.23
Nitrate-N	0.1	0.2	16	17.0	18.0	18.0
Total Phosphorus	5.0	8.0	3.5	4.8	4.0	4.0
Total coliform/100 ml.	--	--	< 36	--	--	36
Fecal coliform/100 ml.	--	--	< 36	--	--	36
Free residual Cl_2	--	--	1.5	--	--	.25
Total residual Cl_2	--	--	2.0	--	--	1.1
Flow (MGD)	--	--	1.09	1.15	1.17	1.14

Concord Sewage Treatment Plant

Location:	Off Bedford Road, Concord
Date sampled:	February 11, 1976; October 20-21, 1976
Receiving water:	Great Meadows Wildlife Area to Concord River
Capacity:	1.0 MGD
Treatment process:	Imhoff tank Sand filter beds Chlorination
Sludge disposal:	Drying beds Landfill
Type of samples:	February 11: One 8-hour composite sample of the influent; One 8-hour composite sample of the effluent; One 8-hour composite sample of the primary effluent from the Imhoff tank; One grab sample after chlorination for coliform bacteria and residual chlorine October 20-21: One 24-hour composite sample of the influent; One 24-hour composite sample of the effluent; One grab sample after chlorination for coliform bacteria and total residual chlorine

Concord Sewage Treatment Plant

Laboratory Analyses (mg/l)

Parameter	Influent		Primary Effluent	Final Effluent	
	2/11	10/20-21	2/11	2/11	10/20-21
COD	238	240	195	67	120
BOD	174	170	147	60	90
pH (std. units)	7.2	7.2	7.1	6.7	7.2
Total alkalinity	101	113	93	82	141
Suspended solids	90	110	52	16	30
Settleable solids (ml/l)	4.0	--	0.5	4.5	0.0
Total solids	370	392	332	244	356
Total Kjeldahl-N	23	25	19	12	20
Ammonia-N	12	15	12	9.5	18.0
Nitrate-N	0.1	0.1	0.1	0.5	0.8
Total phosphorus	3.8	6.0	2.9	3.6	4.4
Total coliform/100 ml.	--	--	--	430	<36
Fecal coliform/100 ml.	--	--	--	<36	<36
Total residual chlorine	--	--	--	--	>3.0

Hudson Sewage Treatment Plant

Location:	Municipal Drive, Hudson
Dates sampled:	April 14-15, 1976; October 18-19, 1976
Receiving water:	Assabet River
Capacity:	2.0 MGD
Treatment process:	Bar rack Comminutor Detrider (grit removal) Primary clarifiers Trickling filters Final clarifiers Chlorination
Sludge disposal:	Vacuum filtration Reused for highway fill, etc.
Type of samples:	One 24-hour composite of the influent One 24-hour composite of the effluent (8-hour in October) One grab sample after chlorination for coliform bacteria and residual chlorine

Hudson Sewage Treatment Plant

Laboratory Analyses (mg/l)

Parameter	Influent		Effluent	
	4/14-15	10/18	4/14-15	10/18-19
COD	460	510	120	130
BOD	192	240	22	36
pH (std. units)	7.8	7.2	7.6	7.6
Total alkalinity	120	156	95	125
Suspended solids	120	130	35	24
Total solids	540	596	350	386
Settleable solids (ml/l)	7.0	--	0.4	0.5
Total Kjeldahl-N	42	32	20	21
Ammonia-N	27	19	14	15
Nitrate-N	0.1	0.1	2.5	3.3
Total phosphorus	5.0	14.0	4.5	9.6
Total coliform/100 ml.	--	--	1,500	93,000
Fecal coliform/100 ml.	--	--	430	2,400
Free residual Cl_2	--	--	0.8	--
Total residual Cl_2	--	--	--	0.5
Flow (MGD)	--	--	1.169	0.72

Marlborough Easterly Sewage Treatment Plant

Location:	Boston Post Road, Marlborough
Dates sampled:	April 14-15, 1976; October 18-21, 1976
Receiving water:	Hop Brook
Capacity:	5.5 MGD
Treatment process:	Aerated grit chambers Comminutor Primary clarifiers Aeration tanks Phosphorus removal Secondary clarifiers Nitrification aeration tanks Final clarifiers Chlorination
Sludge disposal:	Vacuum filter Stockpiled on-site
Type of samples:	April 14-15: One 24-hour composite sample of the influent; One 24-hour composite sample of the effluent; One grab sample after chlorination for coliform bacteria. October 18-21: One 24-hour composite sample of the influent; Three 24-hour composite samples of the effluent; One grab sample after chlorination for coliform bacteria and residual chlorine.

