

**Source, Movement, and Effects of Nitrogen and Phosphorus
in Three Ponds in the Headwaters of Hop Brook,
Marlborough, Massachusetts**

U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 84-4017

Prepared in cooperation with the
COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING
DIVISION OF WATER POLLUTION CONTROL

Table 14.--Chemical and physical data for major sampling sites (continued)

DATE	DI-ELDRIN TOTAL (UG/L)	ENDO-SULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)	HEPTA-CHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MIREX, TOTAL (UG/L)	PER-THANE TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)
Site 12									
01098722 - GRIST MILLPOND OUTLET NEAR MARLBOROUGH, MA (LAT 42 21 26 LONG 071 28 15)									
AUG , 1978									
23...	.00	.00	.00	.00	.00	.00	.00	--	.00
NOV									
21...	.00	.00	.00	.00	.00	.00	--	.00	.00
Site 15									
01098730 - CARDING MILLPOND NEAR MARLBOROUGH, MA (LAT 42 21 42 LONG 071 27 57)									
NOV , 1976									
03...	.00	--	.00	.00	.00	.00	--	--	.00
OCT , 1977									
13...	.00	.00	.00	.00	.00	.00	--	--	.00
JUN , 1978									
22...	.00	.00	.00	.00	.00	.00	.00	--	.00
AUG									
22...	.00	.00	.00	.00	.00	.00	.00	--	.00
NOV									
21...	.00	.00	.00	.00	.00	.00	--	.00	.00
Site 16									
01098733 - HOP BROOK NEAR MARLBOROUGH, MA (LAT 42 22 02 LONG 071 28 01)									
AUG , 1978									
23...	.00	.00	.00	.00	.00	.00	.00	--	.00
NOV									
21...	.00	.00	.00	.00	.00	.00	--	.00	.00

Table 15.--Chemical and physical data for other sampling sites

DATE	TIME	STREAMFLOW, INSTAN- TANEOUS (CFS)	SPECIFIC CON- DUCTANCE (UMHOS)	PH (UNITS)	TEM- PERA- TURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DISSOLVED (PERCENT SATURATION)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	
Site 1									
01098704 - HAGER POND TRIBUTARY AT MARLBOROUGH, MA (LAT 42 21 07 LONG 071 29 43)									
NOV 1976	01...	0830	.13	290	6.6	6.5	10.6	86	.18
Site 3									
01098706 - HAGER POND TRIBUTARY AT MARLBOROUGH, MA (LAT 42 20 57 LONG 071 29 30)									
NOV, 1976	01...	1300	.28	73	5.8	7.0	8.9	73	.40
Site 4									
01098707 - HAGER POND TRIBUTARY AT MARLBOROUGH, MA (LAT 42 20 30 LONG 071 29 20)									
NOV , 1976	01...	1430	.09	68	6.1	6.5	10.3	84	.32
Site 6									
01098708 - HAGER POND TRIBUTARY AT MARLBOROUGH, MA (LAT 42 20 48 LONG 071 29 03)									
NOV , 1976	02...	1300	.12	90	5.9	7.0	12.3	101	.16
Site 10									
01098714 - GRIST MILLPOND TRIBUTARY NEAR MARLBOROUGH, MA (LAT 42 21 16 LONG 071 28 44)									
NOV , 1976	03...	0930	.18	146	6.4	4.0	12.4	94	.19
Site 11									
01098718 - GRIST MILLPOND TRIBUTARY NEAR MARLBOROUGH, MA (LAT 42 21 27 LONG 071 28 42)									
NOV , 1976	03...	1215	.03	200	5.9	7.5	5.8	48	1.3
Site 13									
01098725 - CARDING MILLPOND TRIBUTARY NEAR MARLBOROUGH, MA (LAT 42 21 24 LONG 071 28 00)									
NOV , 1976	03...	1430	.05	210	6.0	6.5	7.8	63	.24
Site 14									
01098728 - CARDING MILLPOND TRIBUTARY NEAR MARLBOROUGH, MA (LAT 42 21 26 LONG 071 27 48)									
NOV 4, 1976	04...	0830	.09	154	6.1	6.0	8.5	68	.19

Table 15.--Chemical and physical data for other sampling sites (continued)

