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ACTIVITY SUMMARY

Technical Operations Section
Research Support Division

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Technical Operations Section
Research Support Division

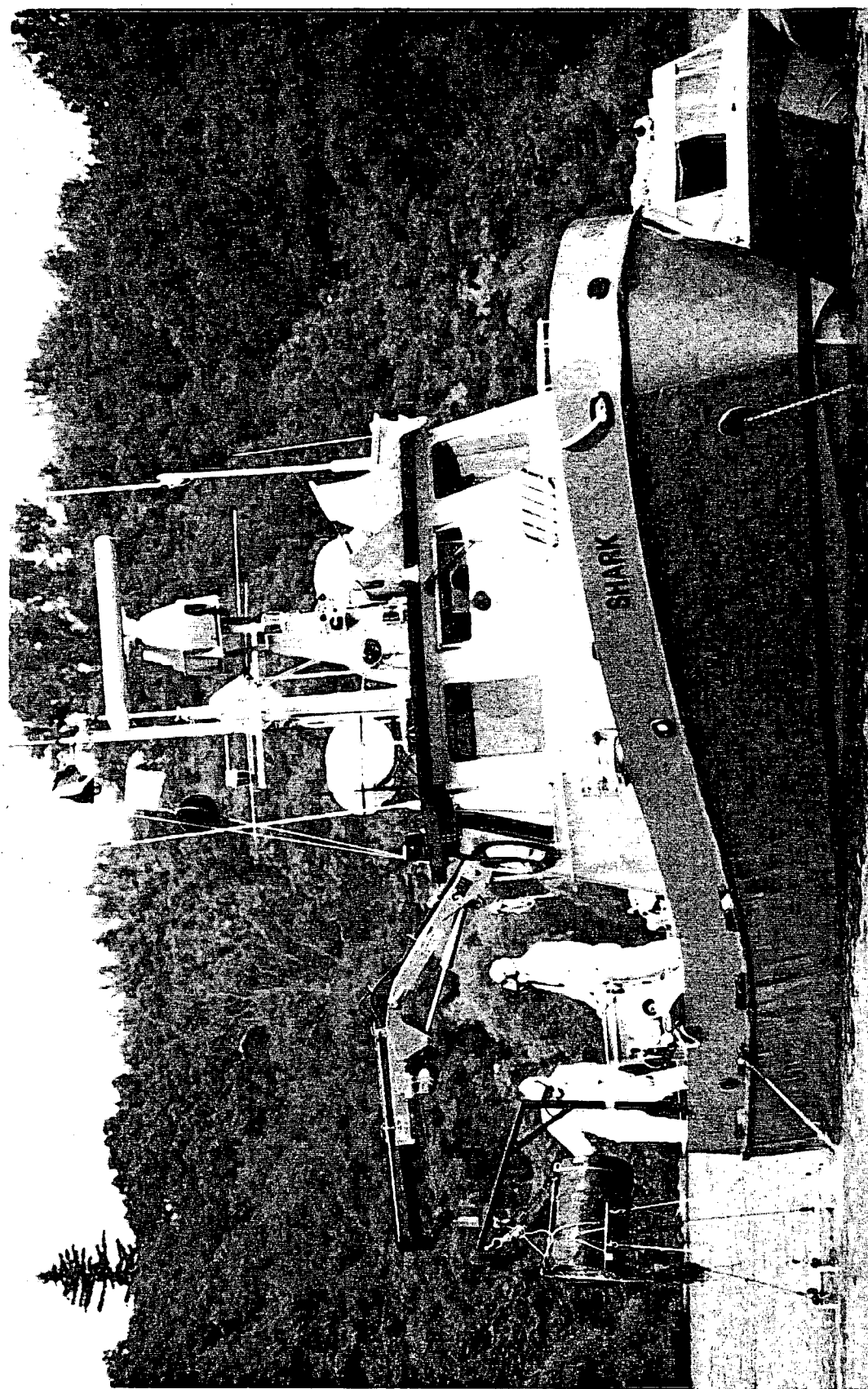


Photo by Harry Rosettani

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INTRODUCTION

Technical Operations Ship and Field sections of the Research Support Division provide a broad range of technical assistance to the scientific community of the National Water Research Institute, on a national scale. Personnel form the working link between scientists and mariners aboard Fisheries & Oceans major vessels such as LIMNOS and BAYFIELD, and minor vessels such as ADVENT and SHARK. Vessels under 15 ton, such as the P-Class PUFFIN, are utilized for nearshore investigations. Marine work for the most part takes place in the Great Lakes Watershed but frequently boats are trailered to or chartered at land-locked and distant areas such as Lake of the Woods and Great Slave Lake. Co-ordination of vessel and personnel movements is considerable, and great diversity of scientific field projects supported, some on short notice, have come to be associated with the sections.

Activities of the sections proceed year-round as scientific requirements for winter work and for snow and ice studies increase. The highly qualified Dive Unit operates in open water, under ice, and at specialized sites such as towers and water intakes. There is a rigging service and stores, with a fleet of vehicles, including a new crane truck to replace the 1970 model. A well-organized limnological and field equipment stores serves the Institute, as does a Video Studio.

This summary of activities is presented as Technical Operations completes 20 years of support to national water research programs at the Canada Centre for Inland Waters.

STAFF LIST

RESEARCH SUPPORT DIVISION

A/Chief, J.D. Smith
Administrative Officer
C. Kennedy
Secretary
S.R. Mitchell

Technical Operations Ship Section

Head, P.M. Healey
Officer-in-Charge, Ship, B.H. Moore
Officer-in-Charge, Ship, S.B. Smith

Sr. Marine Technologists

P.R. Youakim	CSS LIMNOS
T.J. Carew	CSS LIMNOS
E.H. Walker	CSS BAYFIELD; Groundwater

Marine Technologists

J.E. Tozer	CSS LIMNOS; Turkey Lakes Watershed
R.J. Hess	CSS LIMNOS; Hamilton Harbour; Ashbridges Bay
J.A. Kraft	CSS LIMNOS; Hamilton Harbour; Yamaska River
Y. Desjardins	WAVES '87; Yamaska River; CSS LIMNOS

Technical Operations Field Section

Head, W.B. Taylor	Secondment to Research & Applications Branch
A/Head, M.R. Mawhinney	(September - December)
Sr. Field Officer, M.R. Mawhinney	
A/Sr. Field Officer, B.H. Moore	(September - December)

Diving Operations

Head, F.H. Don	Hamilton Harbour
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Sr. Marine Technologists

L.E. Benner	CSS BAYFIELD; Canadian Wildlife Service
G.G. LaHaie	Turkey Lakes Watershed

Marine Technologists

G.D. Bruce	Diving; Hamilton Harbour
K.J. Hill	Diving; Hamilton Harbour

Rigging Unit

Head, L.J. Lomas	Yamaska River
H.E. Greencorn	Yamaska River; Vehicles (September-December)
G.M. Perigo	Vehicles (January - May); Retired May

NWRI Field Stores

W.D. Hunt

Students (May - September)

R.C. Ferguson, M.B. Marshall, R. Bett

OFFSHORE ACTIVITIES

LIMNOS

1987

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
JAN					1	2	3
	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	31
FEB	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
MAR	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31	1	2	3	4
APR	5	6	7	8	9	10	11
	12	13 LAKE	14 ONTARIO	15 SURVEILLANCE	16 LAKE	17 ONTARIO	18
	19	20	21 LAKE	22 ONTARIO	23 SEDIMENTS	24	25
	26	27 LAKE ERIE	28 SEDIMENT	29 LOADING	30 BENTHIC	1 STRUCTURE	2
MAY	3	4 UPPER LAKES	5 SURVEILLANCE	6 LAKE HURON	7 GEORGIAN BAY	8 NORTH CHANNEL	9 UPPER LAKES
	10 SURVEILLANCE	11 SAULT STE MARIE	12 LAKE	13 SUPERIOR	14 LAKE	15 SUPERIOR	16 LAKE
	17 SUPERIOR	18 ISLE ROYALE	19 LAKE	20 SUPERIOR	21 SAULT STE MARIE	22 UPPER	23 LAKES
	24 SURVEILLANCE	25	26	27	28	29	30
	31	1 LAKE	2 ONTARIO	3 MOORINGS	4 LAKE	5 ONTARIO	6
JUN	7	8	9	10	11	12	13
	14	15 ORGANIC	16 AND	17 INORGANIC	18 CONTAMINANTS	19 SAINT	20 LAWRENCE
	21 RIVER	22 ORGANIC	23 AND	24 INORGANIC	25 CONTAMINANTS	26 SAINT	27 LAWRENCE
	28 RIVER	29 ORGANIC	30 AND	1 INORGANIC	2 CONTAMINANTS	3 SAINT	4 LAWRENCE
JUL	5 RIVER	6 QUEBEC CITY	7 ORGANIC	8 AND	9 INORGANIC	10 CONTAMINANTS	11
	12	13 LAKE	14 ONTARIO	15 SURVEILLANCE	16 LAKE	17 ONTARIO	18 SURVEILLANCE
	19	20 LAKE ERIE	21 PISTON	22 CORING	23 BENTHIC	24 STRUCTURE	25 LAKE ERIE
	26	27 LAKE	28 ONTARIO	29 SEDIMENT	30 TRANSPORT	31 RADIONUCLIDES	1
AUG	2	3	4	5	6	7	8
	9	10 LAKE	11 ONTARIO	12 NUTRIENT	13 CONTAMINANT	14 INTERACTION	15
	16	17 LAKE	18 ONTARIO	19 SURVEILLANCE	20 LAKE	21 ONTARIO	22
	23	24 UPPER LAKES	25 SURVEILLANCE	26 LAKE	27 ERIE	28 LAKE	29 HURON
	30 NORTH	31 CHANNEL	1 GEORGIAN BAY	2 UPPER LAKES	3 SURVEILLANCE	4	5
SEP	6	7	8 ORGANIC	9 CONTAMINANTS	10 LAKE	11 HURON	12 LAKE
	13 ERIE	14 LAKE	15 ONTARIO	16 ORGANIC	17 CONTAMINANTS	18	19
	20	21 LAKE	22 ONTARIO	23 SURVEILLANCE	24 LAKE	25 ONTARIO	26
	27	28 LAKE	29 ONTARIO	30 SEDIMENT	1 BENTHIC FAUNA	2 SURVEY	3
OCT	4	5 L. ONTARIO	6 TRANSPORT	7 FATE TOXICS	8	9	10
	11	12	13 LAKE	14 ONTARIO	15 MOORINGS	16 L. ONTARIO	17
	18	19 LAKE ERIE	20 SEDIMENT	21 LOADING	22 BENTHIC	23 STRUCTURE	24
	25	26	27	28	29	30	31
NOV	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
DEC	29	30	1	2	3	4	5
	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30	31		

OPEN LAKES SURVEILLANCE

LAKE ONTARIO

RSD STUDY 86041, R. STEVENS, M. NIELSON, IW/LD-OR

The Lake Ontario Open Lakes Surveillance Program was designed to provide a continuing report and long-term trend information on water quality and eutrophication parameters in the Lower Great Lakes by Canada/U.S. Agreement as input to the Water Quality Board Annual Report to the International Joint Commission.

This ongoing Program was supported during the field season by the completion of four cruises on Lake Ontario (April 13 - 17, July 13 - 17, August 17 - 21 and September 21 - 25). All cruises were organized and completed by Technical Operations staff for IW/LD-OR and were conducted from the CSS LIMNOS operated by Bayfield Laboratories, DFO. The vessel was equipped with electronic bathythermograph, rosette/EBT water sampler, transmissometer, radar, Loran C positioning system and a variety of samplers and winches used for chemical and biological water sampling.

The parameters sampled during the cruises were: temperature profile, transmission profile, dissolved oxygen, specific conductance, pH, chlorophyll a, particulate organic carbon, particulate nitrogen, total phosphorus filtered and unfiltered, soluble reactive phosphorus, total Kjeldahl nitrogen, nitrate and nitrite, ammonia, reactive silicate, major ions, alkalinity, meteorological observations and Secchi disc observations from the shaded side of the vessel.

During the April cruise, water samples were collected only from the 1-metre depth. Sampling depths for the remaining three cruises during July, August and September were:

Unstratified Conditions - 1 metre, 10 metres, 25 metres, bottom minus 10 metres and bottom minus 2 metres

Stratified Conditions - 1 metre, 1 metre above thermocline, mid-thermocline, 1 metre below thermocline, 10 metres above bottom and 2 metres above bottom

On some of the Surveillance cruises, the Long Term Biological Index Monitoring Program in support of Great Lakes Laboratories for Fisheries & Aquatic Sciences, Bayfield Institute, DFO, was piggybacked. In support to this Program at Surveillance stations 41 and 81, additional samples were collected for: specific conductance, pH, total phosphorus filtered and unfiltered, soluble reactive phosphorus, ammonia, nitrate + nitrite, total Kjeldahl nitrogen, silica, chloride, alkalinity, chlorophyll a, particulate organic carbon, particulate organic nitrogen, phytoplankton, zooplankton and ash-free weight determinations.

Some additional tasks supported during the Surveillance Program included: Benthos Coring in support of RAB Study 84020, Satellite Drogue Installation, Study 82047, Trace Metal Sampling for RRB Study 83026, and Hamilton Harbour Cores for LRB study 82015.

STATISTICS SUMMARY

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CSS LIMNOS

DATES FROM April 13 TO September 25, 1987

LAKE ONTARIO

CRUISE TYPE Lower Lakes Surveillance

N. MILES STEAMED 2733

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	401	Moorings Established	2
EBT Casts	404	" Retrieved	
Rosette Casts	404	" Established	
Transmissometer Casts	402	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)	48	" Established	
Secchi Disc Observations	171	" Retrieved	
		" Refurbished	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m	401	Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Water Quality)		Cores Taken, Benthos	2
" " " (Trace Metals)	13		
" " " (D.O.)	1499	Grab Samples Taken	
" " " (Cond/pH)	1499		
" " " ()		Bulk Centrifuge Samples	
" " " (T P u f)	1621		
" " " (TKN)	1609	Observations, Weather	110
" " " (TDS)	25		
" " " (Contaminants)	32	CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	486	Solar Radiation	
" " " (POC/TPN)	547		
" " " (Seston)	28		
" " " (T P f)	1621		
" " " (Nutrients)	156	ONBOARD ANALYSES	
" " " (Major Ions)	1621		
" " " ()		Manual Chemistry Tech. Ops.	4597
" " " ()		Nutrients (WOB)	1041
" " " ()		Microbiology	
" " " ()			

SURVEILLANCE STATIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1	43° 18' 48"	79° 45' 06"
2	43° 20' 24"	79° 39' 54"
3	43° 16' 06"	79° 37' 12"
5	43° 25' 30"	79° 39' 30"
6	43° 28' 00"	79° 31' 48"
7	43° 32' 48"	79° 29' 18"
8	43° 37' 24"	79° 27' 12"
9	43° 35' 12"	79° 23' 42"
10	43° 40' 06"	79° 16' 00"
11	43° 35' 06"	79° 18' 42"
12	43° 30' 12"	79° 21' 12"
13	43° 25' 00"	79° 24' 00"
14	43° 23' 36"	79° 29' 12"
15	43° 19' 00"	79° 26' 36"
16	43° 16' 18"	79° 21' 36"
17	43° 13' 30"	79° 16' 18"
18	43° 18' 12"	79° 16' 42"
19	43° 23' 00"	79° 17' 06"
20	43° 20' 18"	79° 11' 48"
21	43° 18' 00"	79° 07' 12"
22	43° 17' 48"	79° 00' 18"
23	43° 22' 12"	79° 04' 00"
24	43° 26' 24"	79° 07' 42"
25	43° 31' 00"	79° 04' 48"
26	43° 36' 30"	79° 01' 00"
27	43° 42' 12"	78° 57' 24"
28	43° 46' 30"	78° 51' 18"
29	43° 49' 48"	78° 52' 12"
30	43° 49' 48"	78° 39' 42"
31	43° 53' 12"	78° 27' 36"
32	43° 47' 00"	78° 26' 18"
33	43° 35' 48"	78° 48' 06"
34	43° 27' 42"	78° 45' 36"
35	43° 21' 36"	78° 43' 48"
36	43° 29' 30"	78° 23' 12"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
37	43° 23' 30"	78° 22' 12"
38	43° 23' 00"	77° 59' 24"
39	43° 29' 12"	78° 00' 00"
40	43° 35' 24"	78° 00' 42"
41	43° 43' 00"	78° 01' 36"
42	43° 50' 24"	78° 02' 18"
43	43° 57' 00"	78° 03' 00"
44	43° 52' 54"	77° 54' 30"
45	43° 49' 12"	77° 47' 00"
46	43° 53' 06"	77° 41' 24"
47	43° 57' 06"	77° 35' 18"
48	43° 51' 42"	77° 31' 30"
49	43° 46' 18"	77° 26' 18"
52	43° 26' 00"	77° 42' 42"
53	43° 21' 00"	77° 42' 42"
54	43° 24' 48"	77° 34' 30"
55	43° 26' 36"	77° 26' 18"
56	43° 21' 36"	77° 30' 54"
57	43° 16' 30"	77° 35' 30"
58	43° 19' 42"	77° 26' 18"
59	43° 22' 54"	77° 17' 54"
60	43° 34' 48"	77° 12' 00"
61	43° 47' 12"	77° 09' 30"
62	43° 52' 48"	77° 00' 00"
63	43° 43' 54"	77° 01' 00"
64	43° 31' 30"	76° 55' 36"
65	43° 25' 24"	76° 53' 00"
66	43° 20' 00"	76° 50' 24"
67	43° 24' 30"	76° 47' 42"
68	43° 31' 48"	76° 43' 54"
69	43° 36' 24"	76° 42' 48"
70	43° 32' 30"	76° 37' 06"
71	43° 28' 36"	76° 31' 36"
72	43° 33' 00"	76° 31' 30"
73	43° 38' 00"	76° 17' 18"
74	43° 45' 00"	76° 31' 06"
75	43° 50' 36"	76° 21' 18"
76	43° 57' 00"	76° 10' 30"
77	43° 57' 24"	76° 24' 30"
78	44° 05' 00"	76° 24' 24"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
79	44° 04' 30"	76° 31' 18"
80	44° 08' 30"	76° 36' 36"
81	44° 01' 00"	76° 40' 18"
82	44° 04' 00"	76° 48' 42"
83	44° 00' 00"	76° 50' 36"
84	43° 53' 12"	76° 44' 00"
85	43° 45' 00"	79° 05' 00"
86	43° 15' 18"	79° 11' 42"
87	43° 17' 54"	77° 31' 06"
88	43° 35' 18"	76° 25' 00"
89	43° 41' 54"	76° 25' 00"
90	44° 08' 12"	76° 49' 30"
91	43° 55' 12"	78° 18' 24"
93	43° 19' 36"	78° 52' 06"
94	43° 19' 30"	77° 13' 00"
95	43° 18' 48"	77° 00' 00"
96	43° 13' 24"	79° 26' 48"
97	43° 57' 42"	76° 07' 18"
98	43° 56' 06"	76° 13' 54"
100	44° 08' 12"	76° 19' 48"
101	44° 11' 36"	76° 18' 36"
102	44° 12' 12"	76° 14' 12"
103	44° 12' 12"	76° 32' 36"
104	43° 17' 15"	79° 50' 00"

LAKE HURON/GEORGIAN BAY

RSD STUDY 86041, MS. M. NEILSON, IW/LD-OR

The Lake Huron/Georgian Bay Open Lakes Surveillance Program was designed to provide a continuing report and long-term trend information on water quality and eutrophication parameters in the Upper Great Lakes under the Canada/U.S. Agreement as input to the Water Quality Board Annual Report to the International Joint Commission.

Two cruises were conducted during the months of May and August in support of this Program. Both cruises were organized and completed by Tech. Ops. staff for IW/LD-OR and were conducted from the CSS LIMNOS. The vessel was equipped with the usual scientific equipment: electronic bathythermograph, rosette/EBT water sampler,

transmissometer, radar, Loran C positioning system and a variety of samplers and winches used for chemical and biological water sampling.

The parameters sampled during the May cruise were: temperature profile, transmission profile, dissolved oxygen, specific conductance, pH, chlorophyll a, particulate organic carbon, particulate nitrogen, total phosphorus filtered and unfiltered, soluble reactive phosphorus, nitrate and nitrite, ammonia, reactive silicate, major ions, alkalinity, meteorological observations and Secchi disc observations.

During the August cruise, the following parameters were sampled: temperature profile, transmission profile, dissolved oxygen, specific conductance, pH, chlorophyll a, particulate organic carbon, particulate nitrogen, total phosphorus filtered and unfiltered, reactive silicate, major ions, meteorological observations and Secchi disc observations.

During the May cruise, water samples were collected only from the 1-metre depth. Sampling depths for the August cruise were:

Unstratified Conditions - 1 metre, mid-depth if station depth was greater than 50 metres, bottom minus 10 metres and bottom minus 2 metres

Stratified Conditions - 1 metre, 2 metres above thermocline, mid-thermocline, 2 metres below thermocline, bottom minus 10 metres and bottom minus 2 metres

Some of the additional tasks supported during the Program included: phytoplankton sampling for Dr. M. Munawar of GLLFAS Study 86042, Metal Analysis Study 83026, Box Coring Study 82015 and Organic Sampling for Dr. K.R. Lum, Study 82042.

LAKE SUPERIOR

RSD STUDY 86041, MS. M. NEILSON, IW/LD-OR

The Lake Superior Open Lakes Surveillance Program was designed to provide a continuing report and long-term trend information on water quality and eutrophication parameters in the Upper Great Lakes by Canada/U.S. Agreement as input to the Water Quality Board Annual Report to the International Joint Commission.

One cruise was conducted during the month of May from the CSS LIMNOS on Lake Superior. This cruise was organized and completed by Tech. Ops. staff for IW/LD-OR. The vessel was equipped with the usual scientific equipment: electronic bathythermograph, rosette/EBT sampler, transmissometer, radar, Loran C positioning system and a

variety of samplers and winches used for chemical and biological water sampling.

The parameters sampled during the cruise were: temperature profile, transmission profile, dissolved oxygen, specific conductance, pH, particulate nitrogen, total phosphorus filtered and unfiltered, soluble reactive phosphorus, total Kjeldahl nitrogen, nitrate and nitrite, ammonia, reactive silicate, alkalinity, major ions, meteorological observations and Secchi disc observations. All water samples were collected from the 1-metre depth during the cruise.

