

**ANNUAL ACTIVITY SUMMARY**

**1975**

**TECHNICAL OPERATIONS SECTION**

**Scientific Support Division  
Inland Waters Directorate**

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TECHNICAL OPERATIONS SECTION, 1975: OVERVIEW

The Technical Operations Section has the responsibility for the multidisciplinary field support to scientific projects conducted at CCIW, the Pacific and Western Regions. Field support and measurements are carried out from the major and minor vessels and shore bases at a variety of sites in the Great Lakes Basin. 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 shore-based projects on a continuing basis in support of all surveillance, limnological and survey projects, as well as small craft involved with regional shore-based parties, conducted in support of CCIW 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 those 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 planning ship, launch and support programs and in the design of operational facilities aboard new vessels; the Surveillance Working Committee in providing field operational and logistical input into the planning of the Surveillance Program; and the CCIW Buoy Committee to provide field operational input to the development of a Great Lakes data buoy system. Technical Operations is responsible for ensuring that the various programs and projects proposed by the scientific community and outside agencies are coordinated and logically arranged to suit the availability of research vessels.

Expertise in underwater diving has been developed with the need to support research projects proposed by CCIW and interservice groups at CCIW. This support is in response to the need for scientific tower erection, deployment of equipment, inspection and maintenance and other special underwater tasks and studies. Similarly, Technical Operations has the expertise to provide continuous meteorological and radiation data, from installation of measuring systems to final data summary, in support of CCIW and other interservice agencies.

The Technical Operations Section has the responsibility of preparing preliminary descriptive 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
D.J. Cooper	- Senior Operations Officer - transferred to Ocean & Aquatic Sciences, Central Region, April/75
D.J. Brooks	- Operations Officer - transferred to Ocean & Aquatic Sciences, R & D, Central Region, March/75
D.H. Hanington	- Operations Officer
J.T. Roe	- Senior Diving Officer
L.E. Benner	- Sensor Network Unit
T.J. Carew	- Surveillance
W.A. Carney	- Surveillance, on strength April/75, resigned May/75
R.G. Chapil	- Radiation Unit
J.R. Compton-Smith	- Dive Unit
F.J. deVree	- James Bay Project, Ocean & Aquatic Sciences
F.H. Don	- Dive Unit
H.E. Greencorn	- Riggers Shop
P.M. Healey	- Point Source Studies, GLBL
G.J. Koteles	- Water Quality Interconnecting Channels Water Quality Branch, Ontario Region
L.J. Lomas	- Riggers Shop Foreman
M.R. Mawhinney	- LIMNOS
B.H. Moore	- Eutrophication Studies, Lake St. George
H.K. Nicholson	- Sensor Network Unit
G.M. Perigo	- Riggers Shop
A.E. Rothwell	- Surveillance, on strength June/75, transferred July/75
S.B. Smith	- LIMNOS
W.B. Taylor	- Sensor Network Unit
M.R. Thompson	- Land Drainage and Eroding Bluffs
E.H. Walker	- Surveillance
P.R. Youakim	- Surveillance
H.W. Zimmermann	- Asbestos Removal Project

Term Employees

W.A. Carney	- Surveillance, indeterminate position April/75
B.L. Killins	- Hydraulic Research Division
R.S. McGuffin	- Surveillance, on strength July/75, resigned Nov./75
D.F. Moore	- Surveillance
A.E. Rothwell	- Surveillance, indeterminate position June/75
K.F. Salisbury	- Various Projects, transferred to HRD June/75
C.A. Timmins	- Dredging Project, GLBL

Summer Students

P. Atkison  
G. Laing  
B. Logan  
P. Steele

## SENSOR NETWORK UNIT

The Sensor Network Unit provided to CCIW and regional agencies Technical Operations staff experienced in field deployed instrument systems. Their function was to provide sensors and recorders for the measurement of most meteorological and some limnological parameters on inland waters as well as retrieval of the data tapes and initial data processing to ensure high quality data return. Support was given to the programs at Kamloops Lake, B.C., Lake St. George, Big Bay (Bay of Quinte), Douglas Point, and Pickering as well as assistance to other Units within Technical Operations Section.