DATE	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, NITRITE TOTAL (MG/L AS N)	NITROGEN, NITRATE TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	PHOSPHORUS, ORTHO, TOTAL (MG/L AS P)	PHOS- PHORUS, TOTAL (MG/L AS P)	ALGAL GROWTH POTENTIAL, BOTTLE TEST (MG/L)
Site 1							
01098704 - HAGER POND TRIBUTARY AT MARLBOROUGH, MA (LAT 42 21 07 LONG 071 29 43)							
NOV , 1976 01...	.070	.010	.39	.65	.010	.020	--
Site 3							
01098706 - HAGER POND TRIBUTARY AT MARLBOROUGH, MA (LAT 42 20 57 LONG 071 29 30)							
NOV , 1976 01...	.030	.010	.02	.46	.010	.030	2.9
Site 4							
01098707 - HAGER POND TRIBUTARY AT MARLBOROUGH, MA (LAT 42 20 30 LONG 071 29 20)							
NOV , 1976 01...	.010	.010	.02	.36	.020	.030	1.1
Site 6							
01098708 - HAGER POND TRIBUTARY AT MARLBOROUGH, MA (LAT 42 20 48 LONG 071 29 03)							
NOV , 1976 02...	.020	.010	.01	.20	.020	.020	.4
Site 10							
01098714 - GRIST MILLPOND TRIBUTARY NEAR MARLBOROUGH, MA (LAT 42 21 16 LONG 071 28 44)							
NOV , 1976 03...	.010	.010	.00	.21	.010	.020	.5
Site 11							
01098718 - GRIST MILLPOND TRIBUTARY NEAR MARLBOROUGH, MA (LAT 42 21 27 LONG 071 28 42)							
NOV , 1976 03...	.260	.010	.04	1.7	.010	.200	.8
Site 13							
01098725 - CARDING MILLPOND TRIBUTARY NEAR MARLBOROUGH, MA (LAT 42 21 24 LONG 071 28 00)							
NOV , 1976 03...	.010	.010	.02	.28	.010	.030	2.3
Site 14							
01098728 - CARDING MILLPOND TRIBUTARY NEAR MARLBOROUGH, MA (LAT 42 21 26 LONG 071 27 48)							
NOV , 1976 04...	.010	.010	.00	.21	.010	.030	.5

Table 16.--Phytoplankton data for all sampling sites

Site 2				
01098705 HAGER POND TRIBUTARY AT MARLBOROUGH, MA				
PHYTOPLANKTON ANALYSES, AUGUST 1978 TO NOVEMBER 1978				
DATE	AUG 23,78		NOV 21,78	
TIME	1015		0730	
TOTAL CELLS/ML	480		980	
ORGANISM	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHRYSOPHYTA				
.BACILLARIOPHYCEAE				
..CENTRALES				
...COSCINODISCACEAE				
....COSCINODISCUS	--	-	14	1
..PENNALES				
...ACHNANTHACEAE				
....ACHNANTHES	16	3	--	-
...GOMPHONEMACEAE				
....GOMPHONEMA	11	2	--	-
...NAVICULACEAE				
....NAVICULA	16	3	14	1
...NITZSCHIACEAE				
....NITZSCHIA	110#	22	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..HORMOGONALES				
...OSCILLATORIACEAE				
....OSCILLATORIA	320#	67	920#	94
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....EUGLENA	5	1	29	3

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15 PERCENT
 * - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2 PERCENT

Table 16.--Phytoplankton data for all sampling sites (continued)

		Site 5 01098709 HAGER POND AT MARLBOROUGH, MA PHYTOPLANKTON ANALYSES, NOVEMBER 1976 TO NOVEMBER 1978							
DATE		NOV 2,76		JUN 14,77		AUG 11,77		OCT 13,77	
TIME		1030		0930		0900		0830	
TOTAL CELLS/ML		150000		16000		46000		41000	
ORGANISM		CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHLOROPHYTA (GREEN ALGAE)									
.CHLOROPHYCEAE		--	-	2300	14	--	-	--	-
..CHLOROCCOCALES									
...HYDRODICTYACEAE									
....PEDIASTRUM		--	-	2100	13	23000#	51	25000#	59
...MICRACTINIACEAE									
....GOLENKINIA		*	0	--	-	7800#	17	2600	6
....MICRACTINIUM		--	-	530	3	--	-	--	-
...OOCYSTACEAE									
....ANKISTRODESMUS		--	-	*	0	--	-	--	-
....CHLORELLA		88000#	60	--	-	--	-	--	-
....KIRCHNERIELLA		--	-	600	4	--	-	--	-
....OOCYSTIS		--	-	270	2	380	1	--	-
....TETRAEDRON		--	-	--	-	--	-	*	0
...SCENEDESMACEAE									
....SCENEDESMUS		57000#	39	8200#	50	14000#	31	12000#	29
..TETRASPORALES									
...PALMELLACEAE									
...GLOEOCYSTIS		--	-	--	-	--	-	--	-
..VOLVOCALES									
...CHLAMYDOMONADACEAE									
....CHLAMYDOMONAS		960	1	*	0	--	-	340	1
...ZYGNEATALES									
...DESMIDIACEAE									
....STAUSTRUM		--	-	--	-	--	-	--	-
CHRYSOPHYTA									
.BACILLARIOPHYCEAE									
..CENTRALES									
...COSCINODISCACEAE									
....CYCLOTELLA		--	-	*	0	--	-	--	-
..PENNALES									
...ACHNANTHACEAE									
....ACHNANTHES		--	-	*	0	--	-	--	-
...FRAGILARIACEAE									
....FRAGILARIA		--	-	--	-	--	-	340	1
...NAVICULACEAE									
....GYROSIGMA		--	-	--	-	--	-	*	0
....NAVICULA		--	-	--	-	--	-	--	-
...NITZSCHACEAE									
....NITZSCHIA		*	0	870	5	--	-	250	1
...SURIRELLACEAE									
....SURIRELLA		*	0	--	-	--	-	--	-
CRYPTOPHYTA (CRYPTOMONADS)									
.CRYPTOPHYCEAE									
..CRYPTOMONADALES									
...CRYPTOCHRYSIDACEAE									
....CHROOMONAS		--	-	--	-	*	0	--	-
...CRYPTOMONADACEAE									
....CRYPTOMONAS		--	-	*	0	--	-	*	0
CYANOPHYTA (BLUE-GREEN ALGAE)									
.CYANOPHYCEAE									
..CHROOCOCCALES									
...CHROOCOCCACEAE									
....ANACYSTIS		--	-	1200	7	--	-	850	2
..HORMOGONALES									
...RIVULARIACEAE									
....RAPHIIDIOPSIS		--	-	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15 PERCENT
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2 PERCENT

