ANNUAL ACTIVITY SUMMARY

1977

TECHNICAL OPERATIONS SECTION

Scientific Support Division
Inland Waters Directorate

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TECHNICAL OPERATIONS SECTION, 1977: OVERVIEW

The Technical Operations Section has the responsibility for the multidisciplinary field support to scientific projects conducted at Canada Centre for Inland Waters, Central, Western and Northern Regions. Field support and measurements are carried out from major and minor vessels and shore bases at a variety of sites, not only in the Great Lakes Basin, but in other areas across Canada as well.

Over the last couple of years, there has been a shift in emphasis of support from both the Great Lakes Basin and major ships to shorebased surveys across Canada.

Support is provided to those projects and programs that are identified and approved by CCIW management. These not only include specific CCIW projects, but also projects from other Departments, Agencies, Directorates, Regions and Universities. It is the intention of the Section to provide, as requested, the expertise required to support all scientific field research undertaken by departmental and interservice groups from CCIW.

Personnel are assigned to the major vessels and large shorebased projects on a continuing basis in support of all surveillance, limnological and research projects, as well as small craft involved with regional shorebased parties, conducted in support of CCIW approved goals and objectives. Field operations are mainly undertaken by Technical Operations staff; where more specialized field analyses are required, the Technical Operations staff form the back-up group assisting the appropriate scientist performing the more specialized tasks.

In addition to the versatility required in all phases of sampling procedures, the Section provides expertise through several committees: the Assignment of Vessels Committee in the planning of ship, launch, and support programs in the design of operational facilities aboard new vessels; the Surveillance Working Committee in providing field operational and logistical input into the planning and execution of the Surveillance Program; and the CCIW Buoy Committee to provide field operational input to development of a Great Lakes data buoy system. The Technical Operations Section is responsible for insuring that the various programs and projects proposed by the scientific community and outside agencies are co-ordinated and logically arranged to suit the availability of research vessels and other resources.

The Technical Operations Section's Dive Unit responds to the special needs of research projects proposed by CCIW and other interservice groups to conduct underwater tasks. Expertise has been developed and responds to the need for offshore scientific tower erection, deployment of various underwater services, inspection and maintenance and other special underwater tasks and studies.

Similarly, the Technical Operations Section has the expertise to provide data from various continuous recording instrument systems, such as meteorological, radiation temperature, transmissometry and temperature/depth profiling systems. The Section provides installation, maintenance, monitoring and data listings from these various sensors. The use and demand of these self-recording instrument systems is expanding and the Technical Operations Section is responding to this significant additional demand of technical expertise and data reduction.

The Technical Operations Section has the responsibility of preparing preliminary description limnology reports based on individual surveillance cruises on the Great Lakes. These reports, although not very detailed in format, provide a cursory summary of shipboard measured lake parameters and are complementary to the responsibilities of the Water Quality Branch, Ontario Region, IWD.

STAFF LIST - TECHNICAL OPERATIONS SECTION

H.B. Macdonald	- Head
Mrs. A. Stern	- Secretary, resigned March 1977
Mrs. S. Mitchell	- Secretary, on strength March 1977
D.H. Hanington	- Senior Operations Officer, Shore Unit
J.T. Roe	- Senior Diving Officer
R.G. Chapil	- Special Projects Officer
W.B. Taylor	- Head, Sensor Network Unit
L.E. Benner	- Shore Unit, Kootenay Lake Project, Pacific Region
T.J. Carew	- Shore Unit, WAVES 77 and REX
J.R. Compton-Smith	- Shore Unit, resigned September 1977
F.J. deVree	- Dive Unit
F.H. Don	- Dive Unit
H.E. Greencorn	- Rigging Shop
P.M. Healey	- Ship Unit - Officer-in-Charge - Surveillance
B.L. Killins	- Ship Unit - Surveillance and Data
G.J. Koteles	- Ship Unit - Surveillance
L.J. Lomas	- Rigging Shop, Foreman
M.R. Mawhinney	- Ship Unit - Officer-in-Charge
B.H. Moore	- Shore Unit - Persistent Contaminants, GLBL
H.K. Nicholson	- Shore Unit - Various studies and data
G.M. Perigo	- Rigging Shop
S.B. Smith	- Shore Unit - Waste Heat Studies, GLBL
M.R. Thompson	- Shore Unit - Erosion Studies, HRD
E.H. Walker	- Ship Unit - Surveillance
P.R. Youakim	- Ship Unit - Surveillance

Term Employees

G.D. Bruce	- Ship Unit - Surveillance
D.F. Moore	- Ship Unit - Surveillance

Contract Employees

W.M. Cameron	- Shore Unit, GLBL, on strength May - August

LAKE ONTARIO SURVEILLANCE PROGRAM, 1977

The surveillance program provides data for compilation of a continuing report and longterm trend information on water quality and eutrophication parameters in Lake Ontario. Data collected are to be used as input to Canada-United States Agreement on Great Lakes Water Quality and the Annual Report to the International Joint Commission.

During the 1977 field season, a total of nine surveillance cruises were supported by Technical Operations Section on Lake Ontario. Four of these nine cruises were carried out aboard MV Petrel V from March - June, while the remaining five cruises were completed aboard the CSS Limnos from July - November.

The basic surveillance parameters obtained on Lake Ontario cruises were: temperature profile, dissolved oxygen, specific conductance, chlorophyll a, phytoplankton, zooplankton, particulate organic carbon, total phosphorus (unfiltered), chloride, percent transmission, Secchi disc during daylight hours and meteorological observations.

A total of four chemistry and microbiology cruises were piggybacked onto the basic surveillance program. On these cruises additional samples were collected for:

1. Chemistry cruise: total phosphorus filtered, soluble reactive phosphorus, total filtered nitrogen, nitrate and nitrite, ammonia, reactive silicate, dissolved organic carbon, calcium, alkalinity, chloride and pH.

2. Microbiology cruises: fecal coliforms, fecal streptococci, aerobic heterotrophs, pseudomonas aeruginosa, total counts, A.T.P. and fecal sterols.

More specialized studies in support of specific research projects were carried out in conjunction with 1977 Lake Ontario surveillance cruises. These projects included: six current meter mooring installations and one current meter mooring retrieval in support of Project 7-IW-AR-005, seven water samples in support of Project PRD-026, 45 triple Benthos cores in support of Project 7-IW-PR-044, six radiological water samples in support of Project ARD-035, EBT/Rosette Intercomparison Study, two bulk sediment samples in support of Project WQ-28 and six mysis samples for GLBL.

Most aspects of the 1977 surveillance program remained the same as those executed in the 1976 program. The number of cruises were three fewer this year than the past year. Also, during this field season stations 4 and 92 of the surveillance station pattern were deleted, while stations 36, 96, 97 and 98 were initiated. The average shipboard time consumed for the completion of a surveillance cruise throughout this field season was ninety-six hours.

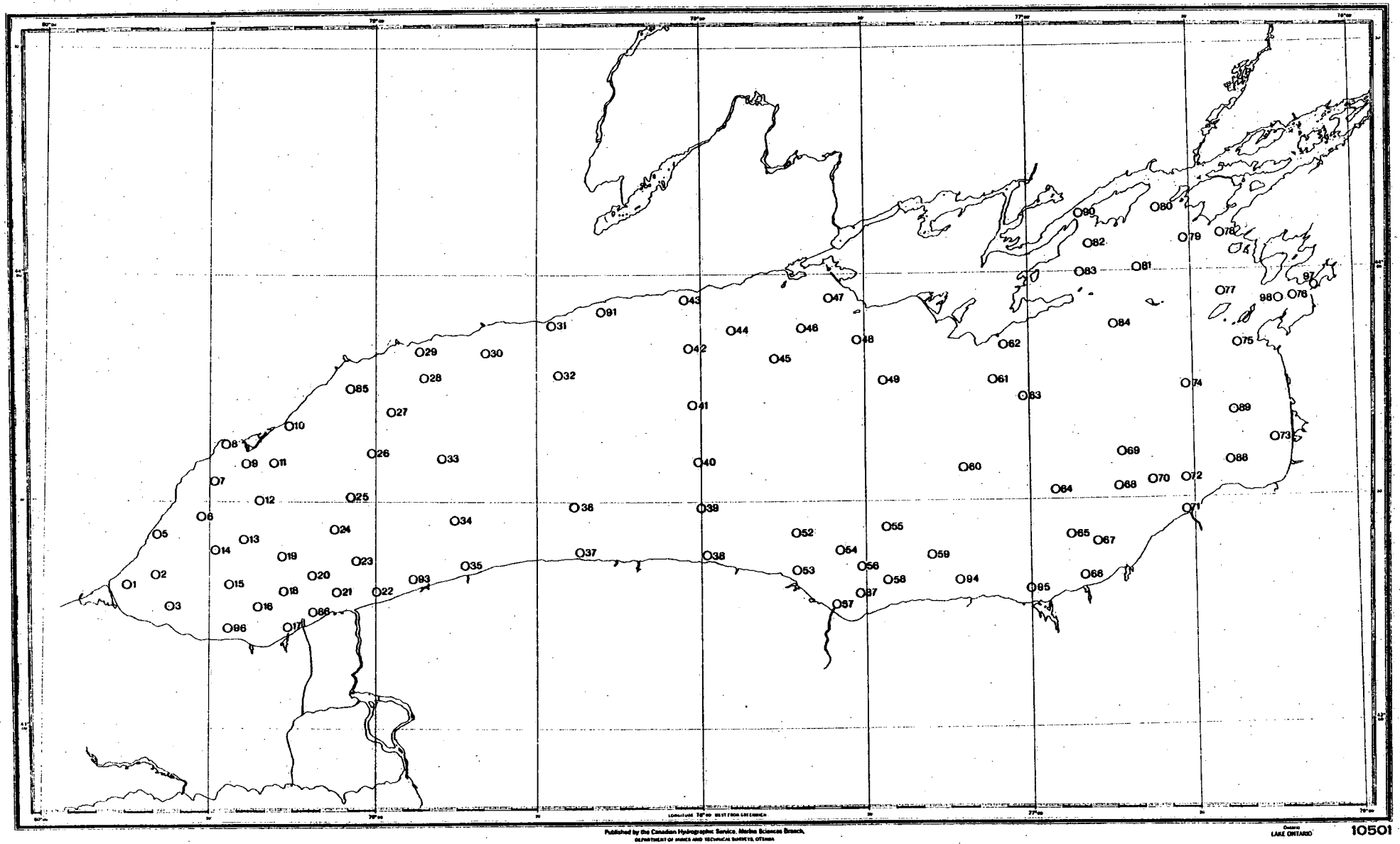
The support provided to the surveillance program by the Technical Operations Section included: co-ordinating the scheduling of a sampling platform to enable all cruises to be carried out at the specified times requested by the surveillance team; co-ordinating all vessels' activities for the collection of surveillance data; plotting and checking station positions and track plot on nautical charts;

collection of all water samples and physical limnological parameters aboard the vessel; analysis of a manual laboratory chemistry aboard ship; maintaining data quality control checks on all sampling and data which were compiled aboard the ship; providing a cruise and preliminary descriptive report upon the completion of all surveillance cruises. This support was carried out by seven members of Technical Operations staff who were assigned to the support of the surveillance program on a regular basis.

The 1977 Lake Ontario station pattern is included following page 7 and statistical summaries of the observations are included in pages 8, 9 and 10.

LAKE ONTARIO

1977 SURVEILLANCE STATION POSITIONS



Published by the Canadian Hydrographic Service, Marine Sciences Branch,
DEPARTMENT OF FISHERIES AND TECHNICAL SURVEYS, OTTAWA

LAKE ONTARIO

10501

1977

STATISTICS SUMMARY

Cruise No.s. 77-00-101 to 77-00-007 Consec. No. _____ Ship PETREL V & LIMNOS

Dates From March 15 to November 18, 1977 Lake ONTARIO

Cruise Type Surveillance, 1977 Miles Steamed 6128.06

Description	Total	Description	Total
Secchi	406	Moorings Established (CM)	6
Stations Occupied	834	Moorings Retrieved (CM)	1
Bathythermograph Casts	-	Moorings Established (Met.)	
E.B.T. Casts	833	Moorings Retrieved (Met.)	1
Transmissometer Casts	817	Moorings Established ( )	
Reversing Thermometer Obs.	156	Moorings Retrieved ( )	
Water Samples Collected (Chemistry)	5536	Moorings Serviced (CM)	
Water Samples Collected (Microbiology)	470	Moorings Serviced (Met.)	
Water Samples Collected (Biolimnology)	1320	Moorings Serviced ( )	
Water Samples Collected (W.Q.)	2845	Cores Taken (Gravity).	45
Water Samples Collected (Cond., pH)	2994	Cores Taken (Piston)	
Water Samples Collected (POC)	590	Grab Samples Taken	
Water Samples Collected (Fecal Sterols)	31	Drogues Tracked	
Water Samples Filtered (Chlorophyll)	1227	Dye Releases	
Water Samples Treated (Phytoplankton)	96		
Zooplankton Hauls		Observations (Weather)	287
Zooplankton Hauls (Mysis)	20	Observations ( )	
Primary Productivity Moorings			
Bottom Samples (Fauna)		Continuous Observations (Days)	
Integrator (10m)	33	Air Temperature	
Integrator (20m)	823	Relative Humidity	
Total Number of Depths Sampled	3185	Water Temperature (In-Hull)	4
Total Number of Water Samples Collected	9539	Water Temperature (Towed)	9
		Integrated Printout	
ONBOARD ANALYSIS		Solar Radiation	
Geolimnology	-	Long Wave (IR) Radiation	
Manual Chemistry (Tech. Ops.)	7231		
Nutrients (W.Q.D.)	1621		
Microbiology	473		

REMARKS

1977 STATISTICS SUMMARY

Cruise No.s. 77-00-101 to 77-00-104 Consec. No. (4 cruises)

Dates From March 15 to June 10, 1977

Cruise Type Surveillance, 1977

Ship MV PETREL V

Lake ONTARIO

Miles Steamed 2643.2

Description	Total	Description	Total
Secchi	186	Moorings Established (CM)	
Stations Occupied	353	Moorings Retrieved (CM)	
Bathythermograph Casts	0	Moorings Established (Met.)	
E.B.T. Casts	353	Moorings Retrieved (Met.)	1
Transmissometer Casts	347	Moorings Established ( )	
Reversing Thermometer Obs.	58	Moorings Retrieved ( )	
Water Samples Collected (Chemistry)	2592	Moorings Serviced (CM)	
Water Samples Collected (Microbiology)	133	Moorings Serviced (Met.)	
Water Samples Collected (Biolimnology)	704	Moorings Serviced ( )	
Water Samples Collected (W.Q.)	1115	Cores Taken (Gravity)	
Water Samples Collected (pH/Cond.)	1277	Cores Taken (Piston)	
Water Samples Collected (POC)	275	Grab Samples Taken	
Water Samples Collected (F. Sterol)	8	Drogues Tracked	
Water Samples Filtered (Chlorophyll)	667	Dye Releases	
Water Samples Treated (Phytoplankton)	36		
Zooplankton Hauls		Observations (Weather)	123
Zooplankton Hauls (Mysis)	11	Observations ( )	
Primary Productivity Moorings			
Bottom Samples (Fauna)		Continuous Observations (Days)	
Integrator (10m)	8	Air Temperature	
Integrator (20m)	353	Relative Humidity	
Total Number of Depths Sampled	1444	Water Temperature (In-Hull)	
Total Number of Water Samples Collected	3731	Water Temperature (Towed)	9
		Integrated Printout	
ONBOARD ANALYSIS		Solar Radiation	
Geolimnology		Long Wave (IR) Radiation	
Manual Chemistry (Tech. Ops.)	3549		
Nutrients (W.Q.D.)	1291		
Microbiology	133		

REMARKS

1977 STATISTICS SUMMARY

Cruise No. s. 77-00-001 to 77-00-007 Consec. No. _____ Ship LIMNOS

Dates From July 18 to November 18, 1977 Lake ONTARIO

Cruise Type Surveillance, 1977 Miles Steamed 3485.86

Description	Total	Description	Total
Secchi	220	Moorings Established (CM)	6
Stations Occupied	481	Moorings Retrieved (CM)	1
Bathythermograph Casts	-	Moorings Established (Met.)	
E.B.T. Casts	480	Moorings Retrieved (Met.)	
Transmissometer Casts	470	Moorings Established ( )	
Reversing Thermometer Obs.	98	Moorings Retrieved ( )	
Water Samples Collected (Chemistry)	2944	Moorings Serviced (CM)	
Water Samples Collected (Microbiology)	337	Moorings Serviced (Met.)	
Water Samples Collected (Biolimnology)	616	Moorings Serviced ( )	
Water Samples Collected (W.Q.)	1730	Cores Taken (Gravity)	
Water Samples Collected (Cond./pH)	1717	Cores Taken (Piston)	45
Water Samples Collected (POC)	315	Grab Samples Taken	
Water Samples Collected (F. Sterols)	23	Drogues Tracked	
Water Samples Filtered (Chlorophyll)	560	Dye Releases	
Water Samples Treated (Phytoplankton)	60		
Zooplankton Hauls		Observations (Weather)	164
Zooplankton Hauls (Mysis)	9	Observations ( )	
Primary Productivity Moorings			
Bottom Samples (Fauna)		Continuous Observations (Days)	
Integrator (10m)	25	Air Temperature	
Integrator (20m)	470	Relative Humidity	
Total Number of Depths Sampled	1741	Water Temperature (In-Hull)	4
Total Number of Water Samples Collected	5808	Water Temperature (Towed)	
		Integrated Printout	
ONBOARD ANALYSIS		Solar Radiation	
Geolimnology	-	Long Wave (IR) Radiation	
Manual Chemistry (Tech. Ops.)	3682		
Nutrients (W.Q.D.)	330		
Microbiology	340		

REMARKS

PROJECT NO. 7-IW-PR-004 - DR. N.M. BURNS

There was a total of nine cruises conducted on Lake Erie in support of Dr. Burns' Hypolimnetic Oxygen Study. The purpose of the project was to follow the change in the hypolimnetic oxygen depletion rates and to relate the observed changes to external loading inputs and the general condition of the lake.

The cruises were conducted from June to October, thereby sampling before, during and at the deterioration of the hypolimnion in the Central and Eastern Basins. Samples were collected for oxygen, total phosphorus (filtered and unfiltered), chlorides, alkalinity, particulate organic carbon and chlorophyll.

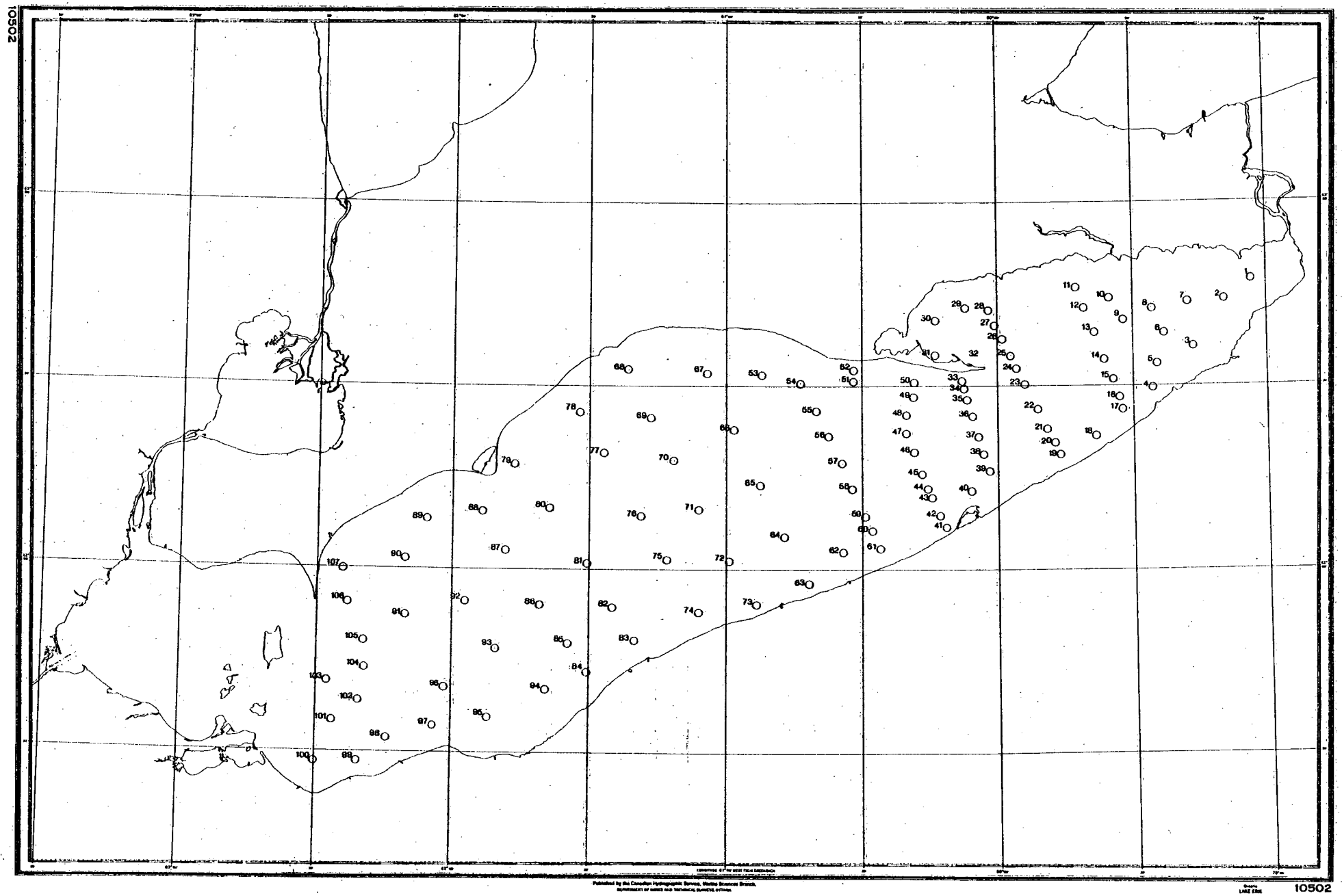
Eight of the nine cruises were completed utilizing both major vessels: the MV Petrel V and CSS Limnos. The Petrel V was used until the end of June and the Limnos from July. One cruise was conducted by the MV Advent during September.

The first seven cruises consisted of 107 stations covering the entire Central and Eastern Basins. The cruises completed in September and October covered only the Eastern Basin as the hypolimnion had dissipated in the Central Basin.

The 1977 station pattern follows page 11 and the statistical summary of observations is included on page 12.

LAKE ERIE

1977 STATION POSITIONS



STATISTICS SUMMARY

Cruise No. 77-01-401 Consec. No. 77-22-111 Ship ADVENT

Dates From September 12 to September 23, 1977 Lake ERIE

Cruise Type Hypolimnetic Oxygen Study Miles Steamed 547 N. Miles

Description	Total	Description	Total
Secchi	46	Moorings Established (CM)	
Stations Occupied	47	Moorings Retrieved (CM)	
Bathythermograph Casts	--	Moorings Established (Met.)	
E.B.T. Casts	47	Moorings Retrieved (Met.)	
Transmissometer Casts	--	Moorings Established ( )	
Reversing Thermometer Obs.	428	Moorings Retrieved ( )	
Water Samples Collected (Chemistry)	832	Moorings Serviced (CM)	
Water Samples Collected (Microbiology)		Moorings Serviced (Met.)	
Water Samples Collected (Biolimnology)		Moorings Serviced ( )	
Water Samples Collected (TPF + TPUF)	436	Cores Taken (Gravity)	
Water Samples Collected (cl^-)	109	Cores Taken (Piston)	
Water Samples Collected ( )		Grab Samples Taken	
Water Samples Collected ( )		Drogues Tracked	
Water Samples Filtered (Chlorophyll)		Dye Releases	
Water Samples Treated (Phytoplankton)			
Zooplankton Hauls		Observations (Weather)	-
Zooplankton Hauls (Mysis)		Observations ( )	
Primary Productivity Moorings			
Bottom Samples (Fauna)		Continuous Observations (Days)	
Integrator (10m)		Air Temperature	
Integrator (20m)		Relative Humidity	
Total Number of Depths Sampled	218	Water Temperature (In-Hull)	
Total Number of Water Samples Collected	872	Water Temperature (Towed)	
		Integrated Printout	
ONBOARD ANALYSIS		Solar Radiation	
Geolimnology		Long Wave (IR) Radiation	
Manual Chemistry (Tech. Ops.) Oxygen	218		
Nutrients (W.Q.D.)			
Microbiology			

REMARKS

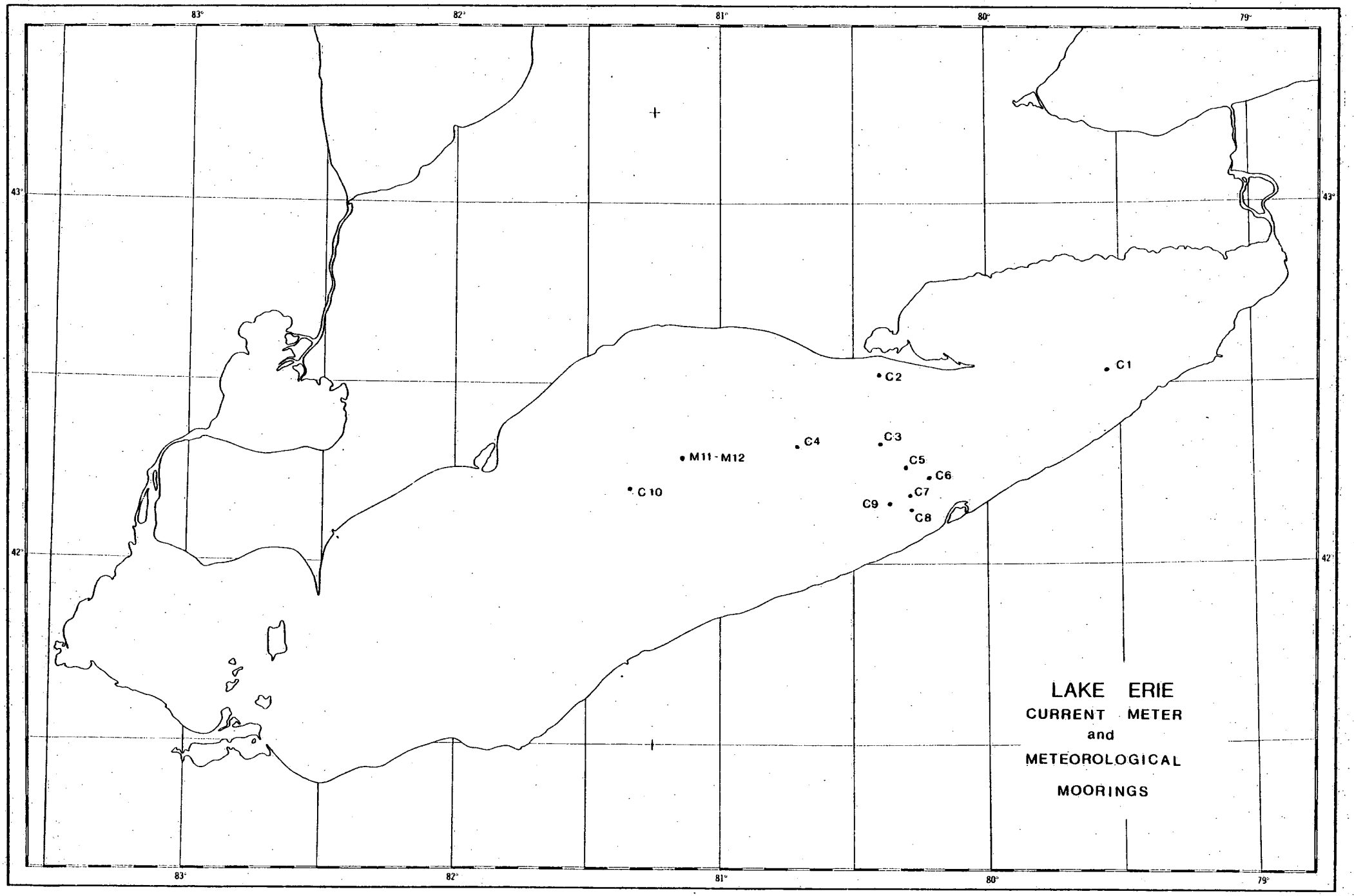
PROJECT NO. 7-IW-AR-07

Ten current meter moorings and two meteorological moorings were established in Lake Erie in support of Dr. Bennett's Mass Transport Project. The meters were also measuring hypolimnetic water flows between the Central-Eastern Basins in support of Dr. Burns' Hypolimnetic Project.