STATISTICS SUMMARY

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DATES FROM May 9 May 11, 1987
August 26 TO September 1, 1987
CRUISE TYPE Upper Lakes Surveillance

SHIP CSS LIMNOS
LAKE HURON
N. MILES STEAMED 2038.8

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	134	Moorings Established	
EBT Casts	134	" Retrieved	
Rosette Casts	134	" Established	
Transmissometer Casts	109	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)	32	" Established	
Secchi Disc Observations	69	" Retrieved	
		" Refurbished	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m	140	Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Water Quality)	389	Cores Taken	
" " " ()			
" " " (D.O.)	384	Grab Samples Taken	
" " " (Cond/pH)	384		
" " " (DOC)	18	Bulk Centrifuge Samples	
" " " (T P u f)	389		
" " " (TKN)	94	Observations, Weather	77
" " " (Contaminants)	18		
" " " ()		CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	197	Solar Radiation	
" " " (POC/TPN)	183		
" " " (Seston)			
" " " (T P f)	389		
" " " (Nutrients)	94	ONBOARD ANALYSES	
" " " (Major Ions)	389		
" " " (Mg, K, Na)	21	Manual Chemistry Tech. Ops.	1152
" " " ()		Nutrients (WOB)	118
" " " ()		Microbiology	
" " " ()			

SAMPLING STATION POSITIONS

LAKE HURON

STATION NUMBER	LATITUDE N.	LONGITUDE N.
1	43° 05' 23"	82° 23' 28"
3	43° 15' 26"	82° 02' 16"
4	43° 19' 28"	81° 47' 18"
5	43° 32' 56"	81° 44' 42"
7	43° 20' 33"	82° 30' 24"
8	43° 33' 59"	82° 29' 09"
9	43° 38' 05"	82° 12' 58"
10	43° 45' 11"	81° 46' 54"
11	43° 57' 23"	81° 47' 13"
12	43° 53' 26"	82° 03' 26"
13	43° 45' 17"	82° 34' 07"
14	43° 56' 34"	82° 40' 00"
17	44° 06' 02"	82° 51' 59"
20	44° 12' 58"	83° 05' 00"
23	44° 19' 58"	83° 17' 59"
27	44° 11' 54"	82° 30' 07"
29	44° 22' 10"	81° 50' 08"
30	44° 29' 05"	81° 27' 20"
32	44° 27' 12"	82° 20' 33"
33	44° 30' 02"	82° 49' 56"
34	44° 38' 23"	83° 13' 53"
36	45° 02' 07"	83° 22' 49"
38	44° 44' 26"	82° 03' 43"
39	44° 39' 21"	81° 22' 47"
40	44° 53' 54"	81° 26' 12"
41	45° 05' 01"	81° 32' 22"
42	45° 13' 16"	81° 49' 12"
43	45° 00' 49"	82° 00' 30"
44	45° 00' 54"	82° 41' 09"
47	45° 15' 18"	83° 20' 43"
48	45° 16' 39"	82° 27' 08"
50	45° 31' 54"	82° 02' 28"
52	45° 38' 47"	82° 38' 42"
54	45° 30' 59"	83° 25' 01"
55	45° 23' 29"	83° 39' 10"

STATION NUMBER		LATITUDE N.	LONGITUDE N.
56		45° 31' 00"	84° 05' 07"
58		45° 52' 02"	83° 15' 45"
59		45° 45' 42"	83° 01' 43"
60		45° 54' 02"	83° 31' 05"
61		45° 45' 00"	83° 54' 58"
62		45° 40' 33"	84° 11' 15"
63		45° 42' 12"	84° 30' 47"
64		45° 48' 44"	84° 44' 58"
65		45° 50' 38"	84° 33' 56"
66		45° 51' 47"	84° 17' 45"
67		45° 56' 11"	83° 53' 58"
68		46° 02' 32"	83° 51' 11"
69		46° 04' 45"	84° 01' 46"
70		46° 08' 12"	83° 40' 21"
71		46° 14' 00"	83° 44' 45"
73		46° 11' 12"	83° 21' 14"
76		46° 00' 03"	83° 25' 56"
77		45° 58' 10"	83° 11' 49"
79		46° 07' 27"	82° 53' 11"
82		45° 56' 15"	82° 45' 31"
83		45° 59' 57"	82° 32' 59"
84		46° 05' 32"	82° 33' 27"
87		46° 03' 44"	82° 11' 52"
88		46° 03' 16"	81° 59' 56"
89		45° 55' 02"	82° 09' 38"
95)		44° 12' 48"	83° 22' 18"
96)		44° 07' 38"	83° 10' 10"
97)		44° 06' 55"	83° 31' 45"
98)	Saginaw Bay	43° 58' 37"	83° 34' 28"
99)		43° 54' 30"	83° 44' 25"
)			
100)		43° 49' 30"	83° 49' 06"
101)		43° 49' 11"	83° 37' 33"

STATISTICS SUMMARY

15

DATES FROM May 9 September 1 TO May 11, 1987 September 3, 1987
CRUISE TYPE Upper Lakes Surveillance

SHIP CSS LIMNOS
LAKE GEORGIAN BAY
N. MILES STEAMED 845.6

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	52	Moorings Established	
EBT Casts	45	" Retrieved	
Rosette Casts	48	" Established	
Transmissometer Casts	45	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)	16	" Established	
Secchi Disc Observations	28	" Retrieved	
		" Refurbished	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m	52	Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Water Quality)	179	Cores Taken	
" " " ()			
" " " (D.O.)	160	Grab Samples Taken	
" " " (Cond/pH)	160		
" " " ()		Bulk Centrifuge Samples	
" " " (T P u f)	179		
" " " (TKN)		Observations, Weather	
" " " (Contaminants)	7		
" " " ()		CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	72	Solar Radiation	
" " " (POC/TPN)	74		
" " " (Seston)			
" " " (T P f)	179		
" " " (Nutrients)	179	ONBOARD ANALYSES	
" " " (Major Ions)	149		
" " " ()		Manual Chemistry Tech. Ops.	480
" " " ()		Nutrients (WOB)	90
" " " ()		Microbiology	
" " " ()			

SAMPLING STATION POSITIONS

GEORGIAN BAY

STATION NUMBER	LATITUDE N.	LONGITUDE N.
1	44° 43' 00"	80° 51' 25"
3	44° 43' 28"	80° 36' 55"
4	44° 38' 44"	80° 10' 02"
5	44° 47' 46"	80° 14' 59"
6	44° 44' 12"	80° 26' 07"
8	44° 57' 14"	80° 08' 10"
9	44° 52' 19"	79° 58' 01"
11	44° 55' 19"	80° 36' 22"
12	44° 55' 11"	80° 52' 29"
15	45° 10' 03"	80° 17' 50"
16	45° 21' 17"	80° 29' 18"
17	45° 14' 43"	80° 52' 29"
19	45° 04' 01"	81° 15' 13"
21	45° 21' 56"	81° 11' 25"
24	45° 40' 44"	80° 50' 21"
26	45° 50' 04"	80° 54' 02"
27	45° 52' 02"	81° 00' 04"
29	45° 34' 59"	81° 05' 05"
31	45° 14' 26"	81° 26' 34"
33	45° 22' 13"	81° 35' 06"
35	45° 31' 40"	81° 40' 06"
36	45° 42' 29"	81° 37' 15"
39	45° 52' 24"	81° 15' 35"
42	45° 54' 42"	81° 35' 47"

STATISTICS SUMMARY

17

CRUISE NO. 87-03-001 CONSECUTIVE NO. 301 SHIP CSS LIMNOS
 DATES FROM May 12 TO May 21, 1987 LAKE SUPERIOR
 CRUISE TYPE Upper Lakes Surveillance N. MILES STEAMED 1461.9

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	76	Moorings Established	
EBT Casts	75	" Retrieved	
Rosette Casts	76	" Established	
Transmissometer Casts	75	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)	16	" Established	
Secchi Disc Observations	31	" Retrieved	
		" Refurbished	
Zooplankton Hauls	30	" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
Integrator 50 m	110	Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Water Quality)	98	Cores Taken	
" " " ()			
" " " (D.O.)	98	Grab Samples Taken	
" " " (Cond/pH)	196		
" " " (Lead)	9	Bulk Centrifuge Samples	
" " " (T P u f)	98		
" " " (TKN)		Observations, Weather	58
" " " (DOC)	29		
" " " (Contaminants)	21	CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	82	Solar Radiation	
" " " (POC/TPN)	90		
" " " (Seston)			
" " " (T P f)	98		
" " " (Nutrients)	98	ONBOARD ANALYSES	
" " " (Major Ions)	98		
" " " (MI(Na, K, Mg))	29		
" " " ()			
" " " ()		Manual Chemistry Tech. Ops.	294
" " " ()		Nutrients (WOB)	98
" " " ()		Microbiology	
" " " ()			

SAMPLING STATION POSITIONS

LAKE SUPERIOR

STATION NUMBER	LATITUDE N.	LONGITUDE N.
1	46° 29' 00"	84° 49' 58"
2	46° 32' 35"	84° 44' 58"
3	46° 36' 03"	84° 35' 29"
6	46° 44' 37"	84° 54' 56"
8	46° 53' 31"	84° 40' 03"
11	47° 18' 29"	84° 39' 44"
12	47° 02' 09"	85° 06' 10"
17	46° 42' 50"	85° 49' 06"
22	46° 58' 06"	85° 43' 41"
23	47° 12' 47"	85° 37' 56"
25	47° 27' 19"	85° 16' 33"
28	47° 35' 00"	85° 03' 52"
30	47° 43' 14"	85° 08' 22"
31	47° 54' 52"	84° 54' 44"
34	47° 49' 47"	85° 12' 13"
35	47° 55' 53"	85° 16' 12"
39	47° 41' 18"	85° 58' 17"
43	47° 02' 55"	86° 25' 16"
50	46° 30' 28"	86° 34' 00"
51	46° 30' 57"	87° 19' 57"
52	46° 33' 56"	87° 19' 56"
62	47° 09' 55"	87° 38' 40"
68	47° 01' 03"	88° 10' 54"
69	46° 51' 42"	88° 25' 45"
70	47° 02' 59"	88° 17' 59"
80	47° 34' 59"	86° 57' 10"
84	48° 06' 40"	86° 18' 03"
89	48° 41' 56"	86° 25' 12"
92	48° 35' 01"	86° 33' 51"
95	48° 13' 09"	87° 01' 08"
100	48° 45' 19"	86° 58' 37"
101	48° 44' 03"	87° 09' 58"
102	48° 36' 53"	87° 26' 14"
105	48° 44' 01"	87° 33' 52"
106	48° 34' 29"	88° 07' 04"

STATION NUMBER	LATITUDE N.	LONGITUDE N.
113	48° 08' 44"	87° 42' 14"
121	47° 29' 04"	87° 50' 00"
125	47° 36' 22"	88° 13' 01"
127	47° 50' 53"	88° 20' 31"
130	48° 06' 30"	88° 27' 24"
133	48° 17' 00"	88° 35' 53"
135	48° 19' 52"	88° 38' 05"
136	48° 17' 26"	88° 49' 52"
137	48° 18' 08"	88° 57' 00"
138	48° 25' 01"	88° 56' 00"
139	48° 17' 55"	89° 10' 47"
140	48° 09' 02"	89° 08' 54"
149	47° 53' 00"	89° 38' 24"
152	47° 41' 15"	89° 27' 59"
155	47° 48' 13"	89° 08' 53"
155A	47° 50' 35"	89° 12' 25"
157	47° 36' 52"	89° 59' 56"
164	47° 01' 38"	89° 02' 15"
164A	47° 02' 33"	88° 58' 04"
165	46° 53' 31"	89° 20' 48"
169	47° 12' 18"	89° 40' 05"
171	47° 26' 57"	89° 55' 13"
177	47° 42' 58"	90° 19' 58"
180	47° 28' 01"	90° 51' 17"
185	47° 06' 01"	90° 27' 45"
187	46° 59' 05"	90° 20' 26"
189	46° 50' 40"	90° 11' 16"
192	46° 41' 57"	90° 01' 56"
193	46° 37' 59"	90° 17' 57"
196	46° 44' 54"	90° 42' 04"
198	47° 00' 38"	90° 58' 58"
201	47° 07' 51"	91° 06' 44"
203	47° 13' 22"	91° 12' 17"
205	47° 03' 14"	91° 34' 04"
207	47° 00' 09"	91° 30' 57"
211	46° 50' 11"	91° 20' 45"
212	46° 44' 59"	91° 40' 35"
216	46° 54' 19"	91° 48' 54"
218	46° 49' 01"	91° 53' 08"
220	46° 42' 17"	91° 57' 55"
221	46° 46' 53"	92° 03' 09"

SEDIMENT/BENTHIC/GEOLOGICAL SAMPLING

HAMILTON HARBOUR

BOX CORES

LRB STUDY 82064, DR. B.K. BURNISON

Box cores were collected at the start of cruises 87-00-002, 87-01-003 and 87-01-007 on the CSS LIMNOS from station 1H in Hamilton Harbour. Cores were subsectioned onboard the vessel and returned to the laboratory to assess the effect of nutrients on the biodegradation rates of selected organic contaminants and to determine the effect of added contaminants on the biological activity of algae and bacteria.

STATION POSITION

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1H	43° 16' 17"	79° 52' 22"

LAKE ERIE

BENTHIC COMMUNITY STRUCTURE

LRB STUDY 82015, DR. T. REYNOLDSON

Three Lake Erie cruises were carried out onboard the CSS LIMNOS-- April 27 - May 1, July 20 - 24 and October 19 - 23. Two other cruises were piggybacked on the Upper Lakes Surveillance cruises in May and August. Samples were collected May 23 - 25 and August 24 - 26. On each cruise, box cores were collected and subsampled onboard. A water chemistry profile of dissolved oxygen and conductivity together with EBT/transmissometer profiles to the bottom were obtained.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 29' 53"	79° 53' 59"
84	41° 55' 49"	81° 39' 16"
357	41° 49' 45"	82° 58' 17"
358	41° 53' 40"	82° 52' 00"

LAKE ERIE

INTERNAL SEDIMENT LOADING

LRB STUDY 82016, F. ROSA

Two Lake Erie cruises were carried out onboard the CSS LIMNOS-- April 27 - May 1 and October 19 - 23. On each cruise, meteorological observations were made every three hours and sediment cores collected and subsampled onboard. The following water chemistry profiles were collected, together with EBT/transmissometer profiles to the bottom and Secchi disc observations:

1. A 10 m integrated water sample was collected for chlorophyll a, particulate organic carbon and Seston weight
2. Water samples were collected from the rosette water sampler for dissolved oxygen, conductivity, pH, chlorophyll a, particulate organic carbon, Seston weight, total phosphorus filtered and unfiltered. Sampling depths were 1 m, sediment trap depths, and bottom -1 m
3. Bulkwater samples (1200L) were collected from 5 m and centrifuged onboard for suspended particulate

The following support was also performed for this study:

1. At station 84, a winter sediment trap mooring was retrieved and a regular mooring installed. This was refurbished once during the season on July 22 and removed on the last cruise. The sediment trap depths were 15, 21 and 24 metres
2. At stations 23 and 84, a combination current meter and sediment trap mooring was installed for the winter

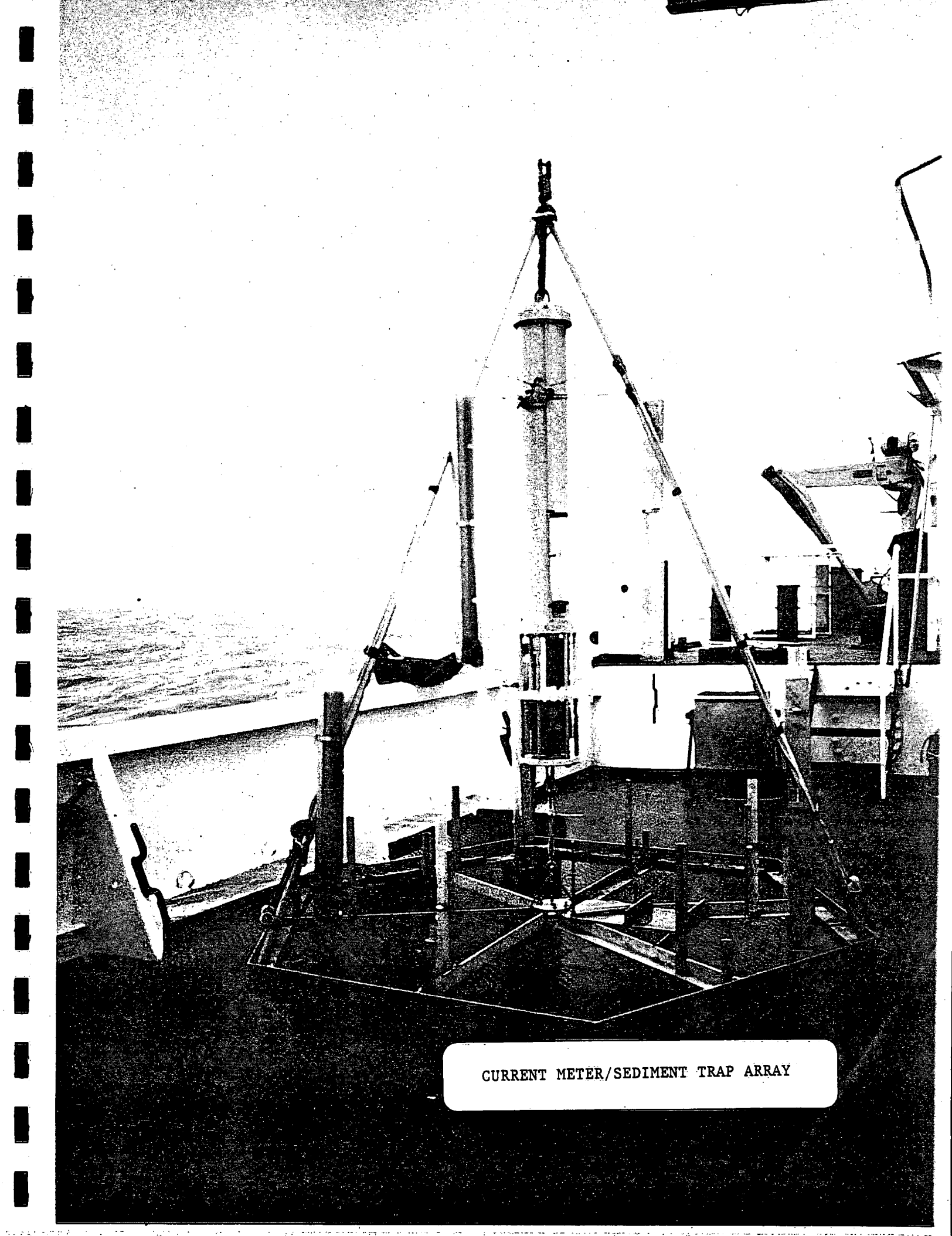
3. At station 358, a combination RSS and current meter mooring was installed for the winter
4. At stations 23, 84 and 357, a box core was collected and the top 1 cm removed and preserved

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 29' 48"	79° 53' 56"
84	41° 55' 51"	81° 38' 59"
357	41° 49' 47"	82° 58' 09"

MOORING POSITIONS

STATION NUMBER	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	TRAP DEPTH	C.M. DEPTH
23	87-01AC-06A	43° 29' 51"	79° 53' 57"	15,40,60	63
84	87-01AC-07A	41° 55' 30"	81° 39' 08"	15, 21	24
357	87-01AC-08A	41° 50' 11"	82° 57' 45"	8	10



CURRENT METER/SEDIMENT TRAP ARRAY

STATISTICS SUMMARY

24

DATES FROM April 27 May 1
October 19 TO October 23

SHIP CSS LIMNOS

LAKE ERIE

CRUISE TYPE INTERNAL SEDIMENT LOADING

N. MILES STEAMED 896.9

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	15	Moorings Established	3
EBT Casts	12	" Retrieved	2
Rosette Casts	7	" Established	
Transmissometer Casts	12	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)	2	" Established	
Secchi Disc Observations		" Retrieved	
		" Refurbished	
Zooplankton Hauls		" Serviced	
Integrator 10 m	1	" Serviced	
Integrator 20 m	5	Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	33
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Water Quality)		Cores Taken, Benthos	1
" " " ()			
" " " (D.O.)	38	Grab Samples Taken	
" " " (Cond/pH)	11		
" " " ()		Bulk Centrifuge Samples , 1200L	7
" " " (T P u f)	16		
" " " (TKN)		Observations, Weather	29
" " " ()			
" " " ()		CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	21	Solar Radiation	
" " " (POC/TPN)	21		
" " " (Seston)	7		
" " " (T P f)	16		
" " " (Nutrients)		ONBOARD ANALYSES	
" " " (Major Ions)			
" " " (Chlorides)	6	Manual Chemistry Tech. Ops.	49
" " " ()		Nutrients (WOB)	
" " " ()		Microbiology	
" " " ()			

LAKE ERIE

GEOTECHNICAL CORING

LRB STUDY 82017, A.J. ZEKMAN

The purpose of this Study was to determine shallow stratigraphy, geotechnical properties and sedimentology in the three basins in Lake Erie and to understand and quantify physical processes that control erosion, entrainment and transport of freshly-deposited cohesive sediments. This Study was supported during a CSS LIMNOS cruise on Lake Erie the week of July 20 - 25 in conjunction with a Benthic Community Structure Cruise.

Ten stations were sampled during the cruise, representing the three basins of the lake. At each station, a box core was collected from which four subsamples were taken. Each subsample of the box corer was taken to the maximum penetration of that core using a 5 cm diameter core liner. All subsamples were stored at 4°C until returned to CCIW Sedimentology Laboratory for geotechnical testing.

A major additional task during this cruise was completed in support of RSD Study 86042. Seven piston cores, and six Benthos cores from the Long Point Bay area, one piston core plus one Benthos core from the Western Basin of Lake Erie were collected. Low frequency (7 and 32 KHz) echo sounding transects were completed in all basins of the lake. In the Long Point Bay area, the sidescan sonar was used in conjunction with the echo sounding profiler. The purpose of this Study was to describe the sedimentology and paleontology of offshore subsurface Lake Erie sediments and interpret late glacial and post-glacial lake history. This Study was completed in support of Dalhousie University in collaboration with Geological Survey of Canada.

STATISTICS SUMMARY

26

CRUISE NO. 87-01-003 CONSECUTIVE NO. 103

SHIP CSS LIMNOS

DATES FROM July 20 TO July 27, 1987

LAKE ERIE

CRUISE TYPE Geotechnical Coring and Benthic Community Structure

N. MILES STEAMED 642.5

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	20	Moorings Established	
EBT Casts	11	" Retrieved	
Rosette Casts	5	" Established	
Transmissometer Casts	11	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)		" Established	
Secchi Disc Observations	2	" Retrieved	
	3	" Refurbished, Sediment Trap	1
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	15
		Cores Taken, Gravity	8
Water Samples Collected (Microbiology)		Cores Taken, Piston	9
" " " (Water Quality)		Cores Taken	
" " " ()			
" " " (D.O.)	28	Grab Samples Taken	
" " " (Cond/pH)			
" " " ()		Bulk Centrifuge Samples	
" " " (T P uf)	5		
" " " (TKN)		Observations, Weather	
" " " (Sediment Trap)	3		
" " " ()		CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	5	Solar Radiation	
" " " (POC/TPN)			
" " " (Seston)			
" " " (T P f)	5		
" " " (Nutrients)		ONBOARD ANALYSES	
" " " (Major Ions)			
" " " ()		Manual Chemistry Tech. Ops.	28
" " " ()		Nutrients (WOB)	
" " " ()		Microbiology	
" " " ()			

INTERNAL LOADING AND BENTHIC COMMUNITY STRUCTURE

STATION POSITIONS

STATION NUMBER		LATITUDE N.	LONGITUDE W.
9		42° 25' 02"	81° 15' 50"
23		42° 29' 51"	79° 54' 01"
84	(87-01A-05B)	41° 55' 39"	81° 39' 25"
85		41° 52' 14"	82° 05' 59"
298		41° 43' 31"	82° 10' 40"
357		41° 49' 42"	82° 58' 14"
358		41° 53' 40"	82° 52' 02"
E454		42° 33' 34"	80° 36' 39"
E468		42° 34' 33"	80° 39' 55"
E490		42° 35' 52"	80° 43' 55"
E517		42° 36' 59"	80° 48' 18"
PC-1		42° 42' 12"	80° 03' 47"
PC-2		42° 40' 50"	79° 56' 48"
PC-3		42° 39' 41"	79° 56' 02"
PC-4		41° 54' 18"	82° 45' 03"
PC-5		42° 06' 46"	82° 02' 21"
PC-6		42° 41' 14"	79° 56' 21"
PC-7		42° 41' 11"	79° 56' 24"
PC-8		42° 43' 52"	79° 58' 35"
PC-9		42° 44' 12"	79° 58' 37"

LAKE ONTARIO

SEDIMENT AND BENTHIC FAUNA SURVEY

RRB STUDY 88514, DR. R.L. THOMAS

In order to update data on both surficial sediment and benthic fauna of Lake Ontario, Cruise 87-00-010 was conducted aboard the CSS LIMNOS. Stations were laid out in a grid and were the same stations as sampled in a similar survey in 1977. At each station, a double Shipek was obtained and subsampled. Due to weather problems, only 65 stations were sampled and the majority of these were in the Eastern Basin. The remaining samples will be collected in the 1988-1989 field year. Box cores were obtained at 3 stations and additional samples were taken by double Shipek to obtain comparison data between the box core and the double Shipek.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
C-31	43° 21' 03"	76° 48' 04"
D-29	43° 26' 03"	76° 59' 56"
D-31	43° 26' 06"	76° 47' 59"
D-32	43° 26' 03"	76° 41' 57"
E-22	43° 29' 58"	77° 41' 56"
E-24	43° 29' 59"	77° 29' 56"
E-30	43° 30' 05"	76° 53' 09"
E-31	43° 30' 10"	76° 47' 08"
E-32	43° 30' 04"	76° 41' 54"
E-33	43° 34' 14"	76° 36' 01"
E-34	43° 39' 56"	76° 30' 00"
F-21	43° 33' 58"	77° 47' 53"
F-23	43° 34' 05"	77° 35' 56"
F-25	43° 34' 08"	77° 23' 13"
F-27	43° 34' 08"	77° 12' 01"
F-29	43° 34' 08"	76° 59' 54"
F-31	43° 34' 12"	76° 47' 56"
F-32	43° 34' 08"	76° 41' 03"
F-33	43° 34' 06"	76° 36' 04"
F-34	43° 34' 02"	76° 30' 03"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
F-35	43° 34' 05"	76° 24' 33"
F-36	43° 35' 02"	76° 17' 07"
G-20	43° 38' 57"	77° 53' 52"
G-22	43° 39' 00"	77° 42' 04"
G-24	43° 38' 56"	77° 30' 03"
G-26	43° 39' 01"	77° 18' 03"
G-28	43° 39' 04"	77° 05' 01"
G-30	43° 38' 12"	76° 54' 04"
G-32	43° 39' 00"	76° 41' 58"
G-33	43° 39' 06"	76° 35' 10"
G-34	43° 37' 58"	76° 28' 06"
G-35	43° 38' 09"	76° 24' 00"
G-36	43° 39' 00"	76° 17' 53"
H-19	43° 42' 57"	78° 00' 07"
H-21	43° 43' 05"	77° 48' 06"
H-23	43° 43' 31"	77° 36' 05"
H-25	43° 43' 02"	77° 24' 03"
H-27	43° 43' 04"	77° 11' 52"
H-29	43° 43' 04"	77° 00' 04"
H-31	43° 43' 03"	76° 48' 01"
H-33	43° 43' 05"	76° 35' 59"
H-35	43° 43' 12"	76° 23' 04"
I-20	43° 47' 02"	77° 53' 57"
I-22	43° 47' 02"	77° 42' 04"
I-24	43° 47' 00"	77° 30' 08"
I-28	43° 47' 07"	77° 06' 01"
I-30	43° 47' 06"	76° 52' 51"
I-32	43° 47' 05"	76° 41' 04"
I-34	43° 47' 08"	76° 30' 00"
I-36	43° 47' 05"	76° 18' 49"
J-19	43° 52' 01"	77° 59' 57"
J-21	43° 52' 00"	77° 48' 02"
J-23	43° 52' 07"	77° 36' 07"
J-25	43° 51' 11"	77° 23' 07"
J-31	43° 51' 59"	76° 48' 01"
J-33	43° 52' 03"	76° 36' 11"
J-36	43° 51' 08"	76° 19' 01"
K-20	43° 55' 59"	77° 54' 03"
K-22	43° 55' 58"	77° 42' 14"
K-34	43° 56' 06"	76° 29' 06"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
K-34A	43° 57' 41"	76° 30' 45"
K-37	43° 56' 07"	76° 11' 59"
L-30	44° 00' 13"	76° 54' 09"
L-31	44° 00' 05"	76° 47' 55"
M-35	44° 04' 14"	76° 23' 16"

CIRCULATION STUDIES

LAKE ONTARIO

LRB STUDIES 82047, 82022, DR. C.R. MURTHY, M.N. CHARLTON

The purpose of these studies was: to determine flow distributions through the St. Lawrence River source for loading estimates from Lake Ontario to the St. Lawrence River system (Study 82047); to measure sedimentation and regeneration rates of nutrients and contaminants in Lake Ontario while relating phytoplankton responses to loading changes and the effect of eutrophication on contaminant management (Study 82022).