### Kamloops Lake

The physical limnology study begun in 1974 was concluded in April, 1975. SNU was responsible for the removal of all field instrument systems and for data processing and editing.

### Lake St. George

A meteorological station was set up on a floating dock where continuous measurements were made of standard met. parameters as well as an additional wind speed sensor located 1/2 m above the water surface. The station started in May and ran successfully until late November when cold temperatures affected the recorder's operation.

### Big Bay

A standard met. buoy was deployed in Big Bay (Bay of Quinte). This was the first time a met. buoy had been installed with only the use of a small boat. This procedure was very successful, however is limited to very calm waters. The station ran successfully from May to late August.

### Douglas Point

A Geodyne buoy fitted with rain collection equipment was deployed near the nuclear generating station at Douglas Point, Lake Huron. The SNU maintained this station and retrieved rain samples every two weeks.

### Pickering

A major field program was launched in December to study the thermal characteristics of the water being expelled from the power generating station at Pickering. SNU provided field support for installation of equipment as well as EBT monitor surveys.

The Unit was also responsible for its own data reduction and editing of meteorological and water temperature (FTP) data. One of the most significant events was the completion of special computer editing programs which allowed data to be visually displayed on a TV screen.

Met. and temperature plots could be scanned; anomalies and missing data could be directly processed by deletion or interpolation. This increased time saving efficiency by up to 500% with a greater degree of accuracy.

The SNU also supported various programs involving shipboard and diving operations as well as some field survey work.

A permanent meteorological station located on the Burlington Pier was maintained on a continuous basis. This system measured winds and air temperature and operated successfully throughout the year.

### DIVE UNIT

The three-man Dive Unit supported sixteen CCIW programs, four O.A.A. programs and four programs involving outside agencies.

The actual underwater time for all programs was seven hundred and sixty-five hours.

In addition to the normal diving and surface support performed during 1975, the Dive Unit accepted the care and operation of the new tethered, remotely operated vehicle, TROV. This unit was extensively tested in Lake Ontario in the fall of 1975 and was successful in all aspects of testing (see TROV, Preliminary Test Report, 1975 - Roe and Sandilands).

The geographical locations of support committed by the Dive Unit were wide ranging; throughout the Great Lakes, west to British Columbia, north to James Bay and east to the Lower St. Lawrence River.

The types of programs requiring dive support ranged from basic mechanical engineering installations to selective chemical, biological and geological sampling.

A Diving Instruction Course was given by the Dive Unit in the winter of 1975, and fifteen candidates applied. The ten successful candidates are now certified N.A.U.I. and CCIW divers, and are able to dive in support of their own programs, if required.

The Dive Unit has completed a comprehensive, illustrated, program by program report for 1975. (See Dive Unit, 1975 Performance Report - Roe).

### RADIATION UNIT

During 1975, Technical Operations increased in strength with the transfer of the Radiation Unit from the Lakes Research Division.

R.G. Chapil continued as Head of the Radiation Unit administrating the support of fifteen radiation stations for CCIW and Regional programs.

Assisting in the data analyses and compilation for an "Annual Radiation Summary" were Mrs. J. Foley and Mrs. J. McAvella on loan from the Data Management Section.

Research programs supported included Kamloops Lake in the interior of British Columbia, South Indian Lake (Hydro development - Missi Falls) in northern Manitoba, CCGS NARWHAL in Hudson Bay and as far east as Big Bay in the Picton area in eastern Ontario.

The major support continued on or near the Great Lakes region with stations at CCIW, Caribou Island, CSS LIMNOS, MV NORTHERN SEAL (Surveillance Vessel), South Baymouth and Thunder Bay.