Seven of the ten current meter moorings were in a transect running from the Western end of Long Point to Presque Isle.

The balance of the moorings were established throughout the Central and Eastern Basins (see following page).

The two major ships were utilized to install and remove the moorings: the Petrel V in June and July and the Limnos from August to October.


83°
82°
81°
80°
79°
43°
42°
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
M11 - M12
LAKE ERIE
CURRENT METER
and
METEOROLOGICAL
MOORINGS

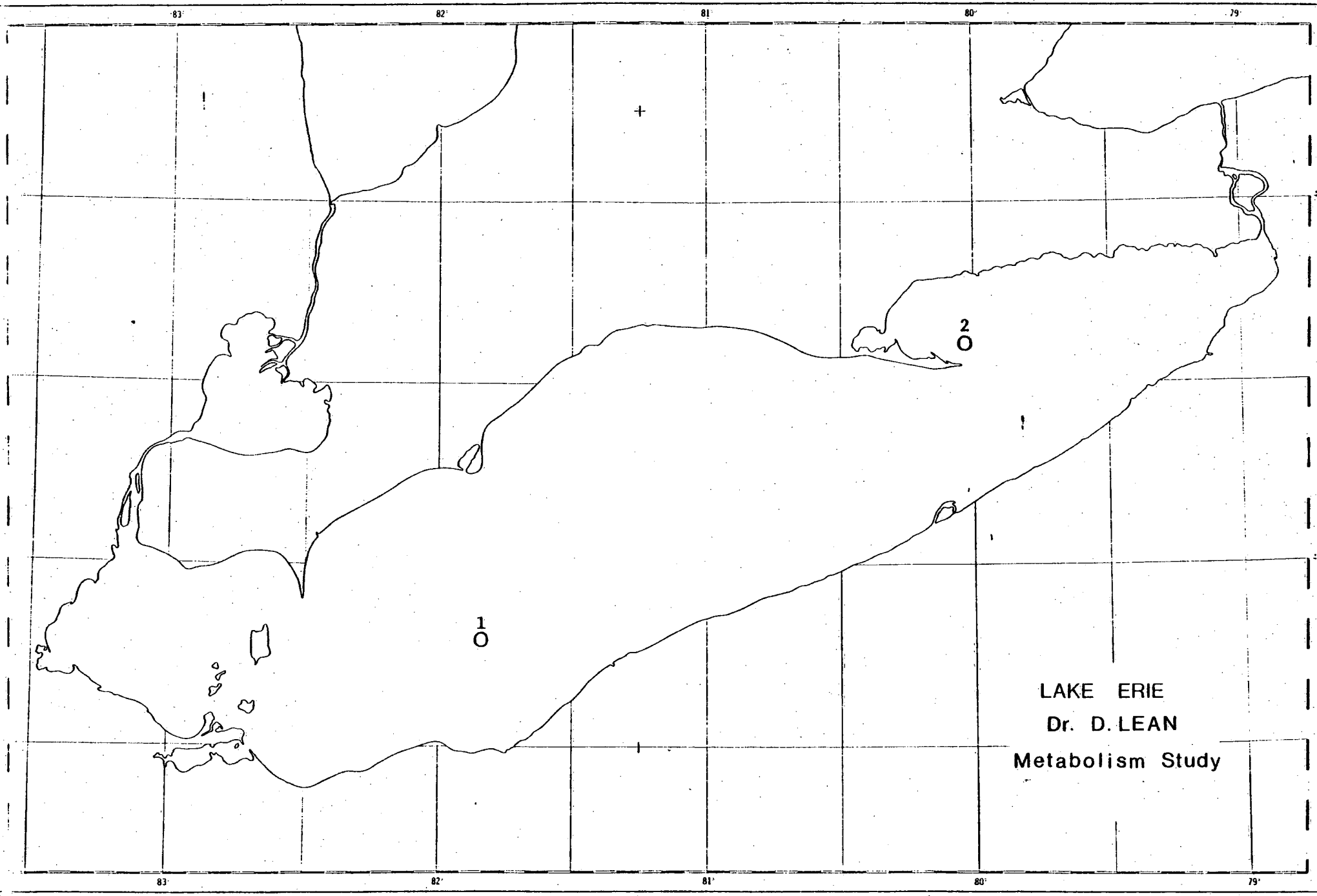
PROJECT NO. 7-IW-PR-008

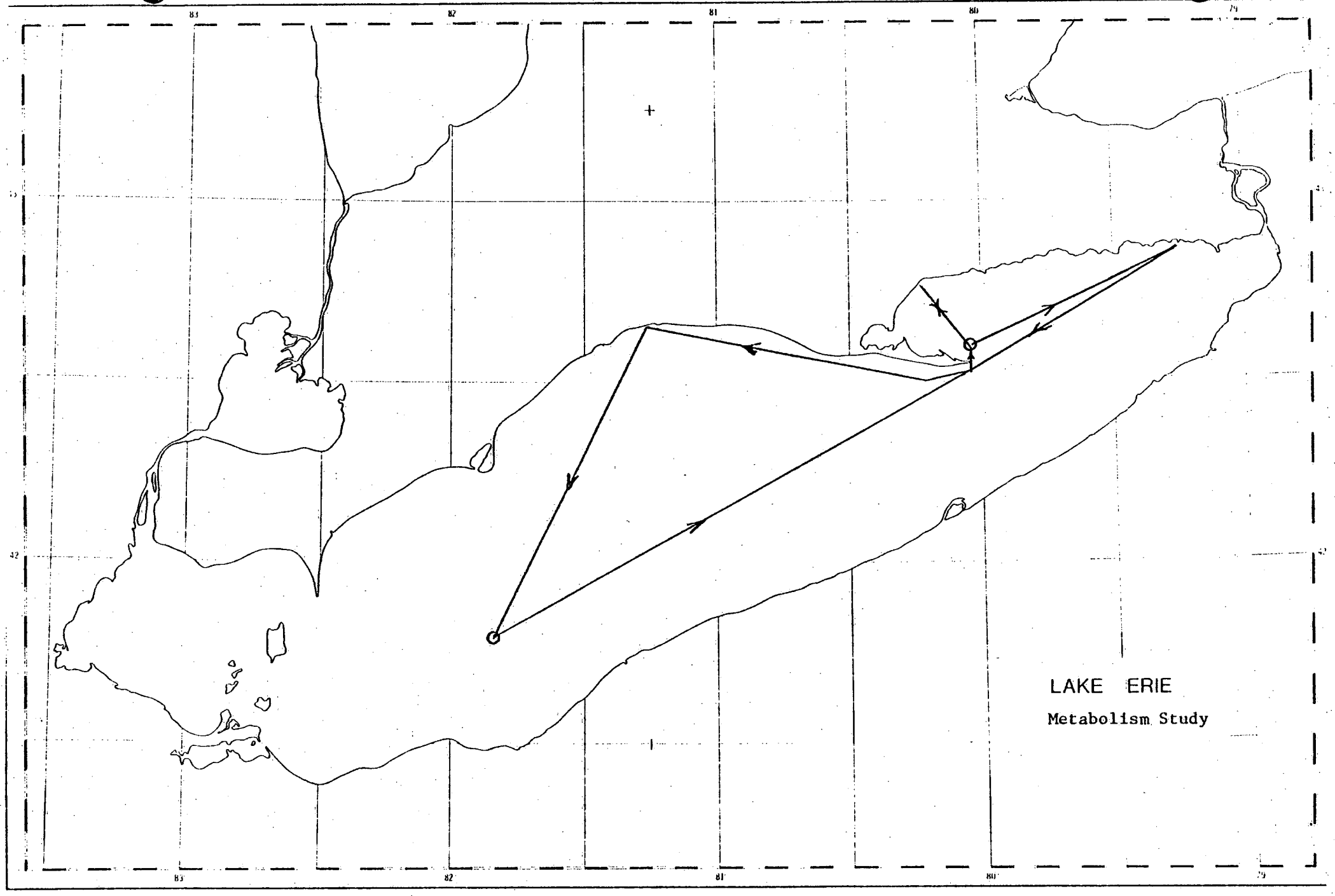
Two cruises were conducted for Dr. D.R.S. Lean on Lake Erie in support of his project. The purpose of the cruises was to determine the relationship between primary production and total carbon balance.

The cruises consisted of anchoring in the Central Basin of Lake Erie for up to four (4) days and collecting water samples for various experiments. Samples were collected for oxygen, primary production, water quality and carbon$_{14}$ analysis.

During the first cruise in September, only one station in the Central Basin was occupied while there were two stations occupied on the second cruise. The stations on the second cruise were in the Central Basin and in Long Point Bay. The Long Point Bay station was sampled as an intercomparison to data collected in 1975 and 1976.

Charts showing the station positions follow page 14.


83
82
81
80
79
2
1
LAKE ERIE
Dr. D. LEAN
Metabolism Study


LAKE ERIE
Metabolism Study

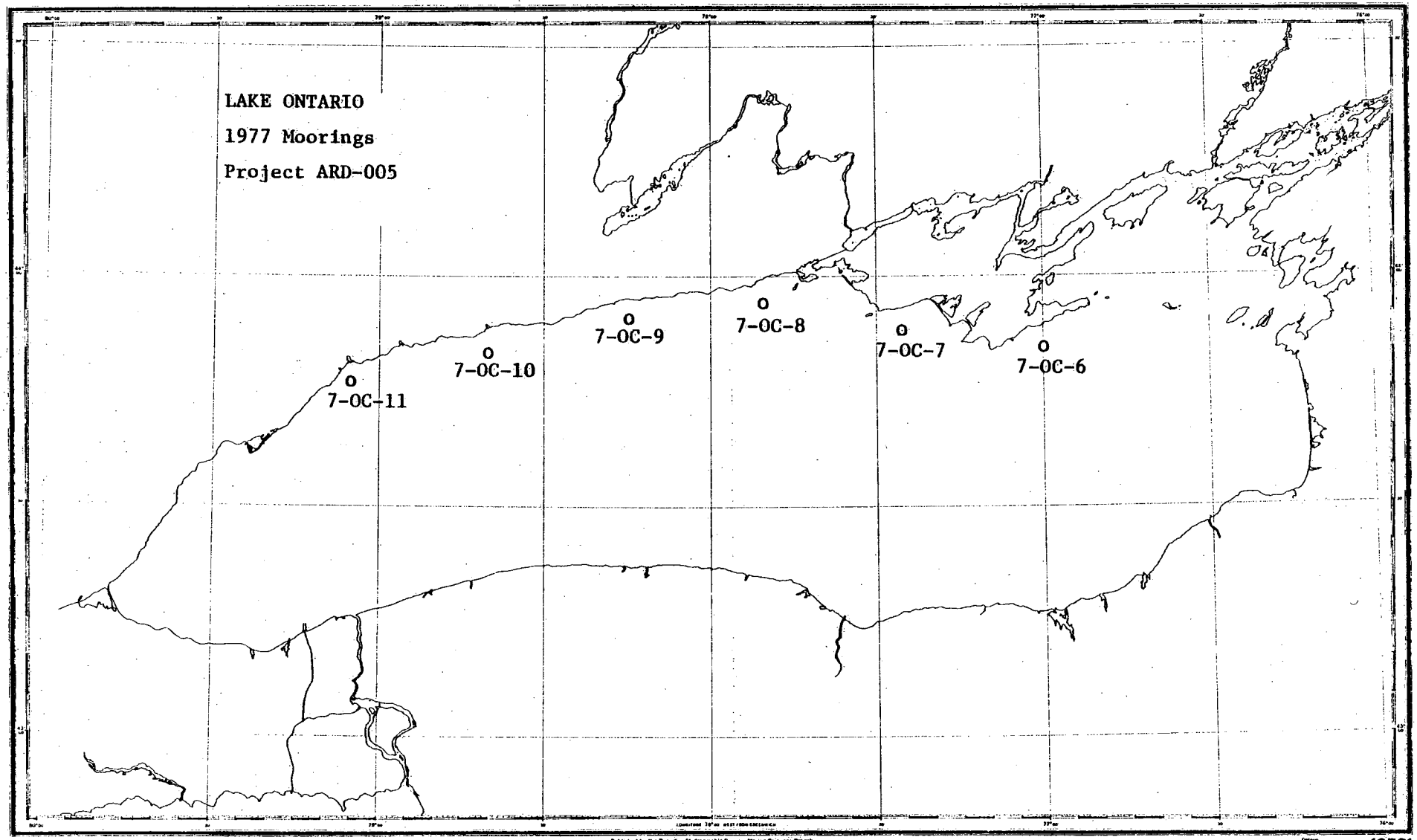
SEDIMENT AND BENTHIC FAUNA SURVEY

A Lake Ontario Sediment and Benthic Fauna Survey was carried out from September 19 - 30 aboard the CSS Limnos. The purpose of the cruise was two-fold: a surficial sediment and Benthic fauna study of Lake Ontario and Toronto Harbour; also a survey of three shoal areas along the North shore of the lake at Port Credit, Oshawa and Mulcaster Patch was completed. The shoal survey was carried out in conjunction with Ontario Ministry of Natural Resources Fish Spawning Study, while the Lake Sediment and Benthic Fauna Survey was completed with participation from the New York Department of Environmental Conservation. An additional task for this cruise was the retrieval of five current meter moorings from the North shore of Lake Ontario which had been established previously during a surveillance cruise in July of this field season.

PROJECT NO. ARD-005 - LAKE ONTARIO MOORINGS

The object of this program was to simulate mass exchange between difference lake compartments under stratified conditions with emphasis on nearshore regions. To support this project, six current meter moorings were placed along the North shore of Lake Ontario from Frenchman's Bay area to the Point Petre area. These current meter moorings were installed in July and retrieved in September by the CSS Limnos.

A chart showing mooring locations follows page 15.



Published by the Canadian Hydrographic Service, Marine Sciences Branch,
DEPARTMENT OF MINES AND TECHNICAL SURVEYS, OTTAWA

LAKE ONTARIO

10501

1977
MV PETREL V

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
							1
JAN	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	5
FEB	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	1	2	3	4	5
MAR	6	7	8	9	10 CCIW	11 CCIW	12 CCIW
	13 CCIW	14 CCIW	15 CCIW Depart 0840	16 Surveillance	17 Lake	18 Ontario	19 Surveillance
	20 Toronto Arrive 0430	21 Toronto	22 Toronto	23 Toronto Depart Arrive Mud Sampling	24 CCIW Arrive	25	26
	27	28	29	30	31	1	2
APR	3	4 CCIW Depart Arrive	5	6	7	8	9 CCIW
	10 CCIW	11 CCIW	12 CCIW Depart 0925	13 Surveillance	14 Lake Ontario	15 CCIW Arrive 1945	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
MAY	1 CCIW Depart 0600	2 Port Colborne Depart 1020	3 Current Meters &	4 Meterological Buoys	5 CCIW Arrive 1530	6	7
	8	9 CCIW Depart 0930	10 Surveillance	11 Lake	12 Ontario	13 CCIW Arrive 1100	14
	15	16	17	18 CCIW	19 CCIW	20 CCIW	21
	22	23	24	25	26	27	28
	29	30 Port Colborne Depart 1625	31 Hypolimnetic	1 Oxygen	2 Study	3 Lake Erie	4 Port Colborne Arrive 1025
JUN	5	6	7	8	9	10	11
	12	13 Port Colborne Depart 1100	14 Hypolimnetic	15 Oxygen	16 Study Lake Erie	17 Port Colborne Arrive 1615	18
	19	20 Port Colborne Depart 1045	21 Moorings	22 Lake Erie	23 Moorings	24 CCIW Arrive 1915	25
	26	27	28	29	30	1	2
JUL	3 CCIW Depart 0600	4 Port Colborne Depart 1030	5 Hypolimnetic	6 Oxygen	7 Study Lake Erie	8 Port Colborne Arrive 1730	9 Arrive CCIW
	10	11	12 Depart CCIW	13	14	15	16
	17	18	19 Ocean	20	21	22	23
	24	25	26 and	27	28	29	30
	31	1	2 Aquatics	3	4	5	6
AUG	7	8	9	10	11	12	13
	14	15	16 Hudson	17	18	19	20
	21	22	23 Bay	24	25	26	27
	28	29	30 Survey	31	1	2	3
SEP	4	5	6	7	8	9	10
	11	12	13 Canadian	14	15	16	17
	18	19	20 Hydrographic	21	22	23	24
	25	26	27 Service	28	29	30	1
OCT	2	3	4	5	6	7	8
	9	10	11 Arrive CCIW	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
	30	31	1	2	3	4	5
NOV	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	1	2	3
DEC	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

1977
CSS LIMNOS

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
							1
JAN	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	5
FEB	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	1	2	3	4	5
MAR	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
APR	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 CCIW Depart 1401	29	30
MAY	1 Ocean	2	3	4	5	6	7
	8	9 and	10	11	12	13	14
	15	16	17 Aquatic	18	19	20	21
	22	23	24	25 Sciences	26	27	28
	29	30	31	1	2 St.	3	4
JUN	5	6	7	8	9	10 Lawrence River	11
	12	13	14	15	16	17	18 Survey
	19	20	21	22	23	24	25
	26	27	28	29	30	1	2
JUL	3	4	5	6	7	8 CCIW Arrive 1955	9 CCIW
	10 CCIW	11 CCIW Depart 0700 Arrive 1806	12 CCIW	13 CCIW	14 CCIW	15 CCIW	16 CCIW
	17 CCIW	18 CCIW Dep.0907 Toronto Arr.2015	19 Toronto Depart 0249	20 Lake	21 Ontario	22 Surveillance	23 CCIW Arrive 0155
	24 CCIW Depart 0905	25 Port Colborne Depart 1022	26 Hypolimnetic	27 Oxygen	28 Study Lake Erie	29 CCIW Arrive 1142	30 CCIW
AUG	31 CCIW	1 CCIW	2 CCIW	3 CCIW	4 CCIW	5 CCIW	6 CCIW
	7 CCIW Depart 0805	8 Port Colborne Depart 1009	9 Hypolimnetic	10 Oxygen	11 Study	12 Lake Erie	13 CCIW Arrive 1339
	14 CCIW	15 CCIW Depart 1009	16 Surveillance	17 Lake	18 Ontario	19 CCIW Arrive 1325	20 CCIW
	21 CCIW	22 CCIW Depart 0859	23 Moorings	24 Port Colborne Arrive 2036	25 Port Colborne	26 Port Colborne	27 Port Colborne
	28 Port Colborne	29 Port Colborne Depart 1009	30 Hypolimnetic	31 Oxygen	1 Study Lake Erie	2 Port Stanley Arrive 1115	3 Port Stanley
SEP	4 Port Stanley	5 Port Stanley	6 Port Stanley Depart 1300	7 Metabolism	8 Study	9 Lake Erie	10 CCIW Arrive 1400
	11 CCIW	12 CCIW Depart 0925	13 Surveillance	14 Lake	15 Ontario	16 CCIW Arrive 0905	17 CCIW
	18 CCIW	19 CCIW Depart 1015	20 Sediment	21 & Benthic	22 Fauna	23 Survey	24 Lake
	25 Ontario	26 Sediment	27 & Benthic	28 Fauna	29 Survey	30 CCIW Arrive 1250	1 CCIW
OCT	2 CCIW Depart 0900	3 Port Stanley Arr.1100 Dep.1215	4 Metabolism	5 Study	6 Lake Erie	7 Port Colborne Arrive 1130	8 CCIW Arrive 0320
	9 CCIW	10 CCIW	11 CCIW Depart 1158	12 Surveillance	13 Lake	14 Ontario	15 Surveillance
	16 CCIW Arrive 1225	17 CCIW	18 CCIW Depart 0831	19 Hypolimnetic Oxygen Study L. Erie	20 Port Stanley Arr.1928Dep.2031	21 Lake	22 Erie
	23 Moorings	24 Lake	25 Erie	26 Port Colborne Arrive 2045	27 CCIW Arrive 1012	28 CCIW	29 CCIW
NOV	30 CCIW	31 CCIW	1 CCIW	2 CCIW	3 CCIW	4 CCIW	5 CCIW
	6 CCIW	7 EBT/Rosette Dep.0930 Arr.1230	8 Intercomparison Dep.0852 Arr.1145	9 Study Dep.0858Arr.1933	10 CCIW	11 CCIW	12 CCIW
	13 CCIW	14 CCIW Depart 0957	15 Surveillance	16 Lake	17 Ontario	18 CCIW Arrive 1048	19
	20	21	22	23	24	25	26
DEC	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

STATISTICS SUMMARY

Cruise No. ALL Consec. No. _____ Ship MV PETREL V

Dates From March to July 1977 Lake ERIE & ONTARIO

Cruise Type All cruises combined Miles Steamed 6018.8 N. Miles

Description	Total	Description	Total
Secchi	351	Moorings Established (CM)	10
Stations Occupied	681	Moorings Retrieved (CM)	10
Bathythermograph Casts	1	Moorings Established (Met.)	2
E.B.T. Casts	678	Moorings Retrieved (Met.)	1
Transmissometer Casts	347	Moorings Established ( )	
Reversing Thermometer Obs.	484	Moorings Retrieved ( )	
Water Samples Collected (Chemistry)	3790	Moorings Serviced (CM)	
Water Samples Collected (Microbiology)	240	Moorings Serviced (Met.)	2
Water Samples Collected (Biolimnology)	1114	Moorings Serviced ( )	
Water Samples Collected (POC)	631	Cores Taken (Gravity)	
Water Samples Collected (WQ)	4707	Cores Taken (Piston)	
Water Samples Collected (pH, Cond.)	1277	Grab Samples Taken	
Water Samples Collected (F. Sterols)	8	Drogues Tracked	
Water Samples Filtered (Chlorophyll)	991	Dye Releases	
Water Samples Treated (Phytoplankton)	36		
Zooplankton Hauls		Observations (Weather)	163
Zooplankton Hauls (Mysis)	11	Observations ( )	
Primary Productivity Moorings			
Bottom Samples (Fauna)		Continuous Observations (Days)	
Integrator (10m)	314	Air Temperature	
Integrator (20m)	353	Relative Humidity	
Total Number of Depths Sampled	2620	Water Temperature (In-Hull)	
Total Number of Water Samples Collected	9151	Water Temperature (Towed)	9
		Integrated Printout	
ONBOARD ANALYSIS		Solar Radiation	
Geolimnology		Long Wave (IR) Radiation	
Manual Chemistry (Tech. Ops.)	4747		
Nutrients (W.Q.D.)	4884		
Microbiology	240		

REMARKS

STATISTICS SUMMARY

Cruise No. ALL Consec. No. _____ Ship CSS LIMNOS

Dates From July to November 1977 Lake ERIE & ONTARIO

Cruise Type All cruises combined Miles Steamed _____

Description	Total	Description	Total
Secchi	220	Moorings Established (CM)	26
Stations Occupied	758	Moorings Retrieved (CM)	6
Bathythermograph Casts	-	Moorings Established (Met.)	
E.B.T. Casts	542	Moorings Retrieved (Met.)	2
Transmissometer Casts	500	Moorings Established ( )	
Reversing Thermometer Obs.	102	Moorings Retrieved (Buoys)	2
Water Samples Collected (Chemistry)	3520	Moorings Serviced (CM)	
Water Samples Collected (Microbiology)	337	Moorings Serviced (Met.)	2
Water Samples Collected (Biolimnology)	732	Moorings Serviced ( )	
Water Samples Collected (POC)	315	Cores Taken (Gravity).	67
Water Samples Collected (WQ)	1730	Cores Taken (Piston)	
Water Samples Collected (pH/Cond.)	1717	Grab Samples Taken	
Water Samples Collected (F. sterols)	23	Drogues Tracked	
Water Samples Filtered (Chlorophyll)	560	Dye Releases	
Water Samples Treated (Phytoplankton)	60		
Zooplankton Hauls		Observations (Weather)	319
Zooplankton Hauls (Mysis)	24	Observations (Underwater TV)	20
Primary Productivity Moorings	10		
Bottom Samples (Fauna)	241	Continuous Observations (Days)	
Integrator (10m)	25	Air Temperature	
Integrator (20m)	470	Relative Humidity	
Total Number of Depths Sampled	1741	Water Temperature (In-Hull)	4
Total Number of Water Samples Collected	6008	Water Temperature (Towed)	
		Integrated Printout	
ONBOARD ANALYSIS		Solar Radiation	
Geolimnology EH & PH	362	Long Wave (IR) Radiation	
Manual Chemistry (Tech. Ops.)	3682		
Nutrients (W.Q.D.) + sp. oxygen analysis	685		
Microbiology	340		

REMARKS

STATISTICS SUMMARY

Cruise No. ALL Consec. No. _____ Ship LIMNOS, PETREL V & ADVENT

Dates From March to November 1977 Lake ERIE & ONTARIO

Cruise Type All cruises combined Miles Steamed 6675.06 N. Miles

Description	Total	Description	Total
Secchi	617	Moorings Established (CM)	36
Stations Occupied	1486	Moorings Retrieved (CM)	16
Bathythermograph Casts	1	Moorings Established (Met.)	2
E.B.T. Casts	1267	Moorings Retrieved (Met.)	3
Transmissometer Casts	847	Moorings Established ( )	
Reversing Thermometer Obs.	1014	Moorings Retrieved (Buoys)	2
Water Samples Collected (Chemistry)	8142	Moorings Serviced (CM)	
Water Samples Collected (Microbiology)	577	Moorings Serviced (Met.)	4
Water Samples Collected (Biolimnology)	1846	Moorings Serviced ( )	
Water Samples Collected (POC)	946	Cores Taken (Gravity)	67
Water Samples Collected (WQ)	6982	Cores Taken (Piston)	
Water Samples Collected (pH & Cond.)	2994	Grab Samples Taken	
Water Samples Collected (Fecal Sterols)	31	Drogues Tracked	
Water Samples Filtered (Chlorophyll)	1551	Dye Releases	
Water Samples Treated (Phytoplankton)	96		
Zooplankton Hauls		Observations (Weather)	482
Zooplankton Hauls (Mysis)	35	Observations (Underwater TV)	20
Primary Productivity Moorings	10		
Bottom Samples (Fauna)	241	Continuous Observations (Days)	
Integrator (10m)	339	Air Temperature	
Integrator (20m)	823	Relative Humidity	
Total Number of Depths Sampled	4579	Water Temperature (In-Hull)	4
Total Number of Water Samples Collected	16,031	Water Temperature (Towed)	9
		Integrated Printout	
ONBOARD ANALYSIS		Solar Radiation	
Geolimnology EH & PH	362	Long Wave (IR) Radiation	
Manual Chemistry (Tech. Ops.)	8647		
Nutrients (W.Q.D.)	5569		
Microbiology	580		

REMARKS

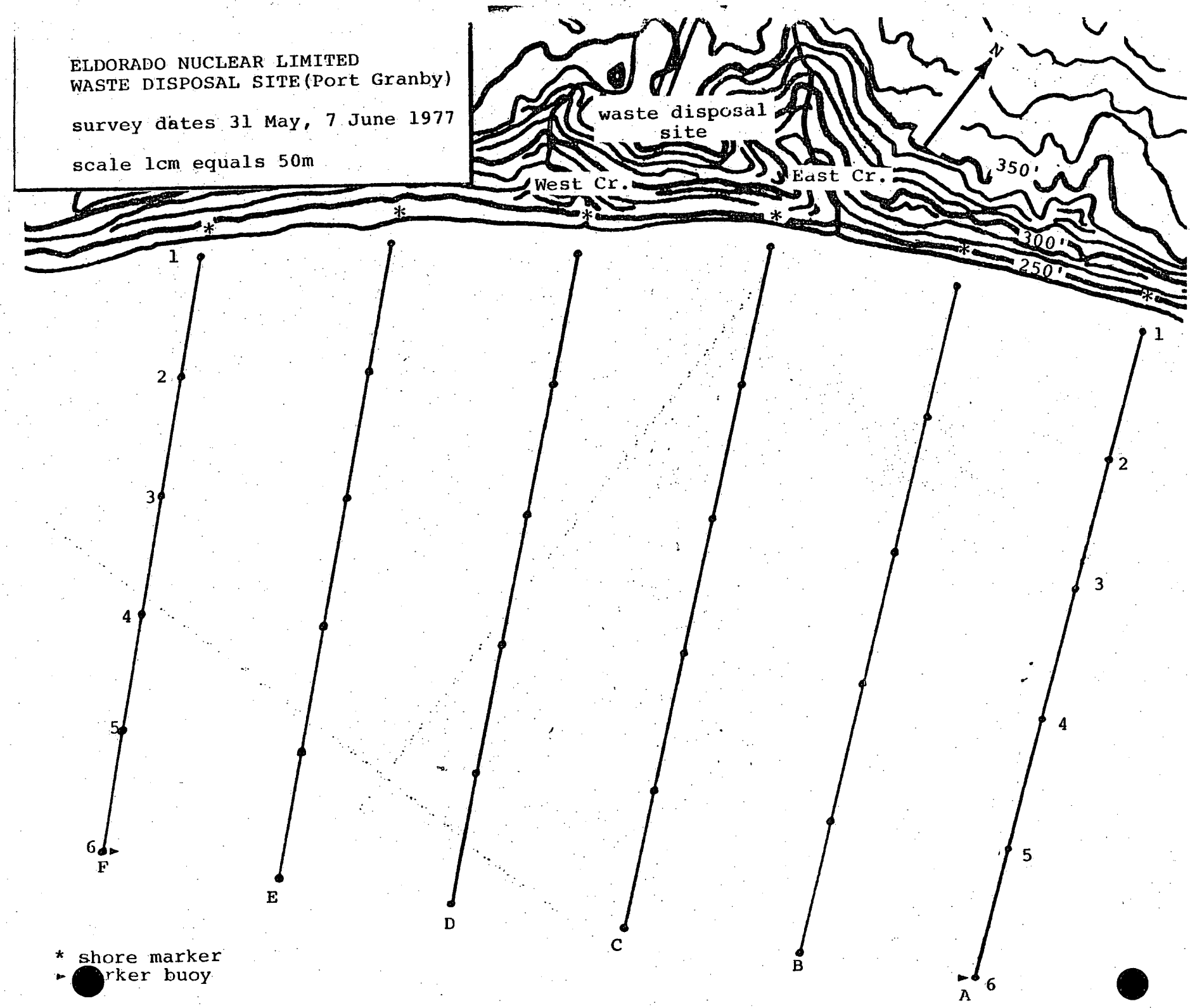
ELDORADO

Radionuclide Sampling

Sampling at the Eldorado Waste Disposal Site near Port Granby, Ontario was started on May 31 and continued on a weekly basis until June 21. A grid of 1 km x 1/2 km was established and sampled on May 31 and June 7. On June 14, the grid was reduced to 1 km x 1/3 km and for June 21, the grid was further reduced to 3/4 km x 1/4 km. On the first three visits, 36 x 4 litre samples were collected and on the final visit, 30 x 16 ℓ were collected. Additionally, duplicate and large volume samples were taken at various times.

