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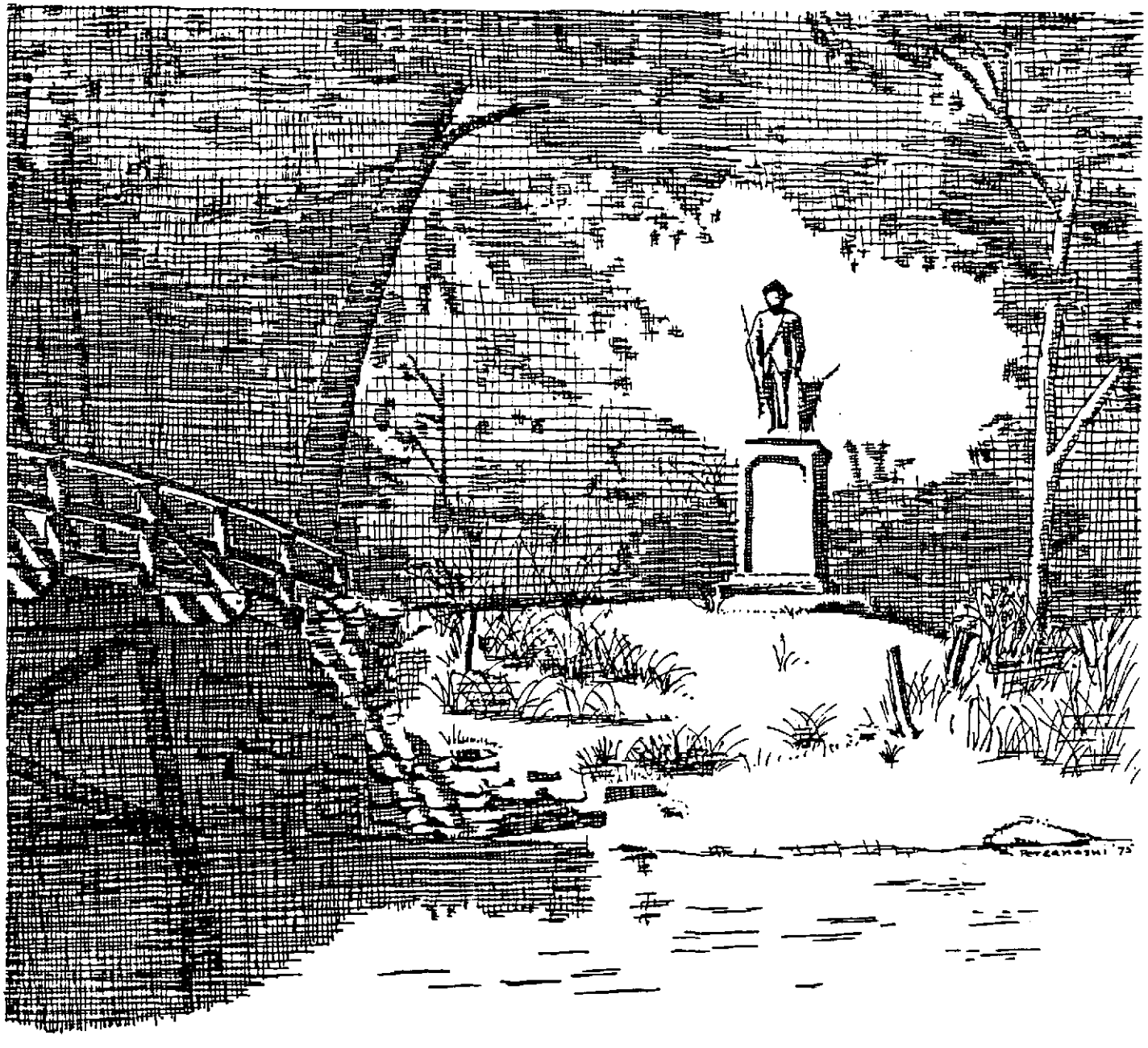
82-B-5

Suasco River Basin

PART B - Wastewater Discharge Data 1983-1985



Massachusetts Department of Environmental Quality Engineering

DIVISION of WATER POLLUTION CONTROL

Thomas C. McMahon, Director

SUASCO RIVER BASIN

1983-1985

WASTEWATER DISCHARGE DATA

Prepared By

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TECHNICAL SERVICES BRANCH

DIVISION OF WATER POLLUTION CONTROL

WESTBOROUGH, MASSACHUSETTS

JANUARY 1987

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FOREWORD

This report contains sampling results from wastewater discharge surveys conducted in the SUASCO River Basin in 1983, 1984 and 1985. Most significant treated discharges in the SUASCO Basin were sampled at least once during 1983-1985. Discharges were sampled for three consecutive days in order to better evaluate the performance of the treatment facilities. Most samples were 24-hour composites. The results of this sampling program, along with a brief description of the various discharges, are contained in this report.

These surveys were carried out to determine if treatment facilities were meeting the limits imposed on them by their permits. Division personnel set up automatic samplers at some treatment plants and obtained coliform samples and chlorine residual analyses at all plants. Automatic samplers operated by plant personnel were used at most of the treatment facilities.

Chemical and coliform analyses were performed at the Lawrence Experiment Station in accordance with the APHA's Standard Methods for the Examination of Water and Wastewater (14th Edition, 1976, New York). Unless otherwise stated, all data are reported as milligrams per liter (mg/l).

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4.	Shrewsbury Wastewater Treatment Plant	Assabet
5.	Marlborough West Wastewater Treatment Plant	Assabet
6.	Hudson Wastewater Treatment Plant	Assabet
7.	Digital Equipment Corporation Wastewater Treatment Plant	Assabet
8.	Maynard Wastewater Treatment Plant	Assabet
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10.	Middlesex School Wastewater Treatment Plant	Assabet
11.	Concord Wastewater Treatment Plant	Concord
12.	Billerica Wastewater Treatment Plant	Concord
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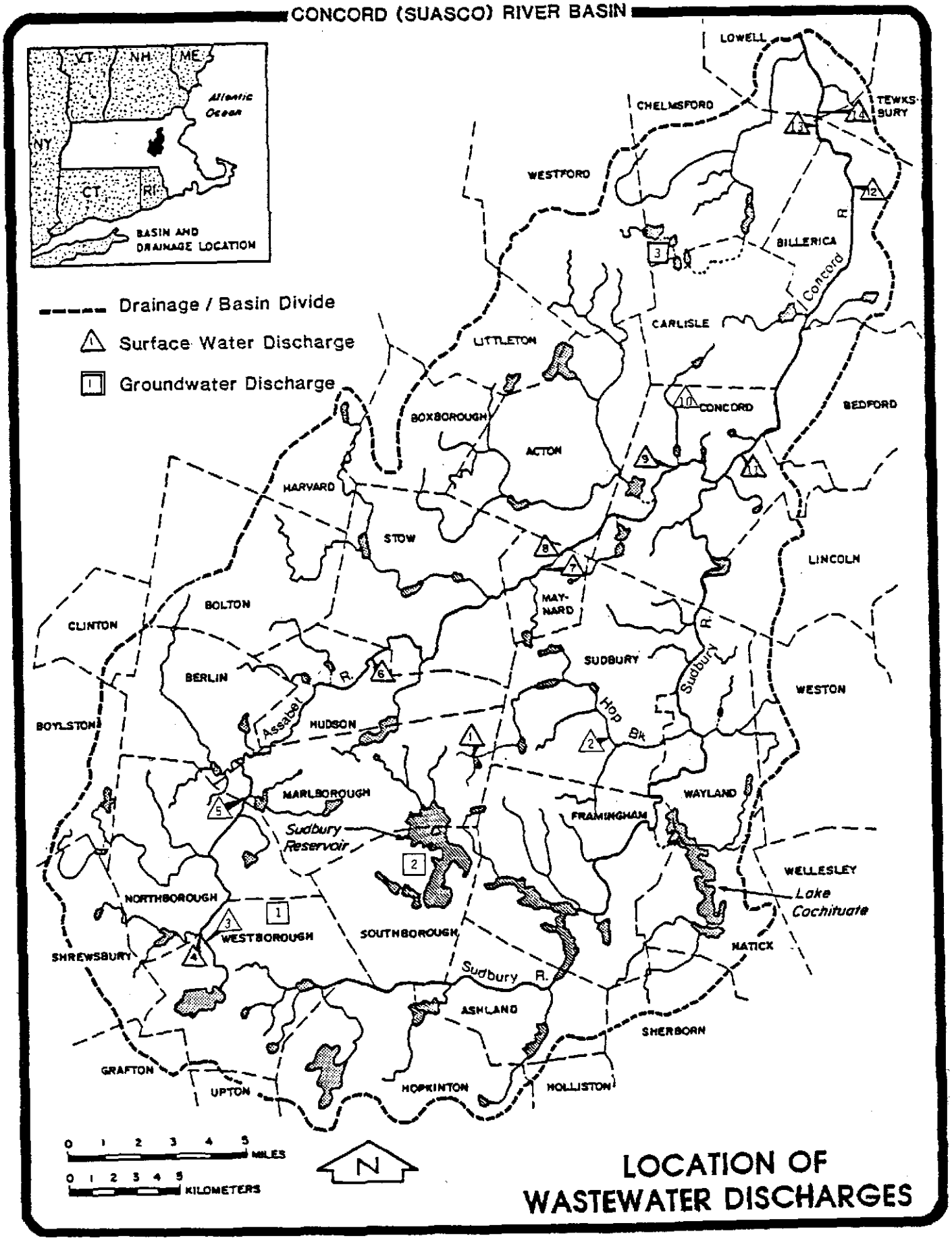
GROUNDWATER DISCHARGES

DISCHARGE		RIVER BASIN
1.	Westborough State Hospital Wastewater Treatment Plant	Assabet
2.	L.B. Darling Co. Wastewater Treatment Plant	Sudbury
3.	Frequency Sources Wastewater Treatment Plant	Concord


CONCORD (SUASCO) RIVER BASIN
VT
NH
ME
NY
CT
RI
Atlantic Ocean
BASIN AND DRAINAGE LOCATION
Drainage / Basin Divide
Surface Water Discharge
Groundwater Discharge
LOWELL
CHELMSFORD
TEWKSBURY
WESTFORD
BILLERICA
Concord R.
CARLISLE
LITTLETON
BOXBOROUGH
ACTON
CONCORD
BEDFORD
HARVARD
STOW
LINCOLN
MAYNARD
BOLTON
CLINTON
SUDBURY
Sudbury R.
BERLIN
Assabet R.
WESTON
BOYLSTON
HUDSON
Hop Bk
MARLBOROUGH
WAYLAND
FRAMINGHAM
Sudbury Reservoir
WELLESLEY
Lake Cochituate
NORTHBOROUGH
WESTBOROUGH
SOUTHBOROUGH
SHREWSBURY
NATICK
Sudbury R.
ASHLAND
SHERBORN
GRAFTON
UPTON
HOPKINTON
HOLLISTON
0 1 2 3 4 5 MILES
0 1 2 3 4 5 KILOMETERS
N
LOCATION OF WASTEWATER DISCHARGES

MARLBOROUGH EAST WASTEWATER TREATMENT PLANT

LOCATION: Boston Post Road, Marlborough

RECEIVING WATER: Hop Brook, Sudbury River

NPDES PERMIT NO.: MA0100498

DESIGN FLOW: 5.5 MGD

TYPE OF TREATMENT:

Primary	First Stage	Second Stage
Aerated grit	Aeration tanks	Aeration tanks
Comminuter	Secondary clarifiers	Final clarifiers
Bar rack		Chlorination
Parshall flume		
Primary clarifiers		

SLUDGE HANDLING: Vacuum filters
Landfill

COMMENTS: This facility operates as a mechanically mixed two-stage nitrification plant. The plant puts out a consistently good effluent. Occasional upsets due to inflow/infiltration have been noted. However, permit violations are very rare even at extremely high flows.