Two mooring cruises were conducted aboard the CSS LIMNOS in support of these studies. On the initial cruise, June 1 - 4, a total of 10 current meter moorings, 2 meteorological buoys and 2 fixed temperature profiling systems were installed at 11 locations in the Kingston Basin/St. Lawrence River source area. In addition, on this cruise 3 sediment trap moorings were retrieved--1 from each basin of the lake. The retrieval of these sediment trap moorings terminated support to LRB Study 82022 which had been a multi-year study supported by this group for approximately 5 years. On the second cruise, October 13 - 16, all instrumentation that had been placed in June was recovered successfully. Also, 4 satellite-tracked drogues were retrieved from the open lake area on the return from Kingston to CCIW.

Piggybacking on this study consisted of collection of suspended sediment samples and Benthos coring from a location in the Western Basin of the lake in support of LRB Study 82025.

STATISTICS SUMMARY

33

CRUISE NO. _____ CONSECUTIVE NO. _____

SHIP CSS LIMNOS

DATES FROM _____ TO _____

LAKE ONTARIO

CRUISE TYPE Lake Ontario Moorings

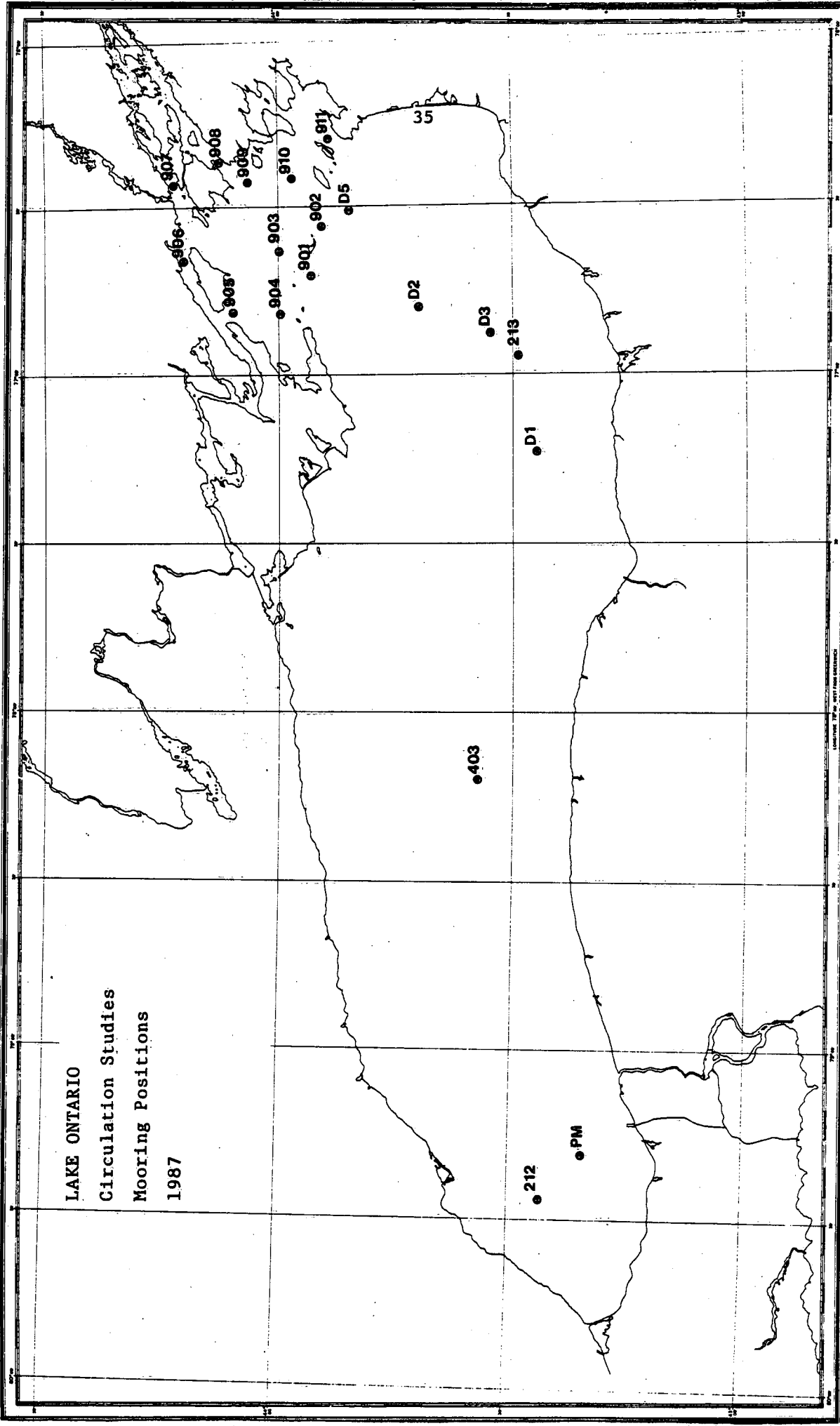
N. MILES STEAMED 830.8

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	33	Moorings Established, Current Meter	10
EBT Casts	29	" Retrieved, Current Meter	10
Rosette Casts		" Established, FTP	2
Transmissometer Casts	28	" Retrieved, FTP	2
Reversing Thermometer Obs. (No. of Therm)		" Established, Meteorological	2
Secchi Disc Observations		" Retrieved, Meteorological	2
		" Retrieved, Sediment Traps	3
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples		Satellite-tracked Drogues, Retrieved	4
		Cores Taken, Box	
		Cores Taken, Gravity, Benthos	1
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Water Quality)		Cores Taken	
" " " ()			
" " " (D.O.)		Grab Samples Taken	
" " " (Cond/pH)			
" " " ()		Bulk Centrifuge Samples, 600L	2
" " " (T P u f)			
" " " (TKN)		Observations, Weather	
" " " ()			
" " " ()		CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)		Solar Radiation	
" " " (POC/TPN)			
" " " (Seston)			
" " " (T P f)			
" " " (Nutrients)		ONBOARD ANALYSES	
" " " (Major Ions)			
" " " ()		Manual Chemistry Tech. Ops.	
" " " ()		Nutrients (WOB)	
" " " ()		Microbiology	
" " " ()			

MOORING POSITIONS

LAKE ONTARIO

STATION NUMBER	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST.(DEPTH)
901	87-00C-04A	43° 56' 01"	76° 42' 06"	CM(12m,B-2m)
902	87-00C-05A	43° 54' 04"	76° 33' 04"	CM(12m,B-2m)
903	87-00C-06A	44° 00' 19"	76° 38' 01"	CM(12m,B-2m)
	87-00M-07A	44° 00' 02"	76° 38' 02"	MET Buoy
	87-00M-08A	43° 59' 56"	76° 37' 46"	MET Buoy
	87-00T-09A	44° 00' 01"	76° 37' 25"	FTP (20 m)
904	87-00C-10A	43° 59' 59"	76° 49' 02"	CM(12m,B-2m)
905	87-00C-11A	44° 05' 50"	76° 48' 50"	CM(12m,B-2m)
906	87-00C-12A	44° 12' 10"	76° 39' 58"	CM(12m,B-2m)
907	87-00C-13A	44° 13' 12"	76° 25' 53"	CM(12m,B-2m)
908	87-00C-14A	44° 06' 51"	76° 21' 54"	CM(12m,B-2m)
909	87-00T-15A	44° 03' 06"	76° 24' 57"	FTP (20 m)
910	87-00C-16A	43° 57' 59"	76° 24' 57"	CM(12m,B-2m)
911	87-00C-17A	43° 53' 02"	76° 17' 56"	CM(12m,B-2m)
D5	54334	43° 52' 09"	76° 28' 07"	Drifter
D2	54278	43° 42' 03"	76° 49' 16"	Drifter
D3	5428D	43° 33' 24"	76° 53' 08"	Drifter
D1	54159	43° 27' 44"	77° 14' 12"	Drifter
PM		43° 20' 00"	79° 19' 56"	
212	86-00A-12C	43° 23' 46"	79° 24' 51"	Sediment Trap
213	86-00A-13B	43° 31' 59"	76° 57' 13"	Sediment Trap
403	86-00A-69B	43° 35' 31"	78° 12' 07"	Sediment Trap



LAKE ONTARIO
Circulation Studies
Mooring Positions
1987

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ST. LAWRENCE RIVER

GREAT LAKES CONNECTING CHANNELS

LRB STUDY 82047, DR. C.R. MURTHY

RSD STUDY 86041

The objective of this project was to determine the flow distribution through the St. Lawrence River source for loading estimates from Lake Ontario to the St. Lawrence River System.

Six scheduled drogue-tracking experiments were to be conducted throughout the summer season. The first deployment of drogues occurred in June and the last experiment was completed in mid-October. On each of the scheduled trips, some drogues were either deployed by CSS BAYFIELD in the middle of Kingston Basin or launched from the WHISTLER at predetermined sites designated by the Project Leader. The drogues were left to drift for the duration of the week or longer if they were in no danger of sailing down the St. Lawrence River.

The drogue's position was monitored from land-line telephone link to the ARGOS Satellite Communications Centre in Washington, D.C. If during the week it appeared the drogues were going to drift ashore, they were retrieved and redeployed in deeper water. Any drogues close to shore at the end of the week were retrieved and returned to CCIW.

Piggybacked onto the drogue-tracking experiments was the water sampling requested for Water Quality Branch. Two transects were visited on a monthly basis beginning in April and continuing through the field season until December. The transects were located on both sides of Wolfe Island. Each transect had four stations. The Northerly transect ran from Carruthers Point West of Kingston to Four Mile Point on Simcoe Island (see chart). The Southerly transect ran from Bradford Point on Wolfe Island to the mouth of Rose Bay on the American shore of the St. Lawrence River. While the transects were being sampled, a centrifuge ran continuously for a 24-hour period. The centrifuge was located at the Water Quality Branch Station located at Bradford Point. On the North transect, an EBT and water samples were collected for continuous extractions while the remaining stations had water collected for water quality analysis (TP, nutrients, major ions, etc.).

CONTAMINANTS

ST. LAWRENCE RIVER

ORGANIC AND INORGANIC CONTAMINANTS

LRB STUDY 82042, DR. K.R. LUM

This was the third St. Lawrence River cruise to be conducted aboard the CSS LIMNOS during the past 3-year period. The initial cruise was from September 30 - October 18, 1985, the second cruise was from June 16 - July 11, 1986 and this year's cruise was completed from June 15 - July 11, 1987. The purpose of this year's cruise was:

1. To determine the transportation pathways, fluxes, partitioning and availability of organic and inorganic contaminants in water, suspended and bottom sediments of the St. Lawrence River from Lake Ontario to Quebec City and in the freshwater-saltwater interface of the upper estuary.
2. To investigate the effects of the discharge of contaminants on selected components of the food web of the upper estuary.
3. To determine the extent to which the upper estuary acts as a filter for contaminants and to establish the retention zones.

This cruise was divided into three segments: sampling St. Lawrence River from Kingston area to Quebec City during downbound transit; the freshwater-saltwater interface of the upper estuary from Quebec City to Saguenay River mouth; plus sediment sampling in the Laurentian Trough area, East of the Saguenay River mouth.

During the downbound transit from the Kingston area of Lake Ontario to Quebec City, water samples and current meter profiles were collected from the CSS LIMNOS and MonArk. The CSS LIMNOS, again this year, was utilized to collect and process all bulk water samples from preselected stations in the river. At each of these stations, an EBT/transmissometer profile was obtained along with water samples for: conductivity, pH, chlorophyll a, particulate organic carbon, seston, suspended particles, organic and inorganic contaminants, polarograph and trace metal analyses. The smaller boat, MonArk, was

utilized to collect current meter profiles across the sampled areas in the river while the master stations were being occupied by the CSS LIMNOS. This method of operation proved to be quite efficient, utilizing personnel and equipment to the maximum.

Seven stations were sampled in the estuary portion of the cruise during the downbound and upbound transits. At each station, the vessel anchored for 16 to 20-hour periods at which time water samples were collected for: conductivity, pH, particulate organic carbon, seston, suspended particles, organic and inorganic contaminants, polarograph and trace metals analyses. At each station, an EBT/transmissometer profile plus zooplankton and larval fish net hauls were collected. The tidal flat areas near four of the estuary sampling stations were sampled using the MonArk while routine sampling was being conducted aboard the CSS LIMNOS. Water and sediment samples were collected or attempted to be collected from each of these sites.

The Laurentian Trough portion of the cruise was completed in approximately 16 hours on July 3rd. Three Benthos cores were collected from three stations in the trough area and processed onboard the vessel. In addition, a bulk saltwater sample was collected from one of the sites and stored for delivery to CCIW upon completion of the cruise.

On the upbound transit from the estuary in the Quebec City area, two stations--one near the bridge and one in the St. Charles River area, were sampled for water and sediment.

A new data base has been created containing information on the St. Lawrence River. There are two cruises for 1985, one cruise for 1986 and two cruises for 1987. Provisional listings and statistics can be obtained from data base LAWRENCE and the data is in STAR format.

STATISTICS SUMMARY

39

CRUISE NO. 87-07-001 CONSECUTIVE NO. 702
 DATES FROM June 15 TO July 11, 1987
 CRUISE TYPE Organic and Inorganic Contaminants

SHIP CSS LIMNOS
 LAKE ST. LAWRENCE RIVER
 N. MILES STEAMED 1432.5

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	277	Moorings Established	
EBT Casts	177	" Retrieved	
Rosette Casts		" Established	
Transmissometer Casts	176	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)		" Established	
Secchi Disc Observations		" Retrieved	
		" Refurbished	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Water Quality)		Cores Taken	38
" " " (Bacteria)	88	Cores Taken, Ponar	3
" " " (D.O.)		Grab Samples Taken, Shipek	12
" " " (Cond/pH)		Grab Samples Taken, Ekman	2
" " " (Chelex)	147	Bulk Centrifuge Samples	
" " " (T P u f)			
" " " (TKN)		Observations, Weather	
" " " (SEP Pack)	86	Number of current speed/direction	248
" " " (Amberlite)	76	CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	173	Solar Radiation	
" " " (POC/TPN)	180	Number of wire angle readings	348
" " " (Seston)	159		
" " " (T P f)			
" " " (Nutrients)		ONBOARD ANALYSES	
" " " (Major Ions)			
" " " ()		Manual Chemistry Tech. Ops. , pH/Spec. Cond. ,	628
" " " ()		Nutrients (WOB)	
" " " ()		Microbiology	
" " " ()			

STATION POSITIONS

ST. LAWRENCE RIVER

1987-1988

STATION NUMBER	LATITUDE N.	LONGITUDE W.	TYPE
27	44° 14' 30"	76° 19' 19"	M
27A	44° 14' 10"	76° 19' 18"	F
27B	44° 14' 22"	76° 19' 02"	F
27C	44° 14' 30"	76° 18' 50"	F
27D	44° 14' 35"	76° 19' 19"	F
27E	44° 14' 42"	76° 18' 33"	F
27F	44° 14' 42"	76° 18' 24"	F
27G	44° 14' 33"	76° 18' 18"	F
27H	44° 14' 22"	76° 18' 09"	F
27I	44° 14' 10"	76° 18' 00"	F
27J	44° 14' 03"	76° 17' 55"	F
28	44° 07' 14"	76° 22' 08"	M
28B	44° 06' 58"	76° 21' 47"	F
28C	44° 07' 03"	76° 21' 48"	F
28E	44° 07' 04"	76° 22' 06"	F
28F	44° 07' 14"	76° 22' 09"	F
28G	44° 07' 22"	76° 22' 18"	F
28H	44° 07' 28"	76° 22' 24"	F
28I	44° 07' 40"	76° 22' 32"	F
28J	44° 07' 39"	76° 22' 36"	F
28K	44° 07' 42"	76° 22' 40"	F
28L	44° 07' 14"	76° 22' 44"	F
29	44° 38' 19"	75° 36' 02"	M
29A	44° 37' 53"	75° 36' 46"	F
29B	44° 37' 49"	75° 36' 35"	F
29C	44° 37' 45"	75° 36' 22"	F
29D	44° 37' 38"	75° 36' 10"	F
29E	44° 37' 36"	75° 35' 57"	F
41	45° 02' 15"	74° 35' 39"	M
41A	45° 01' 48"	74° 36' 57"	F

STATION NUMBER	LATITUDE N.	LONGITUDE W.	TYPE
41B	45° 01' 50"	74° 36' 58"	F
41C	45° 01' 53"	74° 37' 01"	F
41D	45° 01' 57"	74° 37' 05"	F
41E	45° 01' 58"	74° 37' 06"	F
41F	45° 02' 01"	74° 37' 08"	F
41G	45° 02' 03"	74° 37' 09"	F
41H	45° 00' 38"	74° 37' 37"	F
41I	45° 00' 38"	74° 34' 40"	F
41J	45° 00' 40"	74° 37' 43"	F
41K	45° 00' 43"	74° 37' 44"	F
41L	45° 00' 44"	74° 37' 47"	F
41M	45° 00' 10"	74° 36' 26"	F
51	45° 13' 46"	74° 08' 12"	M
51A	45° 13' 33"	74° 07' 04"	F
51B	45° 13' 27"	74° 07' 06"	F
51C	45° 13' 21"	74° 07' 09"	F
112	46° 14' 02"	72° 45' 46"	M
112A	46° 14' 02"	72° 44' 10"	F
112B	46° 14' 27"	72° 44' 32"	F
112C	46° 14' 42"	72° 44' 44"	F
112D	46° 15' 00"	72° 44' 59"	F
112E	46° 15' 21"	72° 45' 16"	F
112F	46° 15' 36"	72° 45' 33"	F
243	45° 58' 45"	73° 11' 36"	M
243A	45° 58' 12"	73° 12' 04"	F
243B	45° 58' 10"	73° 12' 00"	F
243C	45° 58' 09"	73° 11' 54"	F
243D	45° 58' 07"	73° 11' 51"	F
243E	45° 58' 05"	73° 11' 45"	F
243F	45° 58' 03"	73° 11' 41"	F
243G	45° 58' 02"	73° 11' 38"	F
243H	45° 58' 00"	73° 11' 33"	F
252	45° 24' 28"	73° 46' 18"	M
252A	45° 21' 50"	73° 50' 58"	F
252B	45° 21' 45"	73° 50' 51"	F
252C	45° 21' 40"	73° 50' 44"	F
252D	45° 21' 34"	73° 50' 36"	F
252E	45° 21' 29"	73° 50' 28"	F
252F	45° 21' 25"	73° 50' 22"	F
252G	45° 24' 40"	73° 52' 14"	F

STATION NUMBER	LATITUDE N.	LONGITUDE W.	TYPE
252H	45° 24' 45"	73° 46' 26"	F
252I	45° 25' 27"	73° 45' 20"	F
252J	45° 24' 36"	73° 46' 07"	F
253	46° 42' 58"	71° 22' 38"	M
253A	46° 43' 51"	71° 22' 03"	F
253B	46° 43' 38"	71° 22' 00"	F
253C	46° 43' 29"	71° 21' 51"	F
253D	46° 43' 19"	71° 21' 42"	F
253E	46° 43' 08"	71° 21' 29"	F
255	46° 37' 25"	71° 57' 14"	M
255A	46° 36' 14"	71° 58' 55"	F
255B	46° 36' 22"	71° 58' 52"	F
255C	46° 36' 22"	71° 59' 00"	F
255D	46° 36' 21"	71° 59' 14"	F
255E	46° 36' 28"	71° 59' 12"	F
290	46° 44' 36"	71° 17' 56"	C
295	46° 49' 33"	71° 11' 12"	C
7E-100	47° 02' 30"	70° 48' 31"	M
7E-100-1	47° 04' 44"	70° 45' 39"	T
7E-100-2	47° 04' 13"	70° 46' 15"	T
7E-100-3	47° 03' 56"	70° 46' 42"	T
7E-100-4	47° 03' 32"	70° 47' 07"	T
7E-100-5	47° 03' 11"	70° 47' 07"	T
7E-100-6	47° 03' 21"	70° 46' 54"	T
7E-100-7	47° 03' 48"	70° 46' 24"	T
7E-100-8	47° 03' 51"	70° 45' 57"	T
7E-150	47° 03' 15"	70° 31' 17"	M
7E-150-1	47° 01' 37"	70° 28' 48"	T
7E-150-2	47° 01' 02"	70° 29' 50"	T
7E-150-3	47° 00' 20"	70° 31' 18"	T
7E-150-4	46° 59' 36"	70° 33' 42"	T
7E-250	47° 09' 28"	70° 38' 42"	M
7E-300	47° 29' 22"	70° 04' 48"	M
7E-300-1	47° 34' 10"	69° 53' 00"	T
7E-300-2	47° 34' 06"	69° 53' 34"	T
7E-300-3	47° 32' 26"	69° 54' 24"	T
7E-300-4	47° 32' 26"	69° 55' 32"	T
7E-300-5	47° 27' 20"	70° 02' 03"	T
7E-300-6	47° 26' 09"	70° 04' 02"	T
7E-300-7	47° 24' 42"	70° 03' 07"	T

STATION NUMBER	LATITUDE N.	LONGITUDE W.	TYPE
7E-300-8	47° 23' 12"	70° 03' 21"	T
7E-350	47° 52' 15"	70° 04' 52"	M
7E-400	48° 08' 24"	69° 36' 18"	M
7E-450	48° 06' 24"	69° 21' 26"	M
7E-450-1	48° 04' 30"	69° 17' 48"	T
7E-450-2	48° 06' 45"	69° 13' 57"	T
7E-450-3	48° 03' 51"	69° 19' 30"	T
7E-450-4	48° 03' 06"	69° 21' 06"	T
7E-450-5	48° 02' 33"	69° 22' 48"	T
7E-510	48° 33' 46"	68° 56' 48"	C
7E-520	48° 38' 42"	68° 47' 06"	C
7E-530	48° 08' 30"	68° 27' 30"	C

Station Index: C - Coring
 F - Current
 M - Master
 T - Tidal Flats

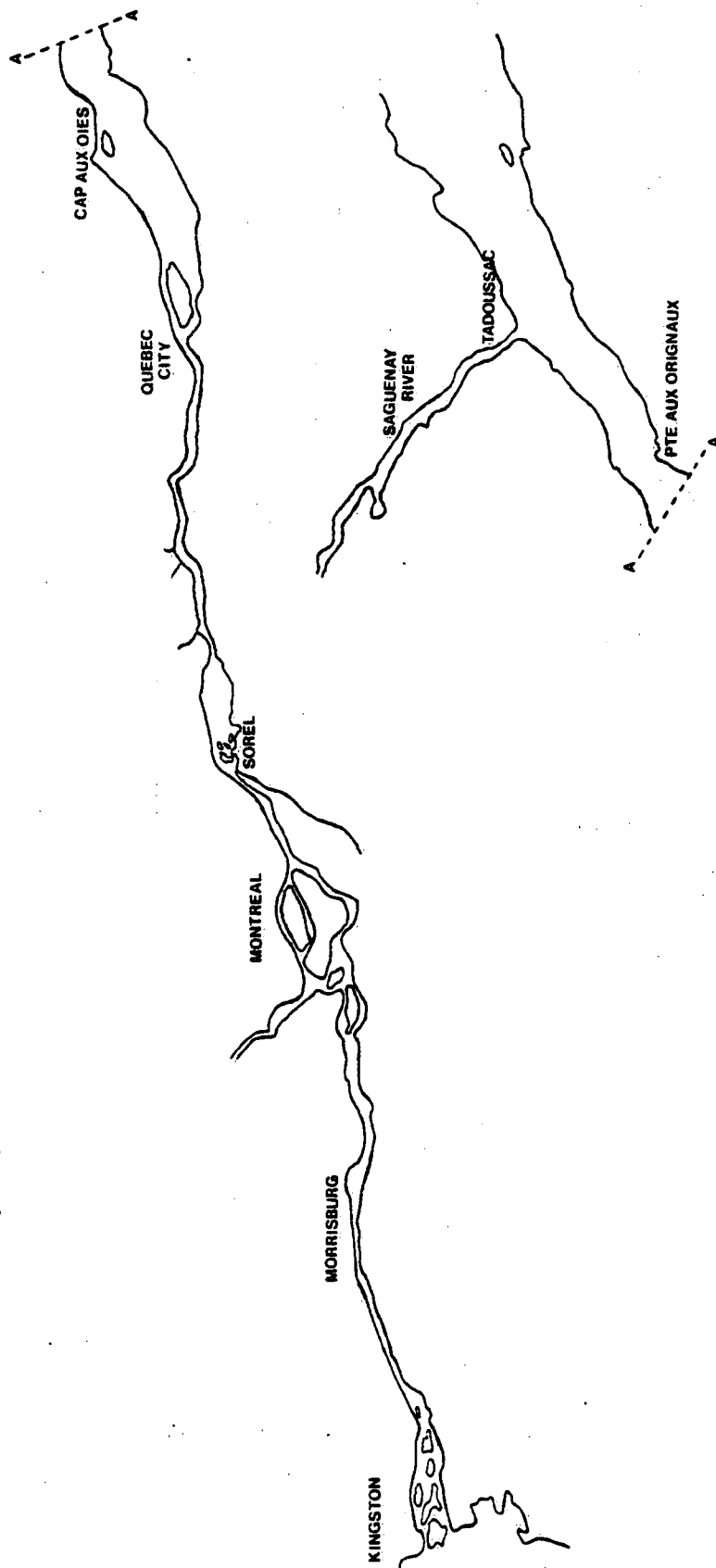
ST. LAWRENCE RIVER

Organic and Inorganic Contaminants

87 - 07 - 001

CSS LIMNOS

June 15 - July 11, 1987



LAKES HURON, ST. CLAIR, ERIE, ONTARIO

INORGANIC CONTAMINANTS

IRB STUDY 82042, DR. K.R. LUM

The purpose of this cruise was to determine the distribution, partitioning, transport pathways, bioavailability and dynamics of cycling of inorganic elements at river/lake interfaces of lakes Huron, St. Clair, Erie and Ontario. A complementary objective of this study was to derive loading estimates of toxic elements upstream and downstream of these aquatic systems and to calculate mass balances. The study also aims at developing a particulate-water interaction chemical model to predict the fate of inorganic elements in the first instance.