Table 16.--Phytoplankton data for all sampling sites (continued)

Site 5 01098709 HAGER POND AT MARLBOROUGH, MA PHYTOPLANKTON ANALYSES, NOVEMBER 1976 TO NOVEMBER 1978						
DATE TIME TOTAL CELLS/ML	JUN 22,78 0815 95000		AUG 22,78 1045 17000		NOV 21,78 0900 93000	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)						
.CHLOROPHYCEAE	--	-	--	-	--	-
..CHLOROCOCCALES						
...HYDRODICTYACEAE						
....PEDIASTRUM	62000#	65	3100#	18	--	-
...MICRACTINIACEAE						
....GOLENKINIA	--	-	--	-	--	-
....MICRACTINIUM	--	-	--	-	--	-
...OOCYSTACEAE						
....ANKISTRODESMUS	--	-	--	-	--	-
....CHLORELLA	--	-	--	-	--	-
....KIRCHNERIELLA	--	-	--	-	--	-
....OOCYSTIS	4500	5	--	-	--	-
....TETRAEDRON	--	-	--	-	--	-
...SCENEDESMACEAE						
....SCENEDESMUS	25000#	26	8500#	50	90000#	97
..TETRASPORALES						
...PALMELLACEAE						
...GLOEOCYSTIS	2800	3	--	-	--	-
..VOLVOCALES						
...CHLAMYDOMONADACEAE						
....CHLAMYDOMONAS	--	-	230	1	--	-
..ZYGNEMATALES						
...DESMIDIACEAE						
....STAUSTRUM	--	-	--	-	2700	3
CHRYSOPHYTA						
.BACILLARIOPHYCEAE						
..CENTRALES						
...COSCINODISCACEAE						
....CYCLOTELLA	780	1	--	-	--	-
..PENNALES						
...ACHNANTHACEAE						
....ACHNANTHES	--	-	--	-	--	-
...FRAGILARIACEAE						
....FRAGILARIA	--	-	--	-	--	-
...NAVICULACEAE						
....GYROSIGMA	--	-	--	-	--	-
....NAVICULA	*	0	--	-	--	-
...NITZSCHIACEAE						
....NITZSCHIA	560	1	--	-	--	-
...SURIRELLACEAE						
....SURIRELLA	--	-	--	-	--	-
CRYPTOPHYTA (CRYPTOMONADS)						
.CRYPTOPHYCEAE						
..CRYPTOMONADALES						
...CRYPTOCHRYSIDACEAE						
....CHROOMONAS	--	-	5000#	29	--	-
...CRYPTOMONADACEAE						
....CRYPTOMONAS	--	-	--	-	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)						
.CYANOPHYCEAE						
..CHROOCOCCALES						
...CHROOCOCCACEAE						
....ANACYSTIS	--	-	--	-	--	-
..HORMOGONALES						
...RIVULARIACEAE						
....RAPHIDIOPSIS	--	-	230	1	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15 PERCENT
 * - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2 PERCENT

Table 16.--Phytoplankton data for all sampling sites (continued)

Site 8				
01098710 HAGER POND OUTLET AT MARLBOROUGH, MA				
PHYTOPLANKTON ANALYSES, AUGUST 1978 TO NOVEMBER 1978				
DATE	AUG 23,78		NOV 22,78	
TIME	1200		0930	
TOTAL CELLS/ML	12000		88000	
ORGANISM	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...CHARACIACEAE				
....SCHROEDERIA	87	1	--	-
...HYDRODICTYACEAE				
....PEDIASTRUM	1500	12	6900	8
...SCENEDESMACEAE				
....SCENEDESMUS	8900#	72	77000#	88
..ZYGNEATALES				
...DESMIDIACEAE				
....STAUSTRUM	--	-	3900	4
CHRYSTOPHYTA				
.BACILLARIOPHYCEAE				
..PENNALES				
...NAVICULACEAE				
....NAVICULA	*	0	--	-
CRYPTOPHYTA (CRYPTOMONADS)				
.CRYPTOPHYCEAE				
..CRYPTOMONADALES				
...CRYPTOCHRYSIDACEAE				
....CHROOMONAS	1100	9	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROCOCCALES				
...CHROCOCCACEAE				
....ANACYSTIS	650	5	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15 PERCENT
 * - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2 PERCENT

Table 16.--Phytoplankton data for all sampling sites (continued)