Marlborough Easterly Sewage Treatment Plant

Laboratory Analyses (mg/l)

Parameter	Influent		Effluent			
	4/14-15	10/18-19	4/14-15	10/18-19	10/19-20	10/20-21
COD	310	830	67	20	30	40
BOD	162	360	11	4.5	4.2	7.2
pH (std. units)	7.0	7.2	6.1	6.9	6.9	7.0
Total alkalinity	26	136	57	15	10	6.0
Suspended solids	110	426	15	7.5	4.5	7.0
Settleable solids (ml/l)	6.0	--	0.2	0.0	0.0	0.0
Total solids	450	762	330	444	440	474
Total Kjeldahl-N	34	42	3.3	1.1	1.4	1.4
Ammonia-N	16	18	0.08	0.6	0.1	0.1
Nitrate-N	0.1	0.2	19	23	26	26
Total phosphorus	6.0	11.0	0.80	1.0	0.9	0.6
Ortho-phosphorus	6.0	--	0.41	--	--	--
Total coliform/100 ml.	--	--	< 36	2,400	--	--
Fecal coliform/100 ml.	--	--	< 36	< 36	--	--
Free residual Cl_2	--	--	0.9	--	--	--
Total residual Cl_2	--	--	--	1.3	--	--
Flow (MGD)	--	--	2.433	2.71	2.51	2.62

Marlborough Westerly Sewage Treatment Plant

Location:	Boundary Road, Marlborough
Dates sampled:	April 14-15, 1976; October 18-21, 1976
Receiving water:	Assabet River
Capacity:	2.0 MGD
Treatment process:	Bar rack Aerated grit chamber Comminutor Primary clarifiers Activated sludge Secondary clarifiers Chlorination
Sludge disposal:	Vacuum filter Stockpiled at Easterly plant
Type of samples:	One 24-hour composite of the influent; one 24-hour composite of the effluent (three 24-hour composites in October); one grab sample after chlorination for coliform bacteria and residual chlorine.

NOTE: Heavy industrial waste load caused an upset of the treatment system

Marlborough Westerly Sewage Treatment Plant

Laboratory Analyses (mg/l)

Parameter	Influent		Effluent			
	4/14-15	10/18-19	4/14-15	10/18-19	10/19-20	10/20-21
COD	1100	860	96	300	300	60
BOD	660	530	11	210	200	9.0
pH (std. units)	6.2	6.7	7.2	7.1	7.2	7.3
Total alkalinity	59	86	99	91	115	105
Suspended solids	490	268	52	200	184	17
Settleable solids (ml/l)	32	--	0.3	60	70	1.0
Total solids	880	566	330	476	516	344
Total Kjeldahl-N	35	29	17	15	19	3.8
Ammonia-N	9.6	8.2	7.2	1.1	0.6	1.3
Nitrate-N	0.5	0.2	0.1	1.6	0.2	0.1
Total phosphorus	4.8	6.0	2.9	6.0	7.6	3.4
Total coliform/100 ml.	--	--	91	2.4×10^6	--	--
Fecal coliform/100 ml.	--	--	< 36	240,000	--	--
Free residual Cl_2	--	--	2.5	--	--	--
Total residual Cl_2	--	--	--	0.4	--	--
Flow (MGD)	--	--	1.3	1.02	1.01	1.05

Maynard Sewage Treatment Plant

Location:	Pine Hill Road, Maynard
Dates sampled:	April 14-15, 1976; October 18-21, 1976
Receiving water:	Assabet River
Capacity:	1.28 MGD
Treatment process:	Bar rack (75% of flow) Comminutor (75% of flow) Grit chamber and classifier Primary clarifier Aeration tanks Secondary clarifier Chlorination
Sludge disposal:	Reaeration Wet well Incineration Ashes buried at dump
Type of samples:	April 14-15: One 8-hour composite of the influent; one 8-hour composite of the effluent; one grab sample for coliform bacteria. October 18-21: One 8-hour composite at the influent; three 24-hour composites at the effluent; one grab sample for coliform bacteria and residual chlorine.