During the period from September 8 - 17, the CSS LIMNOS was utilized to conduct a continuous cruise from Lake Huron through lakes St. Clair and Erie, finishing in Lake Ontario. On each of these lakes, water samples were collected from specified depths for: pH, conductivity, particulate organic carbon, chlorophyll a, suspended particulate matter, chelex, polarograph and trace metal analysis. At each station, an EBT/transmissometer profile was obtained prior to collection of the water samples. Also, on lakes Erie and Ontario a Benthos core was collected from one station on each lake.

STATISTICS SUMMARY

46

CRUISE NO. 87-00-008 CONSECUTIVE NO. 033
 DATES FROM September 13 TO September 17, 1987
 CRUISE TYPE Inorganic Contaminants

SHIP CSS LIMNOS
 LAKE ONTARIO
 N. MILES STEAMED 288.8

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	20	Moorings Established	
EBT Casts	20	" Retrieved	
Rosette Casts		" Established	
Transmissometer Casts	20	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)		" Established	
Secchi Disc Observations		" Retrieved	
		" Refurbished	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Water Quality)		Cores Taken	
" " " (Trace Metals)	33		
" " " (D.O.)		Grab Samples Taken	
" " " (Cond/pH)	33		
" " " (Chelex)	33	Bulk Centrifuge Samples 33 samples for 64, 620 litres	
" " " (T P u f)			
" " " (TKN)		Observations, Weather	
" " " ()			
" " " ()		CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	33	Solar Radiation	
" " " (POC/TPN)	33		
" " " (Seston)			
" " " (T P f)			
" " " (Nutrients)		ONBOARD ANALYSES	
" " " (Major Ions)			
" " " ()		Manual Chemistry Tech. Ops.	33
" " " ()		Nutrients (WOB)	
" " " ()		Microbiology	
" " " ()			

STATISTICS SUMMARY

47

CRUISE NO. 87-01-006 CONSECUTIVE NO. 107
 DATES FROM September 10 TO September 13, 1987
 CRUISE TYPE Inorganic Contaminants

SHIP CSS LIMNOS
 LAKE ERIE
 N. MILES STEAMED 248.4

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	14	Moorings Established	
EBT Casts	14	" Retrieved	
Rosette Casts		" Established	
Transmissometer Casts	14	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)		" Established	
Secchi Disc Observations		" Retrieved	
		" Refurbished	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Water Quality)		Cores Taken	
" " " (Trace Metals)	26		
" " " (D.O.)		Grab Samples Taken	
" " " (Cond/pH)	26		
" " " (Chelex)	26	Bulk Centrifuge Samples 26 samples for 33, 560 litres	
" " " (T P u f)			
" " " (TKN)		Observations, Weather	
" " " ()			
" " " ()		CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	26	Solar Radiation	
" " " (POC/TPN)	26		
" " " (Seston)			
" " " (T P f)			
" " " (Nutrients)		ONBOARD ANALYSES	
" " " (Major Ions)			
" " " ()		Manual Chemistry Tech. Ops.	26
" " " ()		Nutrients (WOB)	
" " " ()		Microbiology	
" " " ()			

STATISTICS SUMMARY

48

CRUISE NO. 87-02-004 CONSECUTIVE NO. 204
 DATES FROM September 8 TO September 9, 1987
 CRUISE TYPE Inorganic Contaminants

SHIP CSS LIMNOS
 LAKE HURON
 N. MILES STEAMED 56.7

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	3	Moorings Established	
EBT Casts	3	" Retrieved	
Rosette Casts		" Established	
Transmissometer Casts	3	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)		" Established	
Secchi Disc Observations		" Retrieved	
		" Refurbished	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Water Quality)		Cores Taken	
" " " (Trace Metals)	3		
" " " (D.O.)		Grab Samples Taken	
" " " (Cond/pH)	3		
" " " (Chelex)	3	Bulk Centrifuge Samples 3 samples for 12, 960 litres	
" " " (T P u f)			
" " " (TKN)		Observations, Weather	
" " " ()			
" " " ()		CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	3	Solar Radiation	
" " " (POC/TPN)	3		
" " " (Seston)			
" " " (T P f)			
" " " (Nutrients)		ONBOARD ANALYSES	
" " " (Major Ions)			
" " " ()		Manual Chemistry Tech. Ops.	3
" " " ()		Nutrients (WOB)	
" " " ()		Microbiology	
" " " ()			

STATISTICS SUMMARY

49

CRUISE NO. 87-04-002 CONSECUTIVE NO. 402 SHIP CSS LIMNOS
 DATES FROM September 9 TO September 10, 1987 LAKE ST. CLAIR
 CRUISE TYPE Inorganic Contaminants N. MILES STEAMED 43.0

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	5	Moorings Established	
EBT Casts	5	" Retrieved	
Rosette Casts		" Established	
Transmissometer Casts	5	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)		" Established	
Secchi Disc Observations		" Retrieved	
		" Refurbished	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Water Quality)		Cores Taken	
" " " (Trace Metals)	5		
" " " (D.O.)		Grab Samples Taken	
" " " (Cond/pH)	5		
" " " (Chelex)	5	Bulk Centrifuge Samples 5 samples for 10, 800 litres	
" " " (T P u f)			
" " " (TKN)		Observations, Weather	
" " " ()			
" " " ()		CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	5	Solar Radiation	
" " " (POC/TPN)	5		
" " " (Seston)			
" " " (T P f)			
" " " (Nutrients)		ONBOARD ANALYSES	
" " " (Major Ions)			
" " " ()		Manual Chemistry Tech. Ops.	5
" " " ()		Nutrients (WOB)	
" " " ()		Microbiology	
" " " ()			

STATION POSITIONS

LAKE ONTARIO

STATION NUMBER	LATITUDE N.	LONGITUDE W.
276	43° 15' 12"	79° 03' 27"
302	43° 24' 14"	79° 24' 44"
360	43° 55' 08"	76° 45' 44"
361	43° 52' 36"	76° 28' 11"

LAKE ERIE

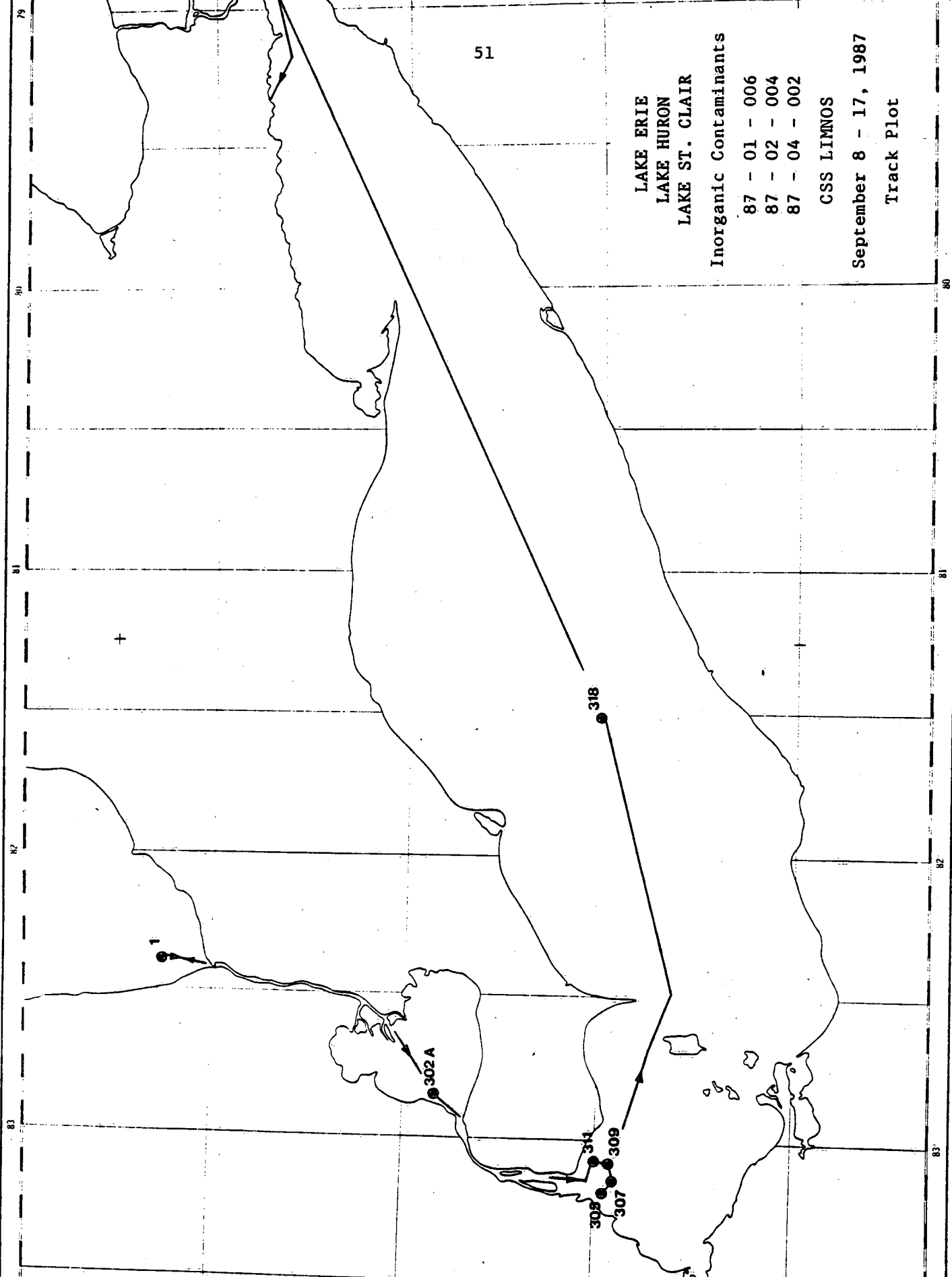
STATION NUMBER	LATITUDE N.	LONGITUDE W.
2	42° 50' 34"	78° 57' 22"
305	41° 57' 40"	83° 10' 45"
307	41° 57' 11"	83° 08' 18"
309	41° 58' 50"	83° 05' 48"
311	42° 00' 45"	83° 04' 23"
318	42° 01' 18"	81° 30' 28"

LAKE HURON

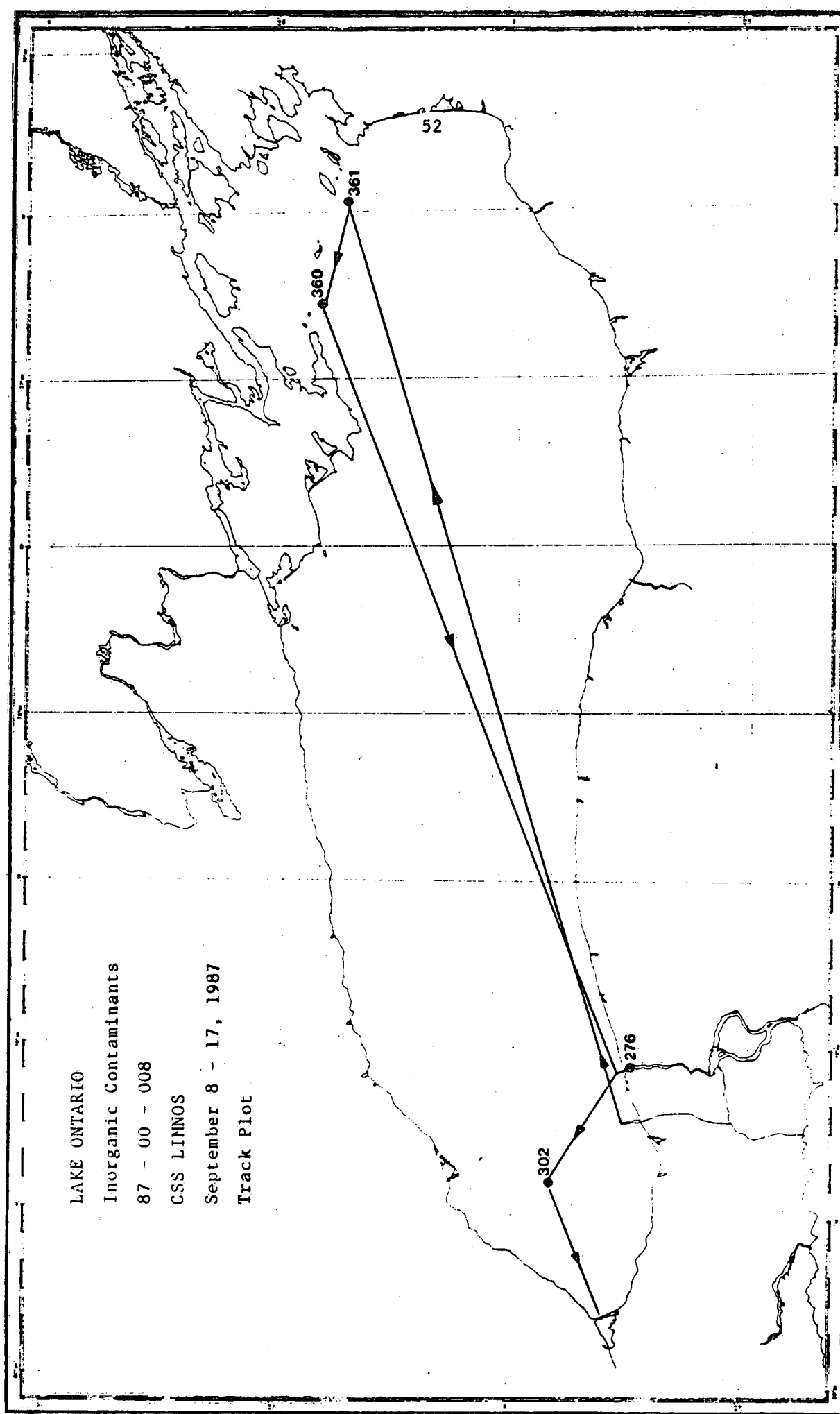
STATION NUMBER	LATITUDE N.	LONGITUDE W.
1	43° 05' 17"	82° 23' 35"

LAKE ST. CLAIR

STATION NUMBER	LATITUDE N.	LONGITUDE W.
302A	42° 25' 00"	82° 51' 15"



LAKE ONTARIO
Inorganic Contaminants
87 - 00 - 008
CSS LINNOS
September 8 - 17, 1987
Track Plot



WESTERN LAKE ONTARIO

SEDIMENTARY TRANSPORT OF RADIONUCLIDES

IRB STUDY 82012, DR. S.R. JOSHI, A. MUDROCH

An investigation took place into the role of the nepheloid layer in the transport and cycling of radionuclides. The nepheloid layer is defined as a mass of suspended material which decreases visibility, as measured by per cent transmission, in the water column. The particles in the nepheloid layer in Lake Ontario consist of dead phytoplankton, and minerals (soil/sediment particles), which remain in suspension up to 40 metres off the lake bottom.

The nepheloid phenomena was in evidence at four of the five stations selected, the exception being 208. Over 6,000 litres of water from the zone under investigation were centrifuged from each station. As well, several hundred litres of both raw and centrifuged water were taken onboard, acidified, and returned to CCIW for analysis.

A broad selection of sediment samples was collected, including six box cores; many were subsampled onboard LIMNOS, and the remainder returned to CCIW.

Sample analysis is continuing under the National Radionuclide Monitoring Program in collaboration with Water Quality Branch, Ottawa.

LAKE ERIE

NUTRIENT CONTAMINANT INTERACTIONS

IRB STUDY 82066, DR. D.R.S. LEAN

A combination Lake Erie/Lake Ontario cruise August 10 - 14 was carried out onboard the CSS LIMNOS to determine the critical processes that control the interactions of nutrients and contaminants. On the cruise, meteorological observations were made every three hours, box cores were collected, and Secchi disc observations were made. The following water chemistry profiles were collected, together with EBT/transmissometer profiles to the bottom:

1. A 20 m integrator water sample was collected for phytoplankton monitoring

2. Water samples were collected from the rosette water sampler for dissolved oxygen, conductivity, pH, major ions, total phosphorus filtered and unfiltered, total Kjeldahl nitrogen, and peroxide. All depths were determined by the temperature structure
3. Box cores were collected and sub-divided using lightweight core tubes. These were subsectioned onboard

LAKE ONTARIO STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
104	43° 17' 12"	79° 49' 58"
212	43° 23' 44"	79° 24' 52"
212A	43° 21' 07"	79° 35' 01"
212B	43° 20' 01"	79° 25' 05"

LAKE ERIE STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 29' 59"	79° 54' 06"
23A	42° 39' 05"	79° 36' 28"
84	41° 56' 01"	81° 39' 49"
84A	41° 52' 30"	81° 48' 27"
221A	42° 12' 30"	80° 47' 00"
357A	41° 43' 20"	81° 39' 40"

BAYFIELD

1987

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
JAN					1	2	3
	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	31
FEB	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
MAR	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
APR	29	30	31	1	2	3	4
	5	6	7	8	9	10	11
	12	13	14 LAKE	15 ONTARIO	16	17	18
	19	20	21 LONG TERM	22 BIOLOGICAL	23 INDEX	24	25
MAY	26	27 LONG TERM	28 BIOLOGICAL	29 INDEX	30 MONITORING	1	2
	3	4 LONG TERM	5 BIOLOGICAL	6 INDEX	7	8	9
	10	11 LONG TERM	12 BIOLOGICAL	13 INDEX	14	15	16
	17	18	19	20 LONG TERM	21 BIOLOGICAL	22 INDEX	23
	24	25 LONG TERM	26 BIOLOGICAL	27 INDEX	28 MONITORING	29	30
JUN	31	1 LONG TERM	2 BIOLOGICAL	3 INDEX	4 MONITORING	5	6
	7	8 LONG TERM	9 BIOLOGICAL	10 INDEX	11 MONITORING	12	13
	14	15 LONG TERM	16 BIOLOGICAL	17 INDEX	18 MONITORING	19	20
	21	22 LONG TERM	23 BIOLOGICAL	24 INDEX	25 MONITORING	26	27
JUL	28	29 LONG TERM	30 BIOLOGICAL	1 INDEX	2 MONITORING	3	4
	5	6 LONG TERM	7 BIOLOGICAL	8 INDEX	9 MONITORING	10	11
	12	13	14	15	16	17	18
	19	20 LONG TERM	21 BIOLOGICAL	22 INDEX	23 MONITORING	24	25
AUG	26	27 LONG TERM	28 BIOLOGICAL	29 INDEX	30 MONITORING	31	1
	2	3	4 LONG TERM	5 BIOLOGICAL	6 INDEX	7 MONITORING	8
	9	10 LONG TERM	11 BIOLOGICAL	12 INDEX	13 MONITORING	14	15
	16	17 LONG TERM	18 BIOLOGICAL	19 INDEX	20 MONITORING	21	22
	23	24 LONG TERM	25 BIOLOGICAL	26 INDEX	27 MONITORING	28	29
SEP	30	31 LONG TERM	1 BIOLOGICAL	2 INDEX	3 MONITORING	4	5
	6	7 LONG TERM	8 BIOLOGICAL	9 INDEX	10 MONITORING	11	12
	13	14 LONG TERM	15 BIOLOGICAL	16 INDEX	17 MONITORING	18	19
	20	21	22 LONG TERM	23 BIOLOGICAL	24 INDEX	25	26
OCT	27	28 LONG TERM	29 BIOLOGICAL	30 INDEX	1 MONITORING	2	3
	4	5 LONG	6 TERM	7 BIOLOGICAL	8 INDEX	9 MONITORING	10
	11	12	13 LONG TERM	14 BIOLOGICAL	15 INDEX	16 MONITORING	17
	18	19 LONG TERM	20 BIOLOGICAL	21 INDEX	22	23	24
NOV	25	26	27 LAKE	28 ONTARIO	29	30	31
	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
DEC	22	23	24	25	26	27	28
	29	30	1	2	3	4	5
	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30	31		

LONG TERM BIOLOGICAL INDEX MONITORING

RSD STUDY 86041, DR. O. JOHANSSON, D.M. WHITTLE

The CSS BAYFIELD's major task for 1987 was the support of the Great Lakes Laboratory for Fisheries & Aquatic Sciences Bioindex Program on Lake Ontario. The CSS BAYFIELD carried out 26 cruises on a weekly basis beginning April 25 and ending October 15. One other Bioindex Cruise was carried out by the CSS LIMNOS as part of a Lake Ontario Surveillance Cruise.

The purpose of the Bioindex Program is to gain a better understanding of lake conditions by intensively sampling two selected stations for biological and chemical activity, simultaneously. One selected station represented open mid-lake conditions while the other was situated closer to shore and better represented littoral lake conditions. The parameters and depths sampled are summarized on the accompanying chart.

The BAYFIELD was also responsible during the field season for monitoring and refurbishing of two meteorological stations and two FTP stations located in the Kingston Basin.

Dr. S. Millard carried out primary productivity experiments aboard the vessel on a bi-weekly schedule throughout the season.