		Site 9 01098712 GRIST MILLPOND NEAR MARLBOROUGH, MA PHYTOPLANKTON ANALYSES, NOVEMBER 1976 TO NOVEMBER 1978							
DATE		NOV 2,76		JUN 14,77		AUG 11,77		OCT 13,77	
TIME		1430		1130		1045		1145	
TOTAL CELLS/ML		140000		13000		85000		46000	
ORGANISM		CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)									
.CHLOROPHYCEAE									
..CHLOROCOCCALES									
...COELASTRACEAE									
....COELASTRUM		--	-	*	0	--	-	--	-
...HYDRODICTYACEAE									
....PEDIASTRUM		--	-	1600	12	45000#	53	31000#	67
...MICRACTINIACEAE									
....GOLENKINIA		*	0	*	0	13000#	15	4000	9
....MICRACTINIUM		890	1	180	1	--	-	--	-
...OOCYSTACEAE									
....ANKISTRODESMUS		--	-	*	0	--	-	--	-
....CHLORELLA		40000#	29	--	-	--	-	--	-
....OOCYSTIS		--	-	89	1	--	-	--	-
....SELENASTRUM		--	-	*	0	--	-	--	-
....TETRAEDRON		--	-	130	1	--	-	--	-
...SCENEDESMACEAE									
....SCENEDESMUS		89000#	64	9200#	68	27000#	32	9500#	21
..VOLVOCALES									
...CHLAMYDOMONADACEAE									
....CHLAMYDOMONAS		*	0	--	-	--	-	--	-
...VOLVOCACEAE									
....PANDORINA		--	-	*	0	--	-	--	-
..ZYGNEMATALES									
...DESMIDIACEAE									
....STAUSTRUM		--	-	*	0	--	-	--	-
CHRYSOPHYTA									
.BACILLARIOPHYCEAE									
..CENTRALES									
...COSCINODISCACEAE									
....CYCLOTELLA		*	0	--	-	--	-	--	-
..PENNALES									
...ACHNANTHACEAE									
....ACHNANTHES		*	0	--	-	--	-	--	-
...CYMBELLACEAE									
....AMPHORA		*	0	--	-	--	-	--	-
...EUNOTIACEAE									
....EUNOTIA		1800	1	--	-	--	-	--	-
...FRAGILARIACEAE									
....FRAGILARIA		1300	1	220	2	--	-	--	-
....SYNDRA		*	0	--	-	--	-	--	-
...GOMPHONEMATAACEAE									
....GOMPHONEMA		*	0	--	-	--	-	--	-
...MERIDIONACEAE									
....MERIDION		*	0	--	-	--	-	--	-
...NAVICULACEAE									
....NAVICULA		*	0	*	0	--	-	--	-
....PINNULARIA		*	0	--	-	--	-	--	-
...NITZSCHIACEAE									
....NITZSCHIA		890	1	650	5	*	0	260	1
.CHRYSOPHYCEAE									
..CHRYSOMONADALES									
...OCHROMONADACEAE									
....OCHROMONAS		--	-	89	1	--	-	--	-
.XANTHOPHYCEAE									
..RHIZOCHLORIDALES									
...STIPITOCOCCACEAE									
....STIPITOCOCCUS		--	-	--	-	--	-	260	1
CRYPTOPHYTA (CRYPTOMONADS)									
.CRYPTOPHYCEAE									
..CRYPTOMONADALES									
...CRYPTOMONADACEAE									
....CRYPTOMONAS		--	-	160	1	--	-	*	0
CYANOPHYTA (BLUE-GREEN ALGAE)									
.CYANOPHYCEAE									
..CHROOCOCCALES									
...CHROOCOCCACEAE									
....ANACYSTIS		--	-	800	6	--	-	970	2
...HORMOGONALES									
...OSCILLATORIACEAE									
....OSCILLATORIA		--	-	240	2	--	-	*	0
EUGLENOPHYTA (EUGLENOIDS)									
.EUGLENOPHYCEAE									
..EUGLENALES									
...EUGLENACEAE									
....TRACHELOMONAS		*	0	--	-	--	-	*	0

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15 PERCENT

* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2 PERCENT

Table 16.--Phytoplankton data for all sampling sites (continued)