Small lake studies were supported at Lake St. George (north of Toronto) and Rawson Lake (Kenora).

Data compiled during 1975 are displayed in (Figure 1) with station location, elevation and project supported (Figure 2).

Rawson Lake radiation station (Figure 3) consisting of a precision Eppley Pyranometer and an Actinograph are typical of a radiation instrumentation site.

Rawson Lake, in the Experimental Lakes Area (ELA), 50 miles southeast of Kenora, Ontario, became the lightning capital of North America. An old proverb that lightning never strikes twice in the same place could well be disproved by 5 strikes in the vicinity of the radiation station at Kenora.

The first lightning storm to hit ELA with severe force occurred on June 18, blowing the thermopile of the radiation sensor, (Figure 4). A second storm occurred on June 28 causing severe damage to the radiation instrument and recorder. General damage to the field camp consisted of a partial failure of the power generator, a blown internal telephone system causing a small fire, various recorders and other related damage. Other periods during which the potential in the surrounding vicinity was severe enough to damage the sensor thermopile or recorder were July 26, August 23 and September 4.

During September, the radiation station was rewired with a shielded 3 conductor cable and the instrument was insulated from the mounting base by a nylon plate and plastic spacers, (Figure 5). Other precautions taken to rectify this station included rewiring the electrical wiring from the power

generator to the radiation recorder house. Due to the termination of the lightning season, the present station has not received its final test.

Lake St. George solar radiation station recorded unexplainable traces on two consecutive days in October, the 27th and 28th, (Figures 6 & 7). Reflection from any object, instrument or recorder failure have been ruled out in our search for a reasonable answer.

Future plans are to develop a self-contained cassette magnetic tape recording system which would record the radiation signal for processing by computer, (Figure 8).

#### Coring and Sediment

During the month of May, the responsibility of maintaining, procuring and deployment of the coring equipment was transferred to Technical Operations from the Physical Sedimentology Section, HRD.

The maintaining and procuring was handled by the Radiation Unit with deployment of the equipment by Technical Operations staff.

In addition to supporting the CCIW projects on the Great Lakes, coring equipment was supplied to the following departments or agencies:

Western Detachment CCIW	Ontario Hydro
Geological Survey of Canada	Carlton University
Energy, Mines & Resources	Department of Public Works
Ocean & Aquatic Sciences, Central Region	

Coring equipment available from Technical Operations (R.G. Chapil) includes:

1200 pound Alpine Corer (Figure 9)	Shipek (Figure 13)
100 & 300 pound Alpine Corer	Mini-Shipek (Figure 14)
Benthos Corer (Figure 10)	Mini-Ponar (Figure 15)
Triple Corer (Figure 11)	Ekman Dredge
Phleger Corer	Peterson Grab Sampler
Impact Corer (Experimental) (Figure 12)	Benthos Piston Corer
Moore Underway Corer	

Support was provided by Technical Operations in the development of an Impact Corer (Figure 12).

During the year, the manually triggered coring valves were replaced by Benthos Automatic Valves. This modification eliminated the loss of core samples and valuable time in having to reset manual valves in cold, icy conditions.

The future predicts more evaluation of through-ice coring and possibilities of coring studies in northern lake areas. The trend to small lake studies will place larger requirements for grab samplers such as the Mini Shipek and small corers like the Phleger Corer.