Note: Flow meter was broken during the October sampling.

Maynard Sewage Treatment Plant

Laboratory Analyses (mg/l)

Parameter	Influent		Effluent			
	4/14-15	10/18-19	4/14-15	10/18-19	10/19-20	10/20-21
COD	380	510	250	110	100	240
BOD	192	280	123	17	24	57
pH (std. units)	7.7	7.2	7.3	7.3	7.6	7.6
Total alkalinity	142	129	124	186	130	120
Suspended solids	130	216	70	24	30	114
Total solids	450	594	380	264	278	372
Settleable solids (ml/l)	10	--	4.5	1.7	2.5	11.0
Total Kjeldahl-N	42	44	41	28	30	37
Ammonia-N	30	26	26	24	24	28
Nitrate-N	0.6	1.0	0.1	0.2	0.1	0.2
Total phosphorus	5.5	14	6.8	9.2	9.6	--
Total coliform/100 ml.	--	--	930	93,000	--	--
Fecal coliform/100 ml.	--	--	< 36	230	--	--
Total residual chlorine	--	--	--	1.7	--	--
Flow (MGD)	--	--	1.3	--	--	--

Shrewsbury Sewage Treatment Plant

Location:	Off Main Street, Shrewsbury/Northborough
Dates sampled:	April 14-15, 1976; October 18-19, 1976
Receiving water:	Assabet River
Capacity:	1.75 MGD
Treatment process:	Bar rack Aerated grit chamber Comminutor Primary settling tank High-rate trickling filter Secondary settling tank Chlorination
Sludge disposal:	Vacuum filter Polymer-lime treatment Landfill
Type of samples:	April 14-15: One 24-hour composite of the influent; one 24-hour composite of the effluent; October 18-19: One 8-hour composite of the influent; one 24-hour composite of the effluent; one grab sample after chlorination for coliform bacteria

Note: Chlorination system broken during the April sampling.

Shrewsbury Sewage Treatment Plant

Laboratory Analyses (mg/l)

Parameter	Influent		Effluent	
	4/14-15	10/18	4/14-15	10/18-19
COD	400	460	180	130
BOD	240	228	75	31
pH (std. units)	7.2	7.5	7.2	7.3
Total alkalinity	113	156	121	183
Suspended solids	100	202	34	32
Settleable solids (ml/l)	6.5	--	1.3	2.0
Total solids	400	610	330	396
Total Kjeldahl-N	29	40	25	23
Ammonia-N	11	24	11	16
Nitrate-N	0.1	0.1	0.1	3.2
Total phosphorus	6.5	13.0	7.8	12.0
Flow (MGD)	--	--	1.7	1.17

Westborough Sewage Treatment Plant

Location:	Meadow Road, Westborough
Dates sampled:	February 10, 1976; October 18-19, 1976
Receiving water:	Assabet River
Capacity:	1.1 MGD
Treatment process:	Bar rack Comminutor Grit chamber Extended aeration tanks Final clarifier Sand filter beds (May to October) Chlorination
Sludge disposal:	Aerobic digestor Drying beds Stockpiled on-site
Type of samples:	February 10: One 8-hour composite of the influent; one 8-hour composite of the effluent; one grab sample after chlorination for coliform bacteria and residual chlorine. October 18-19: One 24-hour composite of the influent; one 24-hour composite of the effluent; one grab sample after chlorination for coliform bacteria and residual chlorine.

Westborough Sewage Treatment Plant

Laboratory Analyses (mg/l)

Parameter	Influent		Effluent	
	2/10	10/18-19	2/10	10/18-19
COD	290	550	120	60
BOD	264	168	75	14
pH (std. units)	7.4	7.3	7.0	6.8
Total alkalinity	118	60	63	123
Suspended solids	105	216	165	17
Settleable solids (ml/l)	6.0	--	1.0	1.0
Total solids	464	590	326	336
Total Kjeldahl-N	27	38	8.8	1.7
Ammonia-N	16	22	3.6	0.9
Nitrate-N	0.9	0.2	0.1	8.3
Total phosphorus	5.3	9.6	3.2	4.8
Total coliform/100 ml.	--	--	750	430
Fecal coliform/100 ml.	--	--	36	36
Free residual chlorine	--	--	0.40	--
Total residual chlorine	--	--	--	0.7
Flow (MGD)	--	--	1.4	0.9