Surface water was collected in a galvanized pail and the water transferred to 4 litre plastic jugs. The samples were delivered to CCIW for processing the following day.

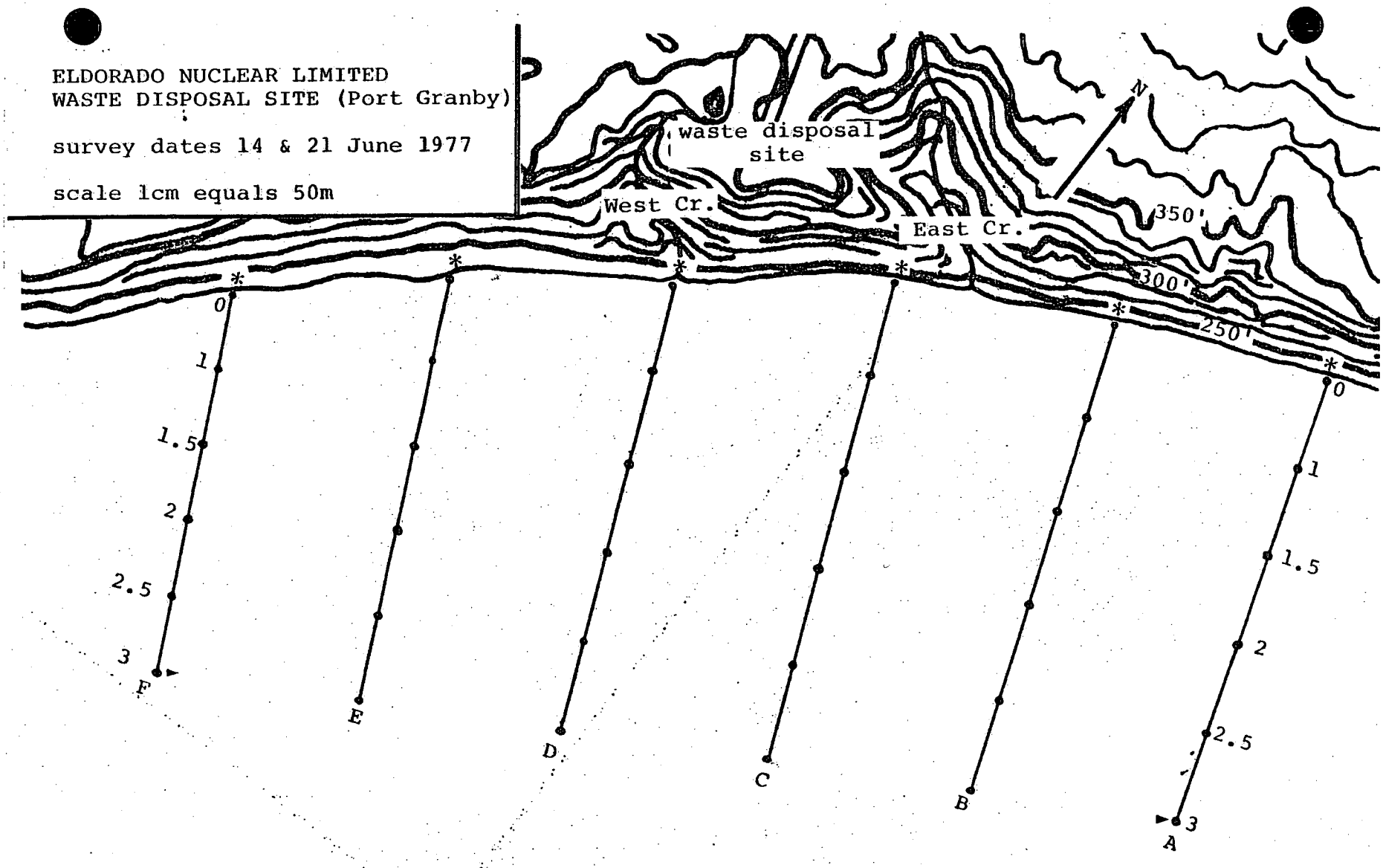
The following two pages illustrate the sampling grids used for this task.


ELDORADO NUCLEAR LIMITED
WASTE DISPOSAL SITE(Port Granby)
survey dates 31 May, 7 June 1977
scale 1cm equals 50m
waste disposal site
West Cr.
East Cr.
N
350'
300'
250'
1
2
3
4
5
6
F
E
D
C
B
A
* shore marker
► marker buoy

ELDORADO NUCLEAR LIMITED
WASTE DISPOSAL SITE (Port Granby)

survey dates 14 & 21 June 1977

scale 1cm equals 50m



* shore marker
► marker buoy

PROJECT NO. 7-IW-HR-024 - SAMPLING OF LITTORAL DRIFT IN SUSPENSION

Personnel

Mr. J.P. Coakley, Study Leader, Shore Process Section, HRD
Dr. N.A. Rukavina, Co-Researcher, Shore Process Section, HRD
Mr. M.R. Thompson, Field Officer, Technical Operations Section, SSD
Mr. J.T. Roe, Head, Dive Unit, Technical Operations Section, SSD
Mr. B.F. White, Electronic System Engineer, Electronic Engineering Unit, ESS
Mr. H. Savile, Design Co-ordinator, Mechanical Engineering Unit, ESS

This report also includes Project No. 7-IW-HR-015.

LITTORAL DRIFT AND EROSION MODEL

Dr. M.G. Skafel, Scientist in Charge, Head, Shore Process Section, HRD

Other personnel from Scientific Support Division and Hydraulics Research Division supported both programs on an intermittent basis.

Purpose

The relationship between nearshore sediment transport rates and wave parameters is poorly defined, particularly in lakes where the process is complicated by seasonal water level changes. This project shall develop and use techniques and procedures aimed at providing a direct measurement of actual littoral drift rates under all wave conditions. The measurements obtained shall be applied to tests of a mathematical predictor model of littoral drift and shall provide information useful to shore erosion control and design of shore structures.

Background

Van Wagner's Beach, Hamilton was chosen as the site for experimental measurements of littoral drift because of its accessibility, existing meteorological data collection system and the Beach Stability Program conducted there in 1972-73. The results from that study were published in "Beach Stability Investigations at Van Wagner's Beach, Western Lake Ontario" by J.P. Coakley (HRD) and H.K. Cho (Technical Operations Section).

In September 1976, a grid system was established for running seventeen sounding lines perpendicular to Van Wagner's Beach. Two of these lines coincided with the 1972-73 survey lines. A survey crew of three Technical Operations personnel completed a preliminary bathymetry survey and shipek sampling along the seventeen lines.

By December, the Dive Unit had installed two twoers with wave staffs and three goal post piles with current meters. Cables were layed and buried from the instruments to the CCIW WAVES program trailer. A severe Easterly storm in January destroyed the installations and the instruments.

Contracts

The Winter studies revealed that the Van Wagner's Beach area is ideal for measuring littoral drift. A land lease agreement was then signed with the City of Hamilton and a copy is on file with Technical Operations. A written letter from Ontario Hydro permitted us to use their property as an access to the site. The Canadian Coast Guard was also notified regarding the hazards to small craft and they approved our recommended safety precautions.

Sled

During the initial stages of development, Technical Operations personnel were involved in preliminary investigations into techniques for measuring currents and sediment transport in the surf zone. The most economical, safest and reliable method was to design and construct at CCIW a sled (Picture 1) capable of carrying all necessary sampling apparatus. The sled was constructed of aluminum and the main body measured approximately 2.84 m by 1.98 m.

The sled carried: a pressure transducer/recorder system for instantaneous depth measurements; two current meters (perpendicular and parallel to shore) and recorders; a suspended sediment sampler consisting of a pump attached to an arm driven by compressed air and sampling through a sixty point circular manifold head that rotates to thirty preset sampling and thirty exhaust positions; thirty, two-litre sampling bags; two diver air tanks (5.24 kilograms/sq. cent.) for pressure compensation and for driving pump arm and manifold head; a sequence/programmer for controlling the sampling and recording instruments; and batteries for power supply. The sled occupied ten different stations collecting samples at 1 cm, 10 cm and 30 cm off the bottom. The sled was towed to each station imploying a carriageway system. Before every run the sled was checked (Picture 6), towed into the surf zone (Picture 7) and after it returned the power shut off (Picture 8) and samples retrieved.

Carriageway System

This system (Pictures 3, 4 and 5) consisted of three piles; one located 130 m from the baseline with a pulley attached; one at the baseline used as a guide and the other behind the shed with a counterweight (630 kilograms) attached. A wire rope with two towing arms was strung (like a clothesline) through the far pulley and around the winch for towing the sled through the surf zone. A concrete slab was constructed as a winch support and floor for the protective shed (Picture 3). These were protected from vandalism by an eight-foot chain link fence.

Complementary Measurements

A. One-third of the WAVES program trailer was allocated for the Littoral Drift Study. Two water level recorders were placed here and water level gauges were installed near sounding run six, 6 m East and 14 m West of the baseline. These instruments measured ground water movements and fluctuations. One recorder malfunctioned and was returned to Hydrographic personnel for repairs and recalibration over the Winter months.

B. To obtain wave height and direction, three wave staffs were attached to piles (Picture 3) located 6.35 m South, 3.66 m North and on line 7 approximately 243 m from the baseline. Wave height was also obtained from a wave staff at the WAVES tower. This information was recorded on magnetic tape. After the last sled run, the three-pile wave staffs ceased giving proper readings.

C. Three sets of two current meters were installed on line six at 73 m, 107, and 145 m from the baseline. The lower meters were 30 cm above the bottom and perpendicular to the shore and the top meters were parallel to the shore. The current meters occasionally required cleaning because of algae growth, debris plugging the propellors or iron filings accumulation on the magnetics. A temperature sensor was also installed with the 73 m current meters.

D. Data consisting of wind speed and direction, relative humidity, air temperature, current and water temperature, from the WAVES tower, was also recorded twenty-four hours a day on the magnetic tape.

E. Wave riders located 3 kilometers and 5 kilometers from shore sent wave height to recorders in the trailer.

F. Three bathymetry and shipek sampling surveys were completed in May, October and December 1977. Charts of the area were drawn to measure sediment movement and the shipek samples are being analysed by the Shore Erosion Process Section personnel.

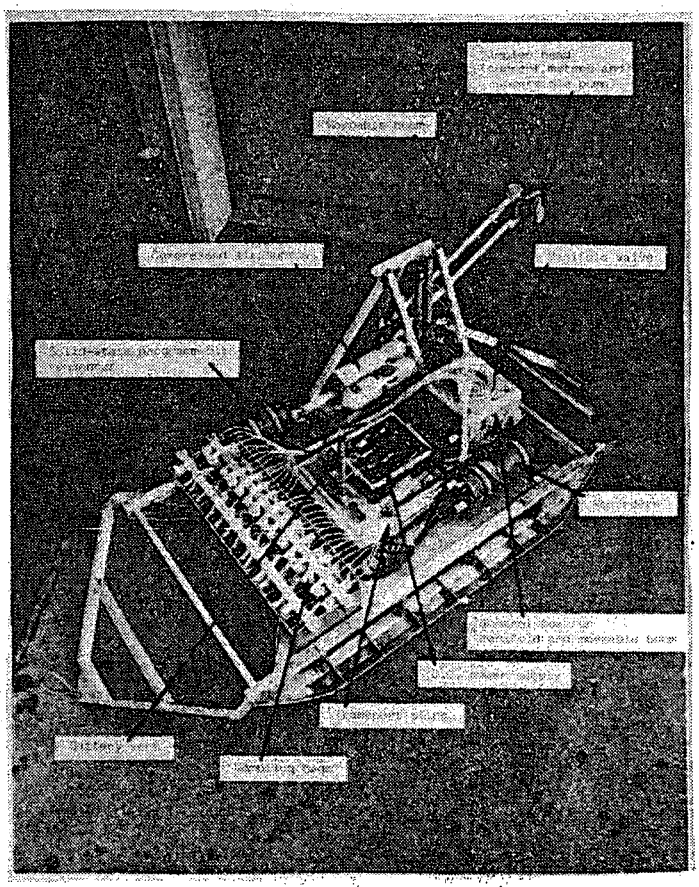
G. Thirty stakes were jetted into the lake bottom on a line running parallel to and 12.5 m North of line seventeen. The last stake was installed 1 kilometer from the baseline. The Dive Unit personnel measured sediment movement by recording the fluctuation of sediment at each stake.

Sampling

Three trouble-shooting runs were made with the sled and many problems were corrected and necessary adjustments performed to both the sled and carriageway. Six experiments with a total of twelve successful sled runs were made between November 17 and December 3, 1977. The data collected on magnetic tapes during these experiments is being copied and reduced by Technical Operations personnel under the guidance of the Special Projects Officer. Dr. M. Skafel, Dr. N. Rukavina and Mr. J. Coakley are analysing all data in preparation for their 1978 field programs.

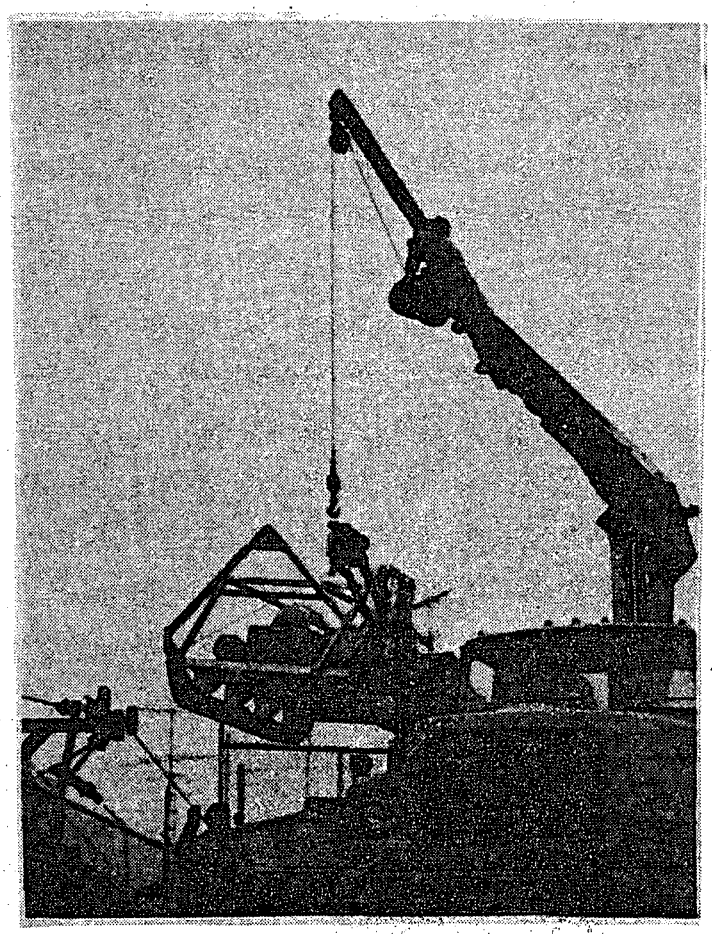
Conclusion

The analysed data shall indicate if the system and techniques used for measuring sediment transport in the surf zone is adequate for the accuracy anticipated. If the data meets the standard envisaged, these and future tests shall be applied to a mathematical predictor model of littoral drift.



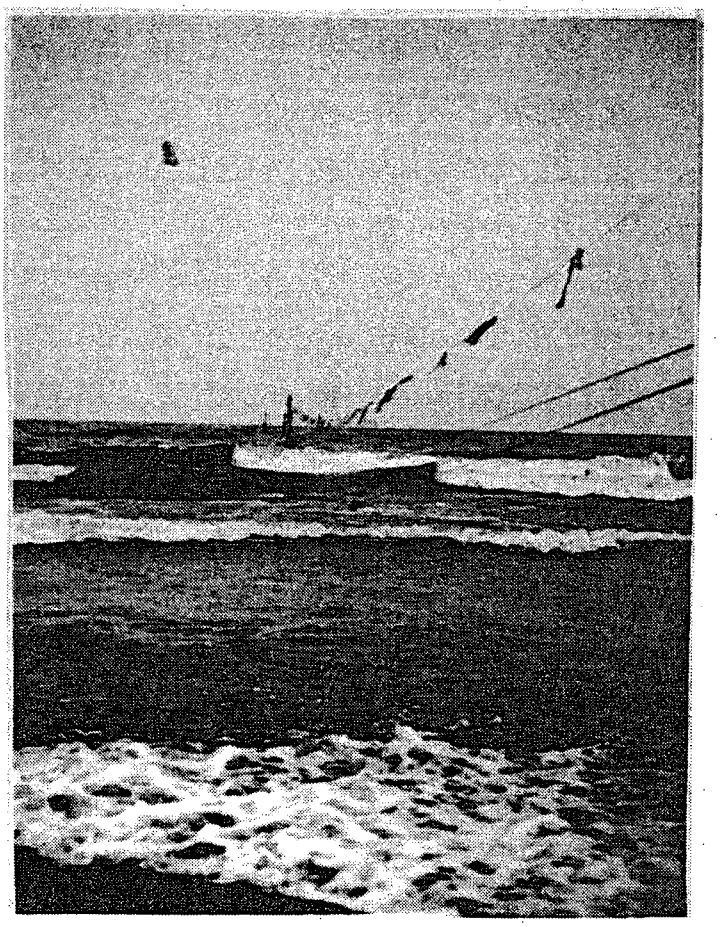
Picture 1

Sampling Sled



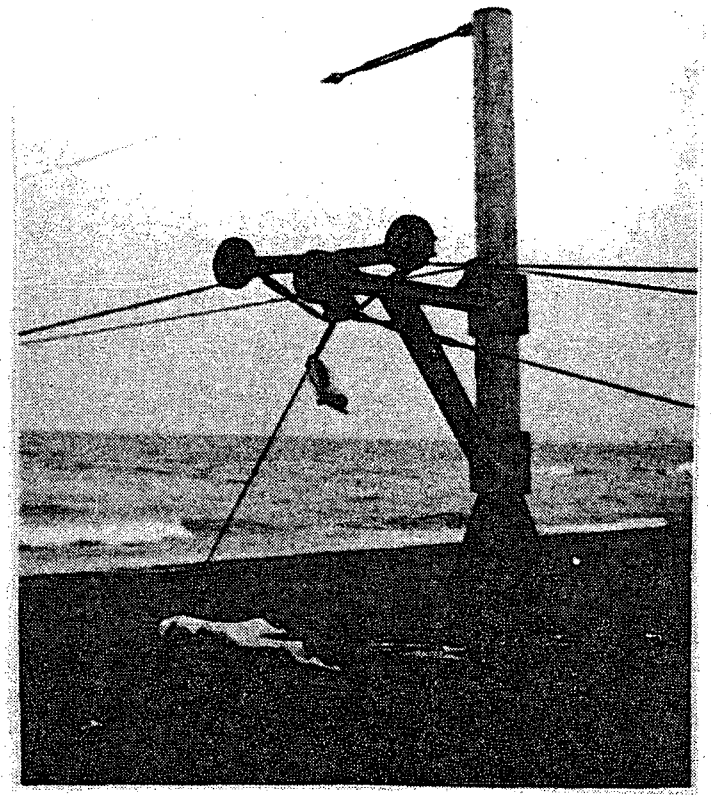
Picture 2

Crane Truck Unloading Sled



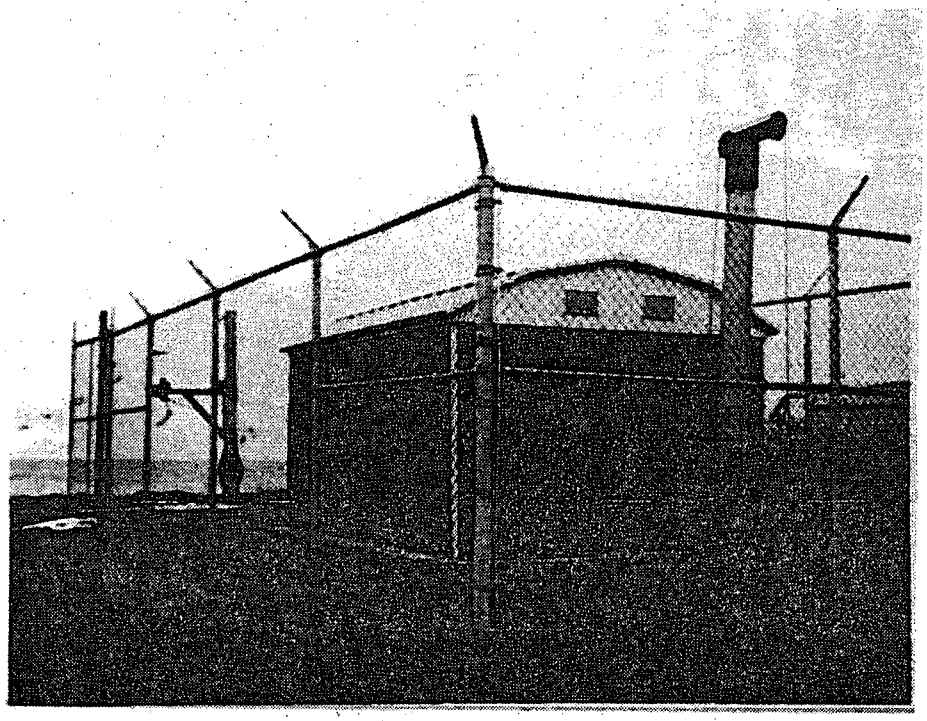
Picture 3

Carriageway System



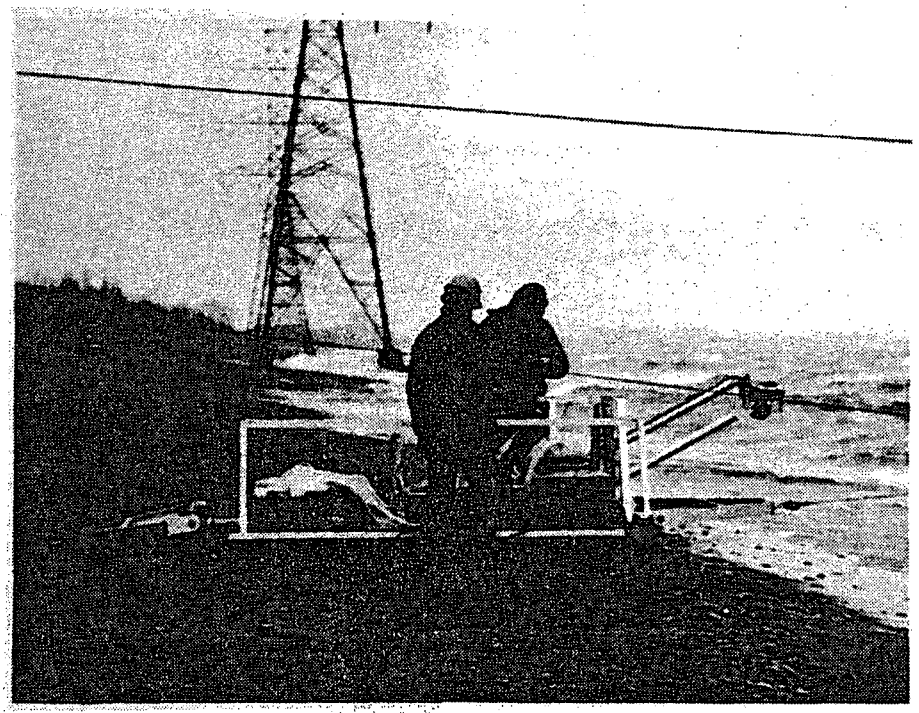
Picture 4

Pile at Base Line



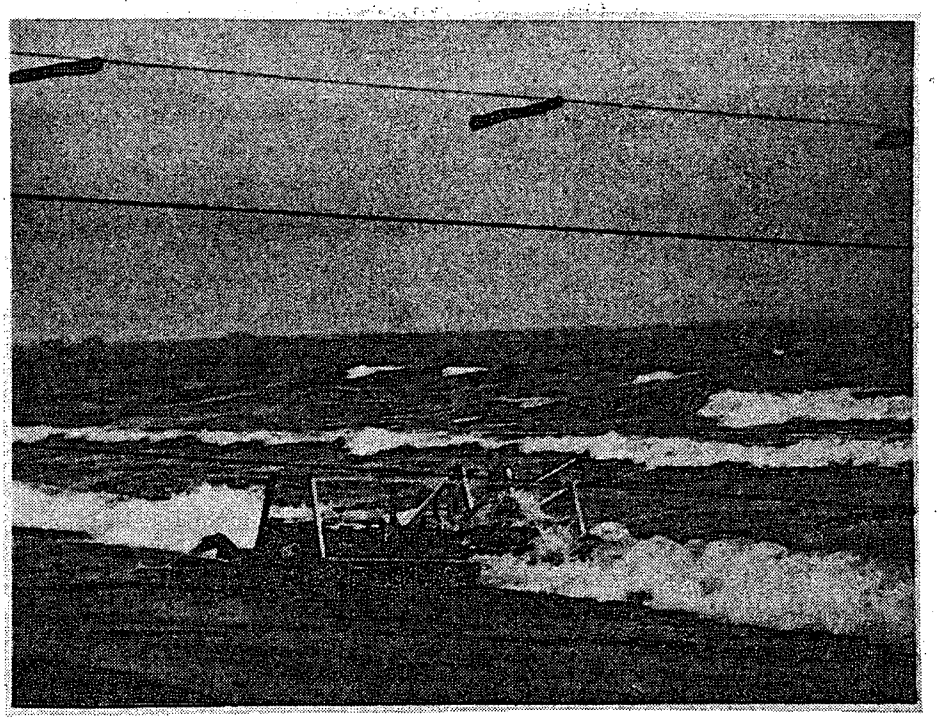
Picture 5

Counterweight, Compound Shed and Concrete Base



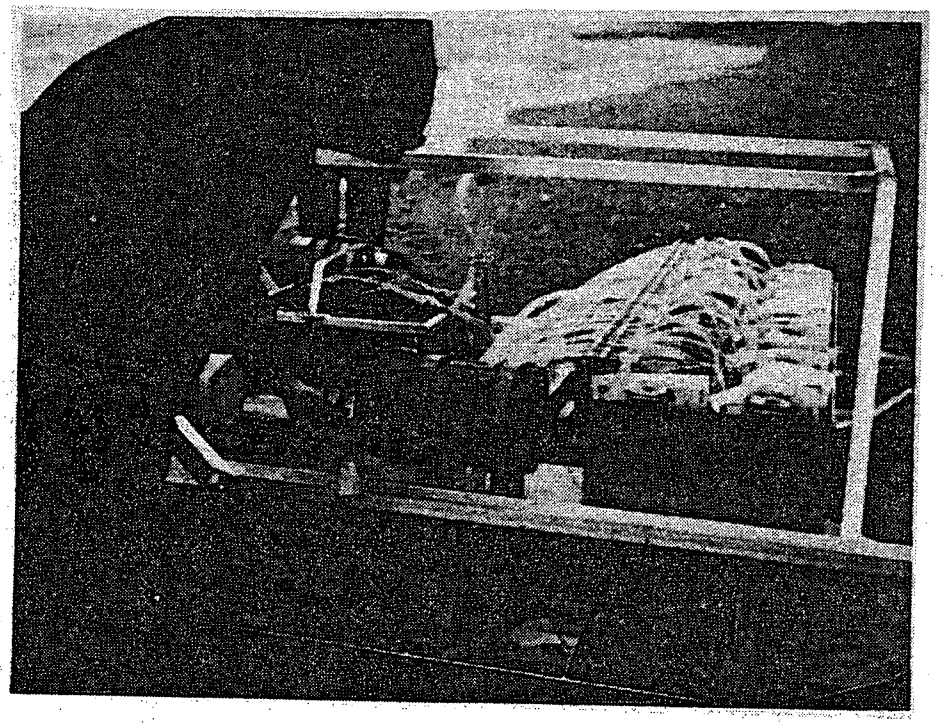
Picture 6

Checking Sled



Picture 7

Sled Entering Surf Zone



Picture 8

Post Sampling Check

PROJECT NO. 7-IW-HR-027 - BLUFF EROSION STUDY

This program was initiated in 1975 to study the problem of steep, unstable bluffs and high erosion rates of the Lake Erie shoreline near Port Burwell. Two types of slope failure are being examined in detail: deep rotational landslips in which chunks of the bluff break free because of undercutting by waves; and rapidly receding gullies by surface water flow and ground water seepage.