		Site 9 01098712 GRIST MILLPOND NEAR MARLBOROUGH, MA					
		PHYTOPLANKTON ANALYSES, NOVEMBER 1976 TO NOVEMBER 1978					
DATE		JUN 22,78		AUG 22,78		NOV 21,78	
TIME		1030		1330		1030	
TOTAL CELLS/ML		14000		84000		120000	
ORGANISM		CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)							
.CHLOROPHYCEAE							
..CHLOROCOCCALES							
...COELASTRACEAE							
....COELASTRUM		--	-	--	-	--	-
...HYDRODICTYACEAE							
....PEDIASTRUM		9700#	71	4700	6	--	-
...MICRACTINIACEAE							
....GOLENKINIA		--	-	670	1	--	-
....MICRACTINIUM		--	-	--	-	--	-
...OOCYSTACEAE							
....ANKISTRODESMUS		--	-	--	-	--	-
....CHLORELLA		--	-	--	-	--	-
....OOCYSTIS		--	-	--	-	--	-
....SELENASTRUM		--	-	--	-	--	-
....TETRAEDRON		--	-	--	-	--	-
...SCENEDESMACEAE							
....SCENEDESMUS		3800#	28	78000#	93	110000#	98
..VOLVOCALES							
...CHLAMYDOMONADACEAE							
....CHLAMYDOMONAS		--	-	*	0	--	-
...VOLVOCAEAE							
....PANDORINA		--	-	--	-	--	-
..ZYGNEATALES							
...DESMIDIACEAE							
....STAUSTRUM		--	-	--	-	2200	2
CHRYSOPHYTA							
.BACILLARIOPHYCEAE							
..CENTRALES							
...COSCINODISCAEAE							
....CYCLOTELLA		--	-	*	0	--	-
..PENNALES							
...ACHNANTHACEAE							
....ACHNANTHES		--	-	--	-	--	-
...CYMBELLACEAE							
....AMPHORA		--	-	--	-	--	-
...EUNOTIACEAE							
....EUNOTIA		--	-	--	-	--	-
...FRAGILARIACEAE							
....FRAGILARIA		--	-	--	-	--	-
....SYNEDRA		--	-	--	-	--	-
...GOMPHONEMATAEAE							
....GOMPHONEMA		--	-	--	-	--	-
...MERIDIONACEAE							
....MERIDION		--	-	--	-	--	-
...NAVICULACEAE							
....NAVICULA		--	-	*	0	--	-
....PINNULARIA		--	-	--	-	--	-
...NITZSCHIACEAE							
....NITZSCHIA		*	0	*	0	--	-
.CHRYSOPHYCEAE							
..CHRYSOMONADALES							
...OCHROMONADACEAE							
....OCHROMONAS		--	-	--	-	--	-
.XANTHOPHYCEAE							
..RHIZOCHLORIDALES							
...STIPITOCOCCACEAE							
....STIPITOCOCCUS		--	-	--	-	--	-
CRYPTOPHYTA (CRYPTOMONADS)							
.CRYPTOPHYCEAE							
..CRYPTOMONADALES							
...CRYPTOMONADACEAE							
....CRYPTOMONAS		--	-	--	-	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)							
.CYANOPHYCEAE							
..CHROOCOCCALES							
...CHROOCOCCACEAE							
....ANACYSTIS		--	-	--	-	--	-
..HORMOGONALES							
...OSCILLATORIACEAE							
....OSCILLATORIA		--	-	--	-	--	-
EUGLENOPHYTA (EUGLENOIDS)							
.EUGLENOPHYCEAE							
..EUGLENALES							
...EUGLENAEAE							
....TRACHELOMONAS		--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15 PERCENT

* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2 PERCENT

Table 16.--Phytoplankton data for all sampling sites (continued)

Site 12				
01098722 GRIST MILLPOND OUTLET NEAR MARLBOROUGH, MA				
PHYTOPLANKTON ANALYSES, AUGUST 1978 TO NOVEMBER 1978				
DATE	AUG 23, 78		NOV 21, 78	
TIME	1400		1445	
TOTAL CELLS/ML	41000		100000	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...SCENEDESMACEAE				
....SCENEDESMUS	41000#	100	94000#	92
..VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CHLAMYDOMONAS	--	-	690	1
CHRYSOPHYTA				
.BACILLARIOPHYCEAE				
..CENTRALES				
...COSCINODISCACEAE				
....CYCLOTELLA	--	-	*	0
..PENNALES				
...NITZSCHIACEAE				
....NITZSCHIA	--	-	*	0
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROOCOCCALES				
...CHROOCOCCACEAE				
....ANACYSTIS	--	-	6900	7

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15 PERCENT
 * - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2 PERCENT

Table 16.--Phytoplankton data for all sampling sites (continued)

Site 15
01098730 CARDING MILLPOND NEAR MARLBOROUGH, MA
PHYTOPLANKTON ANALYSES, NOVEMBER 1976 TO NOVEMBER 1978

DATE TIME	NOV 3,76 0800	AUG 11,77 1430	OCT 13,77 1500	JUN 22,78 1315	AUG 22,78 1600	NOV 21,78 1145				
TOTAL CELLS/ML	100000	130000	220000	8900	65000	120000				
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)										
.CHLOROPHYCEAE										
..CHLOROCOCCALES										
...HYDRODICTYACEAE										
....PEDIASTRUM	--	-	8300	6	150000#	71	2200#	25	3600	5
...MICRACTINIACEAE										
....GOLENKINIA	*	0	*	0	14000	6	--	-	360	1
...OOCYSTACEAE										
....ANKISTRODESMUS	--	-	*	0	--	-	--	-	--	-
...CHLORELLA	18000#	17	--	-	--	-	--	-	--	-
...CHODATELLA	--	-	--	-	--	-	--	-	--	-
...TETRAEDRON	*	0	--	-	*	0	--	-	--	-
...SCENEDESMACEAE										
...SCENEDESMUS	81000#	79	3600	3	32000	15	6700#	75	7500	11
..TETRASPORALES										
...PALMELLACEAE										
....SPHAEROCYSTIS	--	-	--	-	--	-	--	-	4300	7
..VOLVOCALES										
...CHLAMYDOMONADACEAE										
....CHLAMYDOMONAS	1600	2	*	0	*	0	--	-	--	-
...VOLVOCAEAE										
....PANDORINA	--	-	--	-	--	-	--	-	--	-
									19000#	16
CHRYSOPHYTA										
.BACILLARIOPHYCEAE										
..PENNALES										
...FRAGILARIACEAE										
....SYNEDRA	*	0	--	-	--	-	--	-	--	-
...NITZSCHIACEAE										
....NITZSCHIA	--	-	*	0	*	0	--	-	--	-
.XANTHOPHYCEAE										
..RHIZOCHLORIDALES										
...STIPIITOCOCCACEAE										
....STIPIITOCOCCUS	--	-	--	-	*	0	--	-	--	-
CRYPTOPHYTA (CRYPTOMONADS)										
.CRYPTOPHYCEAE										
..CRYPTOMONADALES										
...CRYPTOMONADACEAE										
....CRYPTOMONAS	--	-	--	-	*	0	--	-	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)										
.CYANOPHYCEAE										
..CHROOCOCCALES										
...CHROOCOCCACEAE										
....ANACYSTIS	1600	2	120000#	90	16000	7	--	-	50000#	76