Bay State Abrasives

Location: 12 Union Street, Westborough

Date sampled: February 10, 1976

Receiving water; Rutters Brook

Industrial process: Cooling water

Treatment process: None

Type of sample: Grab

Results of Analyses

Discharge and Description	Temperature (°F)	pH
001 - Cooling water discharge from main building	86	7.2
002 - Cooling water discharge, 36" culvert on Brigham Street	64	7.3

Carling Brewery

Location: 1143 Worcester Turnpike, Natick

Dates sampled: February 9-10, 1976

Receiving water: Lake Cochituate

Industrial process: Beer brewery

Type of sample: 8-hour composite of 002 cooling water discharge;
8-hour composite of intake;
8-hour composite of outlet

1976 Laboratory Analyses (mg/l)

Parameter	Intake	Outlet	#002 Effluent
pH	6.7	6.6	6.6
Settleable solids (ml/l)	0.1	0.0	0.0
Ammonia-N	0.01	0.01	0.01
Nitrate-N	0.5	0.6	0.6
Total phosphorus	0.05	0.02	0.03

Commodore Foods, Inc.

Location:	645 Lawrence Street, Lowell
Date sampled:	February 2, 1976
Receiving water:	River Meadow Brook
Industrial process:	Food processing
Treatment process:	None
Type of sample:	One grab sample of effluent for oil & grease

1976 Laboratory Analysis (mg/l)

Oil & Grease	(percent)	2.4
	(mg/l)	24,000

Corenco Corporation

Location:	525 Woburn Street, Tewksbury
Date sampled:	February 9, 1976
Receiving water:	Concord River
Industrial process:	Rendering
Treatment process:	Settling tank
Type of sample:	8-hour composite of the effluent

1976 Laboratory Analysis (mg/l)

Parameter	Effluent
COD	43
BOD	1.5
pH (std. units)	6.4
Suspended solids	18
Oil & grease	1.0
Ammonia-N	1.2
Total phosphorus	0.38

Dennison Manufacturing Company

Location:	300 Howard Street, Framingham
Date sampled:	February 11, 1976
Receiving water:	Beaver Dam Brook
Industrial process:	Manufacture of paper products
Treatment process:	None
Type of sample:	Grab

1976 Laboratory Analysis

Discharge	Flow (MGD)	Temperature (°F)	pH
#001 cooling water discharge	.215	52	7.3
#002 cooling water discharge	.010	73	7.5

Digital Equipment Corporation

Location: 146 Main Street, Maynard

Date sampled: February 11, 1976; October 21, 1976

Receiving water: Assabet River

Industrial process: Plating

Treatment process: Cyanide and chromium destruction

Type of sample: One 8-hour composite of effluent on 2/11/76; grab sample of the effluent on 10/21/76

Laboratory Analysis (mg/l)

Parameter	2/11/76	10/21/76
pH	7.8	7.3
Chromium	0.01	2.0
Hexavalent chromium	0.005	0.0
Copper	1.2	0.8
Silver	0.00	0.01
Nickel	0.08	0.1
Fluoride	6.5	7.8
Total phosphorus	0.03	5.8
Zinc	0.05	0.0
Aluminum	0.43	0.1
Cadmium	0.00	0.0
Iron	0.05	0.05
Lead	0.10	0.08
Tin	0.50	0.1
Cyanide	0.02	0.0
Cyanide amenable to chlorine	0.02	0.0
Suspended solids	--	11
Total Alkalinity	--	33
Flow (GPD)	--	65,000

Raytheon Corporation

Location:	430 Boston Post Road, Wayland
Dates sampled:	February 10, 1976; October 20, 1976
Receiving water:	Sudbury River
Industrial Wastewater Treatment process:	Continuous pH monitoring, neutralization, sludge stored and removed
Type of sample:	One 8-hour composite of effluent
Sanitary Wastewater Treatment Process:	Comminutor, extended aeration, sand filtration, sludge removal
Type of sample:	One 8-hour composite of the influent; one 8-hour composite of the effluent; one grab sample after chlorination for coliform bacteria.