BIOINDEX SAMPLINGUnstratified Conditions

	Phyto	TP(uf)	TP(f)	NUT	MI	ChlA	PON/ POC	SS	pH	Cond	DO ₂
0-20(Int.)	**	**	**	**	**	**	**	**	**	**	
10 m											**
25 m		**	**	**	**	**		**	**	**	**
Stn 41 Bottom-10 m		**	**	**	**	**		**	**	**	**
Stn 81 Bottom- 2 m		**	**	**	**	**		**	**	**	**

Stratified Conditions

0-1 m above Thermocline(Int.)	**	**	**	**	**	**	**	**	**	**	
Mid-Epi									**	**	**
Thermocline+1 m		**	**	**	**	**		**	**	**	**
Stn 41 Bottom-10 m		**	**	**	**	**		**	**	**	**
Stn 81 Bottom- 2 m		**	**	**	**	**		**	**	**	**

** duplicate sample

Note: ChlA duplicates are for both GF/C and Millipore filters

SHIPS SCHEDULE

CRUISE NO.	VESSEL	DATES	TYPE	CONSECUTIVE PLAN/REPORT CRUISE NO. DISTRIBUTED		
87-00-001	CSS LIMNOS	April 13-17	L.L.Surveillance	87-22-001	*	*
87-00-301	CSS BAYFIELD	April 21-23	L.T.B.I.M.	87-22-002	*	*
87-00-002	CSS LIMNOS	April 21-23	Sed. Sampling	87-22-004	*	*
87-00-302	CSS BAYFIELD	April 27-30	L.T.B.I.M.	87-22-003	*	*
87-01-001	CSS LIMNOS	April 27- May 1	Int.Sed.Loading &Ben.Com.Structure	87-22-101	*	*
87-02-001	CSS LIMNOS	May 4 - 11	Upper Lakes	87-22-201	*	*
87-05-001			Surveillance	87-22-501		*
87-00-303	CSS BAYFIELD	May 4 - 6	L.T.B.I.M.	87-22-005	*	*
87-03-001	CSS LIMNOS	May 12 - 25	Upper Lakes	87-22-301	*	*
87-01-002			Surveillance	87-22-102	*	*
87-02-002				87-22-202	*	*
87-00-304	CSS BAYFIELD	May 11-13	L.T.B.I.M.	87-22-006	*	*
87-00-305	CSS BAYFIELD	May 20-22	L.T.B.I.M.	87-22-007	*	*
87-00-306	CSS BAYFIELD	May 25-28	L.T.B.I.M.	87-22-008	*	*
87-00-307	CSS BAYFIELD	June 1 - 4	L.T.B.I.M.	87-22-009	*	*
87-00-003	CSS LIMNOS	June 1 - 4	L.Ont.Moorings	87-22-010	*	*
87-00-308	CSS BAYFIELD	June 8 - 11	L.T.B.I.M.	87-22-011	*	*
87-00-309	CSS BAYFIELD	June 15-18	L.T.B.I.M.	87-22-013	*	*
87-07-001	CSS LIMNOS	June15-July10	Org. and Inorg. Contaminants	87-22-702	*	*
87-00-310	CSS BAYFIELD	June 22-25	L.T.B.I.M.	87-22-014	*	*
87-00-311	CSS BAYFIELD	June 29-July 2	L.T.B.I.M.	87-22-015	*	*
87-00-312	CSS BAYFIELD	July 6 - 9	L.T.B.I.M.	87-22-016	*	*
87-00-004	CSS LIMNOS	July 13-18	L.L.Surveillance	87-22-017	*	*
87-00-313	CSS BAYFIELD	July 20-23	L.T.B.I.M.	87-22-018	*	*
87-01-003	CSS LIMNOS	July 20-25	Coring & Benthic	87-22-103	*	*
87-00-314	CSS BAYFIELD	July 27-30	L.T.B.I.M.	87-22-019	*	*
87-00-005	CSS LIMNOS	July 27-31	SedTrRadionuclide	87-22-020	*	*
87-00-315	CSS BAYFIELD	August 4 - 7	L.T.B.I.M.	87-22-021	*	*
87-00-316	CSS BAYFIELD	August 10-13	L.T.B.I.M.	87-22-023	*	*
87-00-006	CSS LIMNOS	August 10-14	Nut.Cont.Inter.	87-22-024	*	*
87-01-004				87-22-104	*	*
87-00-317	CSS BAYFIELD	August 17-20	L.T.B.I.M.	87-22-026	*	*
87-00-007	CSS LIMNOS	August 17-21	L.L.Surveillance	87-22-027	*	*
87-00-318	CSS BAYFIELD	August 24-27	L.T.B.I.M.	87-22-028	*	*
87-01-005	CSS LIMNOS	Aug.24-Sept.3	Upper Lakes	87-22-106	*	*
87-02-003			Surveillance	87-22-203		*
87-05-002				87-22-502		*
87-00-319	CSS BAYFIELD	Aug.31-Sept.3	L.T.B.I.M.	87-22-030	*	*

CRUISE NO.	VESSEL	DATES	TYPE	CONSECUTIVE PLAN/REPORT CRUISE NO. DISTRIBUTED		
87-00-320	CSS BAYFIELD	Sept. 7 - 10	L.T.B.I.M.	87-22-031	*	*
87-00-321	CSS BAYFIELD	Sept. 14 - 17	L.T.B.I.M.	87-22-032	*	*
87-00-008	CSS LIMNOS	Sept. 8 - 17	Lum	87-22-033	*	*
87-01-006				87-22-107	*	*
87-02-004				87-22-204	*	*
87-04-002				87-22-402	*	*
87-00-322	CSS BAYFIELD	Sept. 22 - 24	L.T.B.I.M.	87-22-034	*	*
87-00-009	CSS LIMNOS	Sept. 21 - 25	L.L. Surveillance	87-22-035	*	*
87-00-010	CSS LIMNOS	Sept. 28-Oct. 2	Sediment&Benthic Fauna Survey	87-22-036	*	*
87-00-323	CSS BAYFIELD	Sept. 28-Oct. 1	L.T.B.I.M.	87-22-037	*	*
87-00-011	CSS LIMNOS	October 5 - 7	Trans. & Fate of Tox.Org.Contam.	87-22-039	*	*
87-00-324	CSS BAYFIELD	October 5 - 9	L.T.B.I.M.	87-22-040	*	*
87-00-325	CSS BAYFIELD	October 13-16	L.T.B.I.M.	87-22-043	*	*
87-00-012	CSS LIMNOS	October 13-16	Moorings	87-22-041	*	*
87-00-326	CSS BAYFIELD	October 19-21	L.T.B.I.M.	87-22-044	*	*
87-01-007	CSS LIMNOS	October 19-23	Int.Sed.Loading &Ben.Com.Struture	87-22-108	*	*
87-00-401	CSS ADVENT	May 26-June 11	Tr&Fate of Toxic Org.Contaminants	87-22-012	*	*
87-07-401	CSS ADVENT	June 15 - 29	Org. and Inorg.	87-22-701	*	*
87-00-402	CSS ADVENT	July 27-Aug. 7	Tr&Fate of Toxic Org.Contaminants	87-22-022	*	*
87-00-403	CSS ADVENT	August 10 - 14	Sus.Sed.Sampling	87-22-025	*	*
87-01-401				87-22-105		
87-04-401	CSS ADVENT	August 18 - 23	Sus.Sed.Sampling	87-22-401	*	*
87-00-404	CSS ADVENT	August 24 - 28	Sus.Sed.Sampling	87-22-029	*	*
87-00-405	CSS ADVENT	October 6 - 8	Sus.Sed.Sampling	87-22-038	*	*

NEARSHORE ACTIVITIES

ADVENT

TORONTO - NIAGARA

TRANSPORT AND FATE OF TOXIC ORGANIC CONTAMINANTS

LRB STUDY 82045, DR. E. HALFON

This study was conducted to develop an ecological model of the transport and fate of toxic organic contaminants in the Toronto Waterfront area of Lake Ontario. This was a Study done in conjunction with the M.I.S.A. Study being done by the Ontario Ministry of the Environment.

A total of 3 cruises was carried out in support of this Study--2 on the CSS ADVENT: 87-00-401 (May 26 - June 11) and 87-00-402 (July 27 - August 7) and 1 on the CSS LIMNOS: 87-00-011 (October 5 - 7).

Twenty-six stations were sampled on each cruise. At each station, an EBT profile, a transmissometer profile and a large volume water sample were obtained. The large volume water sample (200 L) was collected by March pump and centrifuged through a Westfalia centrifuge at a flow rate of 6 L/min. An extraction of the centrifuged water was done in an APLE sampler using dichloromethane. Analysis was done on the recovered dichloromethane for PCB's, organochlorine, pesticides and chlorobenzenes. Duplicate samples were collected at 3 stations on each cruise. In addition, at 6 stations, a total sample of 600 L was centrifuged and the suspended solids retained for analysis.

On cruises 87-00-402 and 87-00-011, additional samples were collected for MOE to enable comparison of data analysis by two companies.

Additional tasks were completed on all cruises. In support of Study 86041, four moorings were placed in the Niagara River on Cruise 87-00-401 from which Sea Star samplers were suspended later in the field season. These moorings were recovered by the ADVENT in mid-November.

Also on this cruise, a wave recorder was installed off Gibraltar Point in support of Study 82011. A second mooring in support of Study 82011 was installed on Cruise 87-00-402. This was a Neil Brown bottom mounted current meter and was installed beside the wave recorder at Gibraltar Point.

Also on Cruise 87-00-402, water and Shipek samples were obtained from near the main sewage treatment plant at Ashbridges Bay in support of GLLFAS Study 86042. Also in support of GLLFAS Study 86042, water samples were collected on Cruise 87-00-011 from the same area in Ashbridges Bay.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
029	43° 40' 07"	79° 15' 05"
072	43° 37' 34"	79° 28' 04"
073	43° 35' 00"	79° 31' 30"
375	43° 38' 38"	79° 21' 35"
879	43° 33' 14"	79° 32' 45"
881	43° 30' 12"	79° 29' 52"
882	43° 34' 23"	79° 31' 43"
883	43° 35' 35"	79° 29' 04"
885	43° 32' 39"	79° 26' 46"
886	43° 36' 39"	79° 22' 07"
888	43° 34' 43"	79° 20' 58"
889	43° 30' 39"	79° 18' 38"
890	43° 26' 35"	79° 16' 17"
891	43° 37' 37"	79° 19' 04"
892	43° 39' 29"	79° 16' 49"
893	43° 39' 10"	79° 16' 01"
895	43° 36' 41"	79° 14' 31"
896	43° 32' 39"	79° 12' 10"
897	43° 28' 39"	79° 09' 47"
900	43° 40' 56"	79° 09' 12"
901	43° 43' 52"	79° 09' 28"
902	43° 45' 31"	79° 08' 00"
903	43° 47' 25"	79° 05' 29"
905	43° 44' 35"	79° 03' 48"
906	43° 34' 57"	79° 32' 24"
908	43° 47' 30"	79° 06' 48"

LAKE ONTARIO

Transport and Fate of
Toxic Organic Contaminants

87 - 00 - 011

CSS LIMNOS

October 5 - 9, 1987

Study Area

62

ST. LAWRENCE RIVER

ORGANIC AND INORGANIC CONTAMINANTS

LRB STUDY 82042, DR. K.R. LUM

During the period June 15 - 29, the CSS ADVENT conducted a cruise on the Ottawa and St. Lawrence rivers in support of Study 82042 in conjunction with the survey carried out by the CSS LIMNOS.

A total of 8 stations were sampled--one per day. The station in the Ottawa River was sampled on 2 consecutive days.

At each station, 10 bulk water samples of 720L were collected and centrifuged through the Westfalia centrifuges at a flow rate of 6L/minute. The suspended particulate matter was saved from each sample. Five extractions of the centrifuged water were completed at each station using the APLE sampler with 8 litres of dichloromethane. Centrifuged water samples were also collected for trace metals, polarograph and chelex analyses every two hours. Raw water samples were also collected every two hours for pH, conductivity, Seston, POC and chlorophyll *a*. A 54 litre centrifuged water sample was obtained at each station for extraction using the Crab APLE sampler onboard the LIMNOS. Shipek samples were also obtained at each station.

A rendezvous was made with the LIMNOS in Trois Rivières to transfer samples.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
22	45° 27' 12"	74° 06' 00"
31	44° 00' 22"	74° 39' 36"
32	45° 01' 23"	74° 40' 54"
251	46° 38' 28"	73° 28' 38"
504	46° 10' 06"	72° 55' 42"
515	46° 15' 18"	72° 40' 12"
574	45° 14' 38"	74° 11' 30"
575	46° 16' 36"	72° 38' 30"

STATISTICS SUMMARY

64

CRUISE NO. 87-07-401 CONSECUTIVE NO. 701

SHIP CSS ADVENT

DATES FROM June 15 TO June 29, 1987

LAKE ST. LAWRENCE RIVER

CRUISE TYPE Organic and Inorganic Contaminants

N. MILES STEAMED 956.7

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	9	Moorings Established	
EBT Casts	18	" Retrieved	
Rosette Casts		" Established	
Transmissometer Casts	18	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)		" Established	
Secchi Disc Observations	9	" Retrieved	
		" Refurbished	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (500 ml Kwasniewska)	8	Cores Taken, Piston	
" " " (1 L Organics)	3	Cores Taken	
" " " ()			
" " " (pH/Cond.)	90	Grab Samples Taken	8
" " " (Centrifuge 1 L Organics)	8	Grab APLE Samples Taken	27
" " " (500 ml Kwasniewska)	8	Bulk Centrifuge Samples	89
" " " (30 ml Trace Metals)	90	APLE Samples Taken	45
" " " (60 ml Polarograph)	50	Observations, Weather	
" " " (1 L Chelex)	90	Flow Measurements	161
" " " (250 ml Organic)	8	CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)	45	Solar Radiation	
" " " (POC/TPN)	46		
" " " (Seston)	45		
" " " (T P f)			
" " " (Nutrients)		ONBOARD ANALYSES	
" " " (Major Ions)			
" " " ()		Manual Chemistry Tech. Ops.	90
" " " ()		Nutrients (WOB)	
" " " ()		Microbiology	
" " " ()			

ST. LAWRENCE RIVER

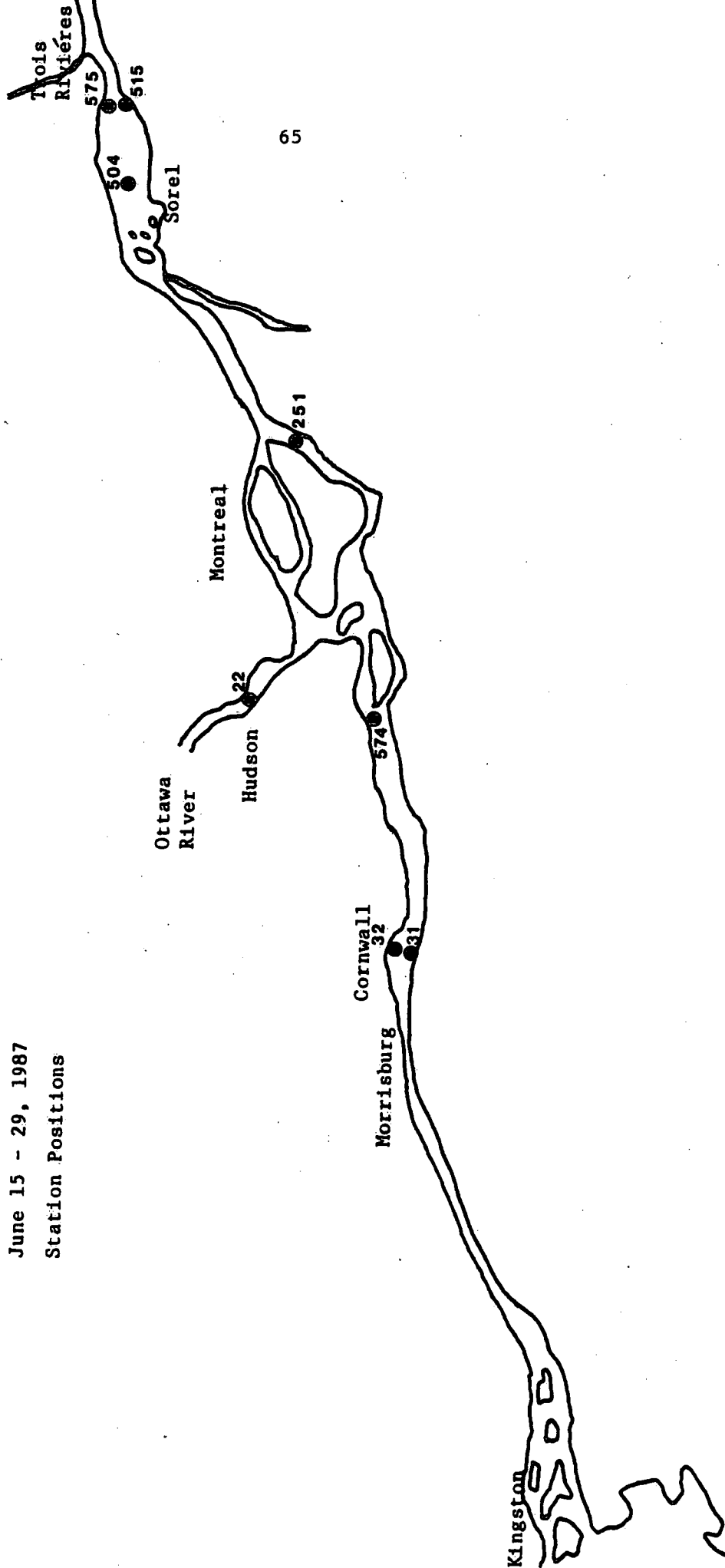
Organic and Inorganic Contaminants

87 - 07 - 401

CSS ADVENT

June 15 - 29, 1987

Station Positions



NIAGARA RIVER AND LAKE ONTARIO

WESTERN LAKE ERIE

LAKE ST. CLAIR AND DETROIT RIVER

BAY OF QUINTE

NEARSHORE SUSPENDED SEDIMENT SAMPLING

LRB STUDY 82025, DR. P.G. MANNING

A total of 5 cruises were conducted from the CSS ADVENT to determine the bioavailabilities of iron and phosphorus in contaminated sediments. These cruises were carried out on the lower Niagara River and adjoining Lake Ontario (87-00-403), the upper Niagara River (87-01-401), Lake St. Clair and the Niagara River (87-04-401) and on the Bay of Quinte and adjoining Lake Ontario (87-00-404 and 87-00-405).

At all stations on all cruises, bulk water samples were collected and centrifuged through a Westfalia centrifuge at a flow rate of 6 L/min. The suspended solid sample was recovered and returned for analysis. Sediment samples were also collected by Shipek at selected stations on all cruises.

On cruise 87-04-401, water samples were collected at several selected stations in support of GLLFAS Study 86042.

STATION POSITIONS

LAKE ONTARIO

STATION NUMBER	LATITUDE N.	LONGITUDE W.
206	43° 23' 54"	79° 27' 40"
207	43° 19' 16"	79° 09' 25"
208	43° 20' 14"	79° 04' 31"
209	43° 20' 36"	78° 59' 31"
210	43° 21' 42"	78° 51' 36"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
295	43° 16' 51"	79° 04' 00"
296	43° 17' 45"	78° 59' 31"
297	43° 15' 16"	79° 03' 30"
298	43° 13' 13"	79° 03' 01"
299	43° 12' 18"	79° 03' 04"

LAKE ERIE

STATION NUMBER	LATITUDE N.	LONGITUDE W.
L 9	42° 52' 00"	78° 53' 42"
L10	42° 52' 06"	78° 54' 54"
L11	42° 52' 30"	78° 56' 06"
L12	42° 53' 24"	78° 55' 06"
L13	42° 55' 48"	78° 54' 42"

LAKE ST. CLAIR AND DETROIT RIVER

STATION NUMBER	LATITUDE N.	LONGITUDE W.
91	42° 24' 56"	82° 42' 30"
93	42° 22' 32"	82° 52' 30"
98	42° 18' 48"	83° 03' 58"
120	42° 22' 30"	82° 35' 00"
805	42° 04' 55"	83° 11' 00"
808	42° 19' 03"	83° 04' 00"
810	42° 16' 35"	83° 06' 44"
811	42° 14' 48"	83° 07' 40"
812	42° 13' 50"	82° 08' 48"
813	42° 10' 40"	83° 07' 20"
814	42° 10' 23"	83° 08' 22"
815	42° 08' 18"	83° 07' 20"
816	42° 05' 40"	83° 08' 50"
818	42° 02' 50"	83° 10' 30"
819	42° 02' 20"	83° 08' 13"
820	42° 02' 20"	83° 06' 50"
822	42° 04' 30"	83° 07' 10"

BAY OF QUINTE AND LAKE ONTARIO

STATION NUMBER	LATITUDE N.	LONGITUDE W.
855	43° 50' 00"	76° 50' 00"
856	44° 00' 00"	76° 50' 40"
857	44° 09' 30"	76° 37' 30"
858	44° 12' 30"	76° 38' 35"
859	44° 10' 28"	76° 46' 00"
860	44° 09' 35"	76° 47' 10"
861	44° 03' 00"	77° 00' 00"
862	44° 05' 37"	77° 04' 27"
863	44° 08' 45"	77° 12' 30"
864	44° 09' 17"	77° 22' 54"

LAKES ONTARIO AND ERIE

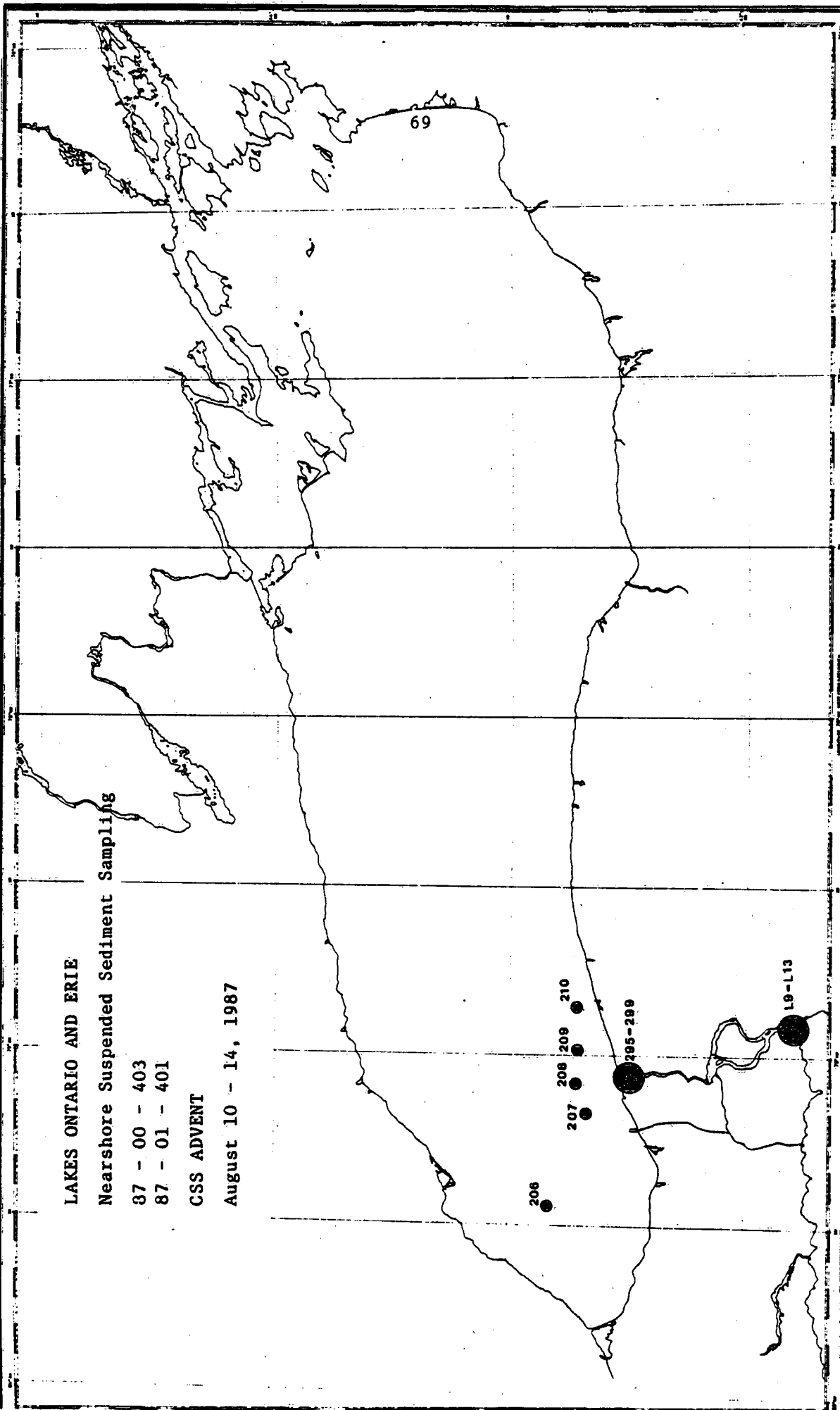
Nearshore Suspended Sediment Sampling

87 - 00 - 403

87 - 01 - 401

CSS ADVENT

August 10 - 14, 1987



70

LAKE ST. CLAIR AND CONNECTING CHANNELS

Nearshore Suspended Sediment Sampling

87 - 04 - 401

CSS ADVENT

August 17 - 22, 1987

30'

42°

30'