To monitor the cause and measure the rate and amount of erosion, each year a topographic survey was completed and a map of the area drawn; continuous punch tape records were kept of piezometer readings (ground water elevations); periodic readings of increase in borehole inclinations were recorded; and in March 1977, the photologger was installed to take pictures of wave action and slope failure.

Personnel

Mr. A. Zeman, Physical Scientist, Shore Process Section, HRD
Mr. R. Thompson, Field Officer, Technical Operations Section, SSD
Mr. J. Valdmanis, Engineering Representative, Engineering Services Section, SSD

Other personnel from Shore Process Section, Technical Operations Section and Engineering Services Section supported the program on an intermittent basis.

Topographic Survey

In July, a team of three Technical Operations personnel surveyed approximately 850 m of Lake Erie shoreline and drew a detailed topographic map (See Diagram). This map was compared to the 1975

and 1976 maps to determine volume of earth eroded, receding rate of gullies and shoreline and, in isolated instances, the accretion of shoreline.

Piezometers

After the initial installation on December 19, 1975, the piezometers (See Diagram 2 for location) gave continuous data until July 23, 1976 when a severe lightning storm occurred and an electrical charge destroyed five of the six piezometers. The destroyed piezometers were replaced and recording again by December 1976. On July 6, 1977, the system again became inoperative due to a lightning power surcharge. No. 1 piezometer was destroyed and the MDIR power unit for the punch tape recorder required minor electronic repairs and adjustments.

To reduce the susceptibility of the system to damage during lightning activity, Ontario Hydro installed a triangle ground rod system at two locations and a second arrestor. Technical Operations personnel grounded the power distribution box and placed the piezometer junction boxes, free floating, in weatherproof plywood boxes. Engineering personnel separated the grounding from the MDIR unit and the punch tape recorder.

On November 22, the repaired monitoring system was re-installed and No. 6 piezometer was not working; a noise problem was discovered in the case of piezometers 4 and 5 and only piezometers 2 and 3 were functioning satisfactorily.

Boreholes

Another component of the Bluff Erosion study is the longterm monitoring of subsurface displacements by means of slope indicator readings. Since January 1976, 14 sets of readings have been taken by our contractor. During the last four sets measured this year, a gradual filling of sand had been observed in borehole No. 2 (See Diagram 2). The increase in the thickness of sand measured during set 14 was of particular concern since the sand limited detailed monitoring of previously defined "active zone" within which consistent lakeward displacements have been measured. On November 14, a successful attempt was made, by pumping, to remove the sand from the borehole. The fine sand is trickling in from the joints in the slope indicator casing and the pumping was a temporary solution.

Photologger

The photologger housing and stand, designed and built at CCIW, and the photologger was installed at the survey site on March 31. The film from April 1 - 5 when developed was distorted and it was apparent that when storm-force winds occurred, the photologger stand vibrated. To prevent these vibrations, the top of the photologger stand was attached to sand anchors with wire ropes and turn buckles.

The April 13 - 20 film showed the bluffs and lake clearly but no storms or slumps occurred during the filming period. Because Technical Operations personnel were supplied with the wrong film spool on April 5 and the film wound the wrong way on April 20, valuable filming periods were lost. The photologger and accessories were returned to CCIW on April 25.

Conclusion

This study is helping scientists gain an understanding of the mechanisms which cause the collapse of some bluffs. Its conclusion will describe some causes of erosion and recession, recommend further work and discuss possible remedial measures.

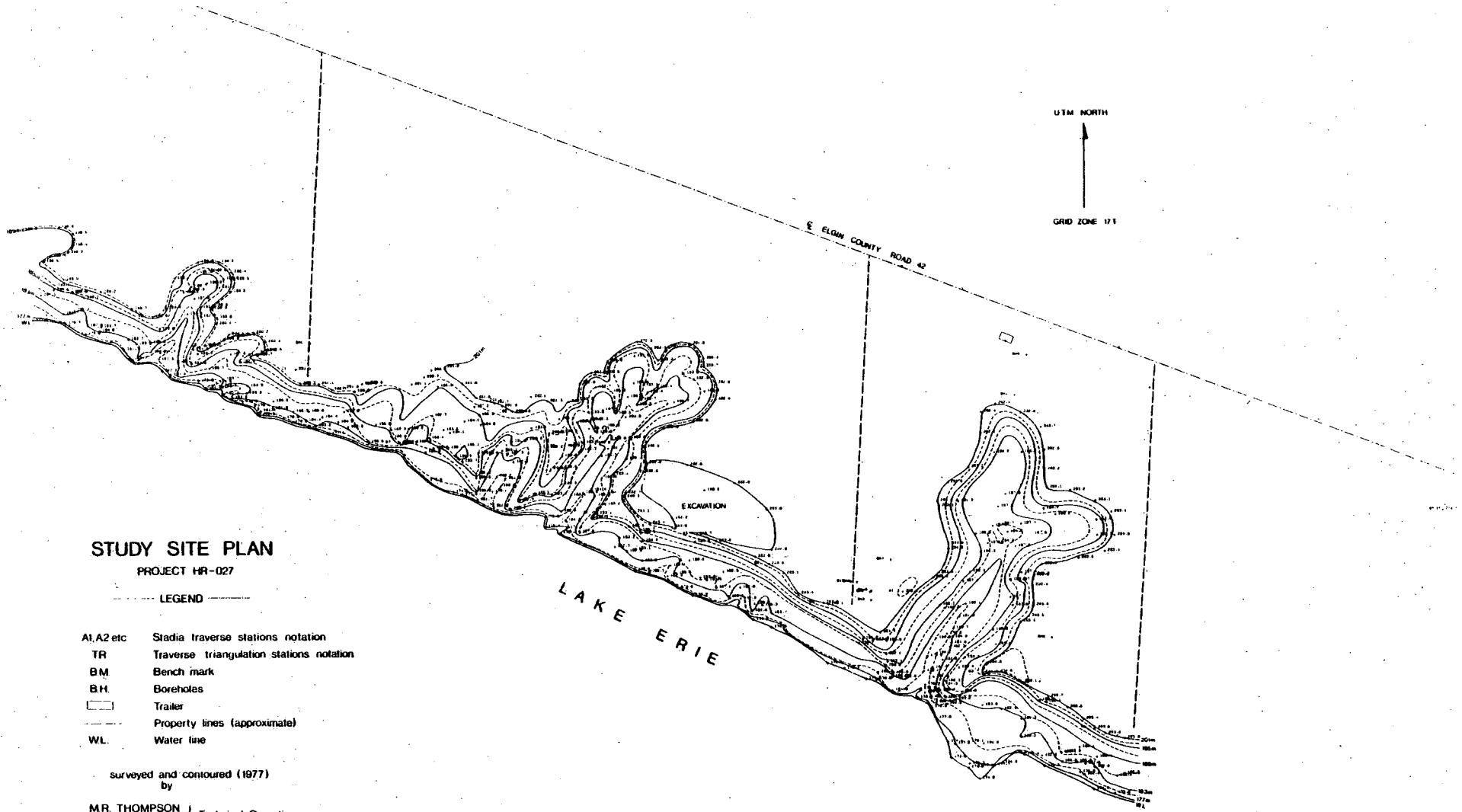
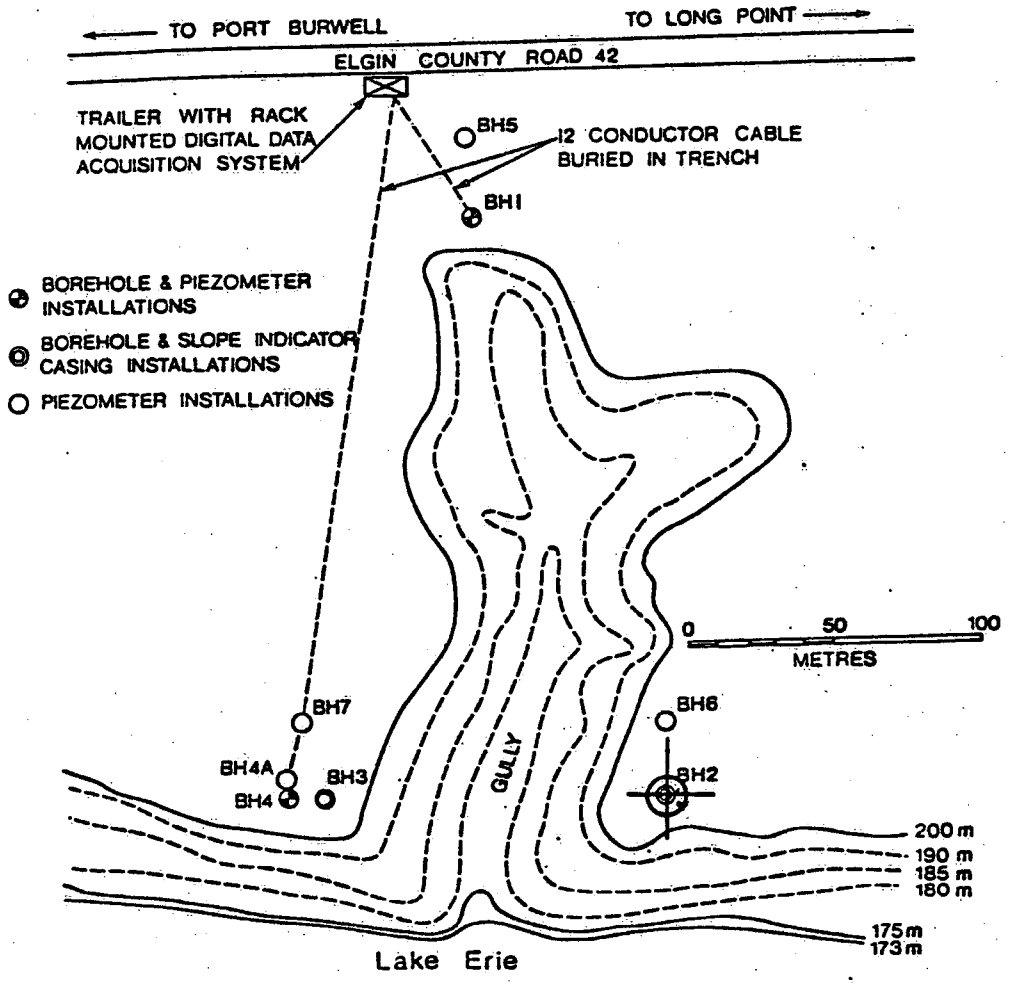

UTM NORTH
GRID ZONE 17
℄ ELGIN COUNTY ROAD 42
EXCAVATION
LAKE ERIE
STUDY SITE PLAN
PROJECT HR-027
LEGEND
A1, A2 etc Stadia traverse stations notation
TR Traverse triangulation stations notation
B.M. Bench mark
B.H. Boreholes
Trailer
Property lines (approximate)
W.L. Water line
surveyed and contoured (1977) by
M.R. THOMPSON W.M.C., D.F.M., J.C.S. | Technical Operations
0 50 100 150
METRES

Diagram 1



SKETCH PLAN OF BOREHOLE LOCATION

Diagram 2

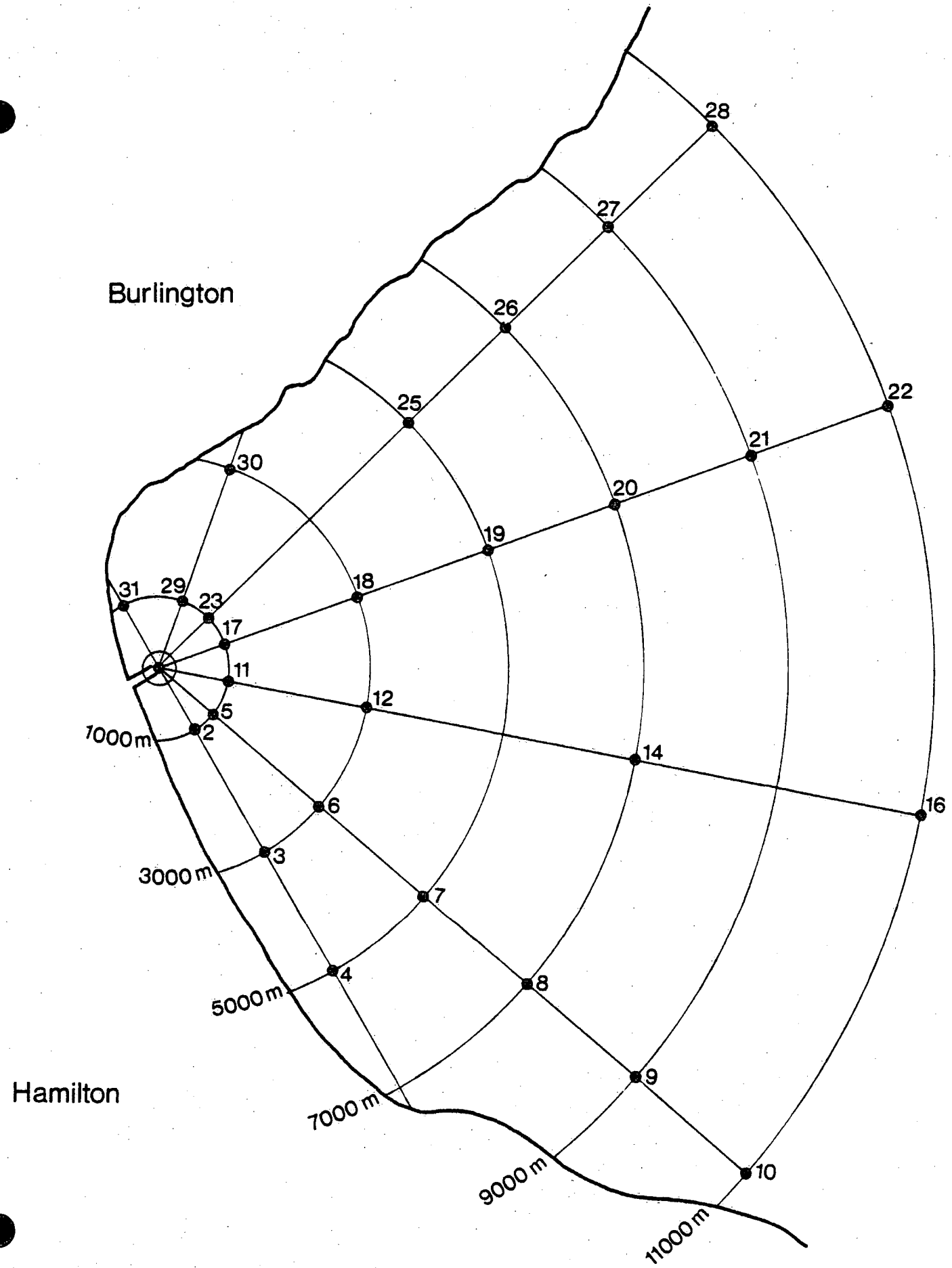
POINT SOURCE SURVEY, 1977

Objectives

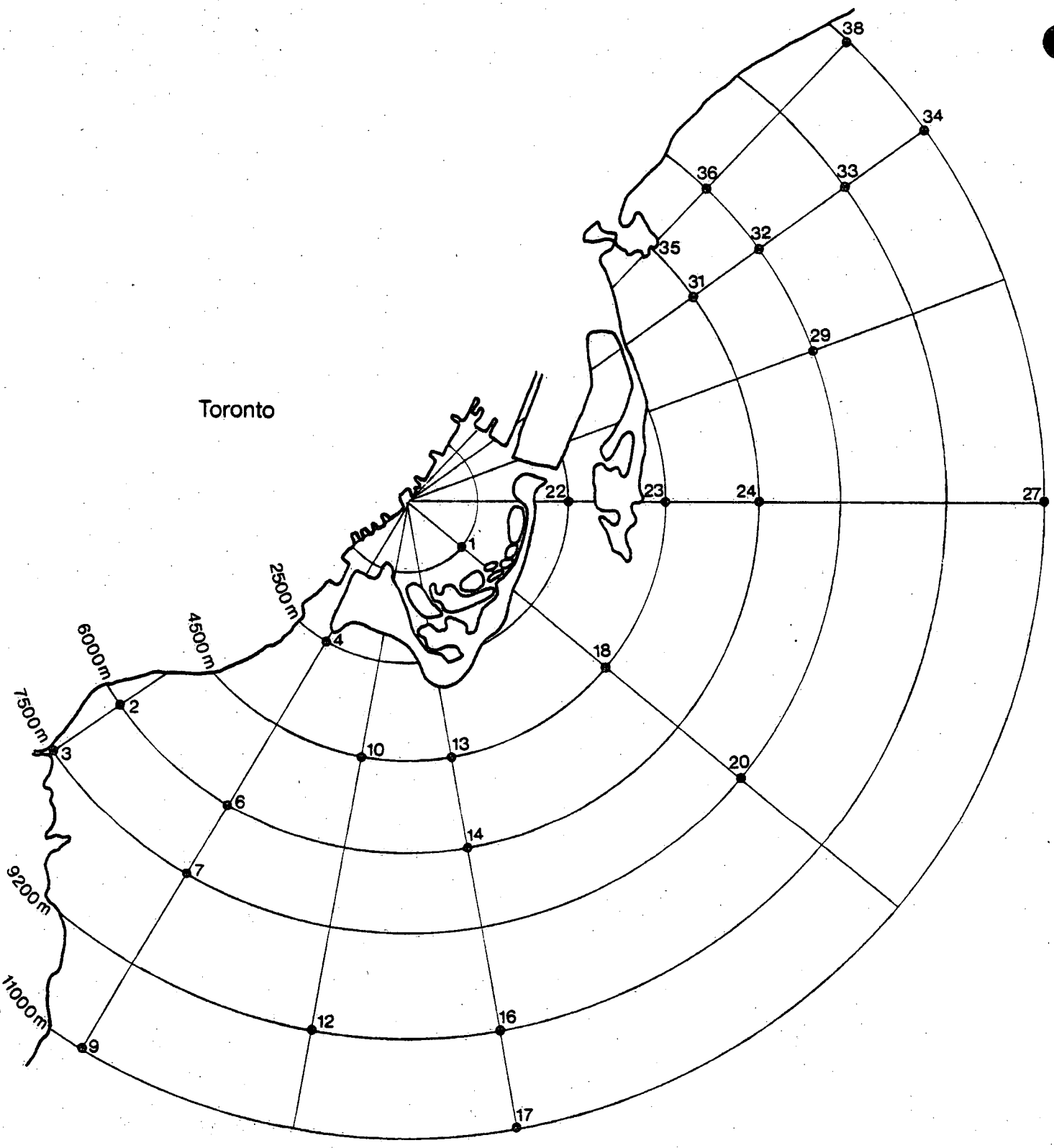
A grid sampling system was set up to ascertain lake water quality in zones near known effluent centers. This study will provide insight into the effective use of bacterial biotypes and densities. This Project, No. 7-IW-AR-027, covered both the Toronto and Hamilton Lake Ontario areas. A chart is included with the location and number of stations. Technical Operations personnel were instrumental in scheduling the vessel "CSL Shark" and in sample collection and preservation.

The Toronto Centre Island Lake Ontario survey involved 27 stations while the Hamilton Lake Ontario survey involved 31 stations. Due to the number of stations sampled each day, a quick insitu type survey was set up for chemistry and microbiology samples. Each station involved an EBT, Van Dorn and microbiology cast. Samples were kept on ice and off-loaded at CCIW into the friges to be analysed the next day.

A total of two five-day surveys were carried out at Toronto, plus one in the Hamilton area. Charts showing the station locations follow page 36.



LAKE ONTARIO MICROBIOLOGY POINT SOURCE, 1977



TORONTO HARBOUR

MICROBIOLOGY POINT SOURCE, 1977

TRIP TO COLCHESTER FOR HRD

Technical Operations Section and Central Region, Ocean and Aquatic Sciences combined to support Hydraulic Research Division on Project No. 7-IW-HR-058 during the week of October 3 - 7. The field party consisted of G.G. Lahaie and J. Faloon of HRD, Dave Ashdown of O&AS and Earl Walker of Technical Operations staff.

The purpose was to complete geological data on the amount of unconsolidated material existing along the nearshore area of Lake Erie from Point Pelee to the town of Colchester. The work was done from the O&AS launch, "Sea Truck" and consisted of jet coring through the unconsolidated material to the solid till or bedrock below. This was done at 34 sites on 13 predetermined transect lines. The positioning was done by a mini ranger unit.

Even though two days were lost due to bad weather, we were able to successfully collect all the desired information.

PROJECT NO. 7-IW-PR-042, WETLANDS

Cores were collected for Mrs. A. Mudroch from the Moira River Basin and from the Bay of Quinte. The cores were subdivided into 1 cm sections and analysed for heavy metal within the sediments for potential availability to biota.

Grab samples and cores were collected simultaneously from a Boston Whaler. The grab samples were collected using an Eckman dredge and the cores were collected using the CCIW lightweight corer.

Samples were collected in early Summer and additional samples are to be collected during the Winter months when upstream lakes will be examined.

PROJECT NO. 7-IW-PR-047, PALEOECOLOGY

During the first week of July, Dr. L.D. Delorme's Paleoecology Project was supported by collecting several cores from various lakes in the Timmons-Motheson, Ontario area. Eleven (11) cores were collected using the CCIW lightweight corer. The cores were subdivided into 1 cm segments and returned to CCIW for freeze-drying and inspection.

The samples are inspected for specific types of shells which prospered in different climatological conditions. The shall identification will give exact climate conditions and any changes in weather conditions from the last ice age to date. This project eventually will have samples covering the whole of Canada.

ELECTRON MICROSCOPY

From January 1 to March 31, Technical Operations personnel:

(a) Prepared and examined water samples, under the electron microscope for asbestos fibre concentrations;

(b) Prepared and developed pictures of sediment samples for particle distribution, size and identification; and

(c) Participated in a comparison study with McMaster University, Lakehead University, Ontario Research Foundation and Ontario Ministry of Environment on different methods of sample preparation. The results were tabulated and compared for a standard method of counting asbestos fibres.

DIVE UNIT, 1977

During the 1976-77 field season, the Diving Unit was able to support eighteen programs in lakes Ontario, Erie and Winnipeg; as well as at Melville Island in the Arctic and the Upper St. Lawrence River. The tasks performed ranged from the mechanical installation and recovery of towers and moorings to the selective sampling and photography of the lake bottoms. The working depths for this field season ranged from zero to one hundred feet, using conventional scuba as well as surface supply and underwater television. The major Spring 1977 program was the Arctic trial of the TROV vehicle in co-operation with G.S.C., Ottawa and Pan Arctic Oils (report April 1, 1977, Roe). The Hamilton Beach programs, three interlocking scientific studies, occupied the Summer and Fall periods, in addition to one week per month in the upper St. Lawrence River (Cornwall) for a water survey.

The Dive Unit operated throughout the season without a designated dive vessel and most of the major work was accomplished with a whaler-type boat pushing a small lifting barge.

The Dive Unit for 1977 consisted of three divers, one team, necessitating careful planning of all operations as all diving ceased on a program when the team was reassigned. These manpower shortages are expected to continue through the coming season.

SPECIAL PROJECTS

Many diverse projects are supported and co-ordinated by the Special Projects Officer, Technical Operations Section. Instrumentation-project liaison, data quality control and fulltime field duties are involved. In addition, the scheduling was done for field use, maintenance and logistics of the various instrument systems (meteorological buoy and field programs, radiation, temperature recording systems, fixed temperature profilers, rain gauges, water quality systems, transmissometers and geological sediment sampling equipment).

Meteorological Systems

Nine (9) meteorological buoys or tower systems (Figure 1) were maintained which produced about 56 months of meteorological data (Figures 2 and 3). One meteorological tower was installed on Hare Island (Figure 4) in support of Ocean and Aquatic Sciences, Central Region studies on the middle estuary of the St. Lawrence River. The meteorological support would be used to provide a data base from which the basic physical processes, distribution of temperature and mixing of the estuary may be deduced.