MARLBOROUGH EAST WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	10/11-12/83 INFLUENT	10/11-12/83 EFFLUENT	10/12-13/83 INFLUENT	10/12-13/83 FIRST STAGE MLSS*	10/12-13/83 SECOND STAGE MLSS*	10/12-13/83 EFFLUENT	4/17-18/84 INFLUENT	4/18/84 MLSS*
COD	417	39	348	--	--	48	278	--
BOD_5	320	1.0	220	--	--	8.0	90	--
pH (Standard Units)	6.8	7.6	7.0	7.4	7.2	7.8	7.1	7.3
Total Alkalinity	140	89	150	310	220	100	95	150
Suspended Solids	176	5	142	3,760	2,500	3.0	79	2,500
Volatile Suspended Solids	--	--	--	2,000	1,730	--	--	1,740
Total Volatile Solids	--	--	--	2,480	1,950	--	--	1,890
Settleable Solids (ml/l)	-	0.0	--	--	--	0.0	--	--
Total Solids	530	460	418	4,300	3,070	410	338	2,930
Total Kjeldahl Nitrogen	52	5.0	36	300	200	5.8	31	208
Ammonia Nitrogen	21	1.3	26	40	0.42	1.7	18	14
Nitrate Nitrogen	0.1	17	0.0	0.4	15	18	0.6	0.8
Total Phosphorus	13	1.3	14	168	116	1.6	6.2	160
Chloride	--	46	--	--	--	62	--	--
Chlorine Residual*	--	--	--	--	--	1.5	--	--
Total Coliform/100 ml*	--	--	--	--	--	<100	--	--
Fecal Coliform/100 ml*	--	--	--	--	--	<100	--	--
Aluminum	--	--	0.90	15	48	0.10	0.4	7.7
Cadmium	--	--	0.00	0.01	0.00	0.00	0.01	0.02
Chromium	--	--	0.00	0.12	0.09	0.01	0.00	0.06
Copper	--	--	0.13	2.7	0.77	0.00	0.04	1.5
Iron	--	--	2.2	310	100	0.42	3.0	160
Lead	--	--	0.05	0.44	0.31	0.04	0.06	0.29
Manganese	--	--	0.08	0.94	11	0.05	0.11	0.95
Mercury	--	--	0.0002	0.0086	0.0062	0.0000	0.0001	0.0038
Nickel	--	--	0.00	0.09	0.13	0.01	0.04	0.06
Silver	--	--	0.00	0.04	0.03	0.00	--	--
Tin	--	--	<0.50	<0.50	<0.50	<0.50	0.13	1.1
Zinc	--	--	--	--	--	--	9,13	1,1
Flow (MGD)	--	1.79	--	--	--	1.76	0.13	1.1

*Grab sample

MARLBOROUGH EAST WASTEWATER TREATMENT PLANT (CONTINUED)

PARAMETER	4/17-18/84 SECONDARY EFFLUENT	4/18/84 FINAL MLSS*	4/17-18/84 FINAL EFFLUENT	4/18-19/84 INFLUENT	4/18-19/84 SECONDARY EFFLUENT	4/18-19/84 FINAL EFFLUENT	4/19-20/84 INFLUENT	4/19-20/84 SECONDARY EFFLUENT	4/19-20/84 FINAL EFFLUENT
COD	110	--	57	302	61	66	213	56	61
BOD_5	30	--	4.5	160	6.8	5.1	150	7.8	0.3
pH (Standard Units)	7.5	6.9	7.4	7.0	7.2	7.5	7.0	7.0	7.3
Total Alkalinity	60	125	60	90	80	80	100	100	100
Suspended Solids	70	2,500	2.5	222	8.0	1.5	115	4.5	3.0
Volatile Suspended Solids	--	1,830	--	--	--	--	--	--	0.0
Total Volatile Solids	--	1,870	--	--	--	--	426	360	410
Settleable Solids (ml/l)	--	--	0.0	--	--	0.00	--	--	--
Total Solids	250	2,860	230	570	346	388	--	--	--
Total Kjeldahl Nitrogen	22	200	6.4	43	9.3	10	23	9.3	5.4
Ammonia Nitrogen	7.3	0.18	0.69	10	6.1	0.26	12	9.1	0.23
Nitrate Nitrogen	7.6	3.9	7.7	1.7	7.3	7.7	0.5	6.2	8.8
Total Phosphorus	5.0	144	0.50	6.3	1.0	0.92	4.3	0.67	0.75
Chloride	--	--	91	--	--	94	--	--	99
Chlorine Residual*	--	--	1.2	--	--	--	--	--	--
Total Coliform/100 ml*	--	--	20	--	--	--	--	--	--
Fecal Coliform/100 ml*	--	--	10	--	--	--	--	--	--
Aluminum	0.2	17	0.3	--	--	--	--	--	--
Cadmium	0.01	0.02	0.00	--	--	--	--	--	--
Chromium	0.00	0.06	0.00	--	--	--	--	--	--
Copper	0.00	1.6	0.00	--	--	--	--	--	--
Iron	30	130	0.12	--	--	--	--	--	--
Lead	0.05	0.31	0.06	--	--	--	--	--	--
Manganese	0.14	1.1	0.13	--	--	--	--	--	--
Mercury	0.0003	0.0044	0.0000	--	--	--	--	--	--
Nickel	0.04	0.10	0.03	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--
Tin	<0.50	<0.50	<0.50	--	--	--	--	--	--
Zinc	0.11	0.96	0.03	--	--	--	--	--	--
Flow (MGD)	--	--	4.73	--	--	--	--	--	--

*Grab sample

MARLBOROUGH EAST WASTEWATER TREATMENT PLANT (CONTINUED)

PARAMETER	2/28/85 SECONDARY EFFLUENT*	5/13/85 FINAL CLARIFIER	5/14/85 FINAL CLARIFIER	5/15/85 FINAL CLARIFIER[1]	5/15/85 FINAL CLARIFIER[2]	5/16/85 FINAL CLARIFIER
COD	96	--	--	--	--	--
BOD_5	56	--	--	--	--	--
pH (Standard Units)	7.4	6.00†	6.60†	6.06	6.06	6.30
Total Alkalinity	130	--	--	--	--	--
Suspended Solids	18	--	--	--	--	--
Total Solids	320	--	--	--	--	--
Total Kjeldahl Nitrogen	19	--	--	--	--	--
Ammonia Nitrogen	14	--	--	--	--	--
Nitrate Nitrogen	0.4	--	--	--	--	--
Total Phosphorus	2.9	--	--	--	--	--
Chloride	80	--	--	--	--	--
Chlorine Residual*	--	--	--	0.30X	0.11X	0.17X
Total Coliform/100 ml*	--	150,000	24,000	3,600	5,700	9,300
Fecal Coliform/100 ml*	--	43,000	2,400	500	500	1,500

* Grab sample

† Problem with pH meter

X Source of chlorine not known possibly due to washing of launders with final effluent. Samples taken prior to chlorination

[1] Taken in the launders

[2] Taken off the weirs

PARAMETER	5/20/85 AFTER NITRIFICATION	5/20/85 AFTER CHLORINATION	5/21/85 AFTER NITRIFICATION	5/21/85 AFTER CHLORINATION
Chlorine Residual*	0.12	0.60	0.05	0.90
Total Coliform/100 ml	3,300	10	4,700	200
Fecal Coliform/100 ml*	500	<5	300	<5

COATINGS ENGINEERING WASTEWATER TREATMENT PLANT

LOCATION:	Union Street, Sudbury
RECEIVING WATER:	Hop Brook (Sudbury River)
NPDES PERMIT NO.:	Not issued
INDUSTRIAL PROCESS:	Producer of soft plastic coverings for tools, wire and hardware
TYPE OF TREATMENT:	None
COMMENTS:	This discharge is of concern because of the high levels of oil and grease, phosphorus, solids, and volatiles. Work is underway to issue a permit and set up an implementation schedule.

COATINGS ENGINEERING WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	10/12/83 EFFLUENT*	10/13/83 EFFLUENT*
COD	87	68
pH (Standard Units)	7.2	7.2
suspended solids	12	3.0
Total Solids	1,514	1,500
Turbidity (NTU)	0.3	0.4
Ammonia Nitrogen	0.05	--
Nitrate Nitrogen	0.00	--
Total Phosphorus	156	108
Oil & Grease	1.6	0.9
Phenols	0.00	0.00
Acetone (µg/l)	830	1,200
bis-2 ethylhexylphthalate (ug/l)	4†	3†
di-isodecylphthalate (ug/l)	2†	30
Aluminum	--	<0.10
Cadmium	--	0.00
Chromium	--	0.00
Copper	--	0.00
Iron	0.34	0.36
Lead	0.08	0.23
Manganese	--	0.00
Mercury	--	0.0000
Nickel	--	0.00
Silver	--	0.00
Tin	--	<0.50
Zinc	0.41	0.22
Flow (MGD)	14,000	15,000

* Grab sample

† Approximate, below lowest standard for quantification

WESTBOROUGH WASTEWATER TREATMENT PLANT

LOCATION:	Meadow Road, Westborough
RECEIVING WATER:	Assabet River
NPDES PERMIT NO.:	MA0100412
DESIGN FLOW:	1.2 MGD
TYPE OF TREATMENT:	Bar rack Comminutor/Bar rack Detritor Aeration Clarifier Chlorination
SLUDGE HANDLING:	Drying beds* Onsite disposal
COMMENTS:	This facility produces a fairly good effluent. Inflow/infiltration problems cause occasional violations. This plant is currently being upgraded to handle both Westborough and Shrewsbury.

WESTBOROUGH WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	10/11-12/83 INFLUENT	10/11-12/83 EFFLUENT	10/12-13/83 INFLUENT	10/12-13/83 MIXED LIQUOR	10/12-13/83 EFFLUENT	2/21-22/84 INFLUENT	2/21-22/84 EFFLUENT
COD	398	49	464	--	68	--	--
BOD_5	200	14	200	--	7.2	--	--
pH (Standard Units)	7.2	6.4	7.3	6.8	6.9	--	--
Total Alkalinity	150	12	130	130	20	--	--
Suspended Solids	86	16	172	3,980	14	--	--
Volatile Suspended Solids	--	--	--	2,980	--	--	--
Total Volatile Solids	--	--	--	2,990	--	--	--
Settleable Solids (ml/l)	--	0.1	--	--	<0.05	--	--
Total Solids	558	386	606	4,190	360	--	--
Total Kjeldahl Nitrogen	44	4.9	37	352	9.1	21	9.2
Ammonia Nitrogen	22	0.76	24	1.5	0.87	16	1.5
Nitrate Nitrogen	0.0	15	0.1	5.4	14	0.1	6.9
Total Phosphorus	9.0	6.2	8.3	144	6.3	5.1	3.2
Chloride	--	60	--	--	84	--	--
Chlorine Residual*	--	--	--	--	0.7	--	--
Total Coliform/100 ml*	--	--	--	--	40,000	--	--
Fecal Coliform/100 ml*	--	--	--	--	900	--	--
Aluminum	--	--	0.60	22	0.10	0.56	0.17
Cadmium	--	--	0.00	0.08	0.00	0.00	0.00
Chromium	--	--	0.01	0.14	0.00	0.00	0.00
Copper	--	--	0.40	13	0.05	0.26	0.03
Iron	--	--	0.84	24	0.24	0.73	0.75
Lead	--	--	0.03	0.90	0.02	0.05	0.03
Manganese	--	--	0.07	0.98	0.06	0.08	0.06
Mercury	--	--	0.0010	0.0320	0.0000	0.0004	0.0001
Nickel	--	--	0.00	0.15	0.00	0.00	0.00
Silver	--	--	0.01	0.08	0.00	--	--
Tin	--	--	<0.50	<0.050	<0.50	0.50	0.50
Zinc	--	--	--	--	--	0.17	0.17
Flow (MGD)	--	--	0.08	6.7	0.12	--	2.06

* Grab sample

WESTBOROUGH WASTEWATER TREATMENT PLANT (CONTINUED)

PARAMETER	2/22-23/84 INFLUENT	2/23-24/84 INFLUENT	2/23-24/84 EFFLUENT	2/13/85 EFFLUENT	4/16/85 EFFLUENT	5/15/85 EFFLUENT
COD	--	--	--	257	80	--
BOD_5	--	--	--	110	4.8	10
pH (Standard Units)	--	--	--	7.2	7.4	7.7
Total Alkalinity	--	--	--	120	107	136
Total Hardness	--	--	--	--	63	--
Suspended Solids	--	--	--	100	11	13
Settleable Solids (ml/l)	--	--	--	0.5	--	--
Total Solids	--	--	--	530	290	300
Total Kjeldahl Nitrogen	21	21	5.3	36	33	--
Ammonia Nitrogen	15	14	1.2	14	12	--
Nitrate Nitrogen	0.4	0.0	4.0	0.2	0.0	--
Total Phosphorus	5.3	5.1	3.2	5.1	21	--
Chloride	--	--	--	92	--	--
Total Coliform/100 ml*	--	--	--	430	30	--
Fecal Coliform/100 ml*	--	--	--	36	<5	--
Aluminum	0.39	0.33	0.33	--	0.26	--
Cadmium	0.00	0.00	0.00	--	0.00	--
Chromium	--	0.00	0.00	--	0.00	--
Copper	0.24	0.23	0.05	--	0.07	--
Iron	0.55	0.63	0.27	--	0.21	--
Lead	0.03	0.03	0.01	--	0.01	--
Manganese	0.08	0.07	0.07	--	0.00	--
Mercury	0.0004	0.0004	0.0000	--	0.0000	--
Nickel	0.00	0.00	0.00	--	0.00	--
Tin	0.50	0.50	0.50	--	<0.10	--
Zinc	0.11	0.10	0.10	--	0.33	--
Flow (MGD)	1.92	--	1.95	1.94	1.61	1.42