# RADIATION STATIONS 1975

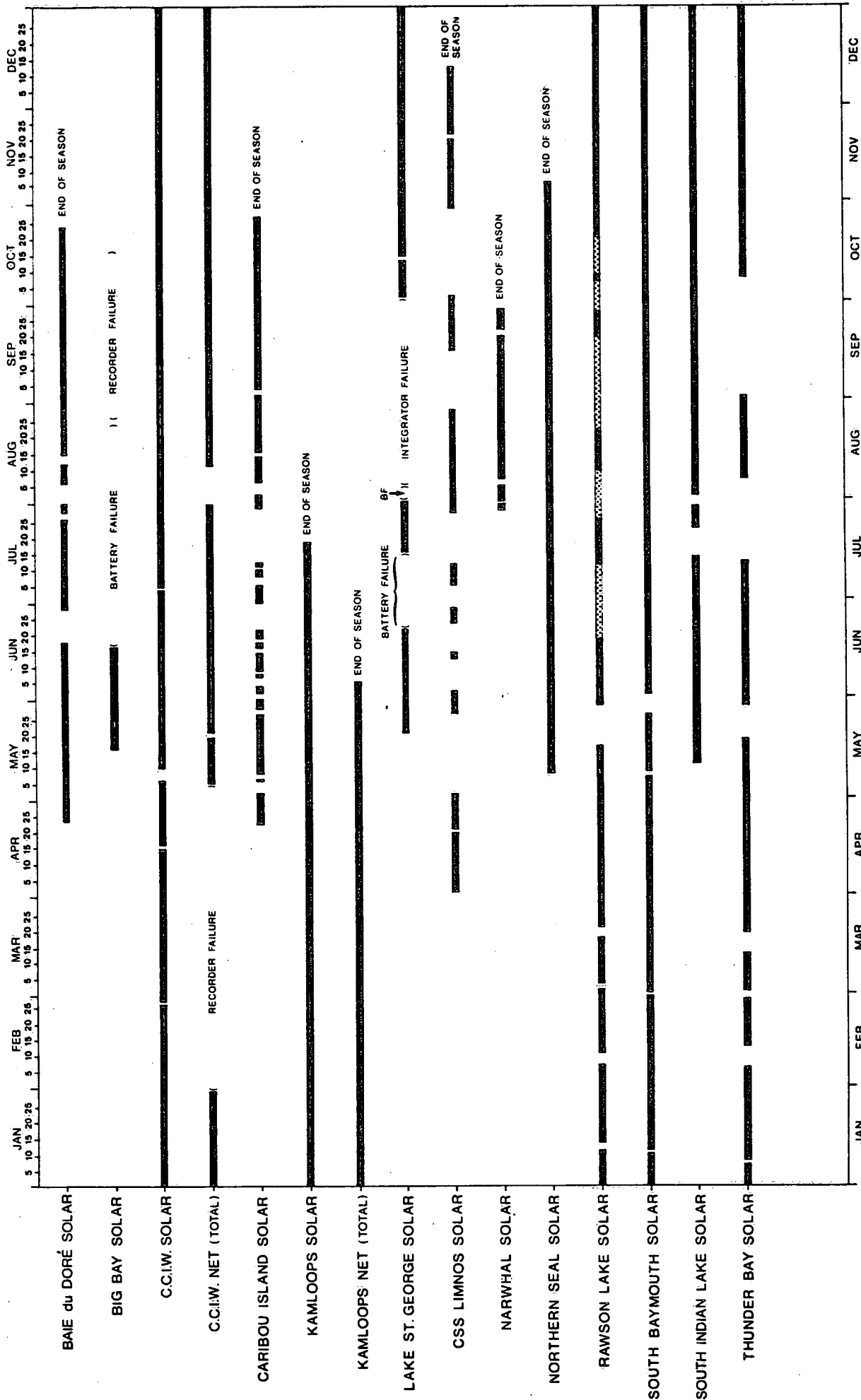


FIG. 1

STATION LOCATIONS AND PROJECTS SUPPORTED BY THE RADIATION UNIT

Baie du Dore	Land-based Meteorological Station Longitude 81° 33' 12" W - Latitude 44° 20' 42" N Project 75-FR-BL-017
Big Bay	Land-based Meteorological Station Longitude 77° 15' 26" W - Latitude 44° 08' 50" N Project 75-IW-PR-023
CCIW	Canada Centre for Inland Waters Longitude 79° 48' 00" W - Latitude 43° 17' 50" N
Caribou Island	Caribou Island - Lighthouse - Lake Superior Longitude 85° 49' 30" W - Latitude 47° 20' 30" N Extension of IJC studies in the Upper Lakes
Kamloops	Kamloops Airport, British Columbia Longitude 120° 27' 00" W - Latitude 50° 42' 00" N Elevation 1133 feet Extension of 1974 Project
Lake St. George	Land-based Meteorological Station Longitude 79° 25' 18" W - Latitude 43° 57' 18" N Project 75-IW-PR-024
CSS LIMNOS	Research Ship
CCGS NARWHAL	Research Ship (Hudson Bay)
MV NORTHERN SEAL	Research Ship (Surveillance on the Great Lakes)
Rawson Lake	Land-based Meteorological Station (Kenora, Ontario) Longitude 93° 43' 00" W - Latitude 49° 39' 00" N Elevation 1175 feet Long term support in the Environmental Lakes Studies (ELA)
South Baymouth	Land-based Meteorological Station Longitude 82° 00' 48" W - Latitude 45° 34' 06" N IJC Upper Lakes - long term climatological studies
South Indian Lake	Land-based Meteorological Station Longitude 56° 47' 00" W - Latitude 98° 55' 00" N Support - Freshwater Institute, Winnipeg
Thunder Bay	Lakehead University Longitude 89° 16' 00" W - Latitude 48° 20' 00" N IJC Upper Lakes - Long term climatological studies