A meteorological system was installed on a lighthouse on Lake Memphremagog (Figure 5), a 40 km lake on the Quebec-Vermont border. A multidisciplinary team project, based in the Biological Department of McGill University was supported by Technical Operations Section.

The meteorological data collected was processed by Technical Operations and used by McGill University in modelling the fole of wind speed and direction in the generation of currents and standing waves.

Lake Ontario, Project 77-IW-HR-038 was supported by one meteorological buoy which encountered severe lake weather conditions (Figure 6). Extreme icing conditions in conjunction with a short mooring line caused all sensors and buoy to be weighted by ice, requiring the replacement of all sensors on January 18 and the removal of all equipment on February 2. Shearing ice caused excessive damage to the Geodyne toroidal buoy (Figure 7). This buoy was replaced on March 28 and removed on termination of this program on June 14.

Regional support was provided to the Winnipeg project at Qu'Appelle with the installation of a meteorological system on a land-based tower (Figure 8). In addition to the standard sensors, a Plessey radiation integrator (Figure 9) was used with an output in binary counts into the Hymet recorder. A Martek 25 cm transmissometer (Figure 10) was mounted in Lake Qu'Appelle and the data was recorded at each 10-minute cycle on the Hymet recorder. We believe this is the first time that continuous measurements have been taken from transmissometers and recorded on magnetic tape.

In addition to the meteorological support, a Martek water quality package with digital read-out (Figure 11) was provided to measure temperature, conductivity, dissolved oxygen, depth and pH.

Further support was provided with a vertical traversing mechanism (Figure 12) which was designed and built by the Mechanical Engineering Section. The mechanism was 20 feet 6 inches in length and could rotate 360 degrees in addition to vertical traverse for mounting two (2) cusing W.C.M. probes. This vertical traverse system was attached to an 80-foot Mallard tower in Lake Manitoba.

Two meteorological buoys were supported on the Kootenay Lake Project 77-IW-AR-014 in addition to three fixed temperature profilers, three water temperature recording stations (Figure 13) and two radiation fields. Minor problems were encountered with the loss of one water temperature recorder in December due to water flooding. Miscellaneous damage was caused to one fixed profiler (Figures 14 and 15) when a wooden packing crate was broken in shipment.

Two buoys were supported in Lake Erie Project 77-IW-AR-007 and one at Lake St. George, 77-IW-PR-008.

Tipping Bucket Rain Gauge System

Five standard meteorological tipping bucket rain gauges (Figure 16), plus one electric tipping bucket rain gauge were supplied in support of Project 76-IW- - in conjunction with PCB loading from atmospheric sources. Due to a shortage of these gauges at CCIW, four gauges were borrowed from the Hydro Meteorological Section at the Atmospheric Services, Toronto.

Lake Ontario Meteorological Support - Project No. SSD-023

On January 10, 1977 a series of storms hit the Hamilton-Burlington area causing wave heights of up to 4 metres, resulting in the

destruction of the Burlington Pier Meteorological site (Figure 17). The 45B anemometer and equipment were removed and replaced on May 24, 1977.

1977 METEOROLOGICAL BUOY STATIONS

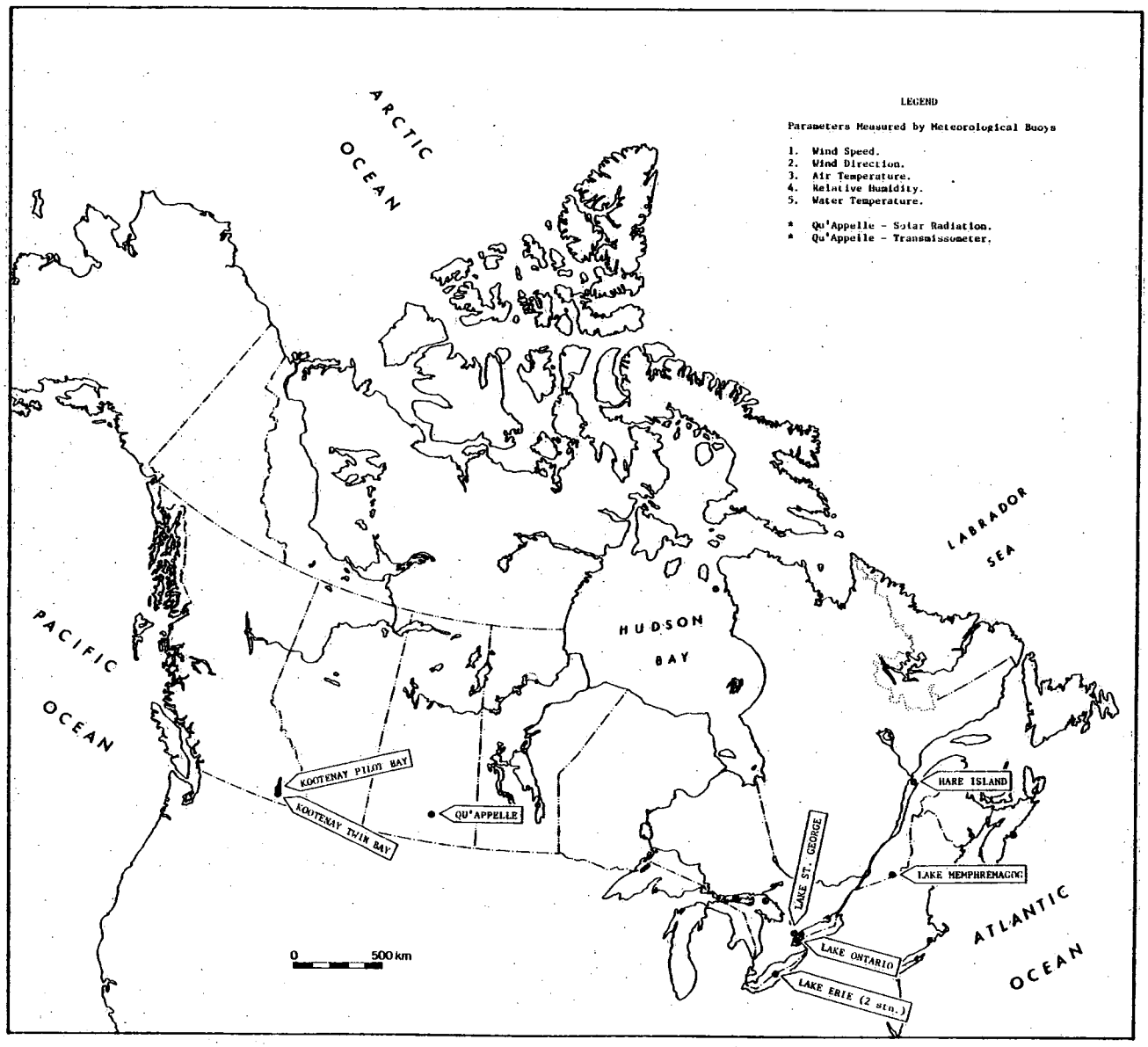


Figure 1

METEOROLOGICAL BUOY DATA 1977

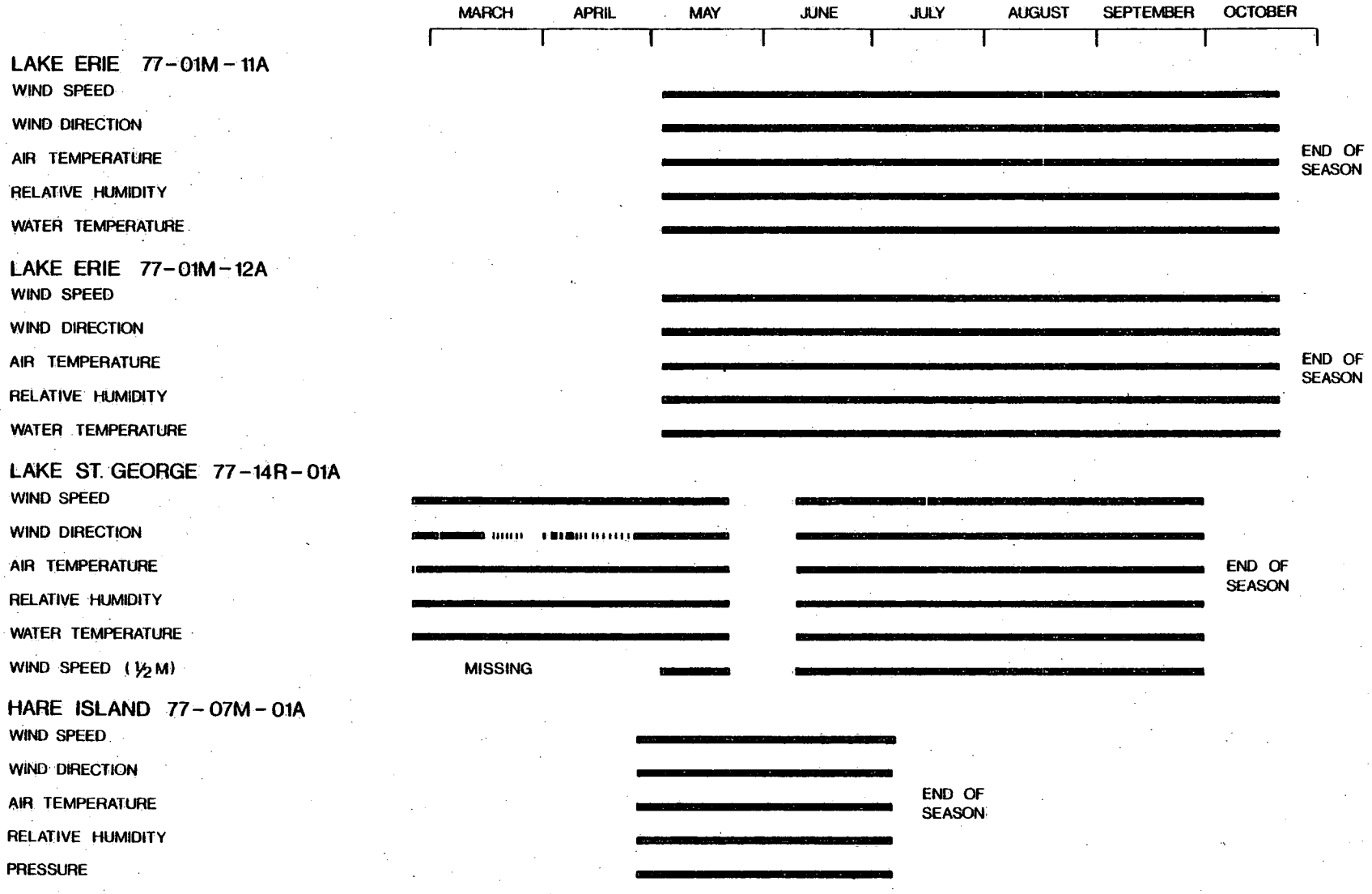


Figure 2

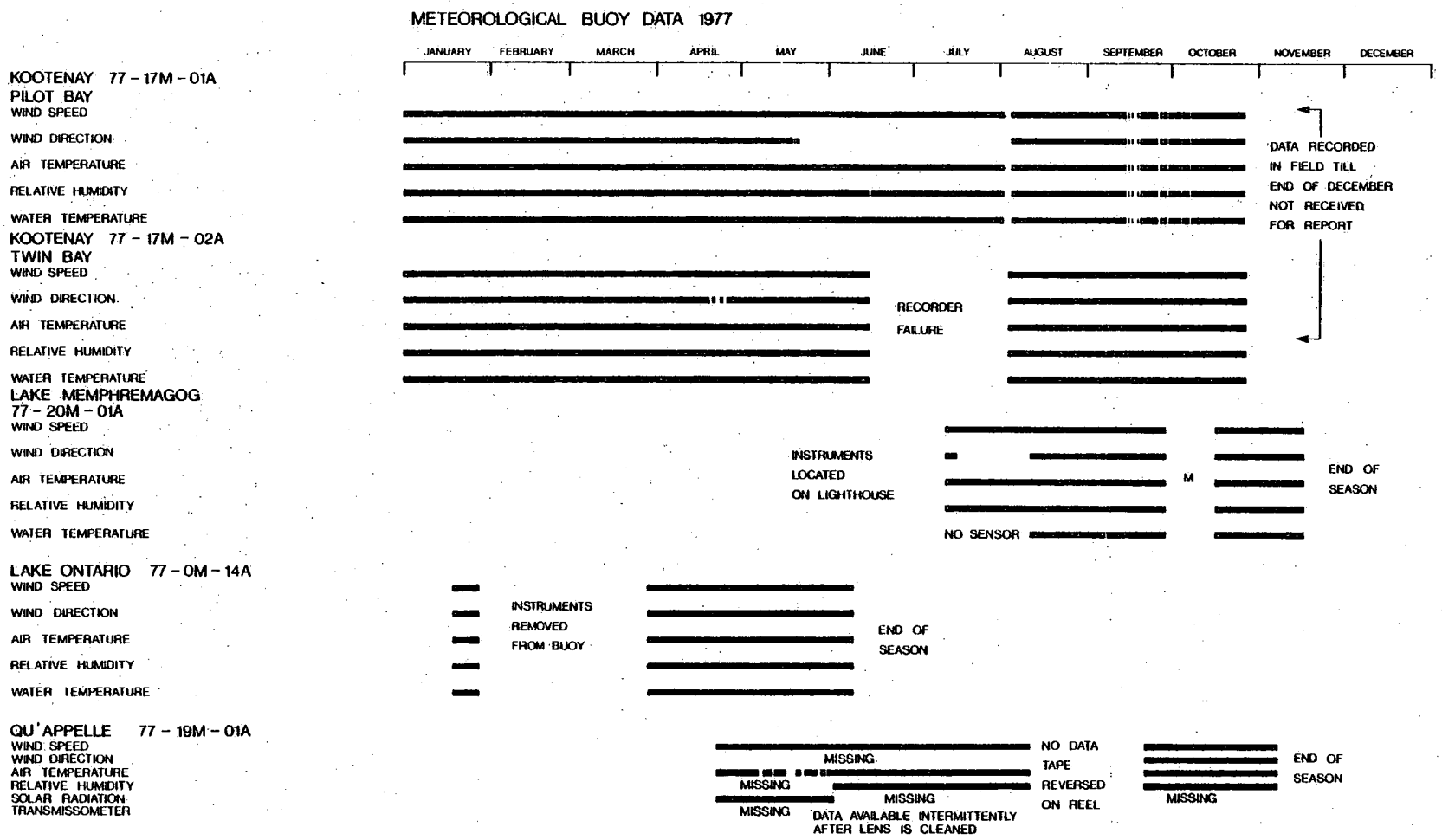

METEOROLOGICAL BUOY DATA 1977
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
KOOTENAY 77 - 17M - 01A
PILOT BAY
WIND SPEED
WIND DIRECTION
AIR TEMPERATURE
RELATIVE HUMIDITY
WATER TEMPERATURE
DATA RECORDED IN FIELD TILL END OF DECEMBER NOT RECEIVED FOR REPORT
KOOTENAY 77 - 17M - 02A
TWIN BAY
WIND SPEED
WIND DIRECTION
AIR TEMPERATURE
RELATIVE HUMIDITY
WATER TEMPERATURE
RECORDER FAILURE
LAKE MEMPHREMAGOG
77 - 20M - 01A
WIND SPEED
WIND DIRECTION
AIR TEMPERATURE
RELATIVE HUMIDITY
WATER TEMPERATURE
INSTRUMENTS LOCATED ON LIGHTHOUSE
M
END OF SEASON
NO SENSOR
LAKE ONTARIO 77 - 0M - 14A
WIND SPEED
WIND DIRECTION
AIR TEMPERATURE
RELATIVE HUMIDITY
WATER TEMPERATURE
INSTRUMENTS REMOVED FROM BUOY
END OF SEASON
QU'APPELLE 77 - 19M - 01A
WIND SPEED
WIND DIRECTION
AIR TEMPERATURE
RELATIVE HUMIDITY
SOLAR RADIATION
TRANSMISSOMETER
MISSING
MISSING
MISSING
MISSING
DATA AVAILABLE INTERMITTENTLY AFTER LENS IS CLEANED
NO DATA TAPE REVERSED ON REEL
MISSING
END OF SEASON

Figure 3

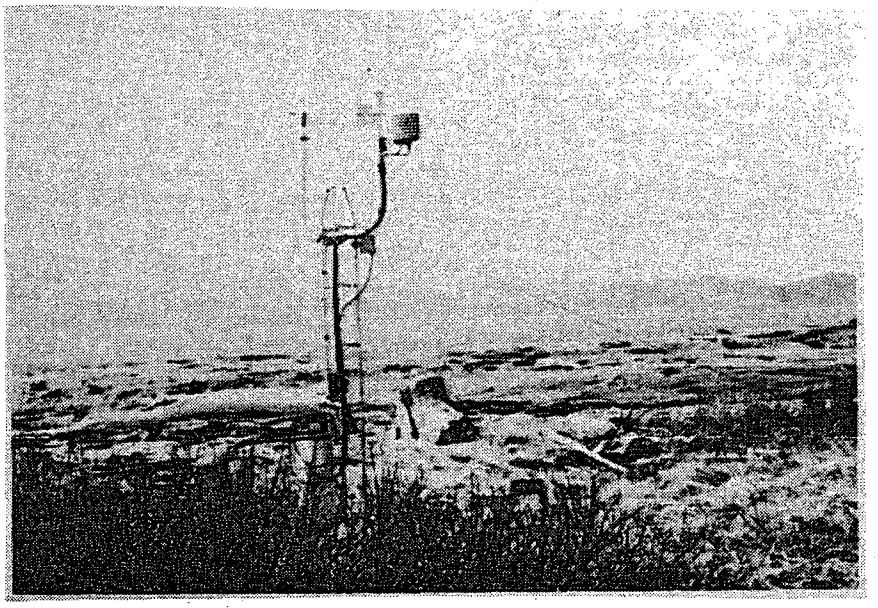


Figure 4

Hare Island Meteorological Station

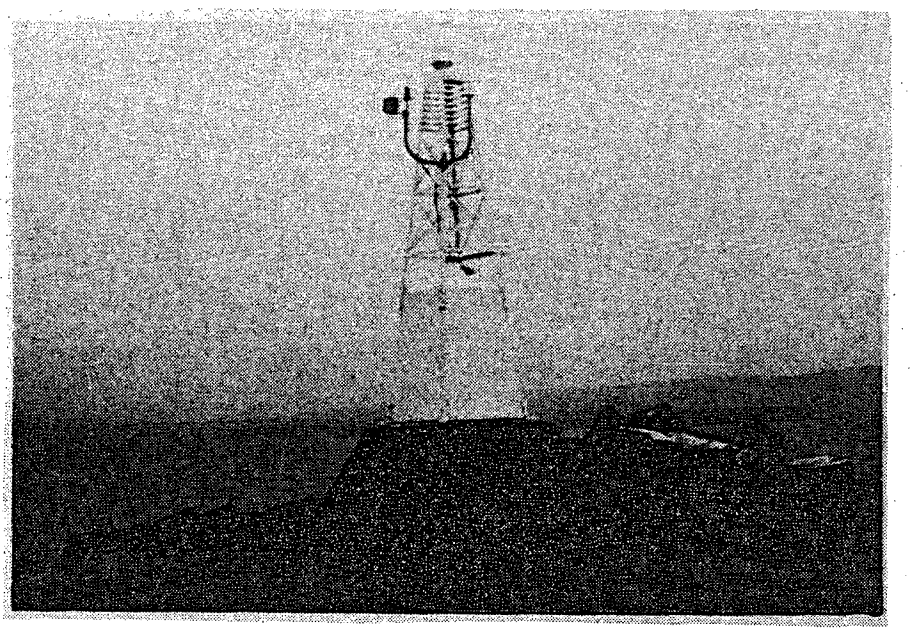


Figure 5

Lake Memphremagog Meteorological Station

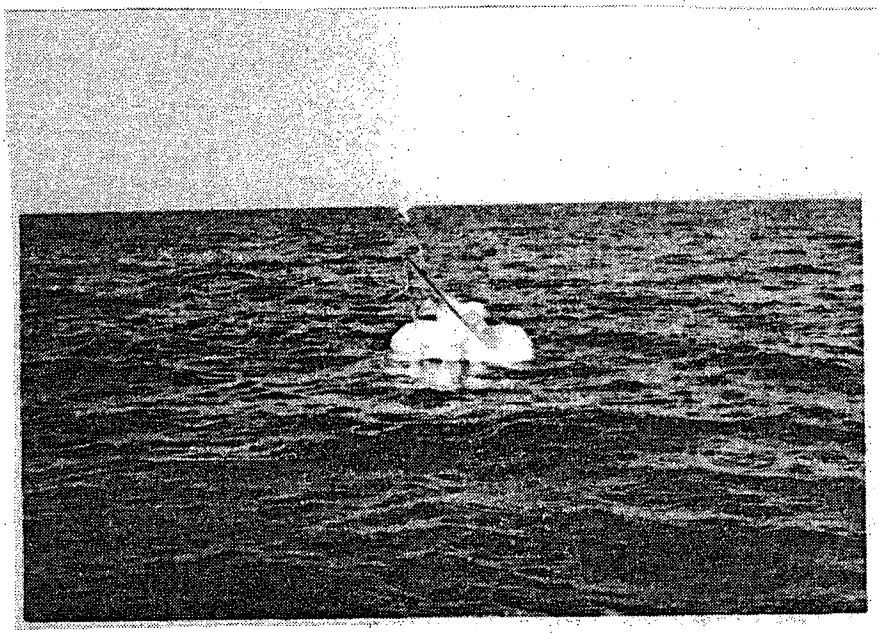


Figure 6

Lake Ontario Buoy, February 7, 1977

Figure 7

Meteorological Buoy Damaged in Lake Ontario

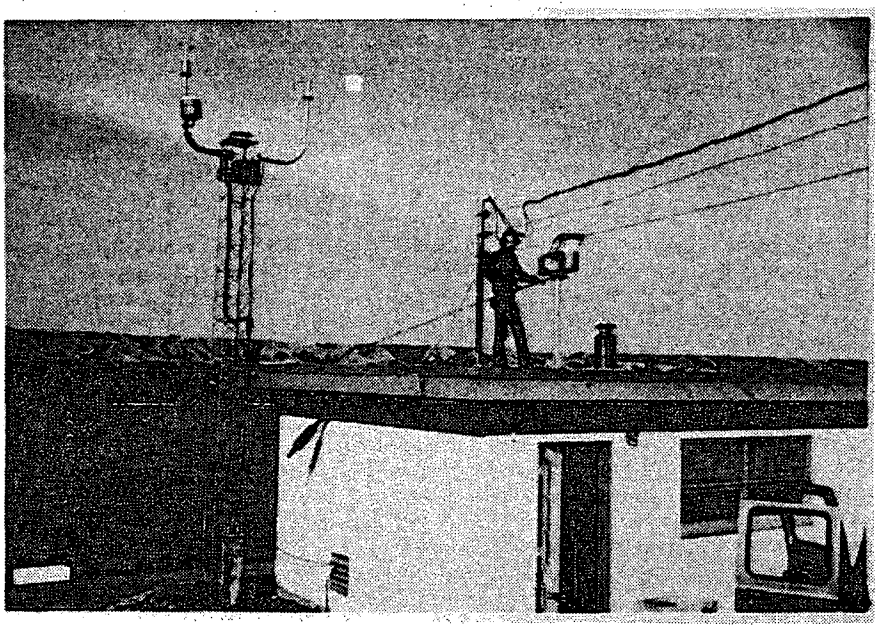


Figure 8

Qu'Appelle Land-based Meteorological Station

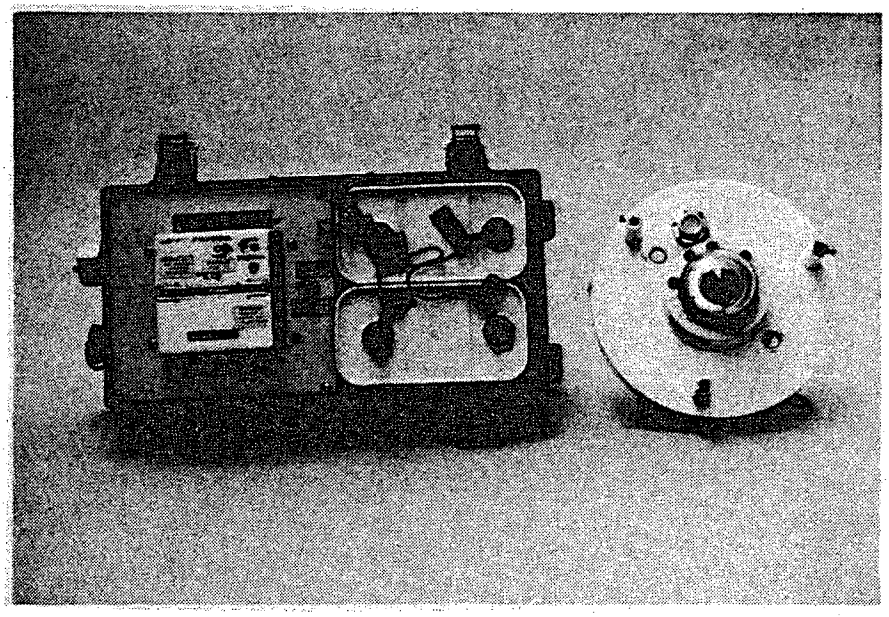


Figure 9

Ou'Appelle Radiation Integrator

Used with Meteorological Hymet Recorder

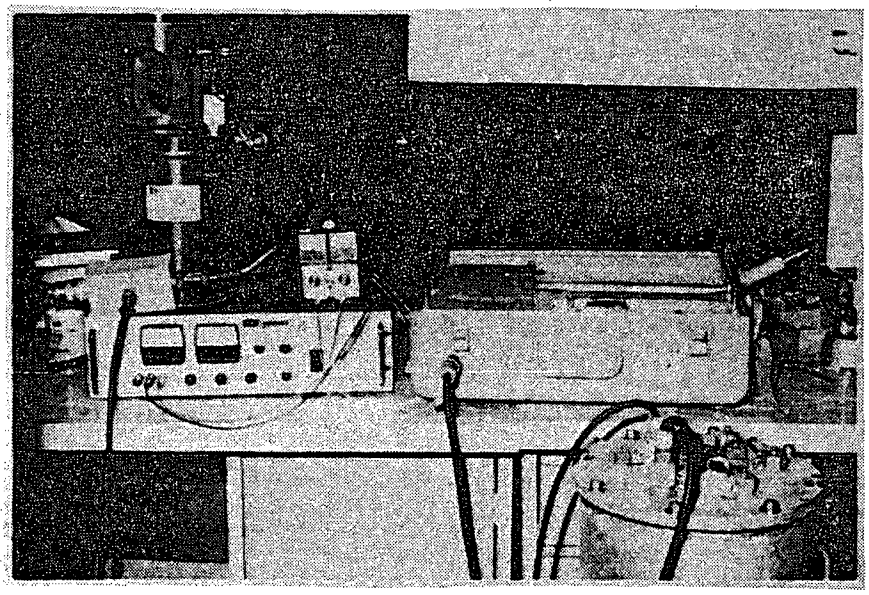


Figure 10
Qu'Appelle Transmissometer
Used with the Hymet Package

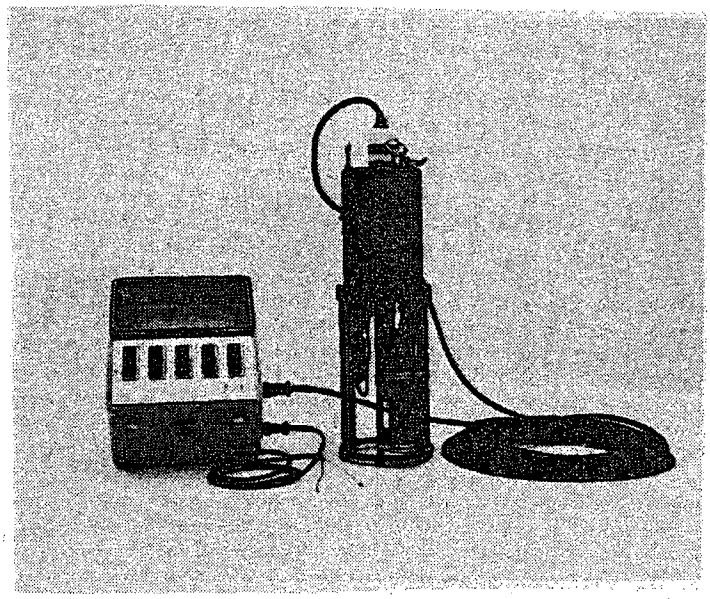


Figure 11
Water Quality (Martek) Package with Digital Read-out
Used in Qu'Appelle During the 1977 Field Season