*Grab sample

WESTBOROUGH WASTEWATER TREATMENT PLANT (CONTINUED)

PARAMETER	6/26-27/85 EFFLUENT	7/16-17/85 EFFLUENT	7/17-18/85 INFLUENT	7/17-18/85 EFFLUENT	8/21-22/85 EFFLUENT	9/9-10/85 EFFLUENT	12/22-23/85 EFFLUENT
COD	120	166	410	230	59	53	--
BOD_5	16	45	252	90	7.8	5.6	--
pH (Standard Units)	6.15	6.75	7.0	6.9	6.25	5.6	--
Total Alkalinity	31	30	138	46	27	32	--
Suspended Solids	23	119	110	184	3.0	18	380
Settleable Solids (ml/l)	1.0	14	--	--	<0.05	--	55
Total Solids	330	310	520	400	294	330	580
Total Kjeldahl Nitrogen	4.0	14	35	17	14	1.5	--
Ammonia Nitrogen	0.14	0.24	20	0.32	0.16	0.15	--
Nitrate Nitrogen	10	4.1	0.1	5.5	11	11	--
Total Phosphorus	3.6	6.5	7.4	10	4.2	5.2	
Chloride	62	39	57	56	69	--	--
Chlorine Residual*	1.50	1.40	--	--	0.95	1.4	--
Total Coliform/100 ml*	230	2,400	--	--	230	200	--
Fecal Coliform/100 ml*	40	<36	--	--	36	<20	--
Aluminum	0.11	0.57	--	--	0.18	<0.10	--
Cadmium	<0.02	<0.02	--	--	<0.02	<0.02	--
Chromium	<0.02	<0.02	--	--	<0.02	<0.02	--
Copper	0.09	0.34	--	--	0.04	0.05	--
Iron	0.31	0.82	--	--	0.08	0.10	--
Lead	<0.04	0.07	--	--	0.04	<0.04	--
Manganese	0.04	0.08	--	--	<0.02	<0.02	--
Mercury	--	--	--		<0.0002	<0.0002	--
Nickel	<0.05	<0.05	--	--	<0.05	<0.05	--
Silver	--	--	--	--	--	<0.02	--
Tin	<0.50	<0.50	--	--	<0.5	--	--
Zinc	0.22	0.14	--	--	0.04	0.05	--
Flow (MGD)	1.25	3.85	--	3.82	1.238	1.434	--

*Grab sample

SHREWSBURY WASTEWATER TREATMENT PLANT

LOCATION:	Main Street, Shrewsbury
RECEIVING WATER:	Assabet River
NPDES PERMIT NO.:	MA0101249
DESIGN FLOW:	1.75 MGD
TYPE OF TREATMENT:	Bar rack Aerated grit chamber Comminutor/Bar rack Primary clarifier Trickling filter Final clarifiers Chlorination
SLUDGE HANDLING:	Vacuum filter Landfill
COMMENTS:	This facility constantly has problems meeting its permit. Solids and BOD_5 are continually above the daily maximum. Although inflow and infiltration contribute to this problem, they are by no means the major factors in the continual violations at this plant. In addition, coliform violations are routine. This facility is scheduled to be replaced by a joint plant at Westborough.

SHREWSBURY WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	10/11-12/83 INFLUENT	10/11-12/83 EFFLUENT	10/12-13/83 INFLUENT	10/12-13/83 EFFLUENT	2/13/85 EFFLUENT*	4/16/85 EFFLUENT*	5/15/85 EFFLUENT*
COD	806	165	773	222	257	302	--
BOD_5	470	53	320	120	110	81	105
pH (Standard Units)	7.4	7.4	7.0	7.0	7.20	7.10	7.10
Total Alkalinity	210	200	180	200	120	163	203
Hardness	--	--	--	--	--	127	78
Suspended Solids	392	32	380	67	100	83	67
Settleable Solids (ml/l)	--	<0.05	--	0.5	0.5	--	--
Total Solids	918	516	764	480	530	440	540
Total Kjeldahl Nitrogen	72	27	72	25	36	39	--
Ammonia Nitrogen	24	21	13	17	14	22	--
Nitrate Nitrogen	0.10	0.00	0.00	0.00	0.2	0.0	--
Total Phosphorus	12	7.1	19	7.8	5.1	6.7	--
Sulfate	--	--	--	--	--	42	5.0
Chloride	--	68	--	62	92	--	--
Total Coliform/100 ml*	--	--	--	--	$2.4x10^6$	--	--
Fecal Coliform/1001ml*	--	--	--	--	$2.4x10^6$	--	--
Aluminum	--	--	1.3	0.3	--	0.30	--
Cadmium	--	--	0.01	0.00	--	0.00	--
Chromium	--	--	0.00	0.00	--	0.00	--
Copper	--	--	0.48	0.20	--	0.25	--
Iron	--	--	2.1	0.84	--	0.66	--
Lead	--	--	0.02	0.04	00	0.00	--
Manganese	--	--	0.11	0.10	--	0.00	--
Mercury	--	--	0.0016	0.0003	--	0.0001	--
Nickel	--	--	0.00	0.00	--	0.00	--
Silver	--	--	0.00	0.00	--	--	--
Tin	--	--	<0.50	<0.50	--	0.13	--
Zinc	--	--	0.24	0.06	--	0.49	--
Flow (MGD)	--	1.64	--	1.79	1.94	1.39	1.24

* Grab sample

SHREWSBURY WASTEWATER TREATMENT PLANT (CONTINUED)

PARAMETER	6/26-27/85 FINAL CLARIFIER	6/26-27/85 OUTFALL	7/16-17/85 FINAL CLARIFIER	7/17/85 OUTFALL*	8/21-22/85 CLARIFIER	8/21-22/85 OUTFALL	9/9-10/85 OUTFALL
COD	296	301	330	280	277	288	207
BOD_5	93	22	132	114	102	120	69
pH (Standard Units)	6.85	7.40	6.75	7.00	6.65	6.85	6.60
Total Alkalinity	183	187	213	192	198	196	151
Suspended Solids	43	28	57	87	41	44	52
Settleable Solids (ml/l)	0.50	0.16	3.8	14	1.6	1.5	--
Total Solids	470	430	540	530	474	480	460
Total Kjeldahl Nitrogen	51	44	30	39	51	41	22
Ammonia Nitrogen	21	21	23	21	19	20	18
Nitrate Nitrogen	0.1	0.1	0.0	0.0	0.1	0.2	0.1
Total Phosphorus	6.6	7.1	7.9	9.0	8.1	7.5	6.5
Chloride	74	77	39	--	77	81	--
Chlorine Residual*	--	0.10	--	0.40	--	0.60	0.10
Total Coliform/100 ml*	--	240,000	--	43,000	--	430	46,000
Fecal Coliform/100 ml*	--	93,000	--	2,400	--	36	9,300
Aluminum	0.38	0.18	0.27	0.22	0.15	0.19	0.16
Cadmium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	0.24	0.22	0.28	0.23	0.23	0.24	0.26
Iron	0.55	0.51	0.82	0.67	0.62	0.62	2.0
Lead	<0.04	<0.04	0.05	<0.04	0.06	0.06	<0.04
Manganese	0.10	0.11	0.10	0.10	0.11	0.11	0.10
Mercury	--	--	--	--	0.0009	0.0001	<0.0002
Nickel	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silver	--	--	--	--	--	--	<0.02
Tin	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--
Zinc	0.10	0.13	0.14	0.14	0.12	0.12	0.15
Flow (MGD)	1.61	1.61	3.85	--	1.546	1.546	1.920

*Grab sample

MARLBOROUGH WESTERLY WASTEWATER TREATMENT PLANT

LOCATION:	Boundary Street, Marlborough
RECEIVING WATER:	Assabet River
NPDES PERMIT NO.:	MA0100480
DESIGN FLOW:	2.0 MGD
TYPE OF TREATMENT:	Aerated grit chamber Comminutor/Bar rack Parshall flume Primary clarifier Mechanical aeration Final clarifier Chlorination
SLUDGE HANDLING:	Vacuum filter Landfill
COMMENTS:	This facility was operating quite well during the surveys. Occasional upsets are, however, experienced due to shock loads and improperly pretreated industrial wastes. While many sources are known the city has been very slow in helping the staff at the plant rectify this situation. Impact to effluent quality has been kept to a minimum due to the ability of the operators and crews.

MARLBOROUGH WEST WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	10/11-12/83 INFLUENT	10/11-12/83 EFFLUENT	10/12-13/83 INFLUENT	10/12-13/83 MIXED LIQUOR*	10/12-13/83 EFFLUENT	4/11/84 INFLUENT
COD	515	58	1,150	--	101	--
BOD_5	280	10	430	--	16	--
pH (Standard Units)	7.3	7.6	7.8	7.8	7.8	3.8
Total Alkalinity	210	84	240	260	170	--
Suspended Solids	292	6.5	734	2,990	16	--
Volatile Suspended Solids	--	--	--	2,510	--	--
Total Volatile Solids	--	--	--	2,780	--	--
Settleable Solids (ml/l)	--	0.0	--	--	0.05	--
Total Solids	902	434	1,490	3,750	512	--
Total Kjeldahl Nitrogen	58	8.1	82	232	12	--
Ammonia Nitrogen	21	4.5	23	7.2	6.4	14
Nitrate Nitrogen	0.2	9.5	0.1	0.7	5.0	53
Total Phosphorus	12	5.5	18	100	5.4	--
Sulfate	--	--	--	--	--	56
Chloride	--	46	--	--	76	76
Chlorine Residual*	--	--	--	--	1.3	--
Total Coliform/100 ml*	--	--	--	--	4,800	--
Fecal Coliform/100 ml*	--	--	--	--	100	--
Aluminum	--	--	3.3	13	0.40	
Cadmium	--	--	0.00	0.01	0.01	--
Chromium	--	--	0.06	1.8	0.01	--
Copper	--	--	0.82	5.9	0.03	--
Iron	--	--	7.4	52	0.34	--
Lead	--	--	0.21	0.98	0.00	--
Manganese	--	--	0.15	0.98	0.09	--
Mercury	--	--	0.0028	0.0064	0.0001	--
Nickel	--	--	1.4	4.9	0.52	--
Silver	--	--	0.02	0.03	0.00	--
Tin	--	--	<0.50	<0.50	<0.50	--
Zinc	--	--	0.87	2.7	0.08	--
Flow (MGD)	--	1.0†	--	--	1.0+	--

*Grab sample
†Estimate - meter broken

MARLBOROUGH WEST WASTEWATER TREATMENT PLANT (CONTINUED)