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15 PERCENT
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2 PERCENT

Table 16.--Phytoplankton data for all sampling sites (continued)

Site 16				
01098733 HOP BROOK NEAR MARLBOROUGH, MA				
PHYTOPLANKTON ANALYSES, AUGUST 1978 TO NOVEMBER 1978				
DATE	AUG 23,78		NOV 21,78	
TIME	1615		1330	
TOTAL CELLS/ML	61000		150000	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...HYDRODICTYACEAE				
....PEDIASTRUM	--	-	1000	1
...OOCYSTACEAE				
....CHODATELLA	--	-	*	0
...SCENEDESMACEAE				
....SCENEDESMUS	14000#	23	130000#	85
..TETRASPORALES				
...PALMELLACEAE				
....SPHAEROCYSTIS	4000	7	--	-
..VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CHLAMYDOMONAS	*	0	--	-
...VOLVOCAEAE				
....PANDORINA	--	-	20000	13
CHRYSOPHYTA				
.BACILLARIOPHYCEAE				
..CENTRALES				
...COSCINODISCACEAE				
....CYCLOTELLA	*	0	*	0
..PENNALES				
...NAVICULACEAE				
....NAVICULA	*	0	--	-
...NITZSCHIACEAE				
....NITZSCHIA	*	0	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROOCOCCALES				
...CHROOCOCCACEAE				
....ANACYSTIS	42000#	69	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15 PERCENT
 * - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2 PERCENT

Table 17.--Streamflow data for site 8, Hager Pond Outlet near Marlborough

01098710 HAGER POND OUTLET AT MARLBOROUGH, MA

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1				3.7	4.8	12	14	10	4.1	4.1	2.8	2.3
2				3.6	4.4	11	13	9.8	4.1	3.6	6.1	2.1
3				3.5	4.4	10	13	9.4	4.1	3.2	5.4	2.1
4				3.4	4.4	10	11	9.3	4.1	2.8	4.5	1.9
5				3.3	4.4	14	17	9.3	4.1	3.0	3.5	1.7
6				3.3	4.4	17	17	9.3	4.1	3.0	3.0	1.5
7				3.6	4.4	14	14	9.0	4.5	2.8	2.7	1.5
8				4.4	4.4	13	13	8.8	5.4	2.6	2.8	1.5
9				3.8	4.4	13	12	10	5.4	3.0	2.9	1.5
10				5.1	4.4	15	12	17	5.5	3.0	3.0	1.7
11				7.5	4.4	16	11	18	6.3	3.1	3.0	1.9
12				6.6	4.4	16	11	17	6.9	3.3	2.9	1.9
13				5.8	4.4	17	9.9	15	6.9	3.8	3.0	1.9
14				5.1	5.1	17	9.5	13	6.3	4.3	3.0	1.7
15				5.1	5.1	19	9.2	12	4.1	4.5	2.8	1.7
16				4.8	5.1	17	9.0	11	3.7	4.5	2.8	1.7
17				4.8	5.1	15	8.8	11	3.5	4.0	2.8	1.9
18				4.8	5.1	15	8.4	11	3.5	3.5	2.6	2.1
19				4.4	5.1	15	8.5	9.5	3.8	3.2	2.3	2.6
20				4.4	5.1	14	9.1	8.8	3.8	2.9	2.6	3.8
21				4.1	5.1	14	9.4	8.0	3.7	3.2	2.6	5.8
22				3.8	5.1	16	9.6	7.4	3.5	3.4	2.3	4.1
23				3.6	5.1	31	11	6.8	3.3	3.1	2.3	3.3
24				4.1	4.8	20	18	6.6	3.1	2.9	2.3	3.0
25				4.1	11	17	21	6.6	3.1	2.7	2.6	3.0
26				4.1	12	16	16	6.2	3.5	3.5	2.6	5.1
27				4.1	12	17	13	5.6	4.1	3.3	2.6	10
28				4.1	12	16	12	5.4	4.3	2.8	2.6	7.2
29				4.8	---	16	11	5.2	4.5	2.5	2.6	5.8
30				4.8	---	17	10	4.4	4.5	2.2	2.6	4.4
31				4.8	---	15	---	4.1	---	2.0	2.6	---
TOTAL				137.4	160.4	485	361.4	294.5	131.8	99.8	92.2	90.7
MEAN				4.43	5.73	15.6	12.0	9.50	4.39	3.22	2.97	3.02
MAX				7.5	12	31	21	18	6.9	4.5	6.1	10
MIN				3.3	4.4	10	8.4	4.1	3.1	2.0	2.3	1.5
(*)				4.00	4.32	7.22	5.52	4.75	3.09	2.52	2.64	2.86

* Diversion, in cubic feet per second, from city of Marlborough Easterly sewage treatment plant to unnamed tributary to Hager Pond. Records furnished by Marlborough Department of Public Works.