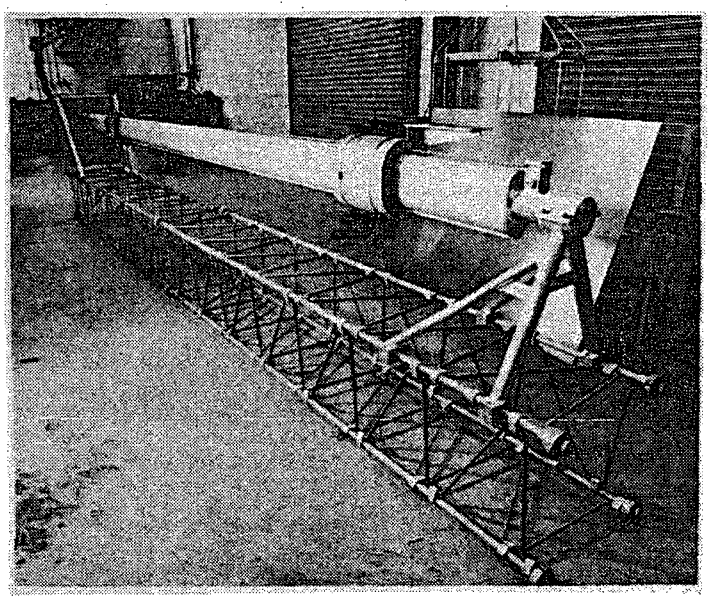


Figure 12

Vertical Traversing Tower

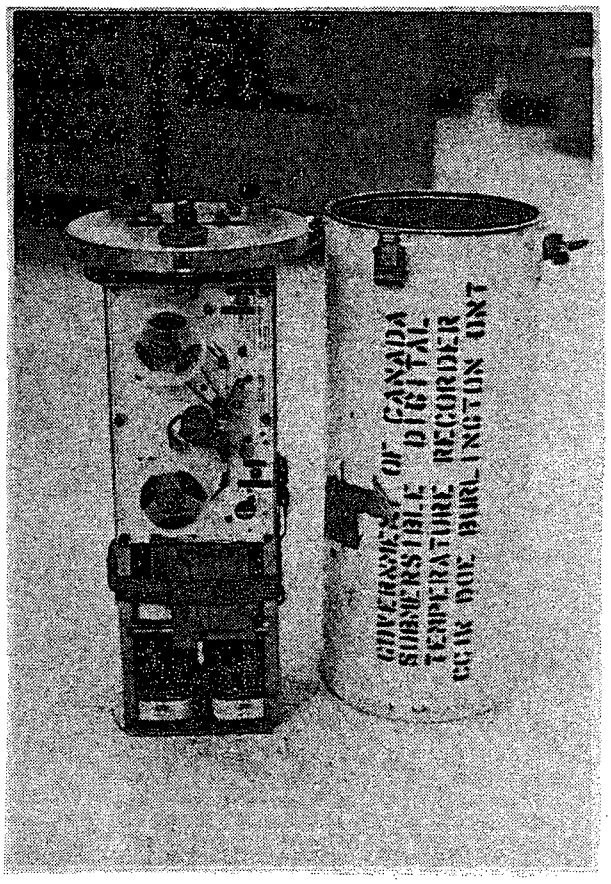


Figure 13

Digital Temperature Recorder

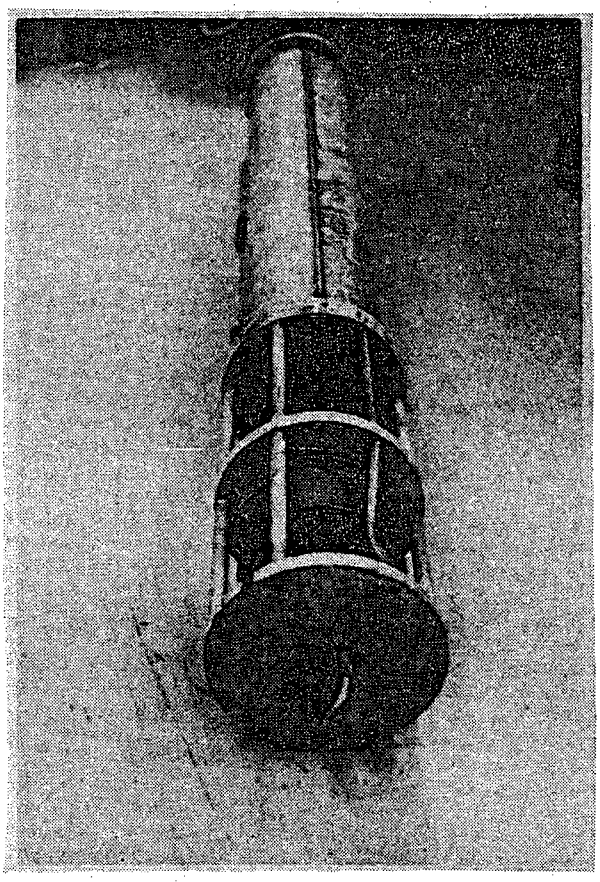


Figure 14
Kootenay Lake Fixed Profiler
Damaged in Shipment

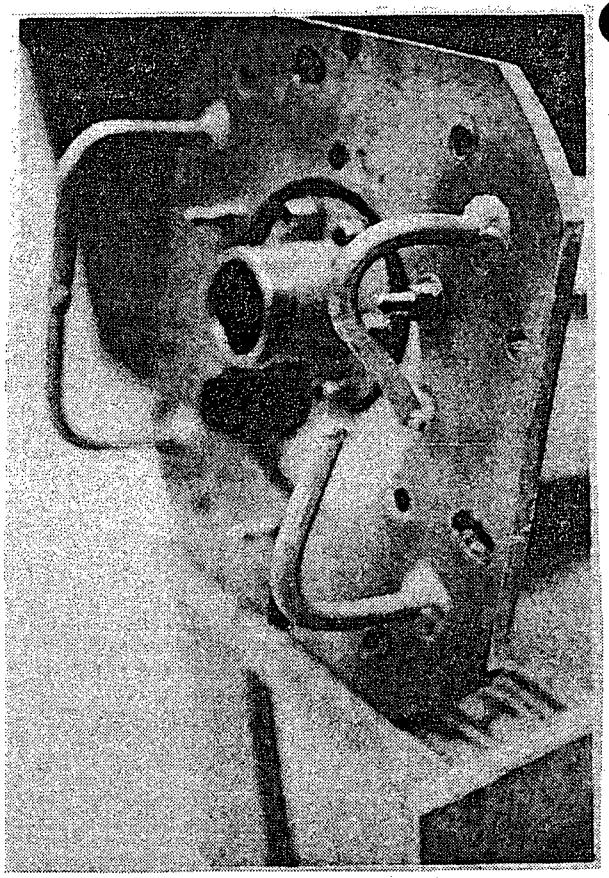


Figure 15
Kootenay Lake Fixed Profiler
Damaged in Shipment

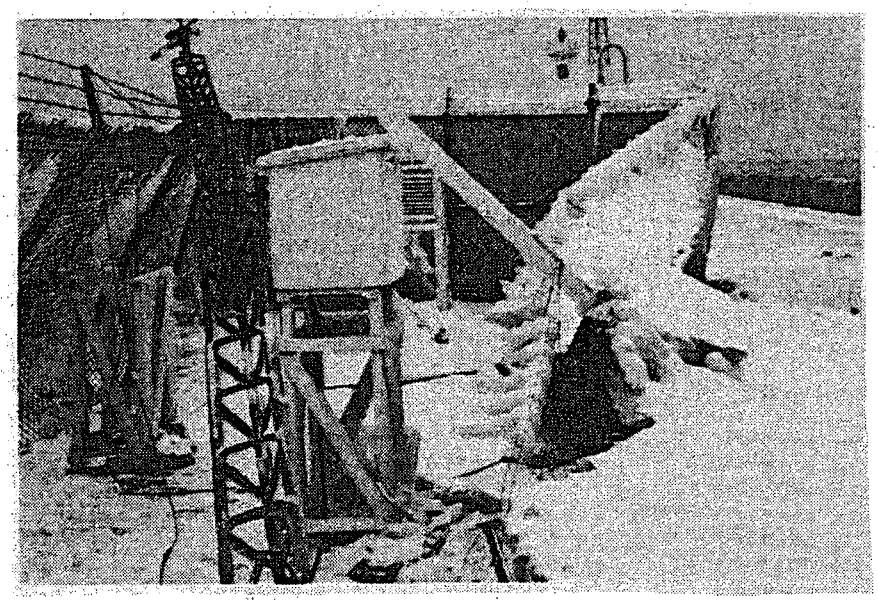


Figure 17
Burlington Pier Meteorological Site

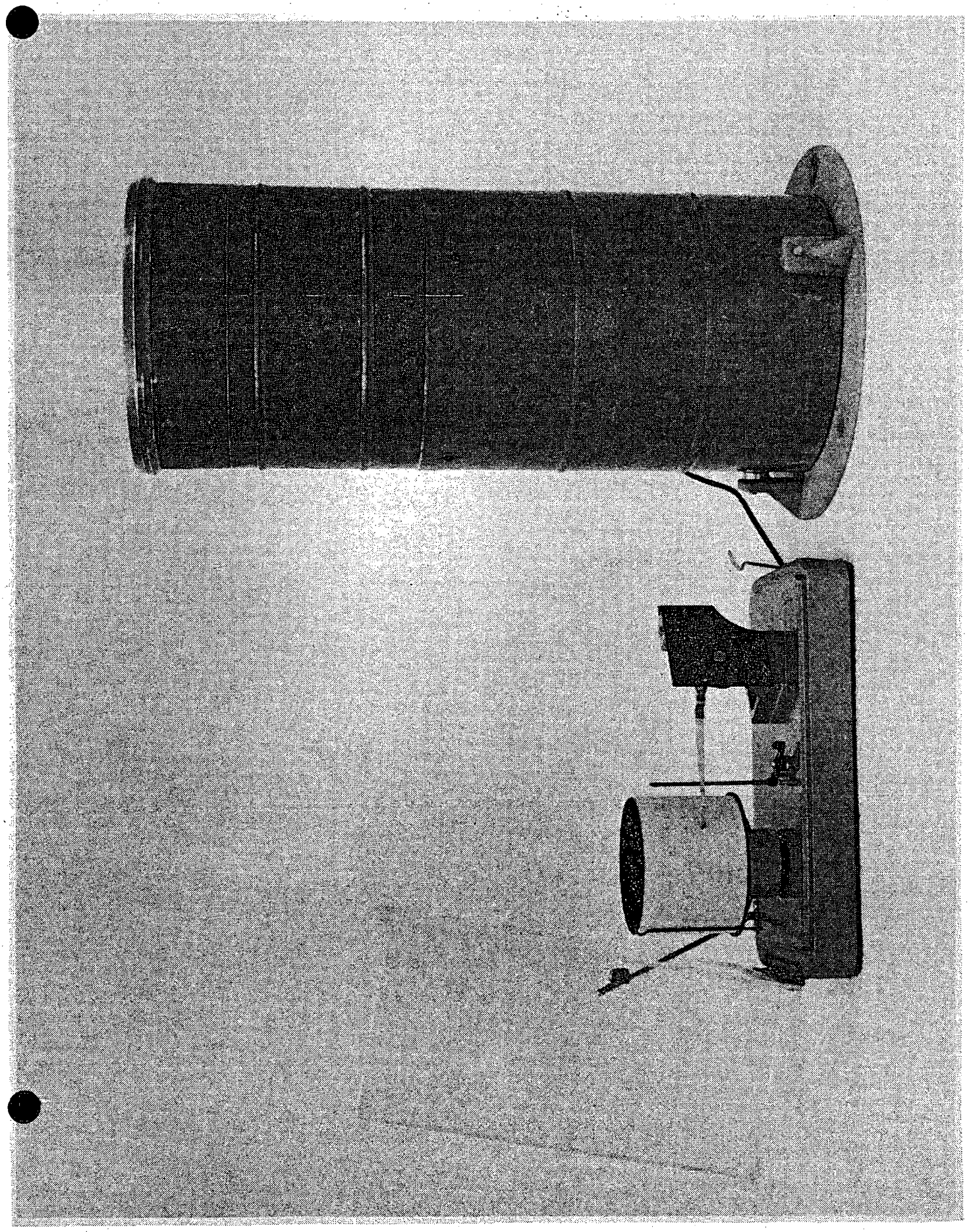


Figure 16
Standard Meteorological Tipping Bucket Rain Gauge

Data from the Burlington Pier is available from May 15, 1969 to January 10, 1977 and from May 24 to December 1977 on magnetic tape and computer punch cards.

On July 16, 1977 Technical Operations Section assumed full responsibility for the Burlington Research Tower and the continuing collection of meteorological parameters. These parameters include wind speed and direction, air temperature, relative humidity, all at 10 metres, and water temperature and wave heights. Further, lower wind speed and air temperature were recorded at 1.5 metres above the water surface.

Data from this research tower will be processed for ten-minute and hourly averaged data which will be used for scientific research reports.

To ensure continuous records of wind speed and direction, the Burlington Pier anemometer was kept operational under December 20 when all major programs were completed on Lake Ontario.

Radiation Systems

A total of sixteen radiation stations were maintained throughout Canada (Figure 1) with about 136 months of data collected (Figure 2).

A precision Eppley (Figure 3) was severely damaged at the Harmony River radiation station when the signal cable was hit by a falling tree causing the radiation sensor to be dragged in the Harmony River. The outer and inner dome and shield were damaged, in addition to water penetration into the thermopile and interior radiation measuring circuit.

Two precision Eppley radiation sensors were damaged by lightning at Dunnville and Rawson Lake during the month of July. A shift in calibration of the CCIW solar radiation sensor may cause some questionable data from this station.

A net (total) radiation station (Figure 4) was established at Pelee Island, Canada's most southerly inhabited island, in June and removed in December. This instrumentation was established in support of Project 77-IW-AR-013.

During 1977, a special committee was established to investigate various radiation integrator systems and to develop integrator specifications to fulfill CCIW scientific requirements for the next ten years, Project SSD-015, R.G. Chapil Project Leader. As a means of reducing the manpower requirement for data reduction, nine Campbell Scientific integrators were purchased with the intention of placing these systems into operation by April 1979. The output of the systems will be key-punched and computer processed, reducing processing time from two days to one-half day for each month of data collected.

During 1977, computer programs were developed for processing of solar radiation from integrated and hand-scaled radiation data.

In addition to CCIW support and regional support, two outside agencies were provided with instrumentation and expertise in the comparative studies by McMaster University at CCIW. A second program was established at Lakehead University, Thunder Bay for measurement of reflected thermo energy of structural buildings.

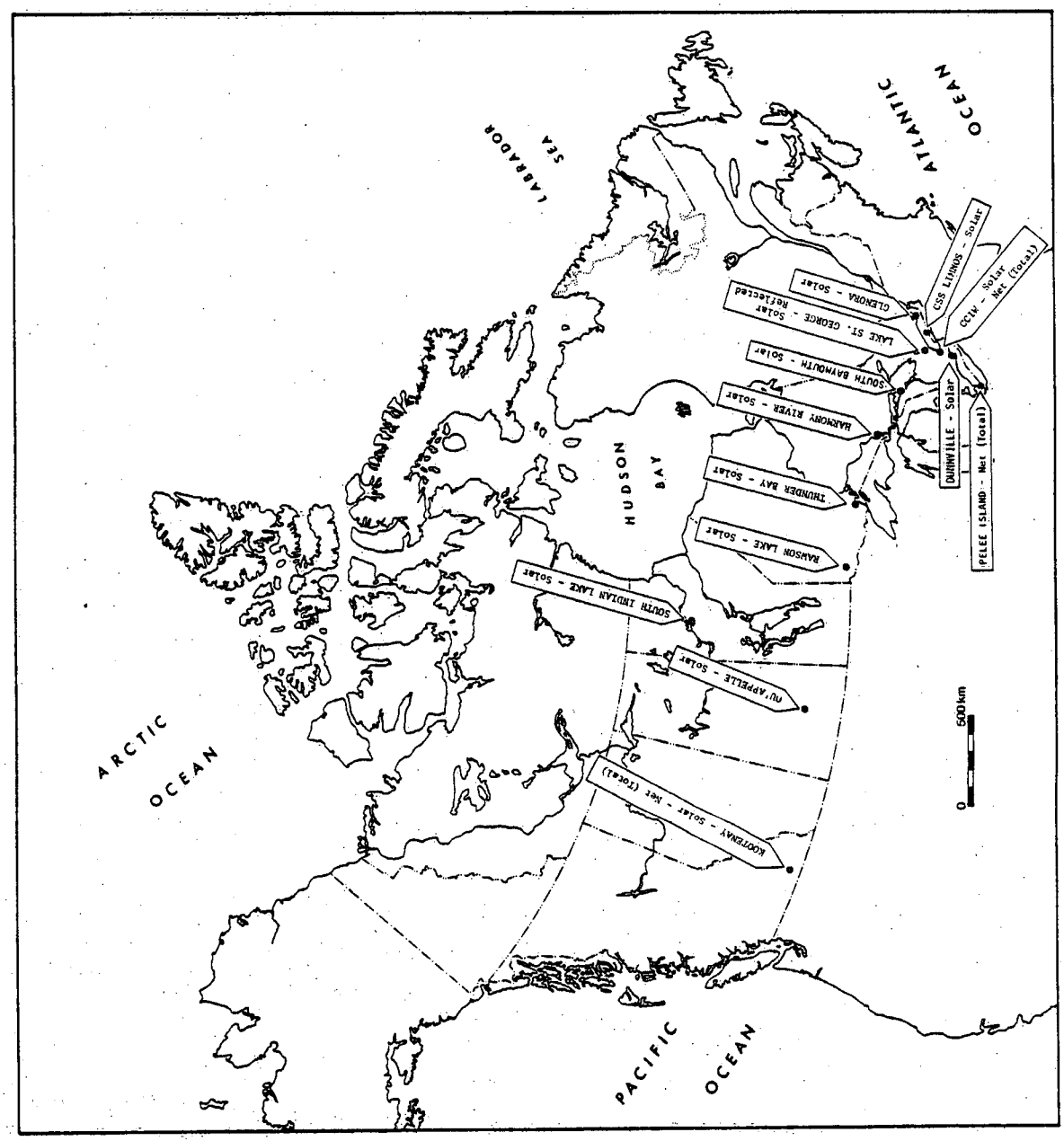

RADIATION STATIONS 1977
ARCTIC OCEAN
LABRADOR SEA
ATLANTIC OCEAN
HUDSON BAY
PACIFIC OCEAN
CSS LUNOS - Solar
CCIW - Solar Net (total)
DUNNVILLE - Solar
PELEE ISLAND - Net (total)
GLENORA - Solar
LAKE ST. GEORGE - Solar Reflected
SOUTH BAYMOUTH - Solar
HARMONY RIVER - Solar
THUNDER BAY - Solar
RAWSON LAKE - Solar
SOUTH INDIAN LAKE - Solar
NU'APPELLE - Solar
KOOTENAY - Solar - Net (total)
0
500km

Figure 1

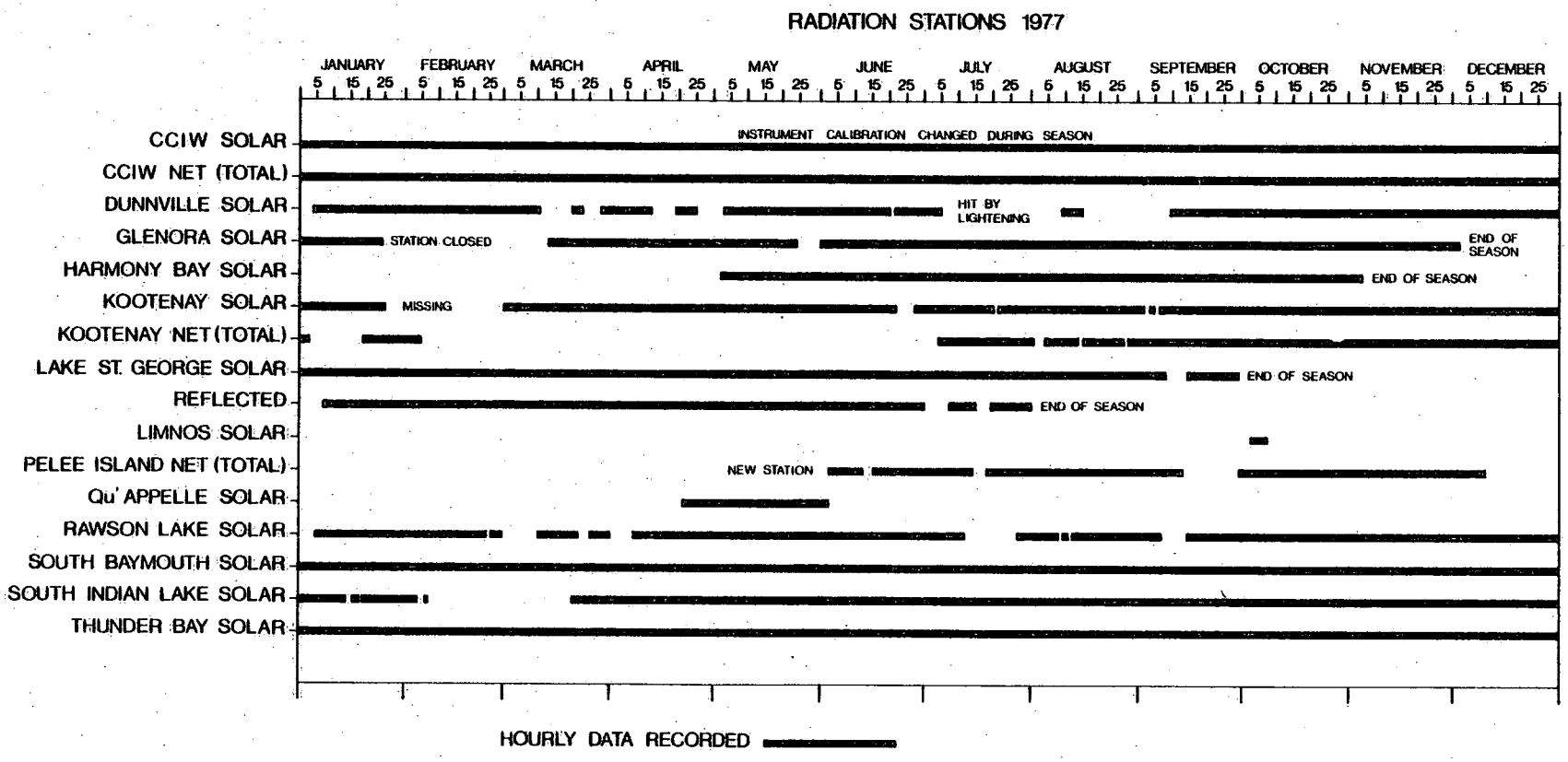

RADIATION STATIONS 1977
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
5 15 25
CCIW SOLAR
CCIW NET (TOTAL)
DUNNVILLE SOLAR
GLENORA SOLAR
HARMONY BAY SOLAR
KOOTENAY SOLAR
KOOTENAY NET (TOTAL)
LAKE ST. GEORGE SOLAR
REFLECTED
LIMNOS SOLAR
PELEE ISLAND NET (TOTAL)
Qu'APPELLE SOLAR
RAWSON LAKE SOLAR
SOUTH BAYMOUTH SOLAR
SOUTH INDIAN LAKE SOLAR
THUNDER BAY SOLAR
INSTRUMENT CALIBRATION CHANGED DURING SEASON
HIT BY LIGHTENING
STATION CLOSED
END OF SEASON
END OF SEASON
MISSING
END OF SEASON
END OF SEASON
NEW STATION
HOURLY DATA RECORDED

Figure 2

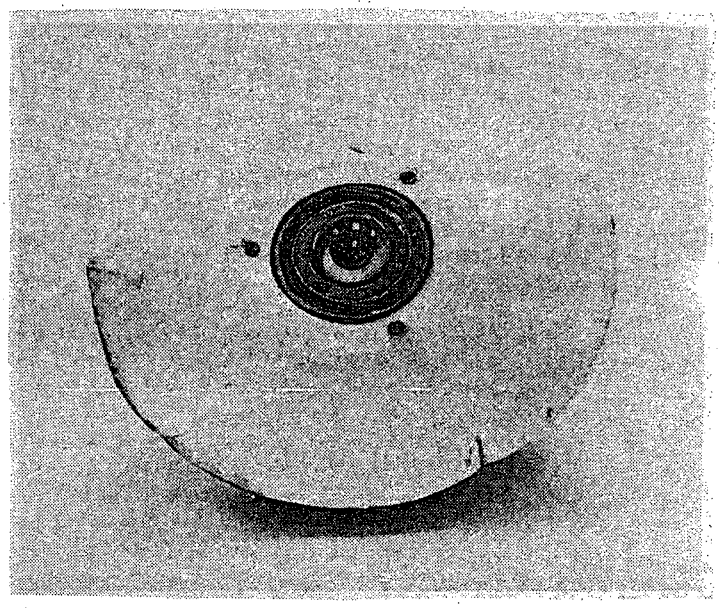


Figure 3
Damaged Precision Eppley

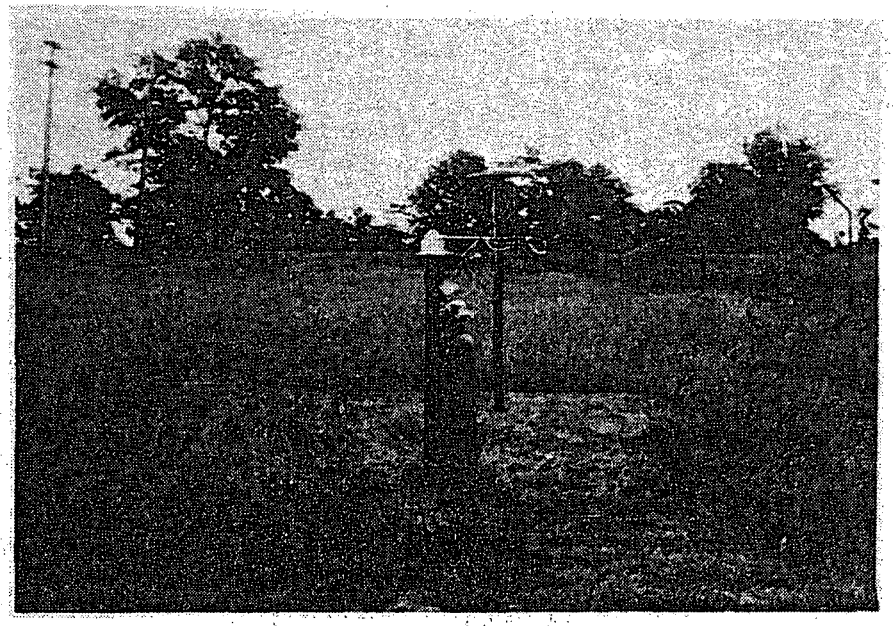


Figure 4
Pelee Island Net (Total) Radiation Station

Coring and Sediments

With the increase of scientific research into bottom samples, sediment drift, bluff erosion, settling of pollutants in our major and small lakes, 1977 was the busiest year for use of coring equipment. The 1977 coring season started in January with lightweight coring measurement being taken through the ice near Qu'Appelle, Saskatchewan.