PARAMETER	4/17-18/84 INFLUENT	4/17-18/84 MIXED LIQUOR*	4/17-18/84 EFFLUENT	4/18-19/84 INFLUENT	4/18-19/84 EFFLUENT	4/19-20/84 INFLUENT	4/19-20/84 EFFLUENT
COD	249	--	100	286	102	305	96
BOD_5	69	--	15	75	10	120	9.6
pH (Standard Units)	7.4	7.2	7.7	7.5	7.9	7.5	7.0
Total Alkalinity	60	100	80	100	100	90	100
Suspended Solids	225	1,580	18	112	17	176	18
Volatile Suspended Solids	--	1,240	--	--	--	--	--
Total Volatile Solids	--	1,260	--	--	--	--	--
Settleable Solids (ml/l)	--	--	0.0	--	<0.05	--	<0.05
Total Solids	300	1,800	174	500	356	510	340
Total Kjeldahl Nitrogen	25	208	16	36	24	23	13
Ammonia Nitrogen	7.8	9.7	6.1	12	8.9	16	13
Nitrate Nitrogen	1.1	0.8	1.5	1.3	1.4	0.9	1.6
Total Phosphorus	3.8	124	2.6	8.8	4.7	5.8	2.4
Sulfate	--	--	--	65	--	--	--
Chloride	--	--	69	82	84	--	88
Chlorine Residual*	--	--	1.1	--	--	--	--
Total Coliform/100 ml*	--	--	1,300	--	--	--	--
Fecal Coliform/100 ml*	--	--	<20	--	--	--	--
Aluminum	0.4	12	0.3	--	--	--	--
Cadmium	0.00	0.01	0.01	--	--	--	--
Chromium	0.30	1.8	0.23	--	--	--	--
Copper	0.11	2.0	0.04	--	--	--	--
Iron	1.5	7.3	0.51	--	--	--	--
Lead	0.07	0.58	0.06	--	--	--	--
Manganese	0.15	7.1	0.14	--	--	--	--
Mercury	0.0002	0.0024	0.0002	--	--	--	--
Nickel	0.44	2.1	0.38	--	--	--	--
Tin	<0.50	<0.50	<0.50	--	--	--	--
Zinc	0.14	1.0	0.15	--	--	--	--
Flow (MGD)	--	--	2.1	--	2.1	--	1.9

*Grab sample

MARLBOROUGH WEST WASTEWATER TREATMENT PLANT (CONTINUED)

PARAMETER	1/7-8/85 EFFLUENT	1/8/85 INFLUENT*	1/8/85 EFFLUENT*	1/10/85 EFFLUENT*	1/16-85 EFFLUENT*	7/16-17/85 EFFLUENT
COD	87	306	142	157	128	113
BOD_5	11	140	18	20	14	17
pH (Standard Units)	7.0	7.0	7.0	7.2	6.9	6.55
Total Alkalinity	150	110	130	120	190	74
Suspended Solids	13	120	31	38	22	65
Settleable Solids (ml/l)	--	--	0.0	0.1	0.0	0.0
Total Solids	390	390	400	590	450	550
Total Kjeldahl Nitrogen	26	17	18	36	20	3.2
Ammonia Nitrogen	18	17	18	31	19	1.1
Nitrate Nitrogen	1.1	0.2	0.9	0.6	0.5	8.7
Total Phosphorus	2.4	3.3	2.9	24	3.8	1.3
Chloride	215	48	76	90	--	106
Chlorine Residual*	--	--	--	--	--	1.0
Total Coliform/100 ml*	--	--	--	--	--	9,300
Fecal Coliform/100 ml*	--	--	--	--	--	2,300
Aluminum	<0.1	<0.1	<0.1	0.1	<0.01	<0.10
Cadmium	0.01	0.00	0.01	0.01	0.00	<0.02
Chromium	0.02	0.04	0.04	0.08	0.04	0.03
Copper	0.08	0.34	0.11	0.12	0.14	0.08
Iron	0.31	1.7	0.72	0.72	0.63	0.27
Lead	0.04	0.04	0.00	0.07	0.00	<0.04
Manganese	0.10	0.10	0.15	0.15	0.14	0.07
Mercury	0.0000	0.0000	0.0000	0.0000	0.0006	--
Nickel	0.54	1.1	0.52	6.5	1.4	1.0
Silver	--	--	--	--	0.00	--
Tin	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Zinc	0.08	0.20	0.17	0.18	0.19	0.11
Flow (MGD)	1.18	--	1.19	1.19	1.16	1.42

*Grab sample

HUDSON WASTEWATER TREATMENT PLANT

LOCATION:	Municipal Drive, Hudson
RECEIVING WATER:	Assabet River
NPDES PERMIT NO.:	MA0101788
DESIGN FLOW:	2.0 MGD
TYPE OF TREATMENT:	Parshall flume Primary clarifier Trickling filter Final clarifier Chlorination
SLUDGE HANDLING:	Vacuum filter Landfill
COMMENTS:	This facility met most of its permit limits. Coliform levels have always been above permitted values, while the chlorine values have been consistently high. Lengthening of the contact time should alleviate this problem. This facility is presently being rebuilt and the new plant is expected to be on line soon.

HUDSON WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	10/3-4/83 INFLUENT	10/3-4/83 EFFLUENT	10/4-5/83 INFLUENT	10/4-5/83 EFFLUENT	10/5-6/83 INFLUENT	10/5-6/83 INFLUENT	7/117/85 EFFLUENT
COD	527	141	350	107	451	127	147
BOD_5	190	24	160	6.0	190	19	25
pH (Standard Units)	7.6	7.7	7.2	7.4	6.1	7.0	6.75
Total Alkalinity	150	91	129	101	31	48	87
Suspended Solids	268	17	164	12	163	23	16
Settleable Solids (ml/l)	--	<0.05	--	<0.05	--	0.05	0.00
Total Solids	852	476	696	428	886	630	700
Total Kjeldahl Nitrogen	30	18	30	18	37	20	21
Ammonia Nitrogen	26	16	23	17	28	20	11
Nitrate Nitrogen	0.0	4.0	0.0	4.8	9.3	5.0	3.3
Total Phosphorus	11	8.2	9.7	6.1	17	14	7.0
Chloride	--	65	--	78	--	170	165
Chlorine Residual*	--	1.9	--	--	--	--	0.8
Total Coliform/100 ml*	--	4,300	--	--	--	--	150,000
Fecal Coliform/100 ml*	--	430	--	--	--	--	2,400
Aluminum	--	--	0.50	0.30	--	--	0.30
Cadmium	--	--	0.01	0.08	--	--	<0.02
Chromium	--	--	0.01	0.04	--	--	<0.02
Copper	--	--	0.29	0.11	--	--	0.13
Iron	--	--	2.2	0.68	--	--	0.85
Lead	--	--	0.09	0.06	--	--	0.06
Manganese	--	--	0.10	0.08	--	--	0.12
Mercury	--	--	0.0002	0.000	--	--	--
Nickel	--	--	0.03	0.02	--	--	<0.05
Silver	--	--	0.01	0.01	--	--	--
Tin	--	--	<0.50	<0.50	--	--	<0.50
Zinc	--	--	0.50	0.15	--	--	0.11
Flow (MGD)	--	1.70	--	1.68	--	1.74	2.5

*Grab sample

DIGITAL EQUIPMENT CORPORATION WASTEWATER TREATMENT PLANT

LOCATION:	Main Street, Maynard
RECEIVING WATER:	Permitted to discharge to the Assabet River, but discharges treated waste to the municipal sewer.
NPDES PERMIT NO.:	MA0022144
DESIGN FLOW:	0.13 MGD
INDUSTRIAL PROCESS:	Electronics Manufacturer
TYPE OF TREATMENT:	pH adjustment
COMMENTS:	Since treatment consists only of pH adjustment, BOD_5 and solids values are comparatively high. The only permit violations were for suspended solids (61.0 mg/l permitted, 333 mg/l daily average during the survey). This should not be a problem, however, as the plant discharges to the municipal sewer.

DIGITAL EQUIPMENT CORPORATION WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	10/3/83 EFFLUENT[1]	10/4/83 EFFLUENT[1]	10/5/83 EFFLUENT[1]
COD	927	359	725
BOD_5	480	160	370
pH (Standard Units)	8.3	8.5	7.0
Total Alkalinity	275	242	150
Suspended Solids	612	114	272
Total Solids	884	434	862
Total Kjeldahl Nitrogen	320	80	36
Ammonia Nitrogen	80	72	35
Nitrate Nitrogen	0.0	0.0	0.1
Total Phosphorus	25	12	12
Chloride	76	62	78
Amenable Cyanide*	0.0	0.00	0.00
Total Cyanide*	0.0	0.00	0.00
Aluminum	1.2	1.1	1.1
Cadmium	0.00	0.00	0.00
Chromium Trivalent	0.02	0.00	0.01
Chromium Hexavalent	0.00	0.00	0.00
Copper	0.18	0.12	0.54
Lead	0.06	0.06	0.07
Nickel	0.00	0.00	0.02
Silver	0.01	0.01	0.01
Tin	<0.50	<0.50	<0.50
Zinc	0.15	0.10	0.21
Flow (MGD)	0.064	0.075	0.044

*Grab sample

[1]8-hour composite

MAYNARD WASTEWATER TREATMENT PLANT

LOCATION:	Pine Hill Road, Maynard
RECEIVING WATER:	Assabet River
NPDES PERMIT NO.:	MA0101001
DESIGN FLOW:	1.29 MGD
TYPE OF TREATMENT:	Bar rack Primary clarifier Aeration tanks Secondary clarifier Chlorination
SLUDGE TREATMENT:	Gravity thickener Transported to Greater Lawrence Sanitary District Wastewater Treatment Plant
COMMENTS:	While this facility has experienced upsets in the past results of this survey show it to be running well. Metals and solids were taken one day from the mixed liquor, as well as the influent and effluent. At present a new plant is under construction and should be on line in the near future. The low pH noted for July 16-17, 1985 was the result of groundwater being pumped into the channel from the construction site.

MAYNARD WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	10/3-4/83 INFLUENT	10/3-4/83 EFFLUENT	10/4-5/83 INFLUENT	10/4-5/83 MIXED LIQUOR*	10/4-5/83 EFFLUENT	10/5-6/83 INFLUENT	10/5-6/83 EFFLUENT	7/16-17/85 EFFLUENT
COD	439	68	350	--	63	417	78	90
BOD_5	180	7.5	150	--	8.7	350	18	16
pH (Standard Units)	7.7	7.9	7.2	7.0	7.4	7.4	7.3	5.35
Total Alkalinity	177	107	150	116	80	150	65	4.0
Suspended Solids	155	13	142	792	16	152	21	8.5
Volatile Suspended Solids	--	--	--	650	--	--	--	--
Total Volatile Solids	--	--	--	1,392	--	--	--	--
Settleable Solids (ml/l)	--	<0.05	--	--	<0.05	--	<0.05	0.0
Total Solids	630	368	438	1,878	262	508	304	330
Total Kjeldahl Nitrogen	49	13	63	250	12	77	16	7.3
Ammonia Nitrogen	34	12	28	14	9.9	33	10	0.51
Nitrate Nitrogen	0.0	1.4	0.1	4.4	3.6	0.1	5.7	13
Total Phosphorus	11	6.9	10	108	6.2	9.5	8.3	6.2
Chloride	--	54	--	--	56	--	58	47
Chlorine Residual*	--	0.5	--	--	--	--	--	1.3
Total Coliform/100 ml*	--	930	--	--	--	--	--	930
Fecal Coliform/100 ml*	--	150	--	--	--	--	--	36
Aluminum	--	--	0.6	6.0	<0.1	--		0.24
Cadmium	--	--	0.00	0.03	0.00	--	--	<0.02
Chromium	--	--	0.02	0.13	0.00	--	--	<0.02
Copper	--	--	0.18	2.1	0.02	--	--	0.03
Iron	--	--	1.4	13	0.35	--	--	0.75
Lead	--	--	0.08	0.16	0.05	--	--	<0.04
Manganese	--	--	0.12	0.45	0.09	--	--	0.28
Mercury	--	--	0.0004	0.0037	0.0000	--	--	--
Nickel	--	--	0.02	0.04	0.02	--	--	<0.05
Silver	--	--	0.02	0.05	0.01	--	--	--
Tin	--	--	<0.50	<0.50	<0.50	--	--	<0.50
Zinc	--	--	0.10	0.95	0.03	--	--	0.19
Flow (MGD)	--	0.695	--	--	0.618	--	0.602	0.85

*Grab sample

CONCORD MCI WASTEWATER TREATMENT PLANT

LOCATION:	Elm Street, Concord
RECEIVING WATER:	Assabet River
NPDES PERMIT NO.:	MA0102245
DESIGN FLOW:	0.162 MGD
TYPE OF TREATMENT:	Bar rack Aeration tank Clarifier Sand filters
COMMENTS:	This facility is hydraulically overloaded. Problems with solids and BOD_5 are common because of this. No plans are currently made to rectify this problem. The Division should take action to expedite the solution.