Table 17.--Streamflow data for site 8, Hager Pond Outlet near Marlborough (continued)

01098710 HAGER POND OUTLET AT MARLBOROUGH, MA												
DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978												
MEAN VALUES												
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.8	5.4	13	9.3	11	5.8	17	7.0	5.6	3.8	2.8	2.6
2	6.6	5.4	14	9.3	11	5.8	18	6.9	5.2	3.7	2.9	2.6
3	6.3	5.4	12	9.3	10	5.8	16	6.9	5.4	3.6	3.0	2.6
4	5.4	5.4	11	8.8	9.5	5.8	14	6.9	5.6	3.7	3.0	2.6
5	4.8	5.4	11	8.5	8.8	5.8	14	6.9	5.4	4.1	3.0	2.6
6	4.8	5.4	11	8.2	8.8	5.8	14	7.2	5.0	4.1	3.9	2.6
7	4.4	5.4	10	8.0	10	5.6	14	7.2	4.7	4.1	5.2	2.6
8	4.1	8.0	9.5	7.7	8.8	5.4	13	6.9	5.2	3.8	12	2.6
9	5.1	20	9.3	22	8.2	5.4	12	6.1	5.4	3.6	9.2	2.3
10	7.2	13	9.3	18	8.0	5.4	12	6.6	5.0	3.6	6.5	2.3
11	6.6	12	8.8	12	7.7	5.4	11	6.1	4.5	3.6	5.3	2.4
12	5.8	10	8.5	11	7.5	5.8	11	5.8	4.2	3.8	4.6	2.8
13	4.8	9.3	8.2	9.8	7.5	7.0	11	5.8	4.1	3.8	4.3	2.8
14	4.8	9.0	8.0	11	6.9	7.6	10	5.8	4.1	3.8	4.1	2.8
15	4.8	8.8	11	10	6.9	10	9.2	8.5	4.1	4.2	4.1	2.8
16	6.1	8.5	12	9.3	6.6	11	9.0	11	4.1	5.4	3.9	2.8
17	12	8.2	11	8.8	6.6	10	8.6	12	4.1	5.4	3.8	2.8
18	11	9.5	9.8	9.3	6.3	9.0	8.4	9.5	4.1	5.4	3.7	2.8
19	9.0	9.0	9.5	9.8	6.3	8.5	8.4	9.0	4.3	4.8	3.6	2.8
20	8.8	8.2	9.5	9.3	6.3	9.0	12	8.7	6.1	4.3	3.1	2.8
21	10	8.0	12	9.3	6.3	10	11	8.5	6.1	3.8	3.0	2.8
22	9.0	8.0	20	7.7	6.3	18	10	8.3	5.6	3.5	3.0	2.8
23	7.7	8.0	15	7.5	6.3	19	8.8	7.6	5.1	3.2	3.0	2.6
24	6.9	8.0	13	7.5	6.4	19	8.3	7.4	4.9	3.0	2.9	2.6
25	6.6	7.7	12	8.0	6.1	17	8.2	8.2	4.4	2.8	2.8	2.6
26	6.6	8.8	13	31	5.8	15	8.0	8.2	4.4	2.8	2.8	2.6
27	6.6	9.8	12	30	5.8	19	8.0	8.0	4.4	2.8	2.8	2.6
28	6.3	9.0	11	20	5.8	25	7.6	7.4	4.1	3.0	2.8	2.6
29	6.1	8.5	11	16	---	22	7.5	7.2	3.8	2.9	2.8	2.6
30	5.4	8.2	9.8	14	---	20	7.3	6.4	3.8	2.8	2.6	2.6
31	5.4	---	9.8	12	---	18	---	6.0	---	2.7	2.6	---
TOTAL	203.8	255.3	345.0	372.4	211.5	341.9	327.3	234.0	142.8	115.9	123.1	79.4
MEAN	6.57	8.51	11.1	12.0	7.55	11.0	10.9	7.55	4.76	3.74	3.97	2.65
MAX	12	20	20	31	11	25	18	12	6.1	5.4	12	2.8
MIN	4.1	5.4	8.0	7.5	5.8	5.4	7.3	5.8	3.8	2.7	2.6	2.3
(*)	4.10	4.55	5.40	5.26	3.85	5.52	5.31	3.89	3.22	2.75	2.94	2.82
CAL YR 1977	TOTAL	2657.3	MEAN	7.28	MAX	31	MIN	1.5				
WTR YR 1978	TOTAL	2752.4	MEAN	7.54	MAX	31	MIN	2.3				

* Diversion, in cubic feet per second, from city of Marlborough Easterly sewage treatment plant to unnamed tributary to Hager Pond. Records furnished by Marlborough Department of Public Works.