Figure 2

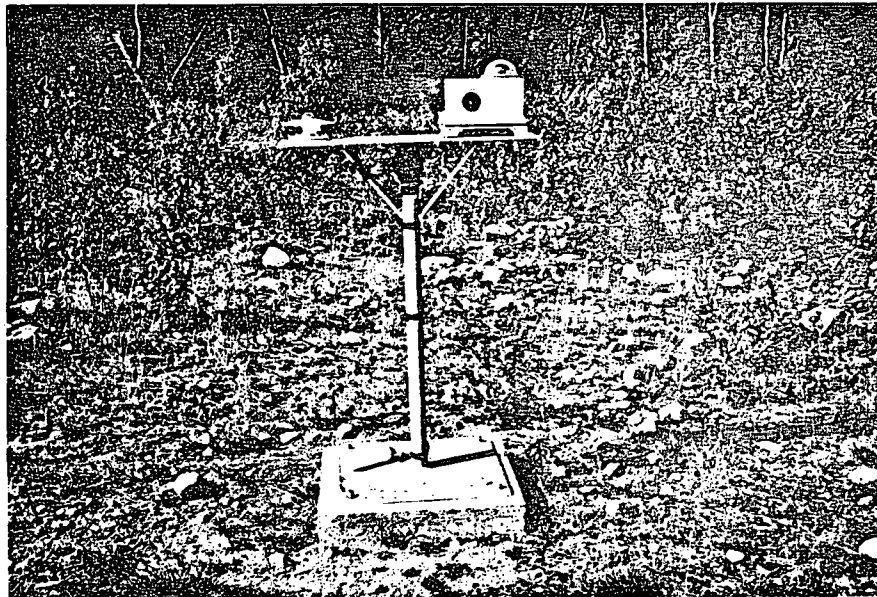


Figure 3. Eppley Pyranometer & Actinograph