A coring seminar with displays of coring equipment (Figures 1 and 2) and demonstration of the use of some coring equipment, was held at CCIW during February. The display and coring demonstrations were co-ordinated by the Special Projects Officer.

Coring equipment was used in the Hudson Bay lowlands, Saskatchewan, Manitoba and Ontario.

The impact corer (Figure 3) was modified to obtain favourable cores in till, sand and light sediments. Experimental trials were accomplished successfully in Lake Ontario during the month of June. This equipment was used extensively in Lake Huron during August with excellent results.

Technical Operations Section co-ordinated and obtained five 15-metre, 1200-pound Alpine cores in Lake Superior near Thunder Bay in support of a Lakehead University program.

The future predicts greater use of the CCIW lightweight corer, mini-Shipek and impact corer. Technical Operations Section will continue to be the lead agency in experimental trials into bluff and sand coring.

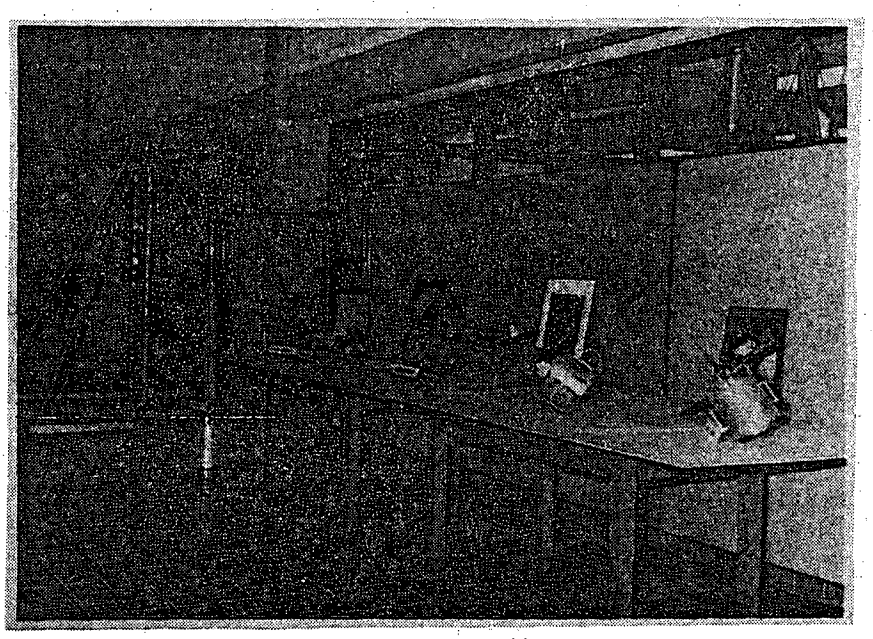


Figure 1

Display of Coring Equipment - CCIW

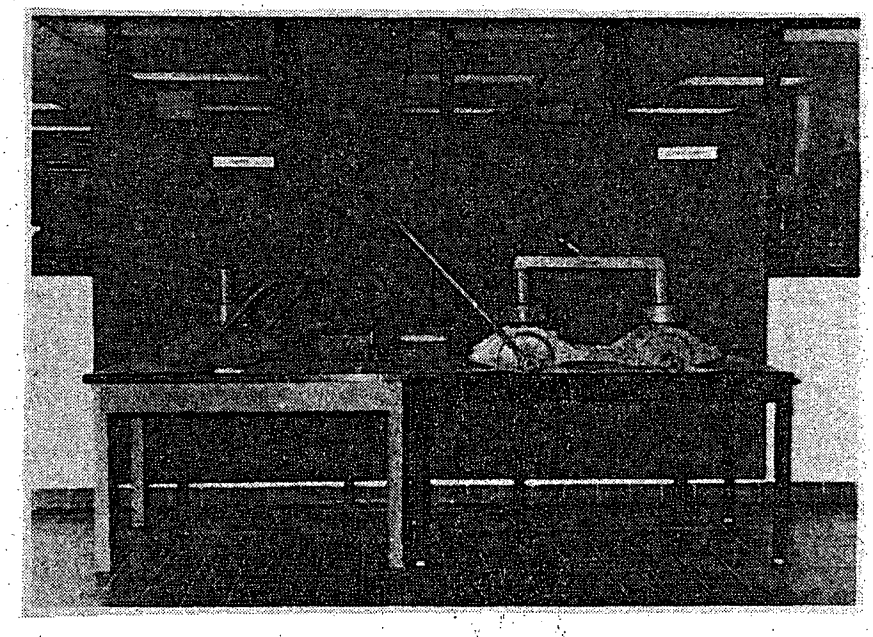


Figure 2

Display of Coring Equipment - CCIW

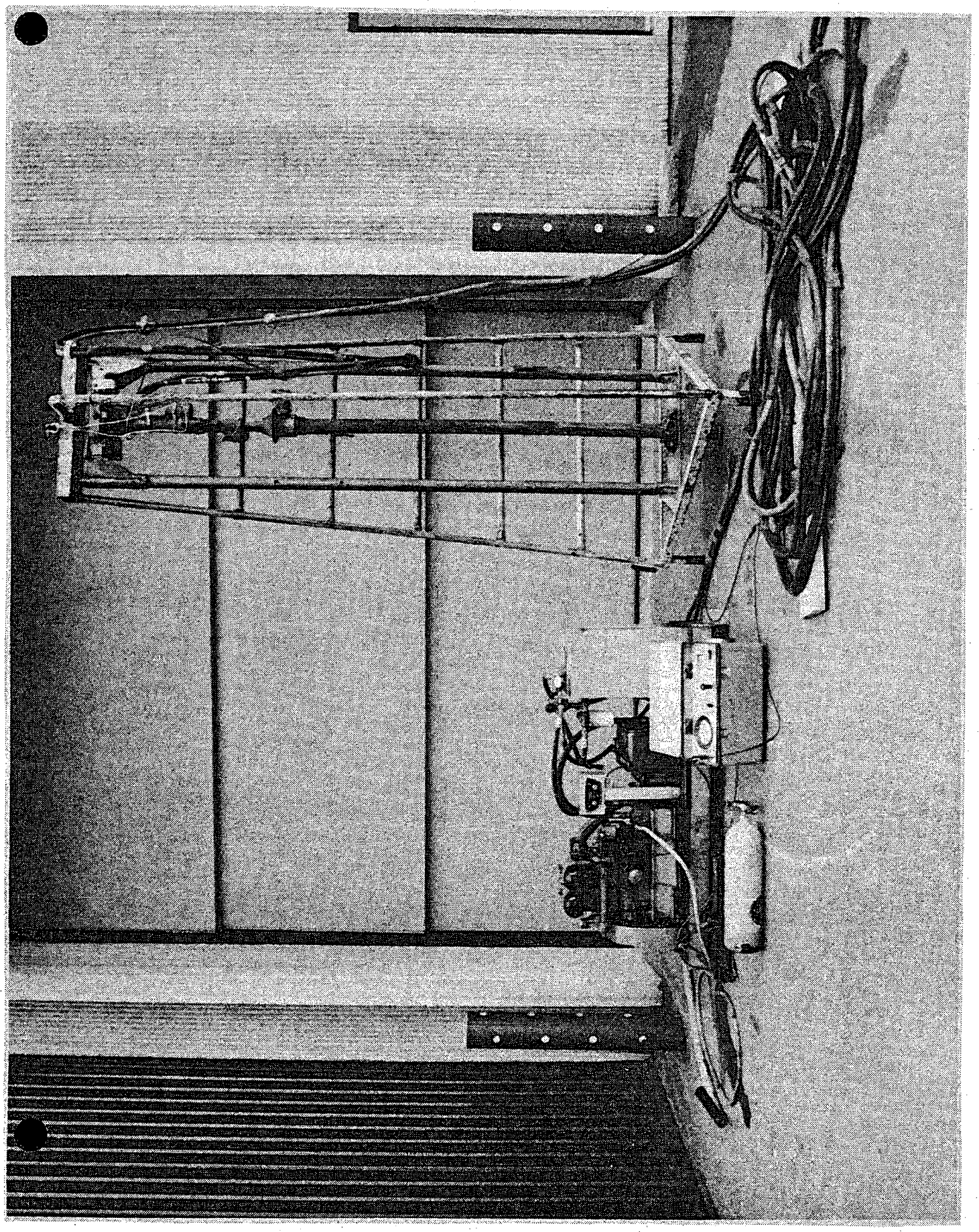


Figure 3

CCIW Impact Corer with Accessory Equipment

CCIW NEARSHORE RESEARCH PLATFORM, 1977

January

WAVES project objectives realized.

Continuous meteorological observations all year.

February

Current meter intercomparison.

March

VAPS trials (Vertical Automatic Profiling System)

April

Spring WAVES.

REX (Robot Experimenter).

June

REX

September

Chlorophyll measurements (fluorometer).

REX

SOLIDS (Sampling of Littoral Drift in Suspension).

October

Chlorophyll measurements.

REX

Toxicity in fish.

November

REX.

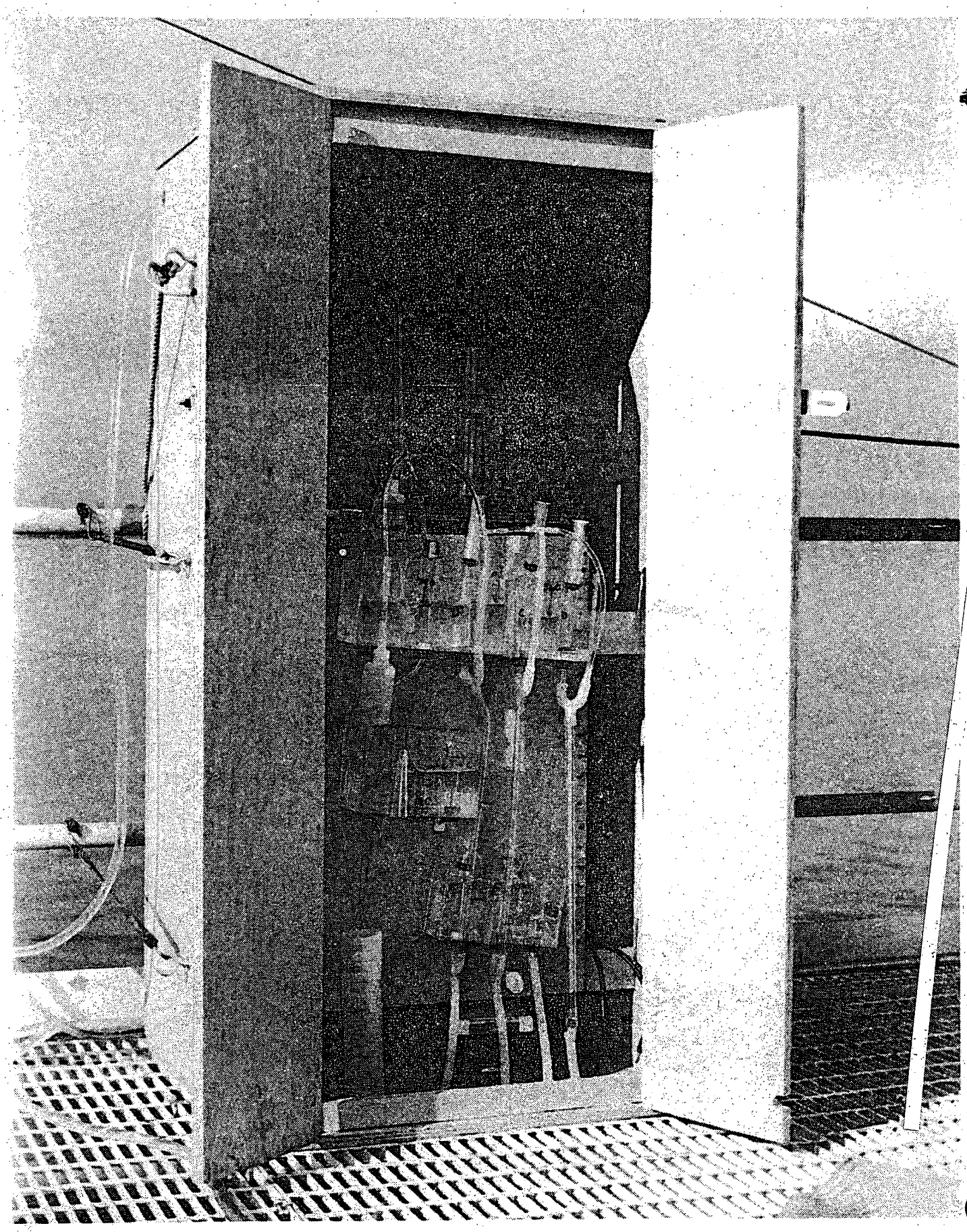
SOLIDS.

December

SOLIDS.

This summary gives an indication of how well the platform or tower can be adapted to support different types of experiments. All of the foregoing projects were accommodated adequately for accessability, space, power requirements and computer communications.

Technical Operations Section is directly involved from consultation to completion, whenever tower projects are proposed, and is the only agency concerned with all tower-related work.



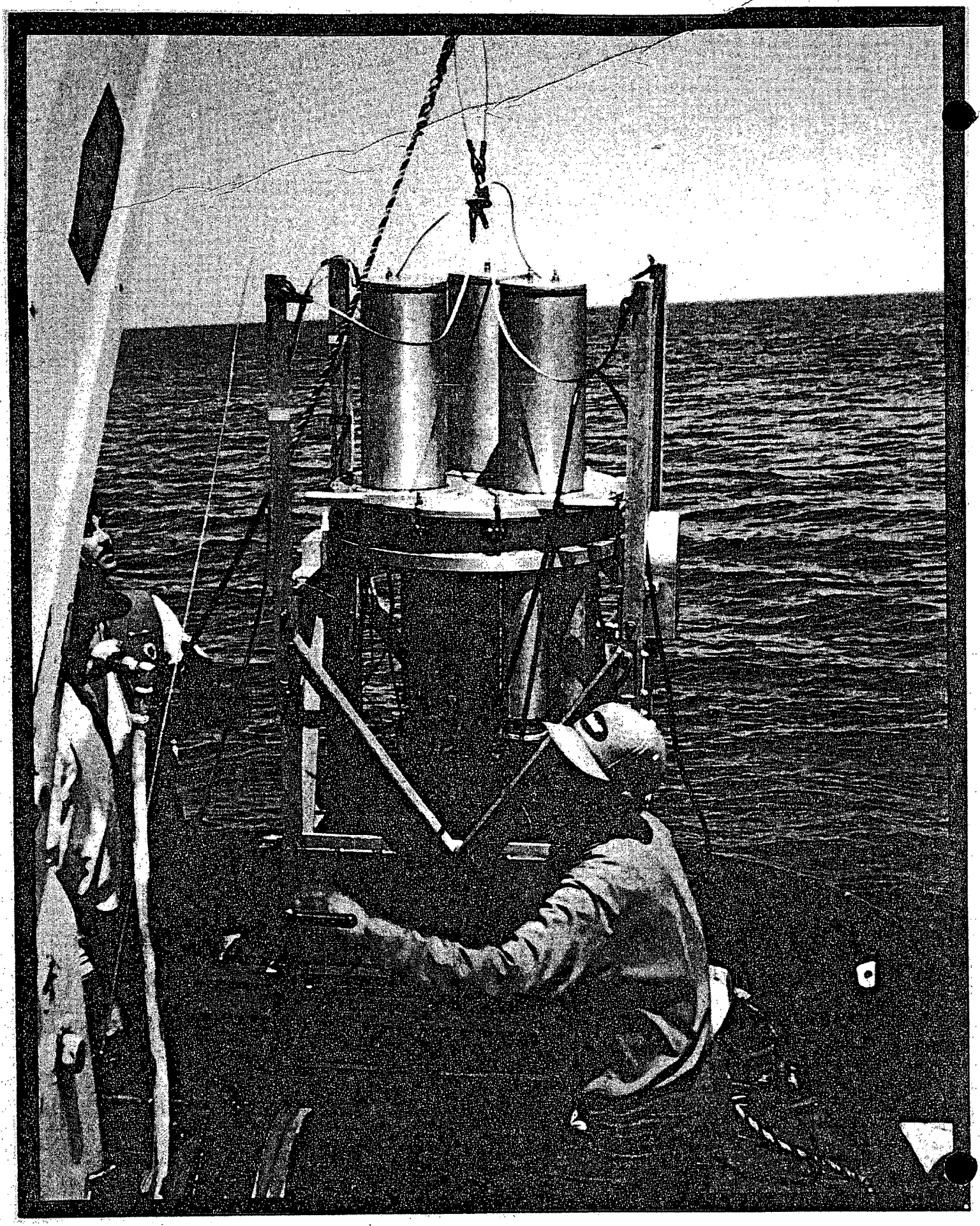
SERIAL MOUNT and BRUNGS DILUTER

used in TOXICITY IN FISH experiment

ROBOT EXPERIMENTER 1977

The Robot Experimenter (REX) was deployed at the research platform in Western Lake Ontario on five separate occasions, and also underwent considerable underwater testing at CCIW. Improvements to the hardware and software components of the system are continuing.

Technical Operations' role with REX has included launching and retrieval of the underwater unit, setting up computer and teletype facilities at test locations, pre-field and post-field calibrations and maintenance of the mechanical parts of the system such as pumps, valves and intake lines.



RETRIEVAL OF REX UNDERWATER UNIT

JUNE, LAKE ONTARIO

PROJECT NO. 7-IW-AR-014 - VAPS

A prototype vertical automatic profiling system was designed and built by ESS in support of the Kootenay Lake, B.C. study. Technical Operations' responsibility for this study was to provide transportation to the site and organize and conduct the field operations for installation, operation and removal of the system. A total of seven field trips were made to Kootenay Lake from April to November. The VAPS was plagued with problems from its first installation at Twin Bays in May which continued until July when the system was returned to CCIW for an overhaul. The following field trip in October met with similar problems. However, the system was finally made operational and installed for the final time at Kootenay Bay. The system operated and successfully collected data from November 8 to December 12, 1977. The system was removed from the field in December and returned to CCIW.

7-IW-SS-009 - LIMITED CAPABILITY BUOY

Hermes Electronics Limited have done further design work on a new buoy for inland waters use. However, because they have fallen seriously behind their original schedules, Technical Operations was not required to support this study beyond a few meetings.

7-IW-SS-011 - GENERALIZED VAPS

As a result of the problems involved with the Kootenay VAPS study, work on a more generalized one has not begun; therefore, no Technical Operations Section support was required.

7-IW-SS-014 - TAPE TRANSLATOR IMPROVEMENT

This study was designed to evaluate the present and future needs of field data tape translating facilities here at CCIW. Technical Operations Section participated in discussions which led to recommendations for translating systems.

WESTERN AND NORTHERN REGION, DR. ALLAN

Several field trips were made to the CCIW Western detachment (Winnipeg) during the 1977 field season. Two such trips were made exclusively for sediment collection using the CCIW lightweight corer.

The first sediment sampling endeavour took place from January 23 to February 15. Samples were collected from three (3) areas of Saskatchewan and Manitoba. The first area sampled was the Qu'Appelle Valley where samples were collected for two projects: the first for trace metal examination by the Western detachment and the second, Dr. Delorme's Paleoecology Project. The second area of investigation was the Pebean-Rock Lake area of Manitoba. Cores were also collected for the aforementioned projects. The last area cored was at the Erickson, Manitoba Aqua Culture Station where cores were collected for a joint project between CCIW (W&NR) and the Aqua Culture Station's Research Department.

The second sediment sampling trip occurred during the latter part of June. Cores were collected from the Boundary Reservoir just South of Estevan, Saskatchewan as confirmation of the results from a 1975 field trip.

Sediment samples were also collected by Eckman dredge throughout the Qu'Appelle Valley during the second field trip.

PROJECT NO. 7-FR-BL-020 - ECOSYSTEM STUDIES - BAY OF QUINTE

Objective

To determine composition and amount of primary and secondary production with emphasis on comparison of macrophyte and algae responses to changed nutrient regimes and algae-zooplankton relationships, plus continued examination of the Benthic macroinvertebrate population in the lower bay.

Work Outline

The project was divided into two main programs:

1. Project Quinte.
2. Persistant Contaminants.

Project Quinte

The Project Quinte portion of the project consisted of 24 weekly sampling series using the CSL "Surf". The stations were done from West to East starting at Trenton on Monday and finishing at Lennox on Wednesday. Eight major sample stations were visited each week and samples were collected for primary productivity, chlorophyll, algae, Seston (total particulate carbon, nitrogen and phosphate) and for nutrient analysis. Other parameters recorded were Secchi disc, oxygen-temperature profile, solar radiation and photometric light extension.

Twenty-six stations were also done in the lower bay between the Upper Gap and the Lennox Gererating Station. Every second week oxygen-temperature profiles were done at each of these stations.

Three stations: Belleville Bridge, Telegraph Narrows and Quick's Quinte Resort were sampled each week for phosphorus, nitrogen and sodium. In addition phytoplankton samples were obtained at four stations each week: Belleville, Big Bay, Muscote Bay and Napanee.

Persistant Contaminants

The Persistant Contaminants portion of the project involved a continuing series of samples for zooplankton, sedimentation, bottom fauna, PCB and heavy metals on a routinely scheduled basis. Zooplankton sampling was done bi-weekly from May 2 to October 28 and then once a week from November 3 to 24. These samples were obtained at four stations in Big Bay (see Chart No. 2) using a 30 ℓ Shindler Petalas trap. Samples were collected at the surface and every metre thereafter to the bottom. 1250 zooplankton samples were collected from Big Bay. A temperature profile using a portable electronic bathythermograph was done once per week at each zooplankton station.

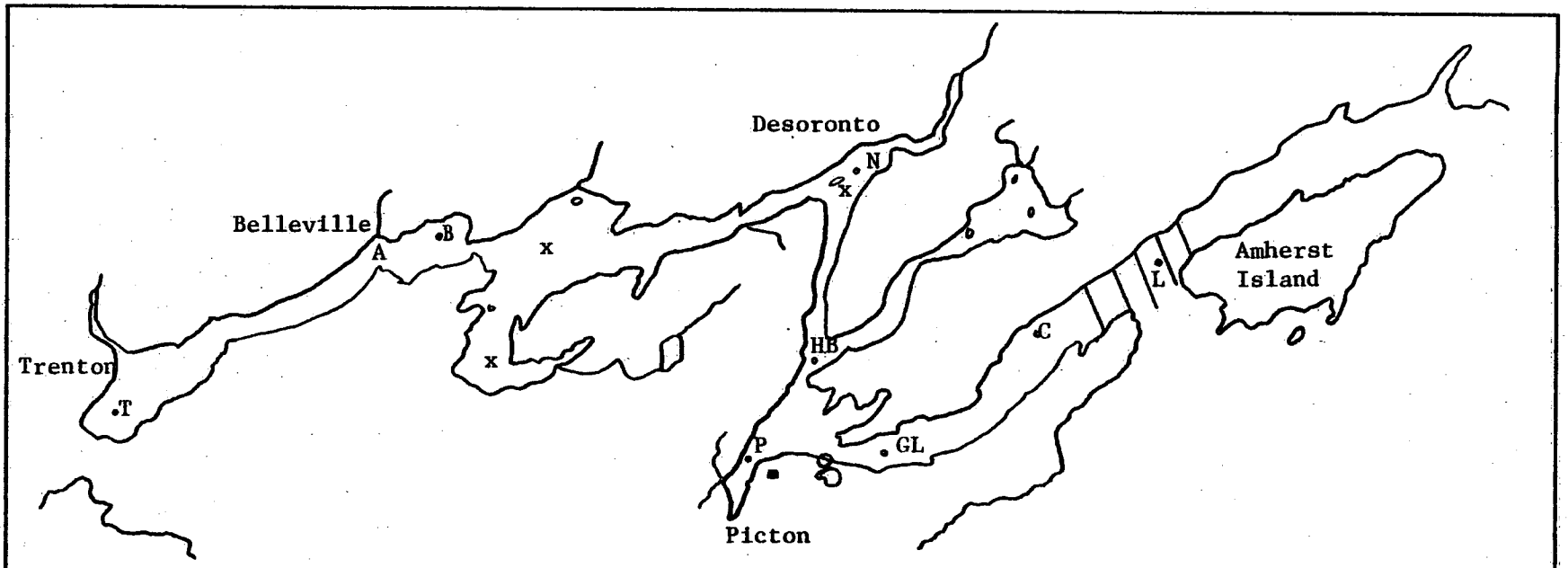
Zooplankton was also collected for PCB analysis using the Monark to tow two 1-metre diameter nets. These tows were done fifteen times from May to November. Grazing experiments using the Honey grazing chamber were also done fifteen times from May to November.

Four sediment trap moorings (see Chart No. 2) were installed in mid-May and left for one week before the sediment trap was recovered by GLBL divers. The sediment traps were reinstalled three additional times throughout the field year. The samples were returned to Burlington for particle size analysis.

Water samples were collected for copper, zinc, arsenic and PCB analysis at the Trent, Moira and Salmon Rivers, Marysville Creek, Sunguin Creek near Belleville Bridge and from near each of the four sediment traps. The samples were collected using a 3 ℓ Van Dorn bottle from a mid-water depth. A temperature profile using an EBT was also done at each station.

Benthic fauna was collected from Big Bay and from Muscote Bay using either a six or nine-inch Eckman dredge. Samples were collected for population density, gut analysis and life history. Mass samples were also obtained for PCB, mercury, arsenic, copper, zinc, nickel and lead analysis.

A solar radiation station and a rain gauge station was set up at Taylor's farm on the Glenora Road. The solar radiation station was in continuous operation from March 14 to December 2. The rain gauge was in operation from May to November with continuous charts from the tipping bucket rain gauge and a monthly rain sample from the collector being returned to CCIW for PCB analysis.