Note: Chlorination system malfunctioning during the October sampling.

Raytheon Corporation - Wayland

Laboratory Analyses (mg/l)

Parameter	Sanitary Influent		Sanitary Effluent		Industrial Effluent	
	2/10/76	10/20/76	2/10/76	10/20/76	2/10/76	10/20/76
COD	740	700	72	40	--	--
BOD	550	360	16	10	--	--
pH (std. units)	8.0	8.2	6.8	7.0	8.3	8.1
Total alkalinity	167	170	40	25	--	--
Suspended solids	218	196	7.5	1.5	3.0	4.0
Settleable solids	20	--	0.0	0.0	--	--
Total solids	764	638	526	416	--	--
Total Kjeldahl-N	79	64	15	10	--	--
Ammonia-N	65	39	14	8.4	--	--
Nitrate-N	1.2	7.4	49	29	--	--
Total phosphorus	6.5	12.0	0.30	0.23	--	0.6
Ortho phosphorus	--	7.0	--	0.12	--	--
Total coliform/100 ml.	--	--	<36	46,000	--	--
Fecal coliform/100 ml.	--	--	<36	46,000	--	--
Chromium	--	--	--	--	0.05	0.12
Hexavalent chromium	--	--	--	--	0.035	0.03
Cyanide	--	--	--	--	0.00	0.00
Cyanide amenable to Cl_2	--	--	--	--	0.00	0.00
Nickel	--	--	--	--	0.00	0.0
Copper	--	--	--	--	0.45	1.0
Fluoride	--	--	--	--	0.50	0.7
Tin	--	--	--	--	<0.50	0.1
Lead	--	--	--	--	0.03	0.0
Cadmium	--	--	--	--	--	0.0
Aluminum	--	--	--	--	--	0.0
Iron	--	--	--	--	--	0.15
Silver	--	--	--	--	--	0.0
Zinc	--	--	--	--	--	0.0

Raytheon Missile Systems Division

Location: Woburn Street, South Lowell

Date sampled: February 10, 1976; October 19, 1976

Receiving water: Concord River

Treatment process: Cyanide removal, chromium removal, neutralization, secondary settling tanks, charcoal filters

Type of sample: 8-hour composite of the effluent on 2/10/76; grab sample of the effluent on 10/19/76

Laboratory Analysis (mg/l)

Parameter	2/10/76	10/19/76
pH (std. units)	8.1	7.4
Copper	1.0	0.26
Silver	0.02	0.05
Nickel	0.08	0.05
Chromium	0.25	0.0
Hexavalent chromium	0.015	0.0
Aluminum	0.35	--
Cadmium	0.00	0.02
Total phosphorus	0.45	0.09
Iron	0.05	0.05
Lead	0.10	0.0
Cyanide	0.02	0.05
Cyanide amenable to chlorination	0.02	0.05
Tin	< 0.50	0.1
Zinc	0.05	0.05
Fluoride	6.0	2.4
Suspended solids	--	2.5

Billerica House of Correction

Middlesex County

Location: Treble Cove Road, South Billerica

Date sampled: February 10, 1976

Receiving water: Concord River

Treatment process: Secondary treatment

Type of sample: 8-hour composite of influent and effluent

1976 Laboratory Analysis (mg/l)

Parameter	Influent	Effluent
COD	360	110
BOD	294	78
pH (std. units)	7.1	7.3
Total alkalinity	56	60
Suspended solids	106	6.0
Settleable solids (ml/l)	0.1	0.0
Total solids	488	322
Total Kjeldahl-N	17	9.5
Ammonia-N	4.6	4.7
Nitrate-N	1.6	4.2
Total phosphorus	5.5	3.5

Billerica Water Treatment Plant

Location:	250 Boston Road, Billerica
Date sampled	February 10, 1976
Receiving water:	Concord River
Treatment process:	Settling tanks
Type of sample:	Grab
Discharge:	Backwash - sludge from settling tanks

1976 Laboratory Analysis (mg/1)

Parameter	Effluent
pH (std. units)	5.0
Suspended solids	932
Flow (MGD)	.02
Temperature (^{o}F)	34

GLOSSARY

Acidity - The quantitative capacity of aqueous solutions to react with hydroxyl ions. It is measured by titration with a standard solution of a base to a specified end point. Usually expressed as milligrams per liter of calcium carbonate.