CONCORD M.C.I. WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	7/16-17/85 EFFLUENT
COD	137
BOD_5	42
pH (Standard Units)	6.35
Total Alkalinity	40
Suspended Solids	57
Settleable Solids (ml/l)	<0.05
Total Solids	290
Total Kjeldahl Nitrogen	19
Ammonia Nitrogen	0.97
Nitrate Nitrogen	3.6
Total Phosphorus	3.1
Chloride	40
Chlorine Residual*	0.3
Total Coliform/100 ml*	240,000
Fecal Coliform/100 ml*	93,000
Aluminum	0.24
Cadmium	<0.02
Chromium	<0.02
Copper	0.02
Iron	0.20
Lead	<0.04
Manganese	<0.05
Nickel	<0.50
Tin	0.08
Flow (MGD)	0.275

*Grab sample

MIDDLESEX SCHOOL WASTEWATER TREATMENT PLANT

LOCATION:	Lowell Road, Concord
RECEIVING WATER:	Spencer Brook
NPDES PERMIT NO.:	MA0102466
DESIGN FLOW:	0.04 MGD
TYPE OF TREATMENT:	Comminutor/Bar rack Contact aeration Alum addition Clarifiers Stabilization tanks Chlorination Pressure filtration
SLUDGE HANDLING:	Drying beds Land application on grounds Excess to Greater Lawrence Sanitary District Wastewater Treatment Plant
COMMENTS:	This plant was under start-up conditions when sampled. In spite of this, the effluent quality was very good. This facility treats phosphorus by alum addition.

MIDDLESEX SCHOOL WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	9/12-13/83 INFLUENT	9/12-13/83 EFFLUENT	9/13-14/83 INFLUENT	9/13-14/83 MIXED LIQUOR*	9/13-14/83 EFFLUENT	9/14-15/83 INFLUENT	9/14-15/83 EFFLUENT
COD	387	42	481	--	38	502	52
BOD_5	290	6.8	370	--	2.8	460	8.7
pH (Standard Units)	7.5	5.4	7.4	5.2	5.9	6.9	5.1
Total Alkalinity	160	5.0	150	25	70	170	3.0
Suspended Solids	272	3.5	260	4,170	2.5	300	1.5
Volatile Suspended Solids	--	--	--	2,560	--	--	--
Total Volatile Solids	--	--	--	3,300	--	--	--
Settleable Solids (ml/l)	--	0.0	--	--	0.0	--	0.0
Total Solids	518	264	500	5,470	246	592	296
Total Kjeldahl Nitrogen	37	5.7	39	280	9.1	58	10
Ammonia Nitrogen	25	5.7	31	8.9	5.1	35	7.0
Nitrate Nitrogen	0.0	15	0.9	15	12	5.0	13
Total Phosphorus	9.1	0.45	10	244	0.50	13	0.50
Chloride	--	36	--	--	36	--	37
Chlorine Residual*	--	--	--	--	--	--	3.5
Total Coliform/100 ml*	--	--	--	--	--	--	<20
Fecal Coliform/100 ml*	--	--	--	--	--	--	<20
Aluminum	--	--	5.8	310	1.2	--	--
Cadmium	--	--	0.00	0.01	0.00	--	--
Chromium	--	--	0.00	0.40	0.00	--	--
Copper	--	--	0.10	1.7	0.01	--	--
Iron	--	--	1.4	47	0.11	--	--
Lead	--	--	0.03	0.92	0.05	--	--
Manganese	--	--	0.04	0.23	9,95	--	--
Mercury	--	--	0.0004	0.0110	0.0000	--	--
Nickel	--	--	0.00	0.01	0.00	--	--
Silver	--	--	0.00	0.08	0.00	--	--
Tin	--	--	<0.05	<0.05	<0.05	--	--
Zinc	--	--	0.15	0.84	0.05	--	--
Flow (MGD)	--	0.017	--	--	0.020	--	0.021

*Grab sample

CONCORD WASTEWATER TREATMENT PLANT

LOCATION:	Bedford Street, Concord
RECEIVING WATER:	Concord River
NPDES PERMIT NO.:	0100668
DESIGN FLOW:	1.0 MGD
TYPE OF TREATMENT:	Imhoff tank Sand filter beds Chlorination
SLUDGE HANDLING:	Drying beds Landfill
COMMENTS:	Despite minor fluctuations this plant met permit values during this survey. Solids and BOD_5 were each slightly high at separate times but the plant still met its weekly averages, and almost met the monthly average. The only violation of the permit was for coliform.

CONCORD WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	10/3-4/83		10/4-5/83		10/5-6/83	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT
COD	468	127	427	126	480	98
BOD_5	230	33	210	44	270	18
pH (Standard Units)	7.3	6.9	7.1	6.8	7.0	6.7
Total Alkalinity	140	58	121	94	130	79
Suspended Solids	201	9.5	188	12	228	45
Settleable Solids (ml/l)	--	0.05	--	0.05	--	1.0
Total Solids	600	380	468	310	572	338
Total Kjeldahl Nitrogen	28	6.5	24	14	25	14
Ammonia Nitrogen	19	4.9	19	12	21	14
Nitrate Nitrogen	0.0	11	0.1	6.5	0.0	8.4
Total Phosphorus	7.3	2.3	8.2	4.8	6.7	5.7
Chloride	--	67	--	70	--	66
Chlorine Residual*	--	0.4	--	--	--	--
Total Coliform/100 ml*	--	9,300	--	--	--	--
Fecal Coliform/100 ml*	--	9,300	--	--	--	--
Aluminum	--	--	0.40	0.40	--	--
Cadmium	--	--	0.00	0.00	--	--
Chromium	--	--	0.28	0.02	--	--
Copper	--	--	0.08	0.18	--	--
Iron	--	--	1.9	1.2	--	--
Lead	--	--	0.31	0.05	--	--
Manganese	--	--	0.10	0.13	--	--
Mercury	--	--	0.0010	0.0001	--	--
Nickel	--	--	0.03	0.02	--	--
Silver	--	--	0.02	0.01	--	--
Tin	--	--	<0.50	<0.50	--	--
Zinc	--	--	0.19	0.06	--	--
Flow (MGD)	--	0.691	--	0.707	--	0.736

*Crab sample

BILLERICA WASTEWATER TREATMENT PLANT & SEWER COMPANY

LOCATION:	Letchworth Avenue, Billerica
RECEIVING WATER:	Concord River
NPDES PERMIT NO.:	MA0101711
DESIGN FLOW:	1.6 MGD
TYPE OF TREATMENT:	Parshall flume Bar screen Mechanical aeration Clarifier Chlorine contact chamber
SLUDGE HANDLING:	Dissolved air floatation Vacuum filter Landfill
COMMENTS:	This plant was sampled on the weeks of March 21, 1983, October 4, 1983 and November 13, 1985. In addition, Roy Brothers Trucking was sampled the week of May 13, 1985 and during the November 1985 survey three pump stations and two discharges to the sewer were sampled. The reason for this special survey is that this plant has difficulty meeting its permit because of heavy industrial loading and excessive flow. Flows during the March survey exceeded design flow by almost three times, due to extreme inflow/infiltration problems. Very heavy loadings of solids, grease, and pH extremes from the town's water treatment plant, Roy Brothers Trucking, North Billerica Company and Correnco Company. These contributed to the operational problems at this facility. Repair of I/I and a strict pretreatment program are the first steps which must be taken to return the plant to proper operation.

BILLERICA WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	3/21-22/83 INFLUENT	3/21-22/83 MIXED LIQUOR*	3/21-22/83 EFFLUENT	3/22-23/83 INFLUENT	3/22-23/83 EFFLUENT	3/23-24/83 INFLUENT	3/23-24/83 EFFLUENT
COD	210	--	100	170	150	200	120
BOD_5	31	--	27	77	42	108	36
pH (Standard Units)	7.3	7.1	7.3	7.3	7.3	7.3	7.1
Total Alkalinity	60	60	60	60	60	120	100
Suspended Solids	94	594	49	34	53	35	54
Volatile Suspended Solids	--	512	--	--	--	--	--
Total Volatile Solids	--	562	--	--	--	--	--
Settleable Solids (ml/l)	--	--	0.2	--	--	--	0.1
Total Solids	364	878	302	396	368	362	314
Total Kjeldahl Nitrogen	14	49	11	14	14	18	14
Ammonia Nitrogen	9.9	12	8.0	8.2	9.3	11	12
Nitrate Nitrogen	1.3	0.2	0.8	0.1	0.2	0.1	0.3
Total Phosphorus	3.0	13	2.3	2.5	2.7	3.2	2.5
Chloride	--	--	73	--	--	--	71
Chlorine Residual*	--	--	1.3	--	--	--	--
Total Coliform/100 ml*	--	--	250,000	--	--	--	--
Fecal Coliform/100 ml*	--	--	2,800	--	--	--	--
Oil & Grease*	20	23	--	13	--	67	--
Aluminum	0.63	6.7	0.52	--	--	--	--
Cadmium	0.00	0.02	0.01	--	--	--	--
Chromium	0.05	0.32	0.04	--	--	--	--
Copper	0.12	0.54	0.12	--	--	--	--
Iron	2.5	6.4	1.6	--	--	--	--
Lead	0.13	0.20	0.13	--	--	--	--
Manganese	0.13	0.24	0.13	--	--	--	--
Mercury	0.0001	0.0020	0.0000	--	--	--	--
Nickel	0.01	0.14	0.08	--	--	--	--
Silver	000	0.03	0.01	--	--	--	--
Tin	<0.50	<0.50	<0.50	--	--	--	--
Zinc	0.18	0.54	0.10	--	--	--	--
Calcium	18	20	16	--	--	--	--
Magnesium	2.7	3.7	2.6	--	--	--	--
Flow (MGD)	--	--	4.361	--	>4.5	--	4.7†

*Grab sample
†Estimated - reading off scale

BILLERICA WASTEWATER TREATMENT PLANT (CONTINUED)

PARAMETER	10/3-4/83 INFLUENT	10/3-4/83 EFFLUENT	10/4-5/83 INFLUENT	10/4-5/83 MIXED LIQUOR*	10/4-5/83 EFFLUENT	10/5-6/83 INFLUENT	10/5-6/83 EFFLUENT
COD	537	537	466	--	388	833	142
BOD_5	220	340	230	--	160	460	21
pH (Standard Units)	7.4	7.4	7.4	6.9	7.2	7.2	7.4
Total Alkalinity	148	85	172	131	81	200	88
Suspended Solids	180	434	156	3,680	299	500	62
Volatile Suspended Solids	--	322	--	2,684	215	--	51
Total Volatile Solids	--	384	--	2,934	310	--	154
Settleable Solids (ml/l)	--	0.00	--	--	18	--	0.5
Total Solids	630	896	650	4,316	718	1,042	534
Total Kjeldahl Nitrogen	39	37	59	284	21	152	11
Ammonia Nitrogen	26	7.0	32	1.4	4.3	35	5.7
Nitrate Nitrogen	0.0	0.7	0.0	1.7	0.8	0.0	0.9
Total Phosphorus	12	20	7.7	162	11	36	4.3
Chloride	--	78	--	--	82	--	80
Total Coliform/100 ml*	--	$4.3X10^6$	--	--	--	--	--
Fecal Coliform/100 ml*	--	430,000	--	--	--	--	
Aluminum	--	--	1.9	100	10	--	
Cadmium	--	--	0.00	0.60	0.06	--	--
Chromium	--	--	0.06	1.5	0.15	--	--
Copper	--	--	0.14	2.3	0.49	--	--
Iron	--	--	1.8	34	3.0	--	--
Lead	--	--	0.08	0.54	0.15	--	--
Manganese	--	--	0.14	0.85	0.19	--	--
Mercury	--	--	0.0006	0.014	0.0010	--	--
Nickel	--	--	0.07	0.92	0.20	--	--
Silver	--	--	0.00	0.03	0.01	--	--
Tin	--	--	<0.50	<0.50	<0.50	--	--
Zinc	--	--	0.14	2.3	0.32	--	--
Flow (MGD)	--	1.4†	--	--	1.4†	--	1.4†

*Grab sample
†Estimated - meter broken

BILLERICA SEWER SURVEY

RESULTS OF LABORATORY ANALYSIS

(All results in mg/1 unless otherwise noted)