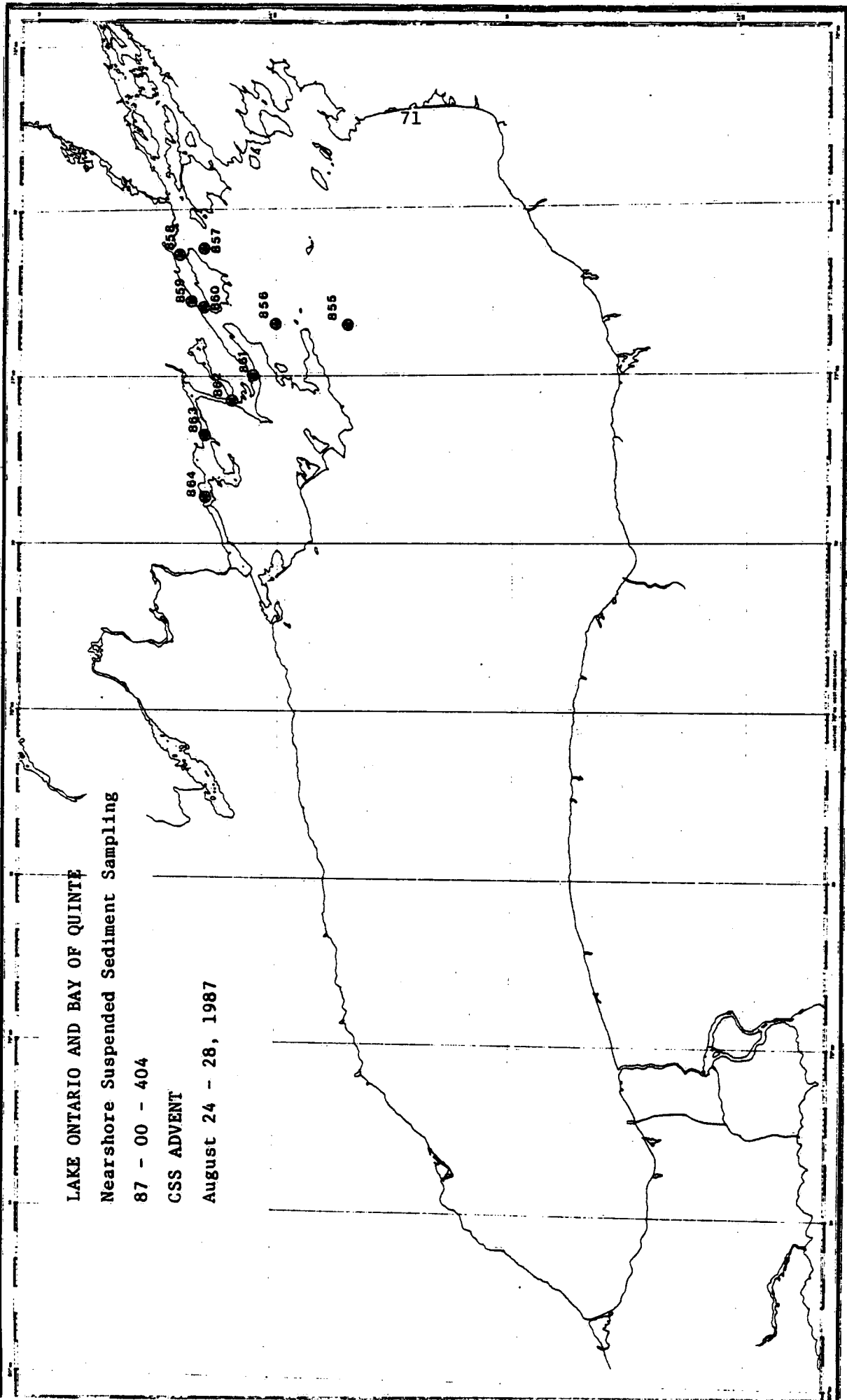
83°

82° 30'

82°



LAKE ONTARIO AND BAY OF QUINTE
 Nearshore Suspended Sediment Sampling
 87 - 00 - 404
 CSS ADVENT
 August 24 - 28, 1987



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HAMILTON HARBOUR STUDY

Hamilton Harbour was identified as an area of concern by the International Joint Commission in 1985. It was recommended that the harbour be used as a Canadian site for implementing a rehabilitation plan. During the last 16 years, the Ontario Ministry of the Environment has concentrated on the monitoring of water and sediment quality in terms of oxygen depletion and the sources and fates of contaminants. This is the second year of NWRI's involvement in a major thrust to answer questions related to harbour rehabilitation. A total of ten studies were organized into a single program to collect the data required to answer these questions. Technical Operations co-ordinated the following activities:

1. Supply and maintenance of all sampling equipment
2. Installation and maintained of a mini-ranger positioning system
3. Installation/retrieval of all moorings and oxygen injection gear
4. Provision of all diving support
5. Scheduling of all vessel requirements through Department of Fisheries & Oceans
6. Observations as required and documentation of the field program in the form of a final report

The following studies were supported for the Hamilton Harbour Rehabilitation Program:

- | | |
|--------------------------|--|
| 1. 82002 - Barica, LRB | - Nitrogen Regime of the Hamilton Harbour |
| | - Ammonia Transects in Hamilton Harbour |
| | - Canal Current Measurements |
| 2. 82064 - Burnison, LRB | - Nutrient/Contaminant Interaction |
| 3. 82031 - Charlton, LRB | - Hamilton Harbour Oxygen and Sedimentation Regime |
| 4. 82030 - Mayer, LRB | - Forms and Bioavailabilities of Heavy Metal Contaminants and Phosphorus in Hamilton Harbour |

5. 82013 - Mudroch, LRB - Behaviour of In Situ Sediment Metals
6. 82027 - Murphy, LRB - Hamilton Harbour Restoration
7. 83033 - Rao, RRB - Toxicity Screening, Hamilton Harbour
8. 82015 - Reynoldson, LRB - Utilizing Benthic Invertebrates
9. 85021 - Rodgers, SLD - Underwater Video, Hamilton Harbour
10. 82029 - Rukavina, LRB - Sedimentology of Hamilton Harbour

NITROGEN REGIME OF HAMILTON HARBOUR

LRB STUDY 82002, DR. J.M. BARICA

During the field season, this program studied the effect of Hamilton Harbour on the nearshore area of Lake Ontario. Also included in the program was the study of the spatial variation of ammonia in the harbour waters, phytoplankton/zooplankton species composition, and oxygen consumption. It is hoped that the spatial variation may provide an insight into the residence time of wastes in the harbour.

Sampling program:

1. Weekly: 6 stations in the harbour (see fig. 1)
April 1 to July 13
2. Bi-weekly: 6 stations (as above)
July 13 to December 14
3. Monthly: 30 stations, ammonia transects
4. Winter: 6 stations (as above, weather dependent)
sampling once per month

Thirty-two cruises were carried out and the canal currents were measured on 17 occasions.

Observations:

- a) Water samples were collected from: 1 m, 2 mid-depths, bottom -1 m
- b) EBT/XMS cast
- c) Conductivity profile
- d) Dissolved oxygen profile (YSI meter)
- e) Dissolved oxygen - Winkler (sample depths)

Figure 1.
HAMILTON HARBOUR
NITROGEN REGIME STN. LOCATIONS

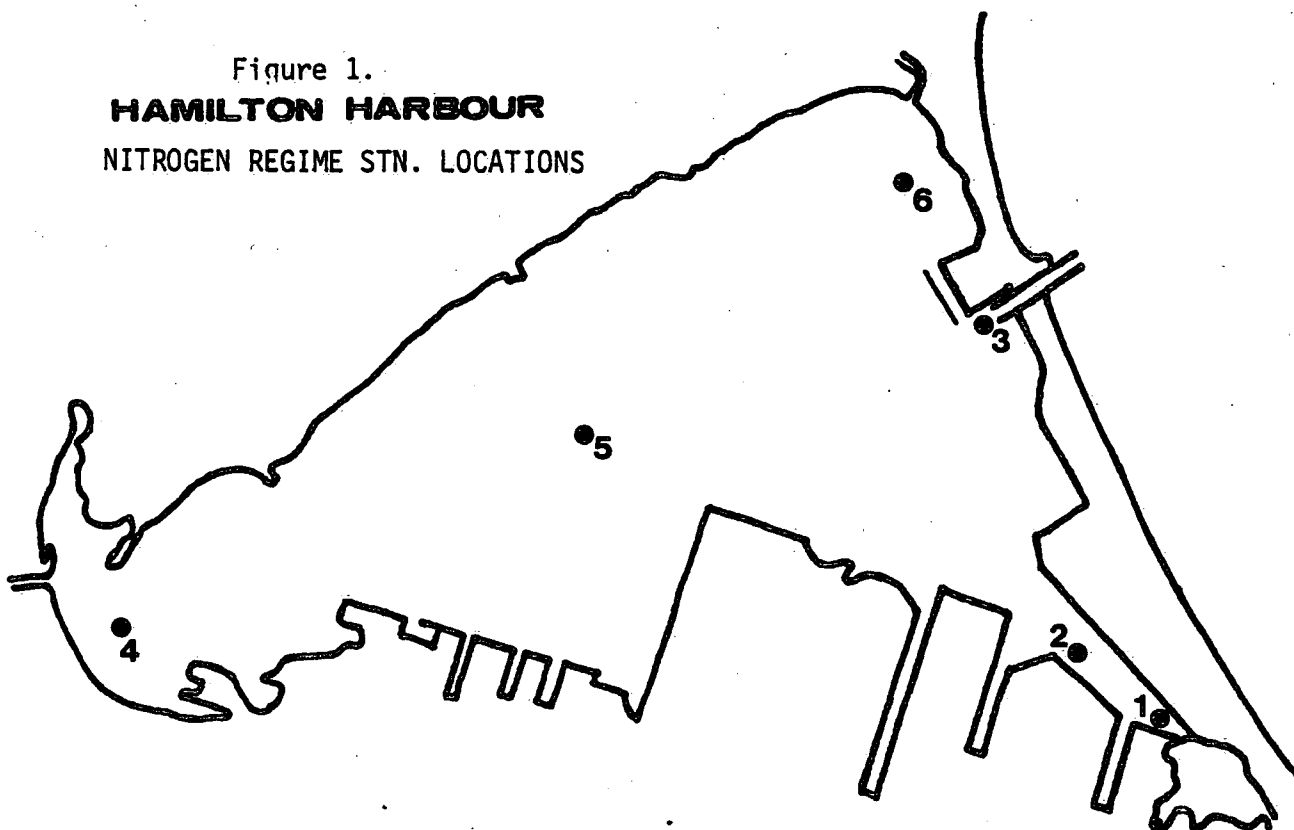
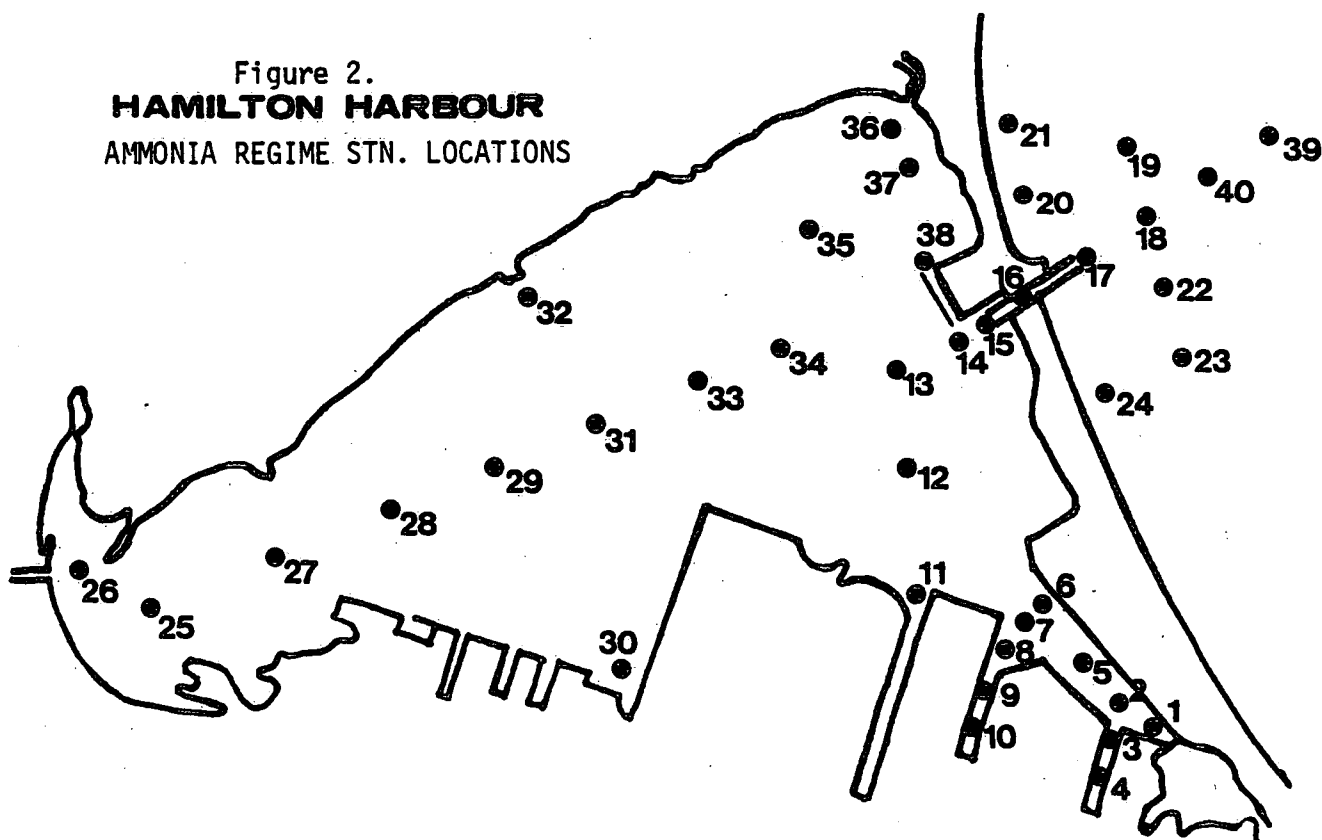


Figure 2.
HAMILTON HARBOUR
AMMONIA REGIME STN. LOCATIONS



f) pH

g) Secchi disk

Canal Currents:

Canal currents were measured on a bi-monthly schedule using an acoustic current meter. Measurements were taken from the lift bridge at six locations equally spaced across the canal. Current readings were measured at depths of 2 m and 8 m at each station. A two-week intensive sampling program took place during January 18 to 29, current measurements and water samples were collected daily. During the field year, canal currents were measure on 17 occasions.

HAMILTON HARBOUR SEDIMENTATION REGIME

LRB STUDY 82031, M.N. CHARLTON

Four sediment trap moorings were installed in Hamilton Harbour to measure sedimentation and, indirectly, the extent of resuspension created by wind, currents and dredging. The organic metal content of the sediment samples was also measured. The barge GOOSE II was utilized for all sediment trap mooring operations.

Moorings:

MOORING NUMBER	LATITUDE N.	LONGITUDE W.
87-00A-50A	43° 18' 26"	79° 48' 50"
87-00A-51A	43° 16' 49"	79° 52' 19"
87-00A-52A	43° 17' 26"	79° 50' 03"
87-00A-53A	43° 17' 09"	79° 47' 48"

Sediment trap moorings were scheduled to be refurbished bi-weekly but weather conditions, equipment problems and personnel assignments disrupted plans. The actual refurbishment schedule follows:

Installation - May 6 and 7

Refurbishment - May 19

June 2, 16, 29

July 30 and 31

August 12, 24

September 21, 22 and 24

Retrieval - October 21 and 26

HAMILTON HARBOUR OXYGEN REGIME**LRB STUDY 82031, M.N. CHARLTON**

The digital dissolved oxygen profiler was used throughout the field season to monitor changes in oxygen concentrations in Hamilton Harbour and Lake Ontario near the Burlington Ship Canal. A new profiling Sonde was built for this season, creating numerous delays as the "bugs" were removed from the system. On a typical cast of the profiler, the following parameters were measured: dissolved oxygen, temperature, light transmission, conductivity, pH and depth. Twenty-eight cruises were carried out with the profiler, occupying sixteen stations per cruise. An intercomparison cruise with the CSS BAYFIELD was carried out on June 11

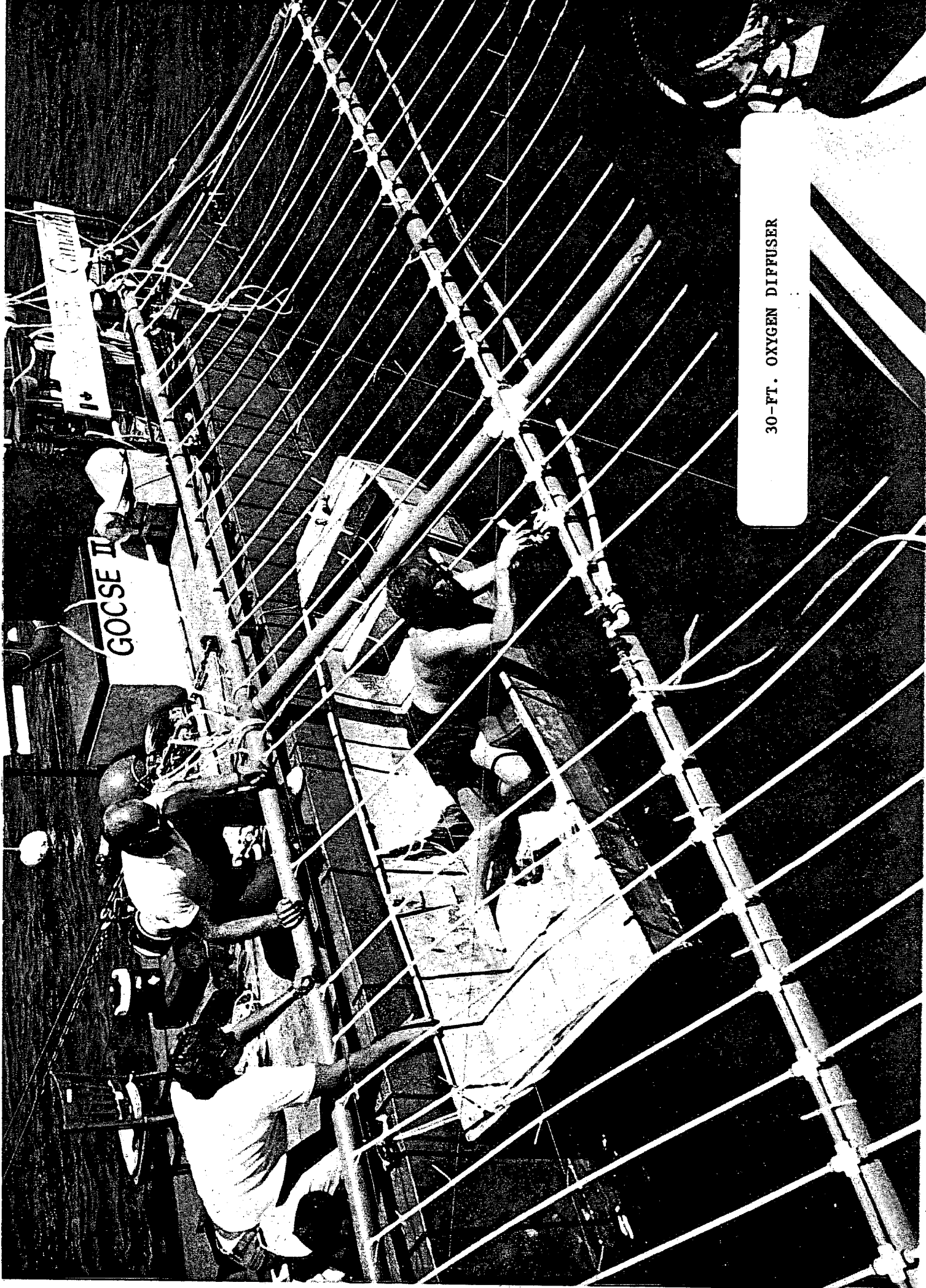
**FORMS AND BIOAVAILABILITIES OF HEAVY METAL CONTAMINANTS
AND PHOSPHORUS IN HAMILTON HARBOUR****LRB STUDY 82030, T. MAYER**

During the field season, Mrs. Mayer continued her Mossbauer studies of iron, heavy metals and phosphorus geochemistry. Centrifuges were used to collect samples from three stations in the harbour, one station in the ship canal, and four stations in Lake Ontario (near the canal). Samples (600L) were collected from two depths determined from the EBT profile. Stations off the ship canal were located using conductivity measurements to determine the location of the harbour plume. Six cruises were carried out:

April 13 - 17	- CSL SHARK
May 11 - 15	- CSL SHARK
June 29 - July 3	- GOOSE II
July 27 - 31	- CSL SHARK
August 17 - 21	- CSL SHARK
September 21 - 25	- CSL SHARK
November 2 - 6	- CSL SHARK

HAMILTON HARBOUR RESTORATION**LRB STUDY 82027, DR. T.P. MURPHY**

This Study continued the oxygen injection experiments which began in 1986. Three oxygen diffusion systems (10 ft., 20 ft. and 30 ft.) were installed near the Macassa Bay Marina in 10 m of water. From a storage tank on shore, pure oxygen was transported through three 1900 ft. rubber hoses (one to each diffuser) to the diffusers where it



30-FT. OXYGEN DIFFUSER

bubbled to the surface. All diffusers at the site were operational on July 23. Divers inspected the diffusers after installation and found everything in order. Current measurements were taken at the three diffuser locations to determine the flow of water around the oxygen bubbles. The oxygen supply at the tank expired on September 24 and all hardware was retrieved from the site by October 30. During the retrieval program, the 10 ft. diffuser with a portable oxygen supply was tested in 23 m of water.

Peepers were installed at and 10 m away from the 10 ft. diffuser on July 21 (2 peepers at each location). Water samples from the peepers were analyzed for heavy metals. All four peepers were refurbished on August 6 and retrieved August 21.

BEHAVIOUR OF IN SITU SEDIMENT METALS

IRB STUDY 82013, A. MUDROCH

This Study dealt with the effect of oxygen injection on the concentration of heavy metals in the sediment porewater. Peepers were installed at the oxygen injection site (10 ft. diffuser) by divers on July 21. One pair of peepers were installed next to the 10 ft. diffuser grid and the other pair was located 30 ft. away. The peepers were refurbished on August 6 and retrieved on August 21.

TOXICITY SCREENING, HAMILTON HARBOUR

RRB STUDY 83033, DR. S.S. RAO

Microbiology sampling monitored the presence of Salmonella and Pseudomonas--pathogens which can restrict swimming. Samples (500 ml) of surface water, bottom water and sediment were collected monthly and in conjunction with the Nitrogen Surveys.

UTILIZING BENTHIC INVERTIBRATES

IRB STUDY 82015, DR. T. REYNOLDSON

Core samples were collected to study the temporal changes in benthic community structure. An IJC protocol to classify the degree of sediment contamination and the potential for bioaccumulation of contaminants was evaluated. On eight occasions, cores and Ekman dredge samples were collected monthly at two stations in Hamilton Harbour (Western Basin and Deep Basin).

SEDIMENTOLOGY OF HAMILTON HARBOUR**LRB STUDY 82029, DR. N.A. RUKAVINA**

A T-frame was installed 50 m offshore of the Wastewater Technology Centre on May 1. Equipped with two transducers and a cable to shore, the installation monitored the movement of sediment at the site. Two temperature loggers were installed on June 15 and XDR measurements taken. The temperature loggers were refurbished on August 18, October 20 and December 16. New transducers and cables were installed at the site on December 4. The site was left operational for the winter months.

SEDIMENTOLOGY OF HAMILTON HARBOUR**LRB STUDY 82029, DR. N.A. RUKAVINA**

The goal of this project was to interpret and report the occurrence, distribution and history of the sediments of Hamilton Harbour in support of Harbour Restoration studies.

Technical Operations contribution to this project was twofold: The project was supplied with a Falcon mini-ranger system for positioning. Staff from Tech. Ops. assisted in the collection of cores and grab samples from all areas of the harbour. During the week of July 6, 34 stations were occupied in Hamilton Harbour. From each station, a double Shipek and two cores were collected whenever possible, depending on bottom type.

A station listing can be obtained from the final field report.

UNDERWATER VIDEO, HAMILTON HARBOUR**SLD STUDY 85021, DR. G.K. RODGERS**

On June 8 and 9, the miniROVER underwater television system was used to survey 10 sites around Hamilton Harbour. The video was used to document aquatic macrophyte growth, sediment distribution and possible contamination.

TURKEY LAKES WATERSHED

LRTAP

RRB STUDY 83021, R. SEMKIN

The Turkey Lakes Watershed Study is an ongoing project monitoring the movements and effects of Long Range Transport of Airborne Pollutants (LRTAP) on the sensitive aquatic ecosystems of the watershed. The chemical and hydrological monitoring of the study area was begun in 1980 and has been supported by Technical Operations throughout this period.

The study site is located on the Canadian Shield 50 Km North of Sault Ste. Marie and 25 Km East of Lake Superior. The area of the watershed is 10.5 Km² and consists of a chain of five small lakes from 6 ha to 52 ha in size. The area is in the very rugged Algoma Highlands, totally forested, uninhabited and receiving the highest amounts of precipitation in Canada, East of the Rockies.

Technical Operations' support consisted of one full-time technician stationed in Sault Ste. Marie. Equipment support consisted of one full-time 4 wheel drive vehicle used for transport to the study area. A second 4 wheel drive vehicle was utilized during the winter months. In addition, four snowmobiles and four all-terrain vehicles were supplied and maintained by Tech. Ops. for use as transportation throughout the watershed. All tools, sampling and safety equipment for the study were supplied by Technical Operations.

A security system on the camp at the work site and a 2-way radio system was operated by Tech. Ops. and maintained by the Communication Centre in Sault Ste. Marie. All roads and trails in the watershed were also maintained by Tech. Ops. with assistance from the Canadian Forestry Service at Sault Ste. Marie.

The Department of Fisheries & Oceans' support consisted of six small boats and one canoe (14 - 16 ft.). One outboard motor, four electric motors and other items to make the boats safe and operational were also supplied.