Alkalinity - The capacity of water to neutralize acids, a property imparted by the water's content of carbonates, bicarbonates, hydroxides, and occasionally borates, silicates, and phosphates. It is expressed in milligrams per liter of equivalent calcium carbonate.

Anaerobic Waste Treatment - Waste stabilization brought about through the action of microorganisms in the absence of air or elemental oxygen. Usually refers to waste treatment by methane fermentation.

Biochemical Oxygen Demand (BOD) - The quantity of oxygen used in the biochemical oxidation of organic matter in a specified time, at a specified temperature, and under specified conditions.

Biological Wastewater Treatment - Forms of wastewater treatment in which bacterial or biochemical action is intensified to stabilize, oxidize, and nitrify the unstable organic matter present. Intermittent sand filters, contact beds, trickling filters, and activated sludge processes are examples.

Chemical Oxygen Demand (COD) - A measure of the oxygen-consuming capacity of inorganic and organic matter present in water or wastewater. It is expressed as the amount of oxygen consumed from a chemical oxidant in a specific test. It does not differentiate between stable and unstable organic matter and thus does not necessarily correlate with biochemical oxygen demand.

Chlorination - The application of chlorine to water or wastewater, generally for the purpose of disinfection, but frequently for accomplishing other biological or chemical results.

Clarification - Any process or combination of processes, the primary purpose of which is to reduce the concentration of suspended matter in a liquid.

Coliform - Bacteria found in abundance in the intestinal tract of warm-blooded animals. They are not harmful in themselves, but their presence indicates that pathogenic bacteria may be present. Since they can be detected by relatively simple test procedures, coliforms are used to indicate the extent of bacterial pollution from sewage. Bacterial tests usually measure the fecal and total coliforms. Fecal coliform make up about 90 percent of the coliforms discharged in fecal matter. Non-fecal coliforms may originate in soil, grain, or decaying vegetation.

Comminution - The process of cutting and screening solids contained in the wastewater flow before it enters the flow pumps or other units in the treatment plant.

Composite Wastewater Sample - A combination of individual samples of water or wastewater taken at selected intervals, generally hourly, for some specified period, to minimize the effect of the variability of the individual sample. Individual samples may have equal volume or be proportioned to the flow at the time of sampling.

Data - Records of observations and measurements of physical facts, occurrences, and conditions, reduced to written, graphical, or tabular form.

Fats (wastes) - Triglyceride esters of fatty acids; erroneously used as synonomous with grease.

Flocculation - In water and wastewater treatment, the agglomeration of colloidal and finely divided suspended matter after coagulation by gentle stirring by either mechanical or hydraulic means. In biological wastewater treatment where coagulation is not used, agglomeration may be accomplished biologically.

Grab Sample - A single sample of wastewater taken at neither set time nor flow.

Grease - In wastewater, a group of substances including fats, waxes, free fatty acids, calcium and magnesium soaps, mineral oils, and certain other nonfatty materials. The type of solvent and method used for extraction should be stated for quantification.

Grit Chamber - A detention chamber or enlargement of a sewer designed to reduce the velocity of flow of the liquid to permit the separation of mineral from organic solids by differential sedimentation.

Hardness - A characteristic of water imparted by salts of calcium, magnesium, and iron such as bicarbonates, carbonates, sulfates, chlorides, and nitrates, that cause curdling of soap, deposition of scale in boilers, damage in some industrial processes, and sometimes objectionable taste. It is expressed as equivalent calcium carbonate.

Heavy Metals - These elements are toxic when present in sufficient quantities and can be fatal. They can adversely affect sewage treatment systems and the biological systems of waterbodies. They include cadmium, chromium, copper, iron, lead, manganese, nickel, and zinc.

Industrial Wastes - The liquid wastes from industrial processes, as distinct from domestic or sanitary wastes.

Inorganic Matter - Chemical substances of mineral origin, or, more correctly, not of basically carbon structure.

Lagoon - A pond containing raw or partially treated wastewater in which aerobic or anaerobic stabilization occurs.

Most Probable Number (MPN) - That number of organisms per unit volume that, in accordance with statistical theory, would be more likely than any other number to yield the observed test result with the greatest frequency. Expressed as density of organisms per 100 ml. Results are computed from the number of positive findings of coliform-group organisms resulting from multiple-portion decimal-dilution plantings.