November 13-14, 1985

PARAMETER	#1	#2	#3	#4	#5	#6	#7
COD	415	314	367	314	620	183	3,300
BOD_5	190	120	120	6.8	370	99	16,500
pH (Standard Units)	6.85	7.15	6.55	3.25	6.75	7.30	7.70
Total Alkalinity	142	148	100	35	175	59	630
Suspended Solids	190	68	290	42	420	110	190
Volatile Suspended Solids	140	34	180	22	300	82	130
Total Volatile Solids	240	190	230	260	410	150	650
Total Solids	690	470	540	1,040	800	460	1,700
Chloride	80	78	84	38	74	78	110
Sulfate	122	54	45	525	83	67	525
Aluminum	1.1	0.23	11	1.3	10	3.9	6.7
Cadmium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	0.18	<0.02	<0.02	0.03	0.07	0.02	<0.02
Copper	0.02	0.05	0.01	0.03	0.42	0.06	<0.02
Iron	--	--	3.5	--	--	--	--
Lead	0.04	<0.04	<0.04	0.04	0.06	<0.04	<0.04
Nickel	<0.05	<0.05	<0.05	<0.05	0.10	<0.05	<0.05
Silver	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	0.16	0.13	0.05	0.22	0.31	0.18	0.60
Flow (MGD)	0.00258	--	0.13955	0.151	--	2.842	0.0363

*Grab sample
#1 Brown Street pump station, wet well, Billerica
#2 Middlesex Avenue pump station, wet well, Billerica
#3 Darby Avenue pump station, wet well, Billerica
#4 North Billerica Company, manhole to sewer, Billerica
#5 Billerica Wastewater Treatment Plant, Influent, Billerica
#6 Billerica Wastewater Treatment Plant, Effluent, Billerica
#7 Corenco, access to sewer, Billerica

ROY BROTHERS TRUCKING

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	5/13-14/85 EFFLUENT	5/14-15/85 EFFLUENT	5/15-16/85 EFFLUENT
COD	3,300	3,050	2,500
BOD_5	1,890	1,710	1,050
pH (Standard Units)	7.35	6.56	9.80
Total Alkalinity	630	660	600
Suspended Solids	19	9.5	7.0
Total Solids	10,040	9,410	6,840
Total Kjeldahl Nitrogen	68	136	240
Ammonia Nitrogen	12	8.5	6.6
Nitrate Nitrogen	0.1	0.0	0.4
Total Phosphorus	84	40	18
Chloride	135	150	155
Oil & Grease*	46	9.0	--
MBAS	8.0	7.8	8.0
Phenol*	22	13	--
Methylene Chloride (ug/l)	1,000	180	--
Acetone (ug/l)	12,000	5,700	--
Methylethyl Ketone (ug/l)	230,000	34,000	--
Methylisobutyl Ketone (ug/l)	55	120	--
Tetrachloroethylene (ug/l)	130	--	--
1,1,1-Trichloroethane (ug/l)	--	30	--
Toluene (ug/l)	--	590	--
Methyl Acetate (ug/l)	†	--	--
Methyl Butanone	†	--	--
Ethyl Benzene(ug/l)	52	45	--
Styrene (ug/l)	2,800	1,900	--
Xylenes (ug/l)	370	240	--
Aluminum	1.9	6.7	15
Cadmium	0.03	0.04	0.02
Chromium	0.11	0.08	0.09
Copper	0.04	0.15	0.18
Iron	1.1	0.70	0.97
Lead	<0.04	<0.04	<0.04
Manganese	0.02	0.05	0.04
Mercury	--	--	0.0000
Nickel	<0.05	<0.05	<0.05
Silver	<0.02	<0.02	<0.02
Zinc	0.15	0.20	0.14
Flow (MGD)		No flow meter	

*Grab sample
†No standard available for quantification

BILLERICA SEWER SURVEY (CONTINUED)

November 14-15, 1985

PARAMETER	#1	#2	#3	#4	#5	#6	#7
COD	334	288	341	397	428	140	2,900
BOD_5	200	170	140	140	280	90	6,900
pH (Standard Units)	6.50	6.60	6.75	8.60	7.15	6.55	7.60
Total Alkalinity	99	153	70	88	145	100	630
PHTH Alkalinity	--	--	--	13	--	--	--
Suspended Solids	150	86	160	120	190	76	92
Volatile Suspended Solids	120	66	82	90	130	48	46
Total Volatile Solids	200	180	290	200	300	140	730
Total Solids	670	430	630	850	700	480	1,760
Chloride	74	70	78	34	76	76	185
Sulfate	150	53	65	450	110	250	183
Oil & Grease*	--	--	--	--	2.9	3.0	5.0
Aluminum	0.54	0.29	19	1.2	2.2	2.1	3.4
Cadmium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	0.27	<0.02	<0.02	0.04	0.04	0.02	<0.02
Copper	20	0.13	0.03	0.17	1.0	0.07	0.03
Lead	<0.04	<0.04	0.04	<0.04	0.06	<0.04	<0.04
Nickel	0.20	<0.05	0.08	<0.05	0.17	0.05	<0.05
Silver	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	0.15	0.13	0.07	0.23	0.43	0.15	0.92
Flow (MGD)	0.00516	--	0.18025	0.130	--	2.657	0.03889

*Grab sample

BILLERICA SEWER SURVEY (CONTINUED)

November 15-16, 1985

PARAMETER	#1	#2	#3	#4	#5	#6	#7
COD	362	376	467	498	406	122	2,620
BOD_5	150	170	230	150	190	9.6	6,600
pH (Standard Units)	6.85	7.40	7.00	8.95	7.30	7.40	1.80†
Total Alkalinity	109	184	012	143	146	78	268
PHTH Alkalinity	--	--	--	31	--	--	--
Suspended Solids	110	64	190	74	110	68	96
Volatile Suspended Solids	82	44	130	38	78	36	54
Total Volatile Solids	210	210	300	260	260	130	170
Total Solids	520	520	630	940	980	510	2070
Chloride	70	80	92	38	74	76	310
Sulfate	68	53	55	288	119	114	470
Oil & Grease*	--	--	--	--	26	8.0	15
Aluminum	0.75	0.23	5.2	0.92	4.5	1.9	--
Cadmium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	2.6
Chromium	0.05	<0.02	<0.02	<0.02	0.10	0.02	<0.02
Copper	0.25	0.02	0.03	0.13	0.42	0.23	<0.02
Lead	0.05	<0.04	<0.04	<0.04	0.04	<0.04	0.11
Nickel	0.20	<0.05	0.13	0.09	0.07	0.08	<0.04
Silver	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	0.13	0.08	0.08	0.21	0.29	0.21	1.1
Flow (MGD)	0.00530	--	0.18037	**	--	2.505	0.03889

* Grab sample
** None reported - small flow observed
† Possible

BILLERICA SEWER SURVEY (CONTINUED)

November 16-17, 1985

PARAMETER	#1	#2	#3	#4	#5	#6	#7
COD	393	284	502	415	472	135	1,570
BOD_5	150	110	280	140	160	23	870
pH (Standard Units)	6.50	7.05	6.80	9.20	6.75	6.05	5.40
Acidity	--	--	--	--	--	--	146
Total Alkalinity	112	130	103	161	120	40	--
PHTH Alkalinity	--	--	--	41	--	--	--
Suspended Solids	100	54	140	32	190	42	88
Volatile Suspended Solids	88	48	120	18	160	38	80
Total Volatile Solids	200	190	330	260	300	120	770
Total Solids	500	470	640	870	620	440	1,730
Chloride	82	90	106	42	102	90	160
Sulfate	72	74	58	258	--	--	883
Aluminum	0.67	0.33	1.9	0.67	0.42	1.0	7.8
Cadmium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	0.03	<0.02	<0.02	0.02	0.02	0.02	0.03
Copper	0.10	0.03	0.05	<0.02	0.03	0.15	0.08
Lead	<0.04	<0.04	<0.04	<0.04	0.04	<0.04	0.17
Nickel	0.05	0.12	0.13	<0.05	0.05	0.05	0.13
Silver	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	0.13	0.08	0.13	0.17	0.34	0.24	0.76
Flow (MGD)	0.005255	--	0.20028	**	--	2.773	0.0000

* Grab sample

** Non reported - small flow noted

BILLERICA SEWER SURVEY (CONTINUED)

November 17-18, 1985

PARAMETER	#1	#2	#3	#4	#5*	#6	#7
COD	241	276	522	355	281	128	1,544
BOD_5	87	120	340	140	120	27	1,200
pH (Standard Units)	6.40	6.75	5.75	9.00	6.9†	6.5†	--
Total Alkalinity	103	125	81	149	109	34	226
PHTH Alkalinity	--	--	--	23	--	--	--
Suspended Solids	80	100	1,130	86	160	56	130
Volatile Suspended Solids	60	66	750	58	110	32	98
Total Volatile Solids	150	180	790	230	220	120	520
Total Solids	390	450	1,180	770	520	440	1,250
Chloride	66	76	82	34	80	88	220
Sulfate	43	65	53	145	64	55	133
Oil & Grease*	--	--	--	--	29	5.2	22
Aluminum	0.20	0.35	24	1.1	6.1*	1.6*	1.5
Cadmium	<0.02	<0.02	<0.02	<0.02	<0.02*	<0.02*	<0.02
Chromium	0.02	<0.02	0.02	<0.02	<0.02*	<0.02*	<0.02
Copper	0.05	<0.02	<0.02	<0.02	0.39*	0.07*	<0.02
Lead	<0.04	<0.04	0.05	<0.04	0.06*	0.05*	<0.04
Nickel	0.05	<0.05	<0.05	<0.05	<0.05*	<0.05*	<0.05
Silver	<0.02	<0.02	<0.02	<0.02	<0.02*	<0.02*	<0.02
Zinc	0.05	0.07	0.07	0.17	0.28*	0.17*	0.68
Flow (MGD)	0.006637	--	0.26466	0.361	--	2.855	0.00722

*Grab sample
†Plant meter

BILLERICA SEWER SURVEY (CONTINUED)

November 18-19, 1985

PARAMETER	#1	#2	#3	#4	#5	#6	#7
COD	241	345	493	400	1,300	330	1,840
BOD_5	130	160	200	240	140	870	1,590
pH (Standard Units)	6.35	6.55	6.35	9.05	6.85	6.00	6.75
Total Alkalinity	113	157	91	102	115	72	104
Suspended Solids	90	100	410	48	100	1,160	130
Volatile Suspended Solids	56	40	290	20	70	770	76
Total Volatile Solids	160	210	370	210	220	1,050	910
Total Solids	500	520	710	760	550	1,610	1,910
Chloride	78	78	82	36	68	82	225
Sulfate	43	58	40	225	70	62	138
Oil & Grease*	--	--	--	--	20	21	21
Aluminum	0.29	0.34	6.8	0.60	0.55	25	3.1
Cadmium	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.40
Chromium	0.02	<0.02	<0.02	<0.02	0.15	0.28	0.02
Copper	0.09	0.03	0.29	<0.02	0.02	0.61	<0.02
Lead	<0.04	<0.04	<0.04	<0.04	<0.04	0.10	<0.04
Nickel	0.22	<0.05	<0.05	<0.05	0.05	0.10	<0.05
Silver	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	0.08	0.08	0.16	0.17	0.10	0.55	0.83
Flow (MGD)	0.004477	--	0.23576	0.032	--	2.716	0.00210

*Grab sample

BILLERICA SEWER SURVEY (CONTINUED)

November 19-20, 1985

PARAMETER	#1	#2	#3	#4	#5	#6	#7
COD	310	330	365	320	365	118	3,700
BOD_5	120	140	150	140	200	36	16,500
pH (Standard Units)	7.50	7.05	6.25	10.35	6.85	6.40	8.35
Total Alkalinity	146	165	100	63	150	83	237
Suspended Solids	100	82	150	40	170	50	78
Volatile Suspended Solids	82	62	130	32	150	36	60
Total Volatile Solids	160	190	210	190	240	110	1,050
Total Solids	640	490	500	850	640	460	2,560
Chloride	98	80	90	34	88	82	200
Sulfate	95	67	53	450	73	64	413
Oil & Grease*	--	--	--	--	19	2.4	5.4
Aluminum	0.37	0.40	1.4	0.84	0.48	0.99	2.1
Cadmium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	0.03	<0.02	<0.02	<0.02	0.03	<0.02	<0.02
Copper	0.14	<0.02	0.03	<0.02	0.48	0.29	<0.02
Lead	<0.04	<0.04	<0.04	0.05	0.08	<0.04	<0.04
Nickel	0.11	<0.05	<0.05	<0.05	0.05	<0.05	<0.05
Silver	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	0.08	0.10	0.08	0.16	0.29	0.20	0.46
Flow (MGD)	0.00540	--	0.18712	0.044	--	2.761	0.03549

*Grab sample

SILICON TRANSISTOR CORPORATION

LOCATION:	Katrina Road, Chelmsford
RECEIVING WATER:	River Meadow Brook
NPDES PERMIT NO.:	MA0025241
DESIGN FLOW:	0.0144 MGD
INDUSTRIAL PROCESS:	Manufacturer of transistors
COMMENTS:	This facility was found to be discharging without a permit when first sampled in 1982. A permit was issued in March of 1985. Major problems were noted in recent samples; however, the overall trend is toward improved effluent quality.