Table 17.--Streamflow data for site 8, Hager Pond Outlet near Marlborough (continued)

01098710 HAGER POND OUTLET AT MARLBOROUGH, MA

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.6	3.0	4.1	5.1	16	8.6	8.2	9.0	9.9	4.5	4.3	5.6
2	2.6	3.3	3.8	8.0	14	9.0	8.6	8.2	9.5	4.5	4.2	5.2
3	2.6	3.3	3.6	13	13	10	11	7.8	8.6	4.5	4.2	4.9
4	2.6	3.3	3.6	11	12	11	11	7.4	8.2	4.2	5.5	4.8
5	2.6	3.3	4.1	8.8	12	13	12	7.0	8.2	4.2	5.5	4.7
6	5.8	3.0	4.1	8.0	11	17	12	6.6	8.2	4.2	5.5	4.7
7	6.3	3.0	3.8	7.5	9.9	20	11	6.6	8.2	4.2	5.5	6.2
8	4.4	3.3	3.8	15	9.5	18	14	6.6	8.2	4.2	5.2	5.3
9	3.3	3.3	5.1	16	9.5	16	14	5.9	7.8	3.6	4.8	5.0
10	2.6	3.3	7.7	11	9.5	14	18	14	7.4	3.1	5.2	4.7
11	2.3	3.3	5.8	10	9.0	17	14	12	7.0	3.1	6.2	4.4
12	3.0	3.8	5.1	9.3	8.2	17	11	7.8	7.0	3.1	13	4.4
13	3.3	5.8	4.1	8.7	7.8	15	10	7.4	6.6	3.3	24	4.4
14	3.6	4.4	3.8	15	7.4	12	9.9	7.4	6.2	3.3	17	4.4
15	4.1	3.6	3.8	14	7.0	9.0	9.9	7.0	5.9	3.5	12	4.8
16	3.8	3.6	3.6	11	7.0	9.0	9.9	7.0	5.5	6.0	9.5	4.3
17	3.6	3.3	3.8	10	6.6	9.0	9.9	6.8	5.2	7.5	7.8	4.2
18	3.0	3.8	3.8	9.9	6.2	9.9	9.5	6.6	4.8	6.3	7.4	4.2
19	2.8	3.8	3.8	9.2	5.9	9.9	9.0	6.6	4.8	5.2	7.0	4.2
20	2.8	3.6	3.8	8.8	5.2	9.9	8.6	7.0	4.8	4.7	7.0	3.9
21	2.6	3.6	4.4	18	5.2	9.9	8.2	7.8	4.5	4.5	6.6	3.6
22	2.6	3.3	5.1	26	5.2	9.9	8.2	7.8	4.5	4.3	5.9	5.9
23	2.8	3.3	5.1	16	5.2	9.9	7.4	7.8	4.5	4.1	5.2	7.0
24	2.8	3.3	5.1	13	11	8.6	7.4	9.0	4.2	3.8	5.0	5.5
25	2.6	3.3	6.1	79	19	9.5	7.4	21	4.2	4.0	4.8	4.8
26	2.3	3.3	6.6	45	14	11	7.4	21	4.5	4.2	5.6	4.5
27	3.0	3.3	6.1	28	10	10	15	16	4.5	6.0	6.5	4.5
28	3.6	3.0	4.4	23	8.6	9.5	17	13	4.2	5.4	7.5	4.2
29	3.3	3.0	4.4	20	---	7.4	13	12	4.5	5.0	7.4	5.9
30	3.3	3.8	4.1	18	---	6.6	10	12	4.5	4.7	7.0	7.4
31	3.0	---	4.1	17	---	8.2	---	11	---	4.5	6.4	---
TOTAL	99.6	104.3	140.6	512.3	264.9	354.8	322.5	293.1	186.1	137.7	228.7	147.6
MEAN	3.21	3.48	4.54	16.5	9.46	11.4	10.8	9.45	6.20	4.44	7.38	4.92
MAX	6.3	5.8	7.7	79	19	20	18	21	9.9	7.5	24	7.4
MIN	2.3	3.0	3.6	5.1	5.2	6.6	7.4	5.9	4.2	3.1	4.2	3.6
(*)	3.70	3.59	4.04	6.48	4.60	5.52	5.14	4.56	3.74	3.12	3.77	3.43
CAL YR 1978	TOTAL	2292.8	MEAN	6.28	MAX	31	MIN	2.3				
WTR YR 1979	TOTAL	2792.2	MEAN	7.65	MAX	79	MIN	2.3				

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

MEAN VALUES					
DAY	OCT	NOV	DAY	OCT	NOV
1	7.4	7.0	21	6.6	---
2	7.4	7.0	22	7.4	---
3	8.2	16	23	7.4	---
4	11	18	24	7.4	---
5	10	13	25	7.0	---
6	9.0	9.9	26	6.6	---
7	8.6	---	27	6.6	---
8	8.6	---	28	6.6	---
9	8.2	---	29	6.6	---
10	7.8	---	30	7.0	---
			31	7.0	---
11	8.6	---			
12	9.0	---	TOTAL	248.7	---
13	11	---	MEAN	8.02	---
14	10	---	MAX	11	---
15	9.5	---	MIN	6.6	---
			(*)	4.32	4.89
16	8.6	---			
17	7.8	---			
18	7.4	---			
19	7.4	---			
20	7.0	---			

* Diversion, in cubic feet per second, from city of Marlborough Easterly sewage treatment plant to unnamed tributary to Hager Pond. Records furnished by Marlborough Department of Public Works.

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