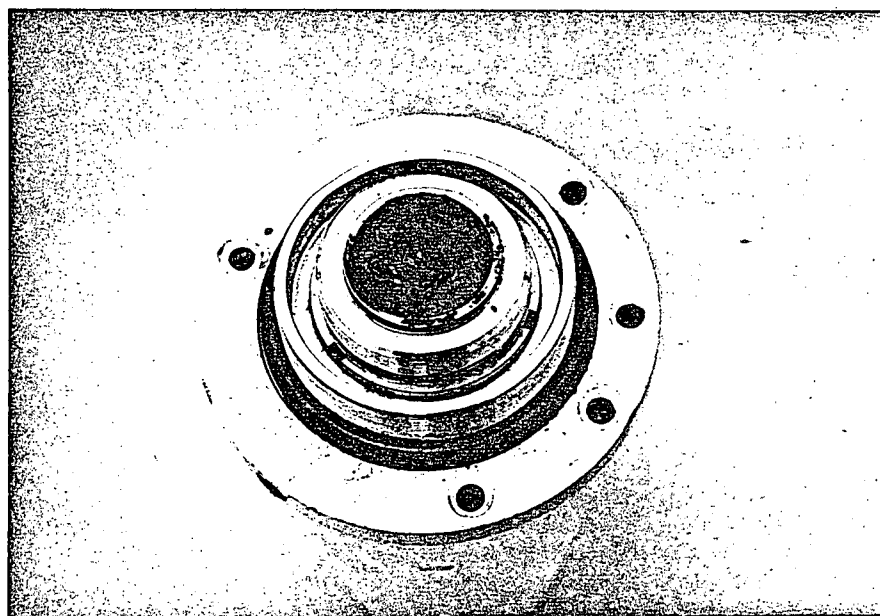


Figure 4. Radiation Sensor

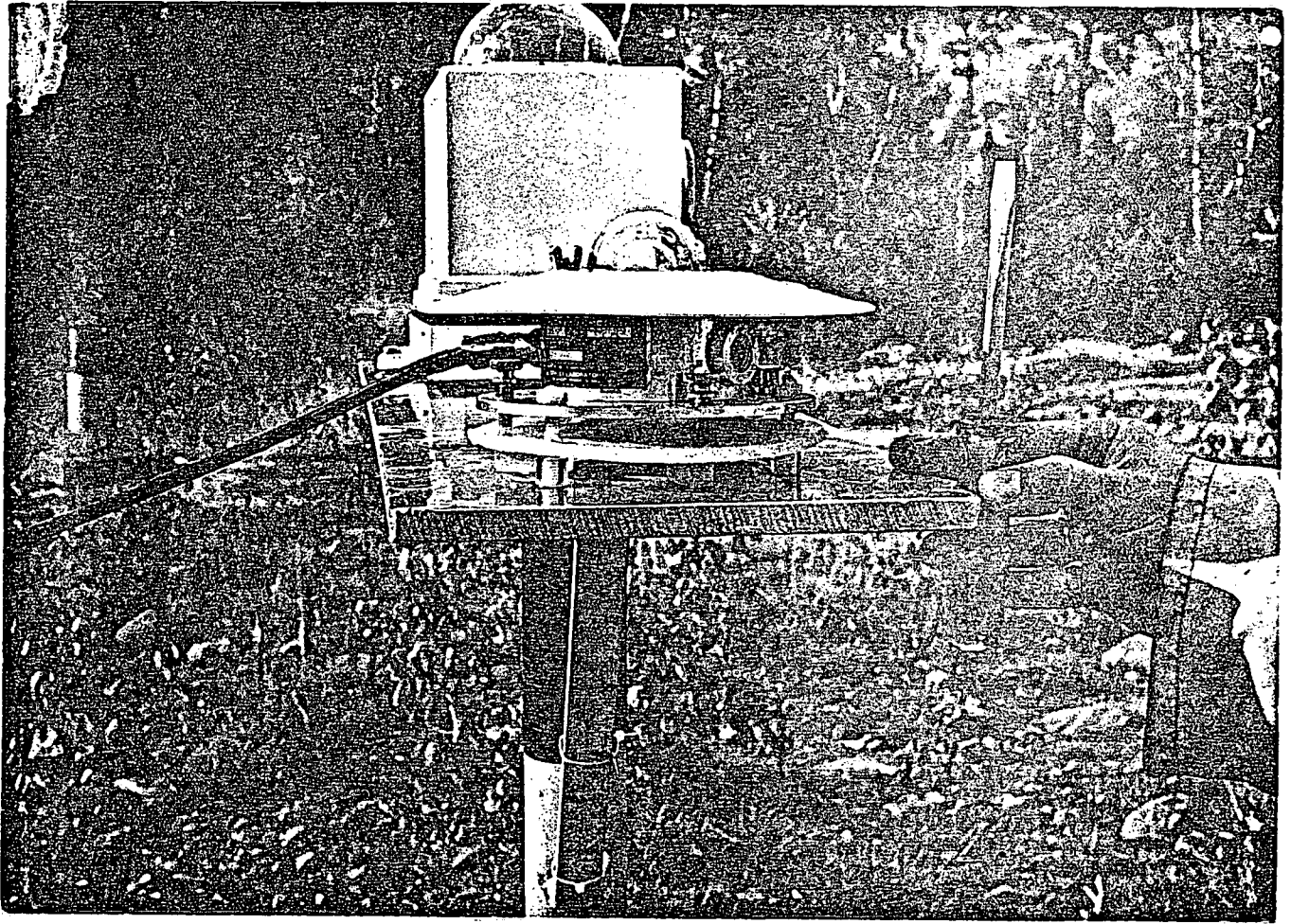