PROJECT QUINTE, 1977

Primary Productivity Stations

T - Trenton
B - Belleville
N - Napanee
HB - Hay Bay
P - Picton
GL - Glenora
L - Lennox

DIP Stations

A - Belleville Bay Bridge
L - Telegraph Narrows Light Station
Q - Quick's Quinte Resort

Back-up Data Stations

- - 26 oxygen-temperature/depth station profiles

x - 4 phytoplankton stations

■ - solar and rain guage station

0 - Glenora M.N.R. Laboratory

Chart No. 1

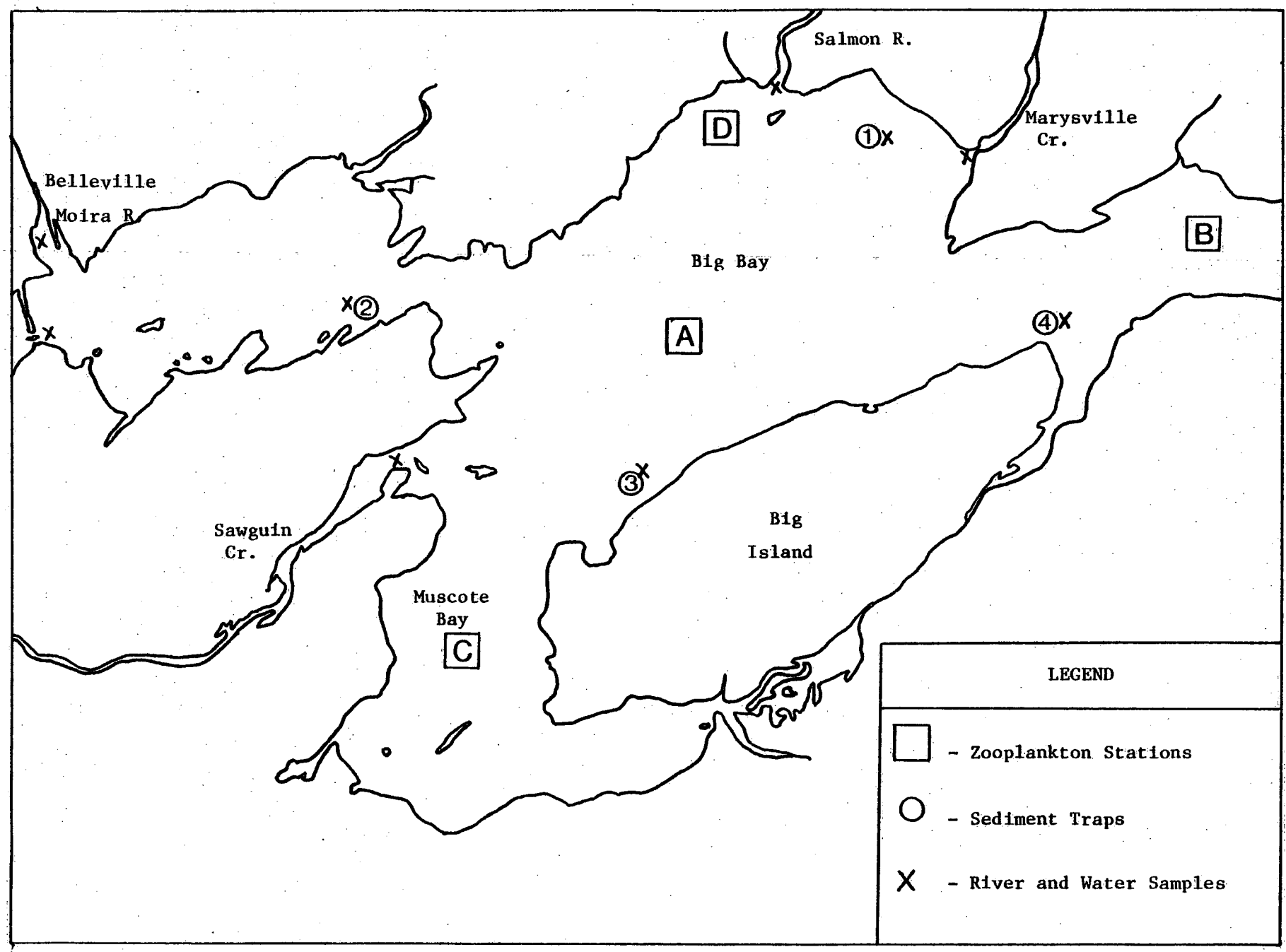
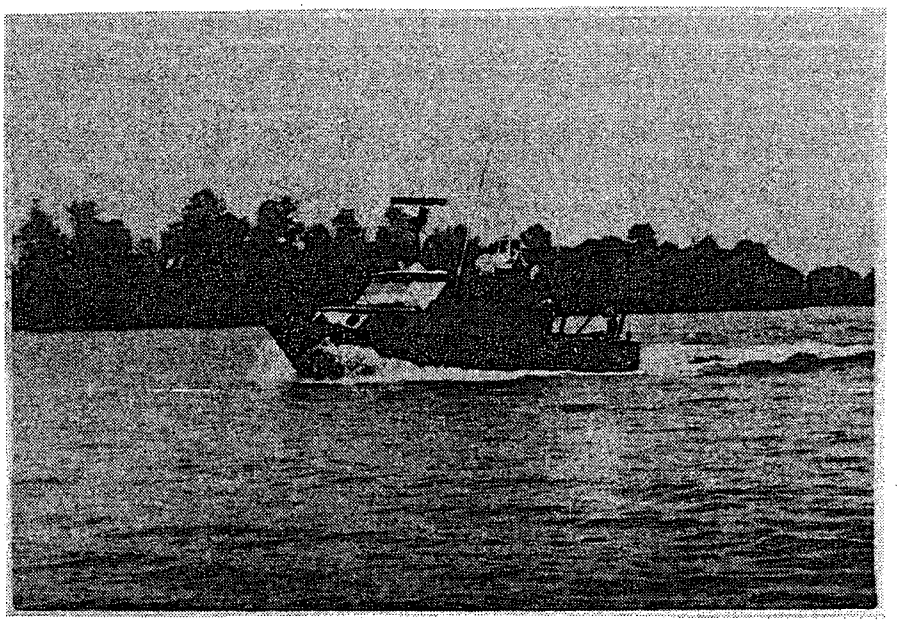
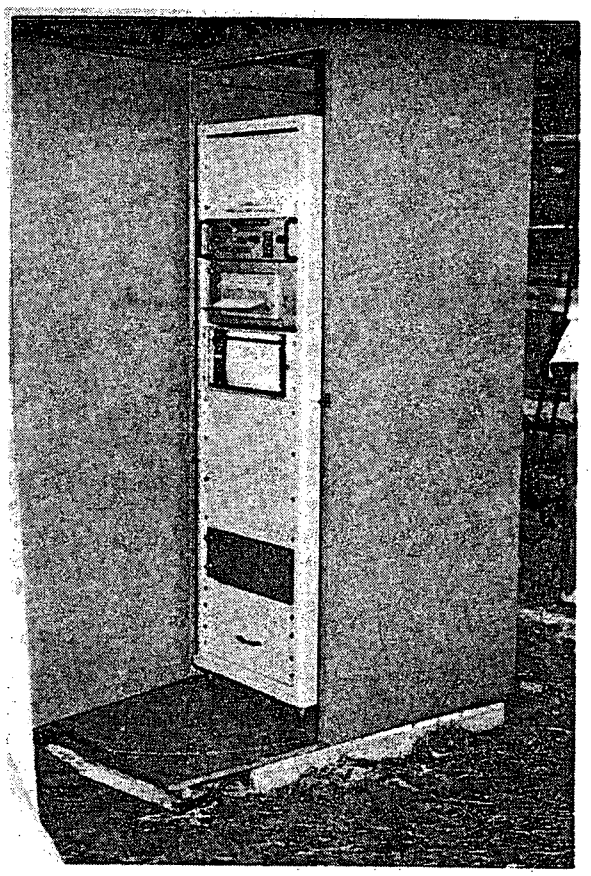

Salmon R.
Marysville Cr.
Belleville
Moira R.
Big Bay
Sawguin Cr.
Muscote Bay
Big Island
D
A
B
C
①
②
③
④
LEGEND
- Zooplankton Stations
- Sediment Traps
- River and Water Samples

Chart No. 2

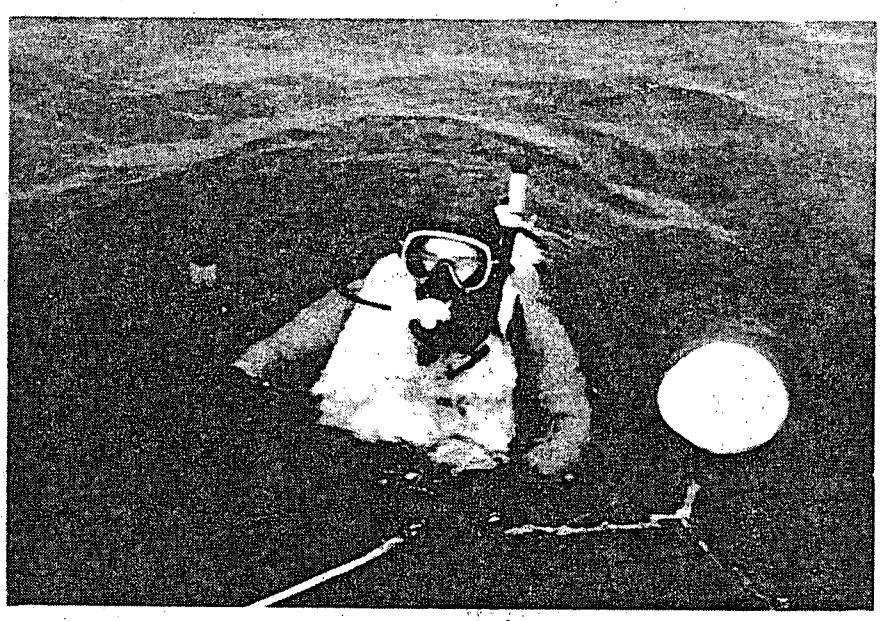


CSL "Surf"
in transit on the Bay of Quinte



Solar Radiation Recorder
and Integrated Printout

Diver with Sediment Trap



Diver with "Diver Taken Hand Core"

PROJECT NO. 7-FR-BL-028 - PERSISTANT CONTAMINANTS

Purpose

The purpose of the 1977 field year at Batchawana Bay was to conduct a study of contaminants PCB, DDT plus metabolites Cu, Ni, Zn, Pb behaviour and transfer in natural aquatic systems. A cursory examination of the biotic community was also carried out.

Personnel

Dr. J. Kelso	Project Leader	Ecosystems, GLBL
Mr. R. Collins	Technician	Ecosystems, GLBL
Mr. R. Love	Biologist	Ecosystems, GLBL
Mr. R. Milliken	Summer Student	Ecosystems, GLBL
Mr. B. Moore	Technician	Technical Operations Section
Mr. W. Cameron	Summer Student	Technical Operations Section
Mr. M. Head	Coxswain	Ocean & Aquatic Sciences
Mr. C. Gammon	Seaman	Ocean & Aquatic Sciences

Field Site

The field site consisted of three mobile trailers and one storage garage set up at the Chippewa River on Batchawana Bay from which all work was carried out. These were used as laboratory, storage, workshop and shortterm living accommodation. Sampling work was carried out from CSL Aqua, one joe boat, one 18-foot crestliner and one 14-foot cartopper.

Field Operations

Technical Operations staff were involved with such activities of the program as follows:

Fish Tracking

Using high frequency transmitters and receivers supplied by Bayshore Electronics, rainbow trout were tracked after spawning to determine their habits after they returned to the Bay. All fish were captured and released from the Stokley Creek at Haviland Bay.

Solar Radiation

Station was installed in the Chippewa River and maintained throughout the field season.

Rain Station

Station was installed in the Chippewa River and wet and dry fall samples collected for PCB's and ocker analysis.

Common Water

Once a month four stations: A, B, C, D were occupied for the collection of PCB's, nutrients, metals, dissolved oxygen, conductivity, Ph, alkalinity, phytoplankton and temperature EBT. Sampling depths were as follows:

Station	Depth
A	1 metre, 1 metre off bottom.
B	Isothermal, 1 metre, mid-water, 1 metre off bottom. Stratified, 1 metre, 1 metre above thermocline, 1 metre below thermocline, 1 metre off bottom.
C	Same depths as station B.
D	Mid water column.

Physical Study

Once every two weeks, nine stations: A, B, C, D, G, H, I, J, K were occupied for the physical measurements of Ph, conductivity, temperature, dissolved oxygen, phytoplankton. The study was to be completed the same week as the common water sampling when applicable.

Primary Production C^{14}

Once every two weeks, primary production experiments were carried out at station B using the trace C^{14}. Bottles were set at 5 metres for three hours, returned to the laboratory and samples filtered. During the experiment, light and temperature profiles were taken along with samples for metals, nutrients and chlorophyll.

Bottom Fauna

During the year late Spring and early Fall, community structure of bottom fauna was taken. Using a ponor dredge sampler, two samples were taken at 25 stations throughout the day. Samples were screened through at 250 μ mesh and preserved in formalin. As well as this major study, once a month samples were taken from stations B, C, I.

Population Studies

Once every five weeks, fish population studies were carried out using gill nets and mid-water trawling along with acoustic equipment run off the CSL Aqua. At ten stations (See Figure 8) throughout the bay, gill nets were set with all captured fish being measured, weighed, scaled and sexed. The first fifteen of each species was subdivided into whole, skeleton, gonads and livers for metals, PCB's and mercury analysis. In conjunction with this, trawling was carried out using a mid-water trawl with all captured fish being measured, weighed, scaled and sexed.

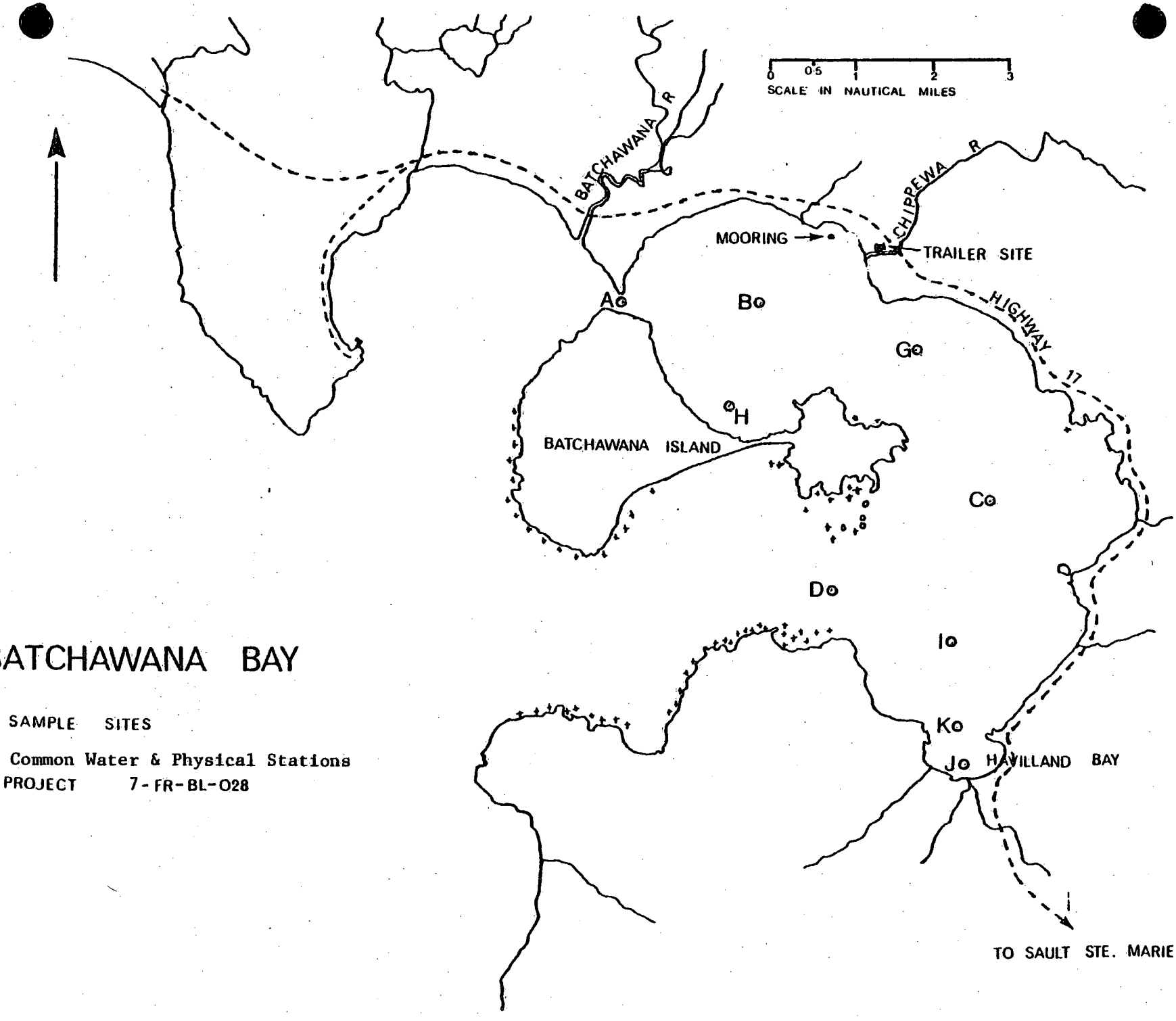
During the trawling, lines were run using acoustic sounding equipment to verify number and distribution of fish being caught.

Black Bay

The week of November 14 to 18 was spent in Black Bay near Nipigon using acoustic gear and mid-water trawl off a local fishing tug to determine fish population and distribution during the Fall herring run. All species caught were measured, scaled and sexed with respect to localities and depth caught. Due to the CSL Aqua's inability to cross Lake Superior, a Ministry of Natural Resources boat was used to run the acoustic equipment.

As well as these major experiments, many minor ones were carried out from time to time such as Benthos cores, macrophytes collection, grazing experiments, algae net hauls, laval fishing and minnow screening.

Taking all factors into consideration, the season produced very good data with all experiments being carried out on time.

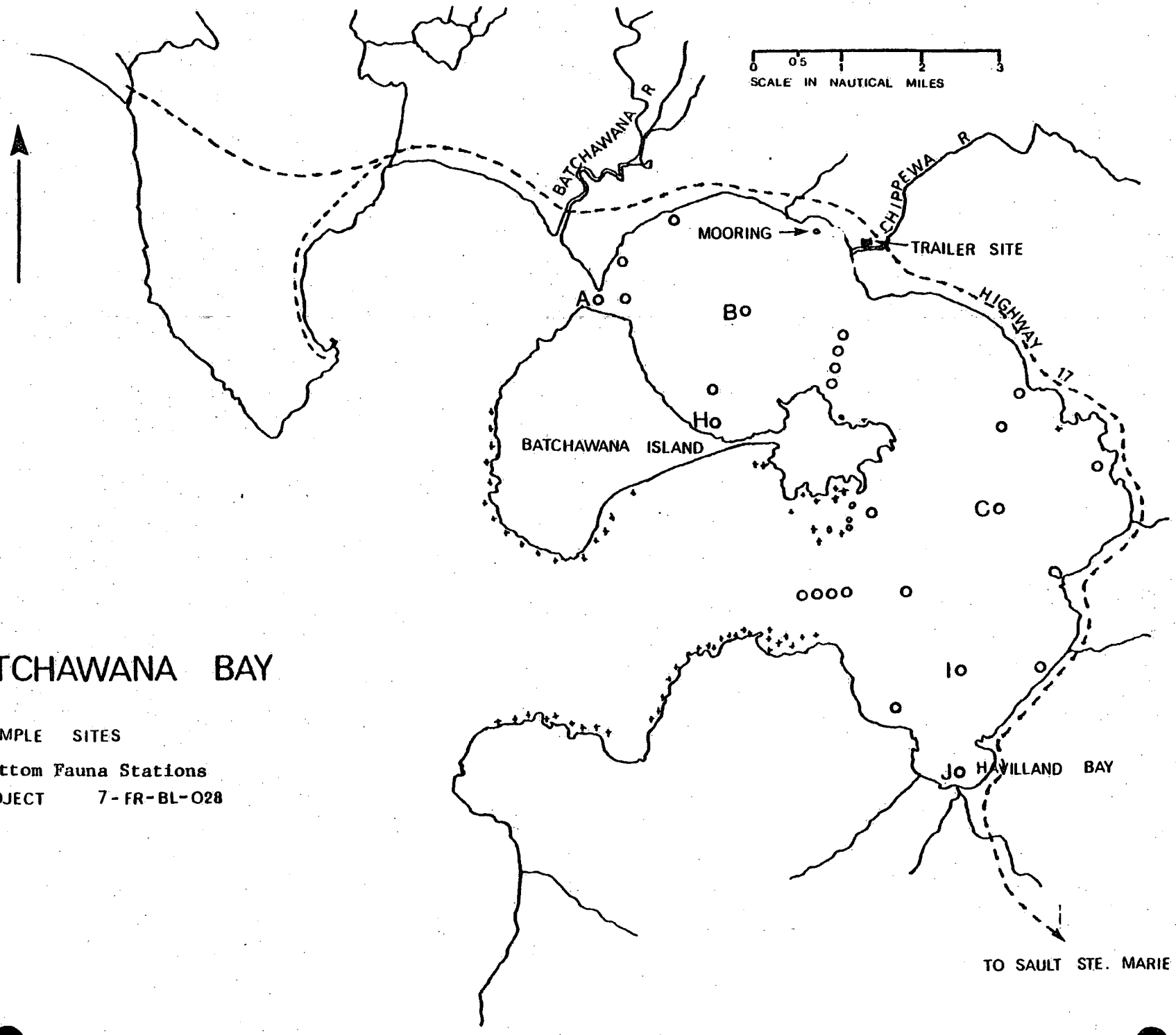


BATCHAWANA BAY

SAMPLE SITES

Common Water & Physical Stations

PROJECT 7-FR-BL-028

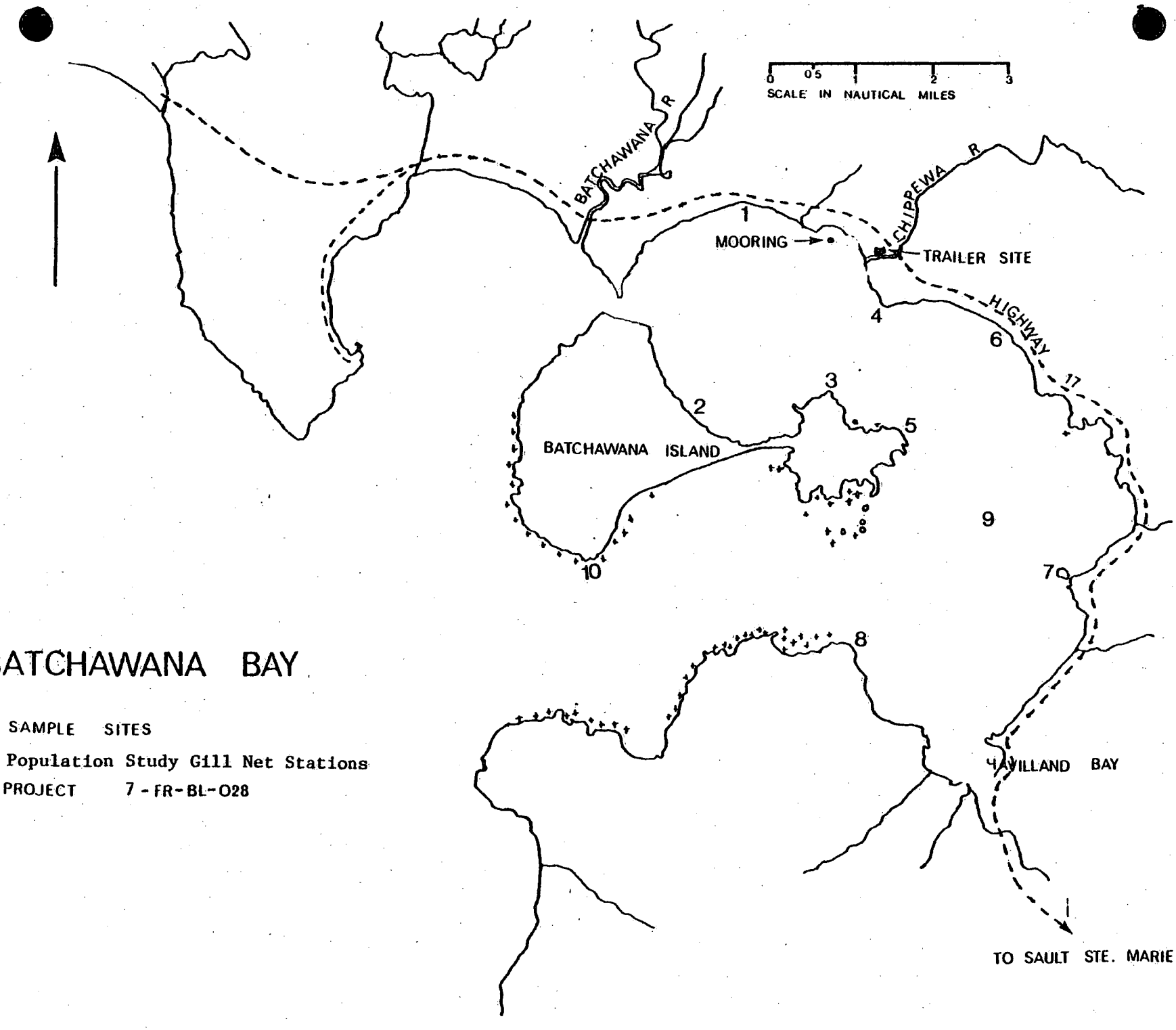


BATCHAWANA BAY

SAMPLE SITES

Bottom Fauna Stations

PROJECT 7-FR-BL-028

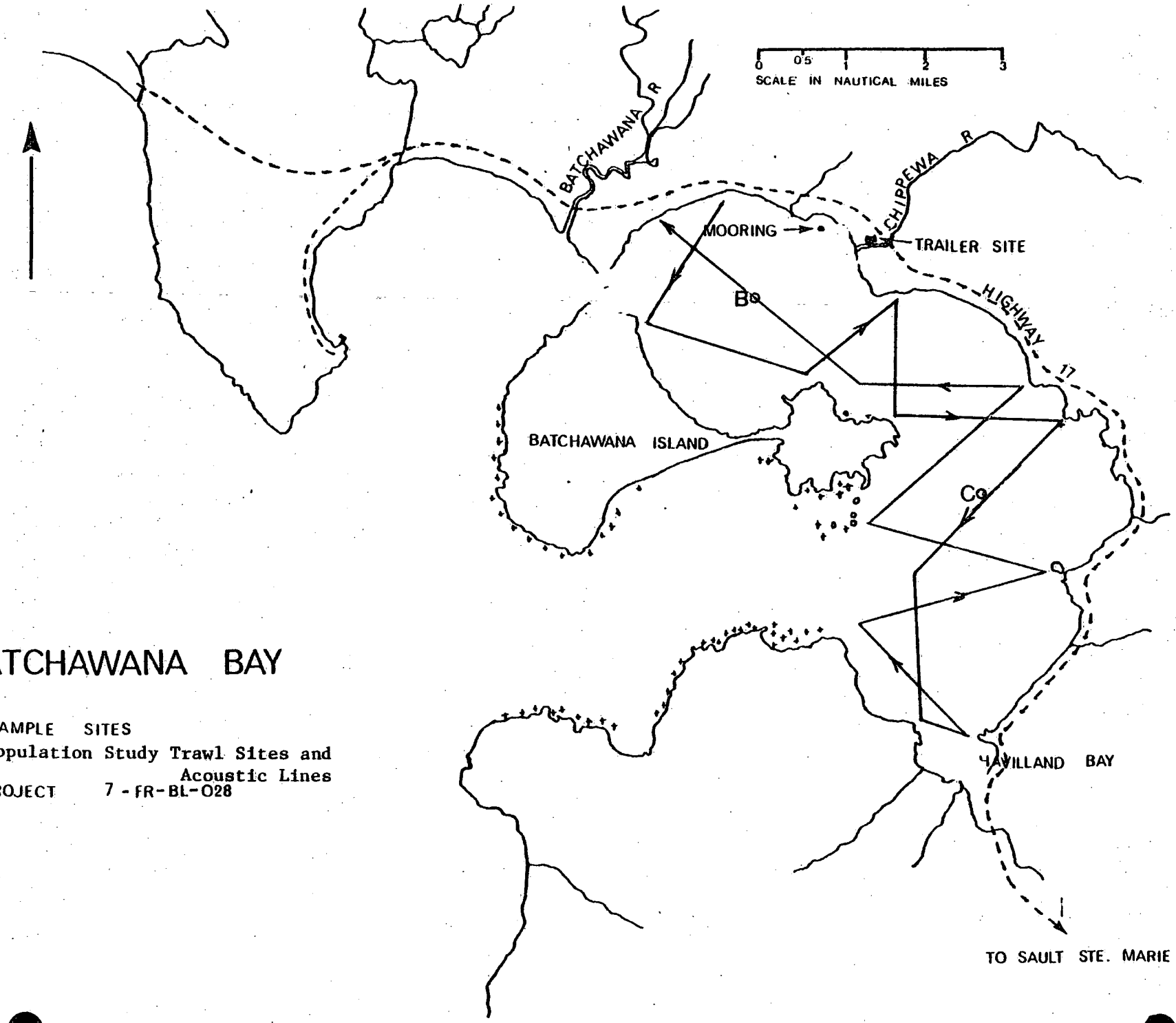


BATCHAWANA BAY

SAMPLE SITES

Population Study Gill Net Stations

PROJECT 7-FR-BL-028



BATCHAWANA BAY

SAMPLE SITES
Population Study Trawl Sites and Acoustic Lines
PROJECT 7 - FR-BL-028

BLACK BAY ACOUSTIC LINES

TRAWLING SITES

PROJECT NO. 7-FR-BL-028