Tech. Ops. staff supported Rivers Research Branch staff in chemical and hydrological monitoring of the watershed. The hydrological monitoring consisted of gauging seven stream locations throughout the

watershed on a weekly basis and sampling these locations for a number of chemical parameters. Four lakes were sampled on a bi-weekly schedule and one lake was sampled weekly for the same chemical parameters with the exception of the spring and fall when they were all sampled once a week. During the remaining seasons, rain volume samplers were measured and changed weekly. Isco samplers were installed in two locations in the watershed prior to and during "Spring Runoff" and samples were collected every 12 hours.

To supplement hydrological and chemical data, a full meteorological station and solar radiation unit were operated on a year round basis by Technical Operations.

Technical Operations supplied additional support during intensive sampling periods. One TOS member supported the study during the intensive "Spring Runoff" period (March 23 - April 17) and again one TOS member completed regular yearly maintenance work on the "Slope" project (November 23 - 25).

Sediment trap moorings in two lakes were regularly maintained on a 6-week and 3-week time schedule in support of Dr. J. Nriagu's Study 83026 and Dr. W.M.J. Strachan, Study 82051.

An additional solar radiation unit and meteorological station was installed, operated and maintained by Technical Operations staff between March and November in support of W. Schertzer's Study 82054.

WATER-AIR EXCHANGE OF ORGANIC CONTAMINANTS

LRB STUDY 82051, DR. W.M.J. STRACHAN

A model is required to describe the distribution of toxic chemicals in large complex systems such as Lake Ontario. In order to do this, all compartments of contaminant loading must be identified and evaluated. This study, led by Dr. W.M.J. Strachan of LRB will attempt to produce a model for a smaller, less complex system; namely, Little Turkey Lake, which can be used later to model a more complex system.

It is known that certain organic contaminants exist adsorbed to particles in the air and as free molecules in vapor state. It has been impossible to accurately measure this vapor portion of total contaminant load in the air. Normal air samplers simply filter particles from the air and capture the vapor fraction in a trap. This vapor fraction not only contains the free molecules but also molecules that are desorbed from the particles on the filter. Dr. Strachan and Dr. W.H. Shroeder, AES, requested the design of an air sampler which would isolate the vapor fraction of the contaminants in the air previous to filtering the sample so that the amount of organics then reaching the filter and trap could be subtracted from the total obtained by a normal air sampler to indirectly determine the free vapor fraction.

The sampler was produced, under the scientific supervision of Dr. Doug Lane, AES, by the Ontario Research Foundation. Mr. Doug Johnson, ORF and Ms. Mary-Jane Hanley, ORF, were involved with its development and testing.

The air samplers were set up onboard a van and driven to the Turkey Lakes where they were run and sampled by the AES and ORF personnel on the MET Hill using power tapped from the camp's electrical system. Three samplers were set up on the MET Hill to collect organic contaminants by sorption onto resin columns.

Additional sampling was carried out to compliment the air monitoring. Samples of water, sediments, and vegetation were collected as indicators of the effect of air borne organic contaminants.

At Little Turkey Lake, water was pumped from a depth of 1.5 m in the area of the deep hole and centrifuged onboard the Joe Boat for suspended sediment analysis. The centrifuge was run at a rate of four litres per minute for a minimum of five hours each day for six days. A second centrifuge was set up on land at the inlet and the outlet of Little Turkey Lake for 3 days at each site. The pumping rate and duration was the same as the lake site.

After starting up each site every day, 140L of centrifuged water was collected from each site and transported to the lab trailer of the Turkey Lakes research site facility. Here, Dr. Strachan and Ms. D. Piché passed 80L of the 140L through a Goulden extractor and the remaining 60L was passed through a resin column at a lower rate overnight. Duplicate extractions were done from each site.

A mooring with two sedimentation traps was installed in Little Turkey Lake near the deep hole and was refurbished every month.

Samples of leaves and soil were collected along the shore and on each of the 4 trips, bottom sediment samples were collected from 6 sites around the lake for contaminant analysis.

Additional in situ meteorological data was obtained from the MET buoy installation in Little Turkey Lake.

Technical and field support was provided by various members of Technical Operations. Mr. J.A. Kraft did the preliminary trip between September 29 and October 4, 1986. Mr. S.B. Smith did the spring trip between May 7 and 15, 1987, at which time the sedimentation trap mooring was installed. Mr. J.E. Tozer did the last 2 trips: July 22 to 31 and October 19 to 27, 1987. Continuity was provided by Mr. G.G. LaHaie, resident Tech. Ops. staff at the Turkey Lakes research site. Mr. LaHaie furnished boats, motors, ATC's and assorted hardware plus the refurbishing of the sedimentation trap mooring on a monthly basis, and monitoring of the on-site meteorological equipment.

SULFUR CYCLE

DORSET, YAMASKA, TURKEY LAKES

RRB STUDY 83026, DR. J.O. NRIAGU

To determine sulfur cycling and dispersion of contaminants according to particle size, three major study areas were sampled. These areas were in the vicinity of Dorset, the Yamaska River, Quebec and the Turkey Lakes Watershed.

The Dorset area included lakes Plastic, Crosson and Heney. At Plastic and Crosson lakes, the Technical Operations Dive Team installed two moorings in each lake. At each mooring, three peepers were placed in the sediment in water depths ranging from 13 m to 20 m. Due to the size and depth of Heney Lake, only one mooring in a depth of 5.5 m was installed.

The Technical Operations Dive Team was involved in the initial installation of August 4 and 5 and the second installation of August 24 and 26. At that time, the peepers were installed in such a manner that retrieval could be accomplished from the water's surface. The final retrieval of September 16 and 17 was done in conjunction with the collection of lightweight cores.

Three trips to the Yamaska River, Quebec took place June 1 - 5, July 6 - 10 and September 21 - 25. Bulk water samples were collected for filtration and centrifuged for suspended solids.

Sediment traps in the Turkey Lakes Watershed were sampled and refurbished periodically throughout the field season. This task was done by the Technical Operations staff member assigned to the Turkey Lakes Watershed Project.

ICE JAMS

THAMES, GRAND, RESTIGOUCHE RIVERS, ROCKWOOD PARK

ICE JAMS AND FLOODING

RRB STUDY 83053, DR. S. BELTAOS

The studies for this project were carried out on the Thames and Grand rivers, Ontario; Restigouche River, New Brunswick and Rockwood Park Conservation Area, Ontario.

The project concentrated on developing methods, theories and models to handle all types of river ice problems. The research program included: forecasting control and prevention of ice jams, effects of ice on winter flows, knowledge of river ice mechanics and release of ice jams.

Field observations on the Grand and Thames rivers were made to develop methods to improve management of ice-covered rivers. Videos of the breakup of these rivers were taken to document these observations.

Support was given by Technical Operations to the Rockwood Lake and Restigouche River areas of the project.

At Rockwood Park Conservation Area, field tests were set up to obtain the flexural strength of ice. Several trips were made during the winter to cut ice beams in the lower pond at Rockwood Park. Due to weather conditions, the ice formation was such that it was not feasible to complete this task--ice formed in layers and not a solid piece.

A reconnaissance survey of the Restigouche River was made June 1 - 5 to determine the logistics necessary to run a survey in the winter of 1988.

WAVES '87

Under the title of WAVES '87, two principal projects were conducted in the vicinity of the WAVES Tower:

AIR-WATER INTERACTION

RAB STUDY 84034, DR. M.A. DONELAN

THREE TOWERS

RAB STUDY 84033, DR. M.G. SKAFEL

Secondary studies conducted in the immediate area of the three towers included:

SEDIMENT TRAP EXPERIMENT

LRB STUDY 82061, F.M. BOYCE

and

SUSPENDED SEDIMENT PROFILER

THE OHIO STATE UNIVERSITY, K. BEDFORD AND R. VAN EVRA

The 1987 season marked the conclusion of the three-year project on the WAVES Tower. The title of the Study was Air-Water Interaction and its goal was to discover or develop theories and/or models to describe the interaction of wind and water, including surface waves, fluxes of mass and energy, turbulence and orbital velocity beneath breaking waves.

The season started early in January when attempts were made to recover exposed cables on the beach. Ten (10) years of shore erosion combined with last year's high water level in Lake Ontario had exposed all the towers (3) and data cables (2) linking the WAVES Tower and the trailer. A contract was let in May to excavate and re-bury all the

cables, including two laid last year for WHOI. At present, all cables (7) cross the Trans-Northern Pipeline at a single point and the cables are separated from the pipeline by 4" pads of Neoprene and several bags of concrete.

In order to operate a new instrument--the "WAVE Follower", the tower-trailer complex had to be equipped with 550V, 3 phase power. A test was performed on the existing cables and a contract signed for installation of electrical boxes, panels, and a new buried power line from the City underground service to the trailer.

The first instrument installation was made on August 31st and the last dismantling was completed December 17th. During that period, on 66 different days, the tower was occupied for a period of as little as an hour to a maximum of 10 hours. A wide range of work was performed by all involved: installation of brackets and instrumentation, maintenance, repairs, monitoring of data using different probes, replacement of probes, supplying nitrogen for purging and dismantling.

Fifty environmental instruments were in use and controlled from shore by computer; over the last 3 years, approximately 5 billion bits of information have been gathered.

This year, 62 individuals from DOE; NWRI, Burlington, Ontario; Wood's Hole Oceanographic Institute (WHOI), Wood's Hole, Mass.; Naval Research Laboratory (NRL), Washington, D.C.; Naval Environmental Prediction Research Facility (NEPRF), Monterey, Ca.; Johns Hopkins University, Baltimore, Ma.; Finnish Institute of Marine Research, Helsinki, Finland; DFO, Burlington, Ontario; Bedford Institute, Halifax, N.S.; and The Ohio State University, Columbus, Ohio were involved in all aspects of WAVES '87 related projects.

In order to have a more complete picture of the goals of WAVES '87, a second project, "3 Towers" was instituted in the nearshore area. Three small towers equipped with waves staffs, bi-vanes, current meters and transmissometers were installed in 2, 4, and 8 m of water a distance of 350 m from shore. These towers were interconnected with a computer in the trailer facility.

While the electronic equipment was being de-bugged, Sea Data recorders were used to collect data during storm events. Technical Operations Section was involved in all aspects of the operations from contract negotiation with McKeil Work Boats for installation and retrieval, laying of cables, maintenance, repairs, dismantling and removal of towers and 3 of the 5 cables. As in the previous season, two (2) wave riders were installed by TOSS at 4 and 11 Km from shore on a line of 60° True from the WAVES platform and the 3 towers, thus providing an eleven Km study of waves with the bulk of the study conducted from the WAVES platform.

The area around the 3 towers was the site of a sediment trap experiment, and of a piggy-backed study by The Ohio State University.

Tech. Ops. Section was involved in installing, refurbishing, and retrieving 6 sediment trap stands and a tripod containing 3 different types of traps for a total of 26 samples. An Isco sampler was installed on T-3.

Additional support included taking EBT/transmission/bucket thermometer readings, collecting water samples for Seston analyses, refurbishing the sediment traps and collection of sediment samples.

To complete this experiment, an acoustic suspended sediment profiler was deployed for a period of 4 weeks by Tech. Ops. Section for The Ohio State University. The DAS cylinder had to be retrieved and relaunched on several occasions.

SUMMARY

TITLE	STUDY NO.	PERIOD OF ACTIVITY	PERSONNEL		NUMBER OF TRIPS
			TOS	ALL	
Maintenance	84034	24/04 to 15/08	6	--	12
WAVES '87	84034	31/08 to 17/12	18	62	96
Preparations	84033	07/05 to 05/09	4	--	--
3 Towers	84033	22/09 to 16/12	6	11	32
Sediment Traps	82061	08/10 to 11/12	8	11	30
Ohio State	82061	17/16 to 08/12	2	6	6

BOAT TRIPS

BOAT NAME	NUMBER OF TRIPS
PEEWEE	1
CARGOMASTER	2
WHISTLER	3
ADVENT	4
SHARK	5
CORMORANT	10
GOOSE II	15
MonArk	49
PUFFIN	87

SAMPLES COLLECTED

Seston	129
Sediment	230

OTHERS

EBT/Transmissometer	48
Bucket Thermometers	48

LOCATION OF INSTRUMENTATION

STUDY	LATITUDE N.	LONGITUDE W.
Wave Rider #1	43° 19' 21"	79° 38' 32"
Wave Rider #2	43° 17' 09"	79° 43' 19"
WAVES Tower	43° 16' 13"	79° 45' 33"
T-3	43° 16' 06"	79° 45' 58"
T-2	43° 16' 02"	79° 46' 10"
T-1	43° 16' 00"	79° 46' 16"

WAVES MONITORING
Burlington Post
Photo



RIVERS

FRASER RIVER

LRB STUDY 82061, DR. J.H. CAREY

The objectives of this program were to study the pathways of accumulation and degradation of chlorophenols. This was the final year in a five-year program which provided data on the environmental distribution of the chlorophenols on the Fraser River from Pattula Bridge to the mouth of the river.

The field trip conducted from October 19 to 23 was spent investigating the salt wedge specifically on the North arm from the Oak Street Bridge to the mouth of the river at Wreck Beach. EBT/XMS/COND profiles were conducted at several stations on a daily basis. In addition to the profiling, water samples were collected from several stations that were designated by the Project Leader. These water sampling stations were chosen after reviewing the EBT/XMS/COND profiles; a strong chemocline dictated when samples were collected. The station positions are available in the final field report.

Sediment trap moorings were deployed at various locations on both arms of the river. These moorings were deployed on October 19. They were refurbished on October 23. The moorings were to be changed on a regular basis by Water Quality Branch personnel from Vancouver. The moorings were located as follows: Mooring #1, attached to navigation buoy S19 off Steveston; Mooring #2 was hung from navigation buoy S32; Mooring #3 was bottom-mounted at the upstream end of a weir located upriver of Annacis Island; Mooring #4 was hung from the South side of the Oak Street Bridge; Mooring #5 was attached to an old abandoned ferry dock at Deering Island; Mooring #6 was suspended from Dolphin #4 directly across from Mooring #5 at Deering Island.

YAMASKA RIVER**FATE OF AMINES IN AQUATIC SYSTEMS****RRB STUDY 83061, DR. R.J. MAGUIRE**

The Technical Operations Section of RSD supported, for a third year, a study by Rivers Research Branch titled Fate of Amines in Aquatic Systems. Aromatic amines are on the Environmental Contaminants Act Candidate Chemical List which means that information is required on environmental occurrence, persistence and toxicity. Amines are high volume industrial chemicals and many are carcinogenic.

This was the third year of this study conducted in the Yamaska River Basin in the Eastern townships of the Province of Quebec. Three separate trips--June 8 - 12, July 6 - 10 and September 21 - 25, were made to sample water, sediments and biota in order to determine the presence of amines and other contaminants.

Compared to the last two years when 19 sites were sampled, only sites 13E and 13W were sampled this year. The procedure was basically the same as last year: centrifuging of 200L into the APLE and running extractions using an acidic and basic medium with DCM as the extraction in each case. Centrifuge bowls were cleaned and the water sediment given to Rivers Research Branch personnel for filtration. This procedure was done from the Joe boat which was launched and returned each day of the trips.

There were five RRB personnel involved in the Study: Janice Metcalfe, Richard Tkacz, Gerry Bengert, Kristen Day and R.J. Maguire; and from Technical Operations: John Lomas, Howard Greencorn, Yvon Desjardins and Barry Moore.

YAMASKA RIVER**BIOLOGICAL ASSESSMENT OF CONTAMINANTS****RRB STUDY 83063, J. METCALFE**

This study, led by Ms. J. Metcalfe, is an attempt to establish methods whereby collections of aquatic invertebrates can be examined at the field site to accurately determine the quality of the water and the type of pollutants present in the water.

The study was supported by a technologist from Technical Operations on two occasions. The first period was a laboratory assignment of twelve weeks duration during which time, samples of invertebrates were sorted according to species, identified and counted. The second period consisted of a field trip to sample sixteen previously established sites within the confines of the Yamaska River Watershed. The field work consisted of the recovery of caged clams and sediment traps and the recovery and sampling of artificial substrate samplers. Water samples were collected for suspended sediment load, and onsite determinations of dissolved oxygen, pH, current speed and water temperature were made at each site at which substrate samplers were found. At all sites, an attempt was made to collect benthos from riffle areas using the surber and/or scoop sampler. The substrate samplers were stripped of their resident organisms, benthos samples were cleaned and prepared for future analysis, and the suspended sediment water samples were filtered.

CANADIAN WILDLIFE SERVICE

RSD STUDY 86041, DR. V.W. WESELOH

Technical Operations Section continued to support the Canadian Wildlife Service (CWS) field program on the Great Lakes.

PURPOSE

The purpose of this study was to determine, or aid in the determination of, how various factors constitute biological effects of toxic chemicals in Herring Gulls, Double Crested Cormorants and other species of colonial waterbirds at several nesting colonies throughout the Great Lakes. The following was undertaken:

- a) Egg collections were made of Herring Gull, Canada Goose, Kestrel and Starling
- b) Population levels of Double Crested Cormorants at 37 locations on the Great Lakes and Lake of the Woods were determined
- c) Congenital anomalies (deformities) in Cormorant chicks on Canadian Great Lakes were investigated (18 sites) in conjunction with studies being carried out on Lake Michigan by the U.S. Fish and Wildlife Service. Cormorants were banded at all these sites
- d) Embryonic mortality in Herring Gulls from 3 colonies was studied

METHOD

The largest percentage of the CWS field program was directed toward the Gull eggs and chicks and Cormorant chicks. Scheduling of field trips was critical. The field program, although short in duration (April - July), was very intensive. Because of varying ice conditions throughout the Great Lakes, egg laying takes place over a two-week period even though the incubation time is the same (26 - 28 days). A two-field-party system was used to monitor the many colonies spread out around the Great Lakes. Several of the colonies were visited at the 3 most important times:

1. Nest building and egg laying during the end of April and early May
2. Egg hatching at mid to late May

3. Chicks at 2 - 3 weeks of age for examination for deformities

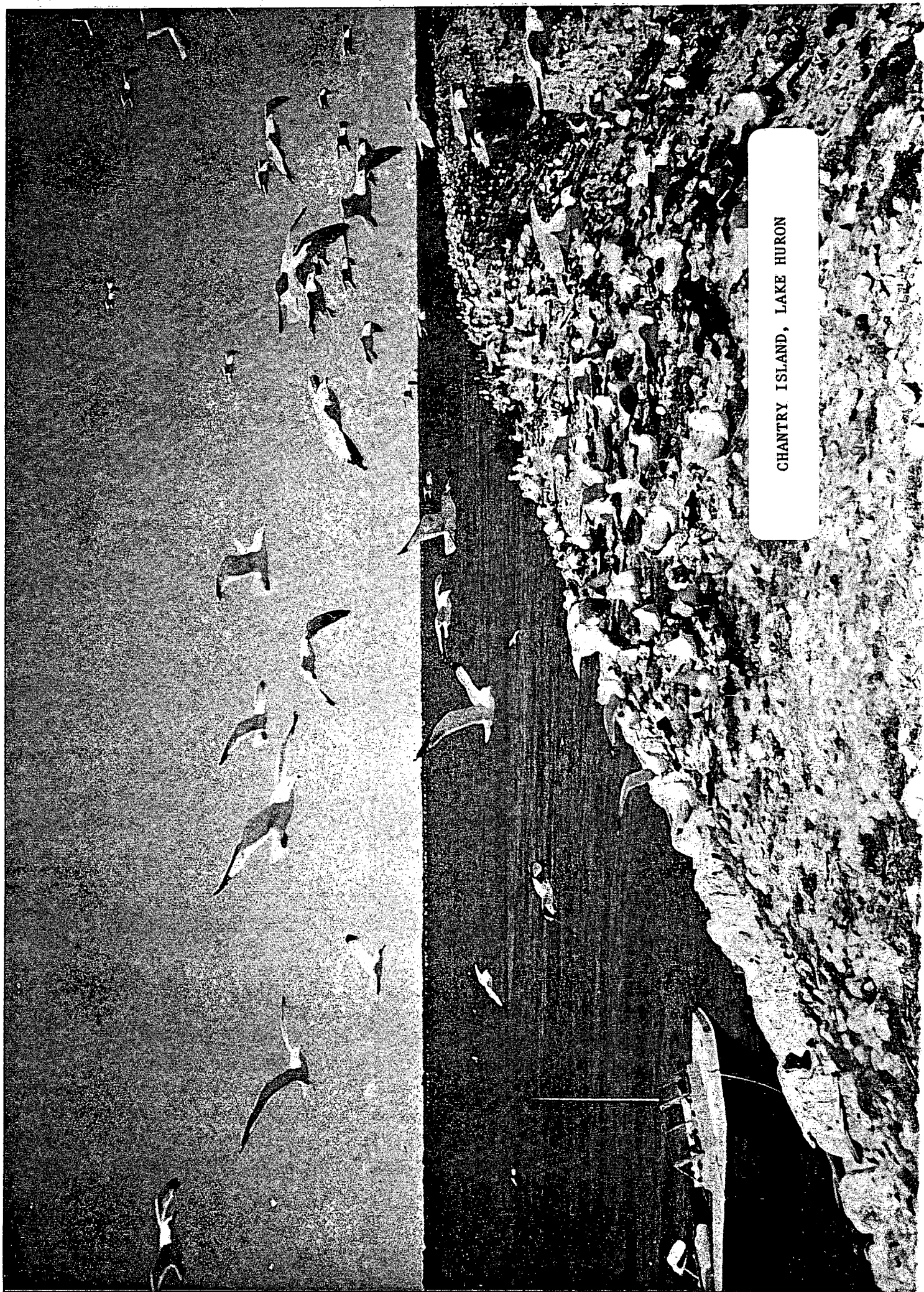
Scheduling of field trips for monitoring and banding of Double Crested Cormorants did not interfere with the Gull survey because they lag 2 - 3 weeks behind in breeding and hatching. Also, the Cormorant egg laying is spread out over a longer period than the Gulls'. While working closely with the U.S. Fish and Wildlife Service, data were exchanged to help complete the picture of Herring Gulls and other species on the Great Lakes.

Two 18' workboats (THUNDERBIRD and SAB 2) were utilized throughout the season to visit the many colonies located on several islands in the Great Lakes, Detroit and Niagara rivers, Lake St. Clair, Lake Nipigon and Lake of the Woods.

Over 2000 sea miles were logged along with over 20,000 land Kms of boat trailering. Although the field work required a great deal of travel on land and water covering a large area, it was successfully completed without mishap, damage or injury.

Similar surveys are planned for the 1988 field season with emphasis on contaminants in the Niagara Peninsula.

CHANTRY ISLAND, LAKE HURON



DIVING OPERATIONS

RSD STUDY 86033, F.H. DON

The Diving Operations Unit of Technical Operations Field Section provided national support to various scientific studies in areas of diver certifications, inspections, installations and retrievals, sample collection, photography, television surveys with video documentation, equipment demonstrations/trials, search and recovery, lectures, and diver training. The Diving Operations Unit supported 15 divers located at Burlington. A significant decline in requests for diving services resulted in a total of only 180 hours (accident free) logged in supported of projects for: NWRI; Water Quality Branch, Ontario Region; Bayfield Laboratory; Canadian Hydrographic Service, and outside agencies (Canadian Aviation Safety Board and the Ministry of the Environment). An additional 80 hours were logged during the pool training program.

The Head of the Diving Operations Unit represented research/scientific diving as a member of the CSA Standards Technical Committee on Diving Safety and the Ontario Commercial Diving Council (Ontario Construction Safety Association). He addressed a seminar of the Construction Safety Association, Toronto, on the subject of "Exposing Divers to Contaminated Waters" and similarly addressed the Police Divers Symposium, Burlington, on the subject of "Diving in Contaminated Environments". In April, he delivered a paper entitled "Remotely Operated Vehicles (ROV's) at NWRI" to the IAGLAR Conference at Ann Arbor, Michigan. The Annual Meeting of the Department of Environment Diving Safety Committee, chaired by Mr. F.H. Don, was held in Cornwall, Ontario in April.

Highlights of the field season include the recovery of a Britton-Norman Islander aircraft which crashed near Toronto Island in Lake Ontario. The aircraft which crashed in January 1987 was found resting in 270 ft. of water in an upright position. The miniROVER was used to survey the aircraft prior to recovery and to assist in positioning the lifting frame under the wings. This recovery established North American records for the intact recovery of an aircraft from 270 ft. and for using ROV's without divers. Another highlight involved the search and recovery of barrels of suspected "toxic" chemicals in the lower Niagara River. The Diving Operations Unit, with a minimum response time and using specialized diving equipment for work in contaminated water, carried out the search and recovery operation.

The Diving Operations Unit has a complete inventory of modern diving and diver support equipment which, when used and operated by highly skilled divers, can complete complex sub-sea operations.