Figure 5. Radiation Station

LAKE ST. GEORGE

OCTOBER 27, 1975

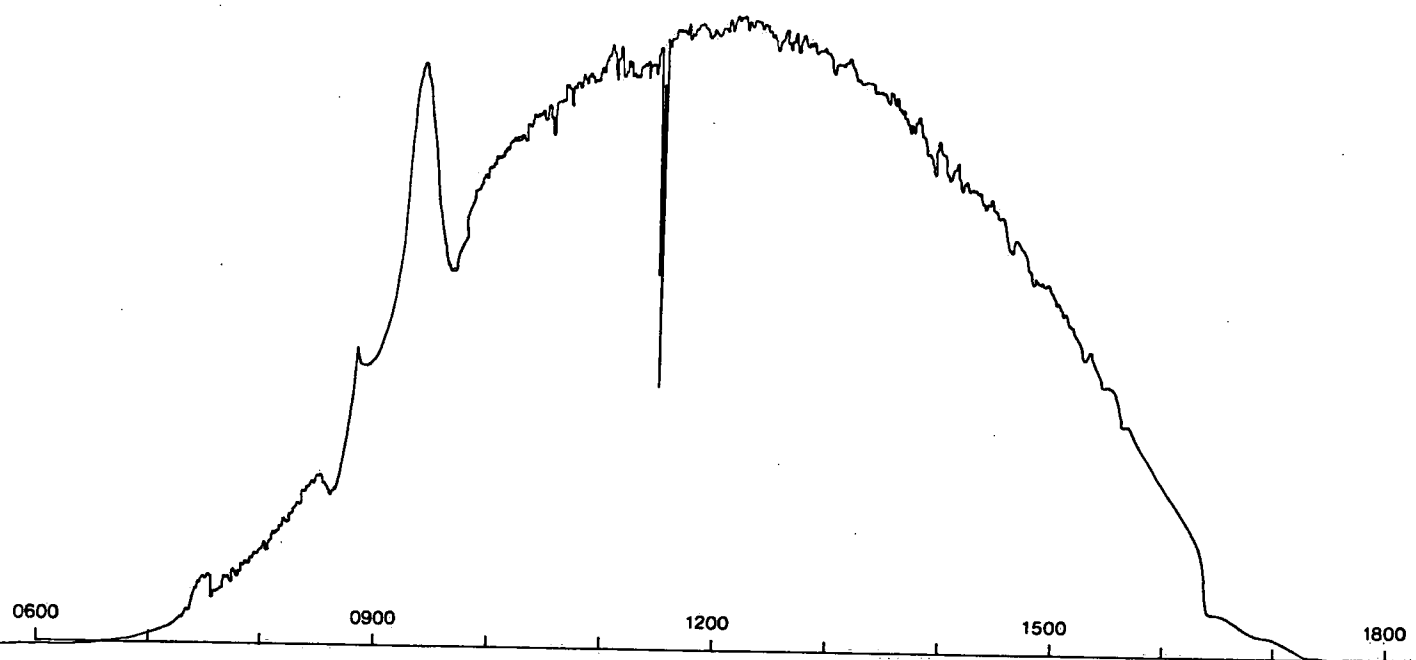