SILICON TRANSISTOR CORPORATION

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	5/15/85 EFFLUENT*	5/23/85 EFFLUENT*	5/30/85 EFFLUENT*	6/3/85 EFFLUENT*	6/12/85 EFFLUENT*
COD	97	31	36	27	16
BOD_5	2.70	3.25	6.45	6.20	6.13
pH (Standard Units)	153	138	--	--	--
Total Alkalinity	--	--	9.0	7.0	12
Suspended Solids	8.0	1.0	0.0	0.0	0.5
Total Solids	230	270	102	66	92
Total Kjeldahl Nitrogen	1.2	0.80	1.5	4.4	0.50
Ammonia Nitrogen	0.00	0.34	1.5	4.4	0.17
Nitrate Nitrogen	65	14	0.8	0.8	0.6
Ortho Phosphorus	--	0.01	0.01	0.02	--
Total Phosphorus	0.17	0.05	0.06	0.03	0.05
Chloride	19	24	21	21	23
Fluoride	39	36	1.2	7.6	0.1
Sulfate	4.0	19	0.0	0.0	8.8
Aluminum	0.43	0.33	<0.10	<0.10	<0.10
Cadmium	<0.02	--	--	--	--
Chromium	<0.02	--	--	--	<0.02
Copper	0.05	0.04	<0.02	0.04	0.02
Iron	0.17	--	--	--	--
Lead	<0.04	<0.04	<0.04	<0.04	<0.04
Manganese	<0.02	--	--	--	--
Nickel	<0.05	--	--	--	--
Silver	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	0.14	--	--	--	--
Methylene Chloride (µg/l)	120	N.D.	--	N.D.	N.D.
Trichloroethylene (µg/l)	N.D.	13	--	16	7.3
Tetrachloroethylene (µg/l)	N.D.	280	--	96	150
Flow (MGD)	†	†	†	†	†

*Grab sample
†No flow meter
N.D. - None Detected

RAYTHEON MISSILE SYSTEMS WASTEWATER TREATMENT PLANT

LOCATION:	Woburn Street, Lowell
RECEIVING WATER:	Concord River
NPDES PERMIT NO.:	MA0001414
INDUSTRIAL PROCESS:	Electronics manufacturing and metal finishing
DESIGN FLOW:	0.13 MGD
TYPE OF TREATMENT:	Chemical addition Settling pH adjustment Chlorine destruction for cyanide
COMMENTS:	Overall effluent quality was very good, however, aluminum on March 22 and copper for March 22-23 and 23-24 were slightly above permit limits. Normally this facility is well within permit.

RAYTHEON CORPORATION MISSILE SYSTEMS WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	3/22/83 EFFLUENT*	3/22-023/83 EFFLUENT	3/23-24/83 EFFLUENT
pH (Standard Units)	7.6	7.2	7.4
Suspended Solids	0.8	1.3	13.8†
Total Solids	992	600	1,076
Total Phosphorus	0.30	0.81	0.88
Fluoride	5.9	4.8	2.3
Amenable Cyanide	0.01	0.00	0.02
Total Cyanide	0.01	0.00	0.02
Oil & Grease*	2.2	--	--
Aluminum	3.0	0.42	0.90
Cadmium	0.00	0.01	0.00
Chromium Trivalent	0.15	0.17	0.13
Chromium Hexavalent	0.00	0.00	0.00
Copper	0.68	3.2	3.4
Lead	0.15	0.12	0.09
Nickel	0.03	0.24	0.70
Silver	0.00	0.03	0.00
Tin	<0.50	0.50	0.60
Zinc	0.07	0.04	0.04
Flow (MGD)	0.0525	0.0420	0.0420

*Grab sample
†Did not filter well - possible polymer interference

SUASCO GROUNDWATER DISCHARGES

WESTBOROUGH STATE HOSPITAL WASTEWATER TREATMENT PLANT

LOCATION:	Off Lyman Street, Westborough
RECEIVING WATER:	Groundwater
NPDES PERMIT NO.:	No permit
DESIGN FLOW:	0.10
TYPE OF TREATMENT:	Bar rack Clarigester Trickling filter Sand infiltration beds
SLUDGE HANDLING:	Sludge drying beds Landfill
COMMENTS:	This plant produces a good secondary effluent for trickling filters. BOD_5 and solids were within permit values. Metals also were quite low. Of concern, however, is nitrate being discharged to the groundwater. Nitrate levels from the plant are consistent with expected values from a secondary plant. However, a build-up of nitrates in the groundwater could create a potential problem if there are wells in the area. One saving point is that the area of infiltration is near Chauncy Pond and the groundwater flow would be toward the pond. Other points are that most of the adjacent land is undeveloped and the town supplies drinking water.

WESTBOROUGH STATE HOSPITAL WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	1/16/85 EFFLUENT*	9/9-10/85 INFLUENT	9/10/85 EFFLUENT*	9/10-11/85 INFLUENT	9/10-11/85 EFFLUENT	9/11-12/85 INFLUENT	9/11-12/85 EFFLUENT
COD	76	356	85	379	89	366	89
BOD_5	22	200	25	170	28	280	26
pH (Standard Units)	6.5	7.1†	6.15	7.6†	6.45	6.6†	6.5
Total Alkalinity	40	106	39	101	46	85	46
Suspended Solids	24	140	50	270	46	190	42
Settleable Solids (ml/l)	--	--	0.1	--	0.1	--	0.1
Total Solids	180	470	190	360	220	370	220
Total Kjeldahl Nitrogen	7.5	29	7.8	23	6.9	25	7.1
Ammonia Nitrogen	7.5	19	5.4	17	4.7	19	5.1
Nitrate Nitrogen	4.0	0.1	7.4	0.1	5.0	0.1	4.8
Total Phosphorus	1.4	5.8	3.6	4.8	3.9	4.8	3.8
Sulfate	--	17	21	12	16	12	21
Chloride	24	--	28	--	30	--	30
Aluminum	<0.10	--	--	0.28	0.10	--	--
Cadmium	<0.02	--	--	<0.02	<0.02	--	--
Chromium	<0.02	--	--	<0.02	<0.02	--	--
Copper	0.07	--	--	0.26	0.12	--	--
Iron	0.45	--	--	2.0	1.0	--	--
Lead	<0.04	--	--	<0.04	<0.04	--	--
Manganese	0.01	--	--	0.04	0.03	--	--
Mercury	<0.0002	--	--	<0.0002	<0.0002	--	--
Nickel	<0.05	--	--	<0.05	<0.05	--	--
Silver	<0.02	--	--	<0.02	<0.02	--	--
Tin	<0.50	--	--	--	--	--	--
Zinc	0.02	--	--	0.23	0.11	--	--
Flow (MGD) Estimated	--	--	0.090	--	0.090	--	0.090

*Grab sample
†pH on Composite

L.B. DARLING WASTEWATER TREATMENT PLANT

LOCATION:	Newton Street, Southborough
RECEIVING WATER:	Groundwater
NPDES PERMIT NO.:	Application pending
INDUSTRIAL PROCESS:	Makes hamburgers for institutions
TYPE OF TREATMENT:	Dissolved oxygen floatation of grease
COMMENTS:	This system only removes grease and possibly some BOD and ammonia as a result of the use of dissolved oxygen floatation. Of note were high BOD (average 790 mg/1), high sulfate (average 1,317 mg/1), high fecal coliform (4,300/100 ml) and low pH, average 4.0.

L.B. DARLING CO. WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	6/27-28/83 EFFLUENT	6/28-29/83 EFFLUENT	6/29-30/83 EFFLUENT
COD	1,417	1,314	1,507
BOD_5	720	780	870
pH (Standard Units)	3.7	4.3	--
Acidity	229	61	102
Suspended Solids	97	82	54
Total Solids	3,600	2,700	3,000
Total Kjeldahl Nitrogen	34	92	58
Ammonia Nitrogen	16	39	43
Nitrate Nitrogen	0.02	0.10	0.10
Total Phosphorus	8.4	7.8	7.3
Sulfate	1,575	1,000	1,375
Chloride	42	440	480
Chlorine Residual*	17	7.2	12
Total Coliform/100 ml*	--	--	24,000
Fecal Coliform/100 ml*	--	--	4,300
Flow (gpd)	11,046	10,041	11,506

*Grab sample

FREQUENCY SOURCES WASTEWATER TREATMENT PLANT

LOCATION: Maple Road, South Chelmsford

RECEIVING WATER: Groundwater

MASS. GROUNDWATER PERMIT NO.: 0-51

INDUSTRIAL PROCESS: Metal Finishing

TYPE OF TREATMENT: Chemical addition
Precipitation
pH adjustment

COMMENTS: While there were improvements in many parameters since the last sample was taken, there were also increases in iron, cyanide and lead. Additional sampling showed (in order of decreasing concentration) sulfate, nitrate, copper, total phosphorus, ammonia, silver, and arsenic.

FREQUENCY SOURCES WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSIS

(All results in mg/l unless otherwise noted)

PARAMETER	3/21-22/83 EFFLUENT	3/22-23/83 EFFLUENT	3/23-24/83 EFFLUENT
pH (Standard Units)	7.6	6.8	6.9
Suspended Solids	18	8.0	1.7
Total Solids	316	434	228
Ammonia Nitrogen	0.01	1.1	3.6
Nitrate Nitrogen	6.0	0.0	11
Total Phosphorus	0.88	0.35	0.30
Sulfate	35	33	33
Fluoride	5.1	4.0	7.0
Chloride	78	65	69
Amenable Cyanide	0.18	0.01	0.25
Total Cyanide	0.18	0.01	0.25
Aluminum	0.47	0.19	0.11
Arsenic	0.0692	0.0231	0.0264
Barium	0.11	0.03	0.06
Cadmium	0.00	0.00	0.00
Chromium	0.10	0.00	0.12
Copper	0.83	--	--
Iron	2.1	0.87	0.95
Lead	0.16	0.02	0.09
Manganese	0.04	0.04	0.03
Nickel	0.33	0.63	0.17
Silver	0.10	0.10	0.18
Flow (gpd)	4,850	5,470	3,970

*Grab sample

GLOSSARY OF TERMS

acidity - The quantitative capacity of aqueous solutions to react with hydroxylions. 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.

activated sludge - The active biological solids (bacteria, rotifers, and ciliates) used to remove dissolved organic matters from sewage.

activated sludge process - The process in which wastewater and activated sludge are mixed and aerated in a reactor basin, bio-oxidating organic waste matter. The biological solids are then removed by clarification.

advanced waste treatment - Wastewater treatment beyond the secondary stage, which includes further removal of nutrients and suspended solids by biological, chemical and physical means.

aeration - A treatment process which artificially supplements oxygen in the wastestream by mechanical mixing or by diffused air.

aerobic - Refers to life or processes that occur only in the presence of free molecular oxygen.

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 - Refers to life or processes that occur in the absence of free molecular oxygen.

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.

backwash - Water forced through a filter bed in the reverse direction to normal flow, used to flush the accumulated solids out of the bed.

bar rack - Bars placed across the influent channel to trap large solids such as sticks, stones, and rags.

belt filter press - See filter press.

biochemical oxygen demand (BOD) - The quantity of oxygen used by microbes in the biochemical oxidation of decomposable waste under aerobic conditions in a specific time at a specified temperature.

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. Activated sludge

processes, rotating biological contactors, and trickling filters are examples.

centrifuge - A mechanical device used to thicken sludge which uses centrifugal force (spinning) to separate the solids (sludge) from the liquid (centrate).

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 by 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.

chlorine contact chamber - A tank in which added chlorine is allowed sufficient time to disinfect effluent.

chlorine free - Chlorine readily available to disinfect or react in the effluent.

chlorine total - All chlorine present reacted or unreacted.

clarification - The removal of suspended solids by gravity settling in a quiescent tank.

clarifier - A tank in which solids are separated from wastewater by gravity settling or floating. Primary clarifiers are found before biological treatment, secondary clarifiers after.

coagulation - The clumping of particles in order to settle out impurities aided by the addition of floc forming chemicals.

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 in sewage. There are separate tests for 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.

combined sewer - A sewerage system that carries both sanitary sewage and storm runoff.