Projects supported during the year included:

STUDY NUMBER	STUDY TITLE
82011	Sediment/Water Interactions 50 Point, Sediment Transport
82024	Mountsberg Limnocostrals
82025	Sediment/Water Interaction
82026	Phosphorus Flux
82027	Hamilton Harbour Restoration
82029	Hamilton Harbour Sedimentology
83026	Sulfur Cycling
83061	Pesticides and Industrial Chemicals
84034	WAVES
86033	Contingency: Aircraft Recovery Niagara Barrels Hull Inspections Search and Recovery
86041	Water Quality Branch Stations: Niagara-on-the-Lake, Fort Erie, Wolfe Island

RESEARCH, ONTARIO LOCALES

CANAGAGIGUE CREEK

STATISTICAL EVALUATION

RRB STUDY 83015, DR. B.G. BROWNLIE

The objective of this project was to evaluate a self-contained and portable data collection and logging systems for use in remote areas. Two Hydrolab and a Terra 8 data logger with the capability of recording parameters such as oxygen, pH, specific conductance, temperature, salinity and time were installed in Canagagigue Creek near Elmira at stations #2, #3 and #4. The Terra 8 was installed at station #2 below the sewage treatment plant while the Hydrolabs were installed at stations #3 and 4. To protect the instrumentation, steel stakes were driven in upstream of each recording package. The recorders were secured to a concrete block for weight and left for a seven-day period. At the end of the period, the recorders were returned to CCIW for subsequent data recovery from the logger. This evaluation was conducted three times throughout the year in conjunction with Dr. J. Carey's Canagagigue Creek Study 82061.

ST. CLAIR RIVER

CONTAMINATION

SLD STUDY 85021, DR. G.K. RODGERS

The purpose of this study was to monitor the status of the 1985 "BLOB" site in the St. Clair River. On two occasions (June 16 and January 13), Technical Operations divers, using underwater cameras and the miniROVER, surveyed the area near the Dow Chemical First Street Outfall. All photos and video tapes were given to the Science Liaison Division with copies to Dow Chemical.

MOUNTSBERG

EURASIAN MILFOIL

LRB STUDY 82024, D.S. PAINTER

This Study was set up in an attempt to explain the dramatic decline in the Eurasian Water Milfoil population in Ontario lakes over the past few years. An ongoing study at Buckhorn Lake has shown that in areas where 80% milfoil coverage was found in the early 1980's, there is now less than 1% coverage. The lake at Mountsberg Conservation Area has also shown large milfoil growth and because of its proximity to CCIW, it was a logical site for this Study.

One reason for the decline of the Eurasian Milfoil might be the aquatic moth larvae Acentria nivea which has been found feeding on the milfoil in large numbers. In order to isolate this larvae to determine if it actually affects milfoil growth, a limnocorral was installed in Mountsberg Lake on May 6. The limnocorral measured 12 m a side and was installed in water less than 2 m deep over an area of substantial milfoil growth.

The area inside the limnocorral was treated with the herbicide Bacillus thurengensis in order to kill any of the moth larvae present on the milfoil. Observations were made on milfoil growth throughout the summer and the limnocorral was removed on September 28.

Upon removal, it was noticed that the limnocorral had been damaged and also that some sampling equipment was missing. In future, studies of this type may require a more controlled environment where access by the public can be controlled.

PORT HOPE

WATER AND SEDIMENT SAMPLING

RRB STUDY 83032, B.J. DUTKA, DR. S.S. RAO

During the period of April 6 - 9, samples were obtained from Port Hope Harbour and also from Lake Ontario in the nearshore zone around Port Hope. A total of 19 stations were occupied with water and sediment samples collected at all stations. Two stations in the harbour were sampled for chironomids using an Ekman dredge and an airlift.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1	43° 57' 06"	78° 15' 54"
2	43° 57' 01"	78° 16' 10"
3	43° 56' 56"	78° 16' 24"
4	43° 56' 52"	78° 16' 40"
5	43° 56' 49"	78° 16' 54"
6	43° 56' 39"	78° 17' 26"
7	43° 56' 49"	78° 17' 33.5"
8	43° 56' 31"	78° 17' 31"
9	43° 56' 25"	78° 17' 27"
9A	43° 56' 39"	78° 17' 34.5"
10	43° 56' 19"	78° 17' 26.5"
11	43° 56' 25"	78° 17' 32.5"
12	43° 56' 27"	78° 17' 36.5"
13	43° 56' 21"	78° 17' 48"
14	43° 56' 29"	78° 17' 46.5"
15	43° 56' 29"	78° 17' 55"
16	43° 56' 30"	78° 18' 04"
17	43° 56' 21"	78° 18' 12"
18	43° 55' 57"	78° 20' 48"

HUMBER BAY

SEDIMENT SAMPLING

LRB STUDY 82011, DR. J.P. COAKLEY

During the period April 21 - 23, a sediment sampling cruise was conducted in Humber Bay from the CSS LIMNOS. A total of 26 miles of sounding records were obtained prior to the commencement of sampling. Once the sounding records had been reviewed, several sites were selected to attempt piston coring operations. On arrival at station, a Shipek sample and a Benthos core were obtained. If bottom sediments obtained showed indications of probable deep penetration, a piston core was attempted. Five piston cores were obtained.

SELECTED CORE STATIONS

STATION NUMBER	PISTON CORE LENGTH	LATITUDE N.	LONGITUDE W.
2	3.8 m	43° 36' 05"	79° 26' 54"
14	8.6 m	43° 36' 27"	79° 25' 14"
18A		43° 36' 20"	79° 27' 21"
25		43° 36' 48"	79° 26' 47"
27	4.8 m	43° 36' 47"	79° 25' 50"
39		43° 37' 06"	79° 26' 13"
40		43° 37' 06"	79° 27' 07"
42	2.2 m	43° 37' 04"	79° 27' 54"
60	4.8 m	43° 35' 38"	79° 26' 16"
65		43° 37' 03"	79° 26' 27"
74		43° 36' 39"	79° 27' 17"
81		43° 36' 22"	79° 27' 59"

HUMBER BAY

FATE OF CONTAMINATED SEDIMENTS

LRB STUDY 82011, DR. J.P. COAKLEY

An attempt was made during 1987 to determine the fate of contaminated fine sediments at 2 sites near Toronto. Studies were done in Humber Bay and the Leslie Street Spit using cesium as a tracer in order to determine the movement of fine sediments into Lake Ontario.

Work began at Humber Bay on April 7 when a cesium/water mixture was pumped into the mouth of the Humber River. The site was visited again on April 10 when 50 (fifty) Shipek samples were taken along 7 lines radiating out from the river mouth. Subsequent samples were taken on June 8 and September 29 in an attempt to determine the flow patterns in Humber Bay. Samples were collected utilizing the CSL SHARK, and positioning was done using the Falcon mini-ranger with 3 shore stations.

In conjunction with the bottom sampling, a wave recorder was installed off Gibraltar Point on June 1 in 7.5 m of water. The recorder was removed for repairs on October 23 and re-installed on October 29.

STATISTICS SUMMARY

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CRUISE NO. 87-00-002 CONSECUTIVE NO. 004

SHIP CSS LIMNOS

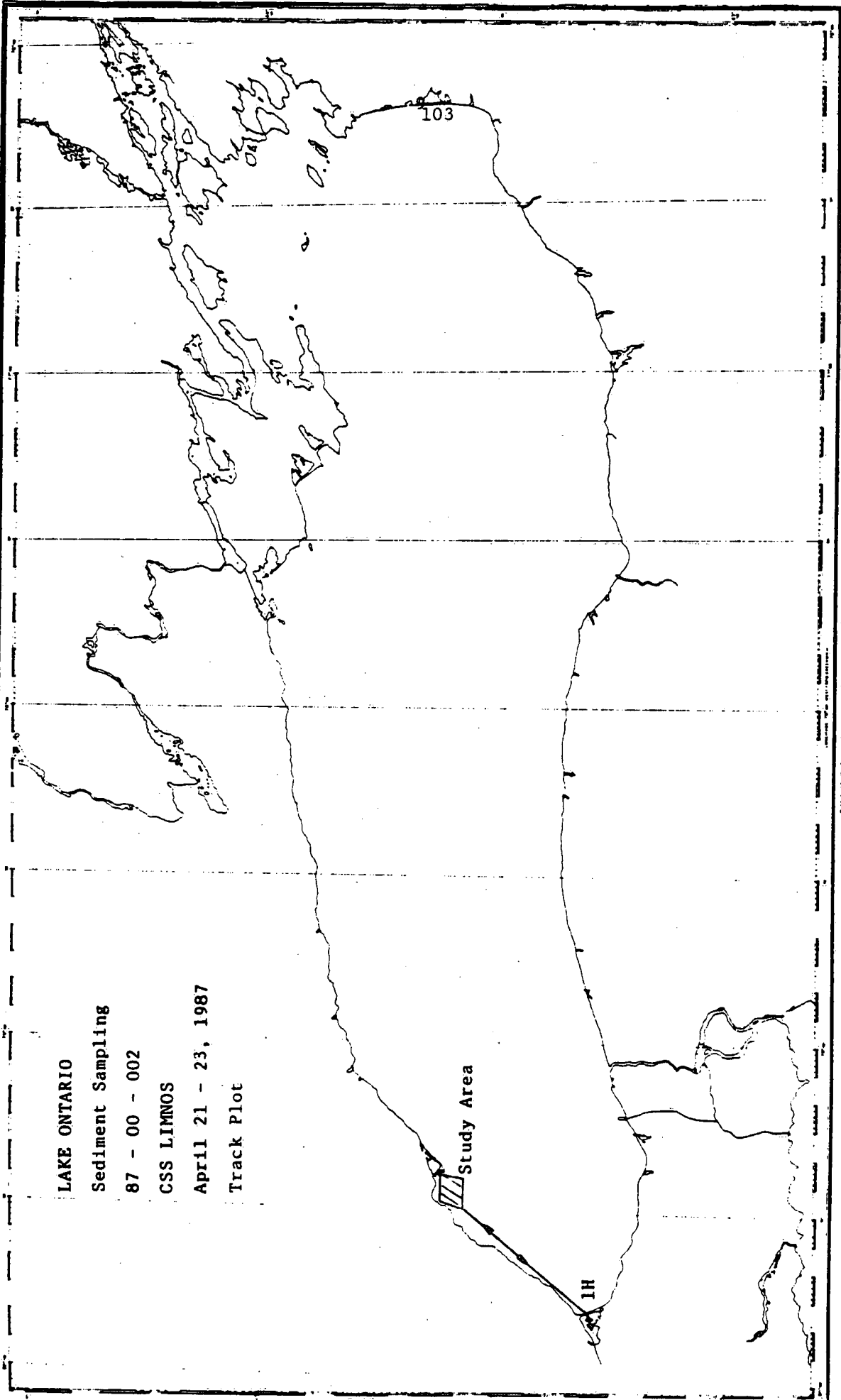
DATES FROM April 21 TO April 23, 1987

LAKE ONTARIO

CRUISE TYPE Sediment Sampling

N. MILES STEAMED 91.18

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	14	Moorings Established	
EBT Casts	1	" Retrieved	
Rosette Casts		" Established	
Transmissometer Casts	1	" Retrieved	
Reversing Thermometer Obs. (No. of Therm)		" Established	
Secchi Disc Observations		" Retrieved	
		" Refurbished	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	2
		Cores Taken, Gravity	13
Water Samples Collected (Microbiology)		Cores Taken, Piston	5
" " " (Water Quality)		Cores Taken	
" " " (400L)	1		
" " " (D.O.)		Grab Samples Taken	12
" " " (Cond/pH)		Sounding Records, Miles	26
" " " ()		Bulk Centrifuge Samples	
" " " (T P uf)			
" " " (TKN)		Observations, Weather	
" " " ()			
" " " ()		CONTINUOUS OBSERVATIONS (days)	
Water Samples Filtered (Chlorophyll)		Solar Radiation	
" " " (POC/TPN)			
" " " (Seston)			
" " " (T P f)			
" " " (Nutrients)		ONBOARD ANALYSES	
" " " (Major Ions)			
" " " ()		Manual Chemistry Tech. Ops.	
" " " ()		Nutrients (WOB)	
" " " ()		Microbiology	
" " " ()			



LAKE ONTARIO

Sediment Sampling

87 - 00 - 002

CSS LIMNOS

April 21 - 23, 1987

Track Plot

Study Area

1H

103

O.D.

Published by the Canadian Hydrographic Service, Marine Science Branch
Revised Edition, 1987, 1:50,000 scale

Work at the Leslie Street Spit began on October 6 when a cesium dispenser, designed and built at CCIW, was installed on the East arm of the spit in 1 m of water. Two 20 Kg bags of cesium were added on October 6 and again on October 29. However, a visit to the site on November 16 revealed that the dispenser had been destroyed by a major storm on November 12.

Thirty-five Shipek samples were collected near the dispenser site on December 7 utilizing the CSL SHARK.

Future attempts at this type of experiment will require a different method of release for the tracer.

BAY OF QUINTE

PHOSPHORUS FLUX

LRB STUDY 82026, DR. P.G. SLY

The project was conducted to assess the use of dialysis chambers as a means of measuring integrated phosphorus flux near the sediment-water interface. Two mooring sites in the Bay of Quinte area were established by a Technical Operations Dive Team. These moorings were installed at the mouth of Hay Bay and near Belleville Harbour on May 21 and 22. The chambers were attached to the moorings in such a way that facilitated the refurbishment of the sampling equipment from the water's surface. Periodic sampling was done in conjunction with DFO Project Quinte throughout the season until removal of the moorings September 29.

CLARKSON

GROUNDWATER STUDY

RRB STUDY 83041, K. NOVAKOWSKI

Technical Operations supported NHRI Study 83041 at Clarkson, Ontario from September 28 until November 20. Support consisted of one technician who accompanied NHRI staff to the site on a daily basis as well as the necessary vehicles, a 20 ft. laboratory trailer located at the field site, and numerous small articles from Field Stores.

The purpose of the study is to investigate the flow of groundwater through individual fractures in solid rock. This information can be used to determine the possible hazards of pollution escaping through the bedrock from highly contaminated areas.

At the Clarkson site, seven bore holes were drilled on a 30-metre grid system through the overburden and into the solid shale bedrock beneath. A single fracture was found running through the bedrock and connecting all seven holes approximately 10 metres below the surface. The fracture was studied to define the hydraulic flow of groundwater in this fracture and to help develop ideas of how fluids flow through all single plane fractures. Constant head injection tests, step volume slug tests, short and long-term pump tests, pulse interference tests and forced gradient tracer tests were all used for this purpose.

This project will continue during the 1988 field season.

COMMON-USER/OUTSIDE AGENCIES

RESEARCH SUPPORT DIVISION STUDIES 86031/86043

During the 1987/88 fiscal year, close to 50 different NWRI projects were supported. The projects required support from all parts of Canada ranging from the Fraser River in the West to Inuvik in the North to Halifax in the East. Equipment was loaned to universities, other branches of Environment Canada, other government departments and private consulting firms with contracts to governments.

Technical staff supported numerous projects for the above-mentioned programs most of which were of one week duration. The major projects supported will be summarized later in this report. During the winter months, several scientists were supported by staff from the Field Section by assisting in NWRI laboratories or in the statistical analysis of information collected during the summer months. Most inhouse assignments were 12 weeks in duration. This year, there were 12 requests for support to the branches at NWRI.

Rigging Unit

Again this year, numerous projects were supported by the riggers. Some duties included the maintenance of all mooring equipment, buoys, winches, generators and various other pieces of research equipment used at CCIW. Riggers also gave support to several projects by assisting technical staff to conduct field sampling. They were also responsible for the delivery of boats and lab trailers to field sites, delivering scientific equipment to major ships throughout the Great Lakes Basin, erecting towers, and operating boats, heavy trucks and forklifts.

The Rigging Unit was also responsible for the maintenance of the NWRI vehicle fleet, trailers, snowmobiles, all-terrain cycles and forklifts. Its other responsibility was to ensure that the Rigging Shop, Warehouse and outside compounds were kept in orderly fashion.

The Rigging Unit had one of its members retire this past season--George Perigo who started in Tech. Ops. in 1970 decided it was time he hung up the old vehicle keys and became a full-time golf nut.

Field Stores

The Field Stores was supported on a full-time basis by one staff member who was responsible for issues and receipt of field equipment, inventory maintenance in conjunction with the Rigging Shop, and scheduling of all day-use vehicles for NWRI staff. The computerization of the inventory control system is in progress and may be in operation by early Spring of 1988.

GREAT SLAVE LAKE

SEDIMENT SAMPLING

RSD STUDY 86032, B. OLDING, WQB, YELLOWKNIFE, DR. R.J. ALLAN, LRB, NWRI

The objective of this project was to investigate the deposition of sediment-associated pesticides originating from the Slave River Drainage Basin and to assess the possibility of their transport into the Mackenzie River.

To accomplish the above, cores were collected from Great Slave Lake along a transect between the mouth of the Slave River and the outlet of the lake as it flowed into the Mackenzie River. Five stations were occupied along the transect. At each site, five cores were collected and subdivided when the boat returned to the dock. Cores from station 1A and 3 were subdivided into 1 cm sections to 15 cm and those cores collected from station 4 were subdivided into 1 cm sections to 30 cm. Three cores were kept for size analysis and two cores were analyzed for pesticides. Locations of the stations occupied were as follows:

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1	61° 02' 00"	115° 43' 06"
1A	61° 02' 00"	115° 30' 30"
2	61° 10' 36"	114° 49' 30"
3	61° 01' 00"	114° 07' 54"
4	61° 28' 12"	113° 40' 00"

In order to complete this project, the Department of Fisheries & Oceans were kind enough to assist NWRI in loaning a launch, the CHRISTIE BAY and crew; otherwise the stations could not have been sampled.

OWEN SOUND

GREAT LAKES LABORATORY FOR FISHERIES & AQUATIC SCIENCES

RSD STUDY 86032, DR. M.G. JOHNSON

Again this year, Tech. Ops. Field Section supported Dr. M. Johnson's Acid Rain Study in the Parry Sound area by supplying equipment, vehicles and technical staff.

The purpose of this project was to study the effects of airborne pollutants on several acid stressed lakes in the Parry Sound area. The study was to assess the changes that occur in water chemistry as well as in fish and benthic community as the acidic waters passed through the watershed. The lakes studied this year were: Carruthers, Lane, Pender, Crow, Lady, Raven K7, Orange and Cochrane.

The fish population estimates and their movements through Carruthers Lake were of primary importance during the May support period. Six four-foot trap nets were used to capture the fish over a period of three weeks. The nets were emptied daily and the fish were released after noting the pelvic fin clip or pelvic dye mark which indicated what section of the lake that the fish had been previously captured, marked and released. The number and marking of each species of fish caught was recorded. All Largemouth Bass were measured, weighted and had scale samples removed for aging before being released; some Yellow Perch, White Suckers and Brown Bullheads were kept for fin aging and metal analysis.

A total of six 9 x 9 Ekman dredges were collected from all the lakes sampled for Chironamid identification. These samples were returned to Owen Sound alive to allow the Chironamids to hatch. This is the only way to truly identify each type of Chironamid.

The larval fish study was supported while the staff assisted the Owen Sound office. Weekly visits were made to Red Bay on Lake Huron to tow fish nets from a small boat. Any larval captured were stored in formalin for later identification. Water temperature and plankton net hauls were conducted in conjunction with the fish net tows.

TORONTO HARBOUR

MUNICIPAL/INDUSTRIAL STRATEGY FOR ABATEMENT

RSD STUDY 86032, W.B. TAYLOR

SUBJECT

Impact of effluent-bound contamination on primary productivity in the vicinity of Ashbridges Bay.

RELEVANCE

Little is known about the impact of municipal and industrial contaminants on the biological processes of the Toronto Harbour area. The Ministry of the Environment's "Municipal-Industrial Strategy for Abatement" (Misa) is a program initiated to confront the complexity of decontamination of the harbour and eventually Lake Ontario.

PERSONNEL

Dr. M. Munawar, Study Leader, Great Lakes Laboratory for Fisheries & Aquatic Sciences

R.J. Hess, Tech. Ops. Ship Section, Research Support Division, NWRI

L. McCarthy, GLLFAS

D. Myles, GLLFAS

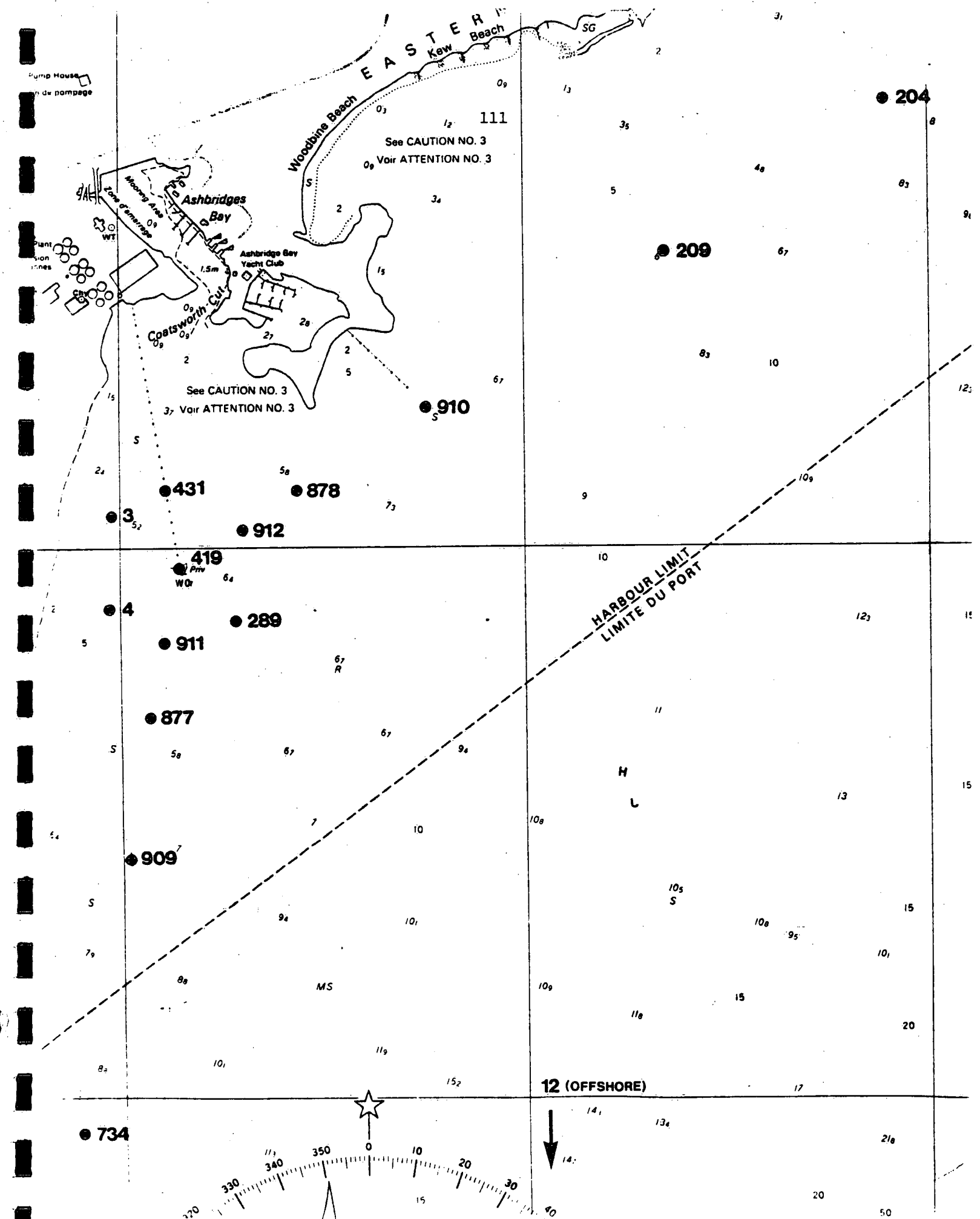
On October 13 and 14, sampling was conducted in Ashbridges Bay by launch. On October 15, CSS ADVENT was utilized to sample 15 stations recommended by MOE. Greg Hodson of MOE was onboard at this time to determine the extent of the sewage treatment plant effluent plume. At this time, an EBT and oxygen profile was collected at each station.

During the remaining time of the survey, the following was accomplished: On selected stations, bioassays were conducted using the ^{14}C algal fractionation technique. The impact of effluent receiving water on an offshore Lake Ontario algal population was measured by adding filtered and unfiltered effluent water in increasing dosages to offshore samples. After 4 hours of incubation, the samples were size fractionated. An oxygen profile was taken at each station by using the multi-parameter profiling system.

Sampling dates: October 15 - 16
October 19 - 23
November 3 - 6

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
3	43° 39' 03"	79° 18' 54"
4	43° 38' 53"	79° 19' 02"
204	43° 40' 05"	79° 14' 58"
209	43° 39' 32"	79° 17' 39"
289	43° 38' 52"	79° 18' 43"
419	43° 38' 57"	79° 18' 51"
431	43° 39' 06"	79° 18' 53"
734	43° 37' 56"	79° 19' 07"
877	43° 38' 42"	79° 18' 56"
878	43° 39' 06"	79° 18' 33"
909	43° 38' 27"	79° 18' 59"
910	43° 39' 15"	79° 18' 15"
911	43° 38' 50"	79° 18' 53"
912	43° 39' 02"	79° 18' 41"
Offshore Control	43° 36' 57"	79° 18' 05"



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