Nitrogen - A common non-metallic element that in free form is normally a colorless, odorless, tasteless, insoluble, inert, diatomic gas. In the combined form, it has a wide range of valences and is a constituent of biologically important compounds (as proteins) and hence of all living cells as well as industrially important substances (as cyanides, fertilizers, dyes).

Nitrogen, Ammonia - A compound of nitrogen and hydrogen, NH_3, which is part of the nitrogen cycle. Its presence in sufficient amounts in a stream can indicate a wastewater discharge. The oxidation of ammonia depletes a stream of dissolved oxygen. It is toxic in sufficient amounts, especially to fish.

Nitrogen, Kjeldahl - This represents the total organic nitrogen content of water.

Nitrogen, Nitrate - Nitrate represents the most highly oxidized phase in the nitrogen cycle and normally reaches important concentrations in the final stages of biological oxidation. Nitrogen in this form is readily available to plants.

Organic Matter - Chemical substances of animal or vegetable origin, or more correctly, of basically carbon structure, comprising compounds consisting of hydrocarbons and their derivatives.

Oxidation - The addition of oxygen to a compound. More generally, any reaction which involves the loss of electrons from an atom.

Oxidation Pond - A basin used for the retention of wastewater before final disposal, in which biological oxidation of organic matter is affected by natural or artificially accelerated transfer of oxygen to the water from air.

Parshall Flume - A calibrated device developed by Parshall for measuring the flow of a liquid in an open conduit.

Pathogenic Bacteria - Bacteria that may cause disease in the host organism by their parasitic growth.

pH - The reciprocal of the logarithm of the hydrogen ion concentration. The concentration is the weight of hydrogen ions in grams per liter of solution. Neutral water, for example, has a pH value of 7 and hydrogen ion concentration of 10^{-7}.

Phenol - An aromatic compound which is a monohydroxy derivative of benzene. In concentrated solution, it is quite toxic to bacteria. Widely used as a germicide. Commonly known as carbolic acid.

Phosphorus - A nonmetallic multivalent element of the nitrogen family that occurs widely in combined form, especially as inorganic phosphates in minerals, soils, and natural waters, and as organic phosphates in all living cells; it exists in several allotropic forms. The majority of

the phosphorus contained in domestic sewage and industrial wastes comes from detergents.

Primary Settling Tank - The first settling tank for the removal of settleable solids through which wastewater is passed in a treatment works.

Primary Treatment - The first major (sometimes the only) treatment in a wastewater treatment works, usually sedimentation. The removal of a substantial amount of suspended matter but little or no colloidal and dissolved matter.

Residual Chlorine - Chlorine remaining in water or wastewater at the end of a specified contact time as combined or free chlorine.

Sampler - A device used with or without flow measurement to obtain an aliquot portion of water or waste for analytical purposes. May be designed for taking a single sample (grab), composite sample, continuous sample, or periodic sample.

Secondary Settling Tank - A tank through which effluent from some prior treatment process flows for the purpose of removing settleable solids.

Secondary Wastewater Treatment - The treatment of wastewater by biological methods after primary treatment by sedimentation.

Sludge Digestion - The process by which organic or volatile matter in sludge is gasified, liquified, mineralized, or converted into more stable organic matter through the activities of either anaerobic or aerobic organisms.

Sludge Thickening - The increase in solids concentration of sludge in a sedimentation or digestion tank.

Solids, Settleable - That matter in wastewater which will not stay in suspension during a pre-selected settling period, such as an hour, but which either settles to the bottom or to the top. In the Imhoff cone test, the volume of matter that settles to the bottom in one hour.

Solids, Suspended - Solids that either float on the surface of, or are in suspension in, water, wastewater, or other liquids and which are largely removable by laboratory filtering. The quantity of material removed from wastewater in a laboratory test, as prescribed in Standard Methods for the Examination of Water and Wastewater, and referred to as non-filterable residue.

Solids, Total - The sum of dissolved and undissolved constitutents in water or wastewater, usually stated in milligrams per liter.

Wastewater Survey - An investigation of the quality and characteristics of each waste stream, as in an industrial plant or municipality.