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

comminutor - A mechanical device used to cut and grind solids in the wastewater flow.

composite sample - A combination of individual samples, taken at selected time intervals or in proportion to flow and combined into a single sample.

composting - A controlled process of degrading organic matter, such as sludge, by microorganisms either aerobically or anaerobically.

cooling tower - A device used to remove excess heat from water used in industrial processes.

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

detritor - An older form of grit chamber which removes both grit and heavy organic particles from the influent flow.

dewatering - The removal of part of the water in sludge in order to reduce volume.

diffused air - A method of putting air into waste water for treatment. Air is pumped into the sewage through perforated pipes or porous stone diffusers; used in place of mechanical aeration.

digester - A tank used for the digestion of sewage sludge.

digestion - The biochemical decomposition of organic matter either aerobically or anaerobically.

dissolved air floatation - A method of sludge thickening which utilizes fine bubbles of air to float the sludge particles to the water surface where they can be skimmed off.

dissolved oxygen (D.O.) - The oxygen dissolved in water, or sewage necessary for the life of most aquatic organisms. In an activated sludge plant D.O. is necessary to sustain the bacteria which feed on the incoming wastes.

dissolved solids - See solids, dissolved.

drying bed - Beds of sand to which liquid sludge is applied. The liquid percolates through the sand or evaporates leaving dried solids which can be scraped off and disposed.

effluent - Treated or untreated water discharged from an industry, business, home, sewer, or treatment plant.

evaporation ponds - See sludge drying bed.

extended aeration - A type of activated sludge plant differentiated by its lack of primary clarifiers and its long retention times in the aeration basins.

fats - Triglyceride esters of fatty acids; erroneously used as synonomous with grease.

fecal coliform bacteria - See coliform.

filter press - A mechanical press used for dewatering sludge in which sludge is pumped to filter cloths, and compressed. The filtrate passes through the cloth leaving behind the dewatered sludge. Two common types are plate and frame which is a batch process and a belt filters press which is continuous.

filtration - The mechanical process that separates water from particulate matter by passing it through granular medium such as sand, or fiber medium.

floc - A clump of solids formed in sewage by biological or chemical action.

flocculation - The process of separating solids from water by the biological or chemical action.

flow meter - A device which measures the rate at which a gas liquid, or semi-solid moves through a conduit.

flume - A channel either natural or man-made which carries water; in a treatment plant it is usually constructed to facilitate flow measurement.

grab sample - A single sample, taken at neither a set time nor flow.

gravity thickener - A settling tank for sludge in which pickets rake through the sludge releasing entrained water thus concentrating the solids.

grease - In wastewater, a group of substances including fats, waxes, free fatty acids, calcium and magnesium soaps, mineral oils, and certain other non-fatty materials.

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

ground water - Subsurface water found in aquifers, soils, and voids.

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.

headworks - The structures at the influent side of a treatment plant which include channels,bar racks, comminutors, grit chamber, and sometimes flow measuring equipment.

heavy metals - Metallic elements with high molecular weights, generally toxic in low concentrations to plant and animal life. (They can inhibit microbial action in wastewater treatment plants.) Examples

include arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.

hydrogen sulfide (H_2S) - A malodorous gas made up of hydrogen and sulfur with the characteristic odor of rotten eggs. It is produced in the anaerobic decomposition of organic matter, and is found in digesters, poorly ventilated stagnate sewers and wet wells, as well as naturally in swamps and marshes. It is toxic in low concentrations and quickly disables the sense of smell.

implementation plan - A document of the steps to be taken to assure the attainment of environmental quality standards within a specified period of time.

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

infiltration/inflow - The total quanity of water entering the sewer other than sanitary and industrial wastes. Infiltration denotes entry of ground water through defective pipes, joints, manhole walls, or covers. Inflow denotes flow from illegal hookups, sump pumps, roof leaders, or storm drainage.

inorganic matter - Substances of mineral origin.

interceptor sewers - Pipes used to collect the flows from the main and trunk sewers and carry them to a central point for treatment.

integrated phosphorus removal - The removal of phosphorus at a wastewater treatment plant using existing structures and processes, as opposed to systems such as pho-strip which use separate tanks and processes.

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

landfill - A site for solid waste disposal where waste is spread in layers, compacted, and covered with soil each day.

lateral sewers - Pipes used to collect sewage from homes and businesses and convey it to the main or trunk lines.

leachate - Liquid that has percolated through solid waste or other mediums.

main sewer - Pipes which collect the flow from lateral lines and convey it directly to the interceptor.

mechanical aeration - The addition of air to wastewater by mixing or churning the upper layer with a set of blades driven by an electric motor.

methane (CH_4) - A colorless, nontoxic, flammable, gaseous hydrocarbon. Methane is produced anaerobically in sludge digesters, wet wells, poorly ventilated sewers, landfills and marshes. This gas can create an explosion hazard.

MGD - Millions of gallons per day, commonly used to express rates of flow.

mg/l - Milligrams per liter. A measure of concentration expressed in weight of constituent per volume of liquid. Mg/l can be used interchangeably with ppm when measuring concentration in water.

microtox - A system utilizing bioluminescent bacteria to determine the toxicity of a water or wastewater.

mixed liquor - A mixture of activated sludge and wastewater found in the aeration tank of a wastewater treatment plant.

mixed liquor suspended solids (MLSS) - The suspended portion of the solids found in mixed liquor.

nitrification - The conversion of ammonia (NH_3) to nitrate (NO_3) by bacterial action in the presence of oxygen. This process is the basis for advanced waste treatment.

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 (i.e. proteins) as well as industrially important substances (i.e. cyanides, fertilizers, dyes).

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

nitrogen, kjeldahl - This is the total nitrogen in organic form. It includes ammonia but not nitrite and nitrate.

nitrogen, nitrate (NO_3) - 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 for plant growth. It is measured as milligrams of nitrogen as NO_3.

nitrogen, nitrite (NO_2) - It is relatively unimportant in wastewater or water pollution studies because it is very unstable and easily oxidized to NO_3. It is an indicator of past pollution in the process of stabilization and seldom exceeds 1 mg/l in wastewater. It is measured as milligrams of nitrogen as NO_2.

N.P.D.E.S. - National Pollutant Discharge Elimination System, a federal permitting system for dischargers.

nutrients - Elements or compounds essential as raw materials for an organisms growth and development, such as, carbon, hydrogen, nitrogen, oxygen, and phosphorus.

oil & grease - This includes hydrocarbons, fatty acids, soaps, fats, waxes and oils. Tests for oil and grease are determined on the basis of their common solubility in freon.

organic matter - Chemical substances of animal or vegetable origin, consisting of a carbon structure base.

outfall - The mouth of a sewer drain or conduit where an effluent is discharged.

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

oxidation ditch - A type of activated sludge plant which utilizes an oval "racetrack" shaped tank. The water is aerated and moved around the "track" by a cylindrical brush type aerator installed across the channel at the surface.

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.

package plant - A prefabricated wastewater treatment plant, usually one unit containing screening, aeration, settling, and disinfection.

Parshall Flume - A calibrated conduit developed for measuring flow of liquids, it is usually used with a level sensing device and recorder.

pathogenic bacteria - Bacteria that cause or are capable of causing diseases.

pH - The reciprocal of the logarithm of the hydrogen ion concentration. Neutral pH's are given a value of 7.0 with hydrogen ion concentration 10^{-7}. The more acid the lower the pH, the more alkaline the higher the pH.

phenols - A group of organic compounds that in very low concentrations produce taste and odor problems in water. In higher concentrations they are toxic. Phenols are the by-products of petroleum refining, tanning, textile, dye, and resin manufacturing.

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. The majority of the phosphorus contained in domestic and industrial wastes comes from detergents. Phosphorus is the major limiting factor in eutrophication in the northeast.

plate and frame press - See filter press.

pollution - Matter or energy whose nature, location or quantity produces undesired environmental effects, or renders something unfit for its desired use.

P.O.T.W. - Publicly owned treatment works.

ppm - Parts per million; used to express concentration, in water and wastewater it is use interchangeably with mg/l.

pretreatment - Any process used to reduce pollutant load before the wastewater is introduced into the sewer.

primary treatment - The first major (sometimes the only) treatment in a wastewater treatment plant, usually consisting of sedimentation. This removes a substantial amount of suspended matter but little or colloidal and dissolved matter.

pumping station - A facility at which sewage is pumped to increase its pressure head, allowing it to flow to the treatment plant. They are sometimes referred to as lift stations.

raw sewage - Untreated domestic or commercial wastewater.

receiving waters - Rivers, lakes, oceans, or other bodies of water that receive treated or untreated wastewater discharges.

residual chlorine - The chlorine remaining in water or wastewater as available (free) or available and combined (total) chlorine.

reverse osmosis - An advanced method of wastewater treatment using a semipermeable membrane to separate water from dissolved matter.

river basin - The total area drained by a river and its tributaries.

sampler - A device used to obtain an aliquot of water or waste for analytical purposes. May be designed to take a series of individual samples or a composite, continuous or periodic sample.

sand filter - A mechanical means of removing solids by passing the waste stream through a bed of sand.

sanitary sewers - Sewers that carry only domestic or commercial sewage, separate from storm runoff.

screening - The removal of relatively coarse floating and suspended solids by straining through racks or screens.

secondary treatment - Wastewater treatment beyond primary in which bacteria consume the organic portion of the wastes. This type of treatment is designed to remove virtually all floating and settleable solids and approximately 90 percent of the BOD and suspended solids. Some metals are assimilated by the bacteria.

sedimentation - The settling out of solids by gravity.

sedimentation tank - See clarifier.

septic tank - An underground tank used for treating wastewater by settling and anaerobic digestion.

settleable solids - See solids, settleable.

settling tank - See clarifier.

sewage - The total water and solid wastes generated by residential and commercial establishments.

sewer - Any pipe or conduit used to collect and carry away sewage or storm-water runoff from the generating source to the treatment plant or receiving stream.

sewerage - The entire physical system of sewage collection, piping, treatment works, and disposal lines.

skimming - The mechanical removal of scum or oil from the surface of a liquid.

sludge - The accumulated solids removed from the clarifiers during treatment.

sludge cake - The processed solids from a wastewater treatment plant, usually 15-40% solids.

sludge digester - See digester.

sludge digestion - See disgestion.

sludge drying beds - See drying beds.

sludge thickening - The increase in solids concentration of sludge in a gravity thickener or digester. This process usually doubles the solids concentration.

solids, dissolved - The amount of material organic and inorganic remaining after the evaporation of a sample which has been filtered. Excessive dissolved solids make water unpalatable and unsuitable for industrial uses.

solids, settleable - That matter in wastewater which will not stay in suspension during a set time period. In the Imhoff cone test, it is the volume of matters 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, and which are removable by laboratory filtering, stated in mg/l.

solids, total - The sum of dissolved and undissolved solids in water or wastewater, stated in mg/l.

stabilization - The process of converting active or organic matter in sewage, sludge, or solid wastes into inert material.

sump - A depression or tank that serves as a drain or receptacle for liquids for salvage or disposal.

suspended solids (SS) - See solids, suspended.

tertiary treatment - See advanced waste treatment.

total chlorine - See chlorine, total.

total coliform - See coliform, total.

total solids (TS) - See solids, total.

toxicity - The quality or degree of being poisonous, or harmful to plant and animal life.

toxic pollutants - A number of pollutants, which after discharge and upon ingestion, inhalation, or assimilation into an organism, can cause death, disease, mutation, deformities, or malfunctions, in the organism.

trickling filter - A device used for the biological treatment of wastewater, consisting of a bed of crushed rock on which a bacteriologic slime grows. Sewage is sprayed over the bed and the bacteria assimilate the organic wastes.

trunk lines - See main sewer.

turbidity - A cloudy condition in water due to the suspension of silt or finely divided organic matter.

vacuum filter - A device used to dewater sludge consisting of a large drum, a smaller roller, a cloth belt going around both, and a tank in which conditioned sludge comes in contact with the drum. A vacuum is applied through the drum causing the solids to adhere to the belt and drawing off the water. The solids are discharged to a conveyor and hauled away.

volatile organics - Organic compounds which readily vaporize at relatively low temperatures, usually solvents. Examples are acetone, methylene chloride and chloroform.

volatile solids - The solids which "ignite" upon ashing a sample in a muffle furnace at 550°C for one (1) hour.

wastewater - See sewage.

wet well - A tank where water or waste is stored until there is enough to make pumping feasible.

water pollution - See pollution.

Zimpro - A method of sludge conditioning utilizing heat which allows dewatering without the use of chemicals.