Fig. 6

LAKE ST. GEORGE

OCTOBER 28, 1975

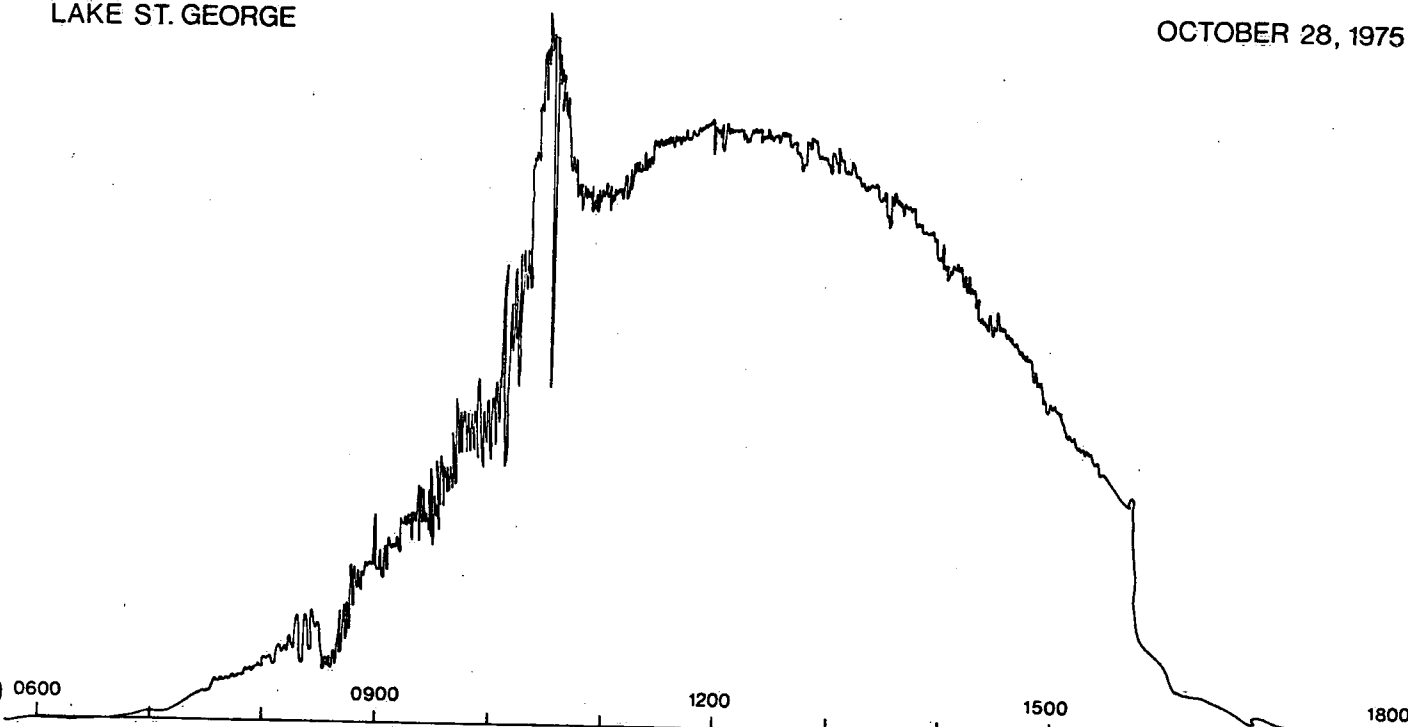


Fig. 7

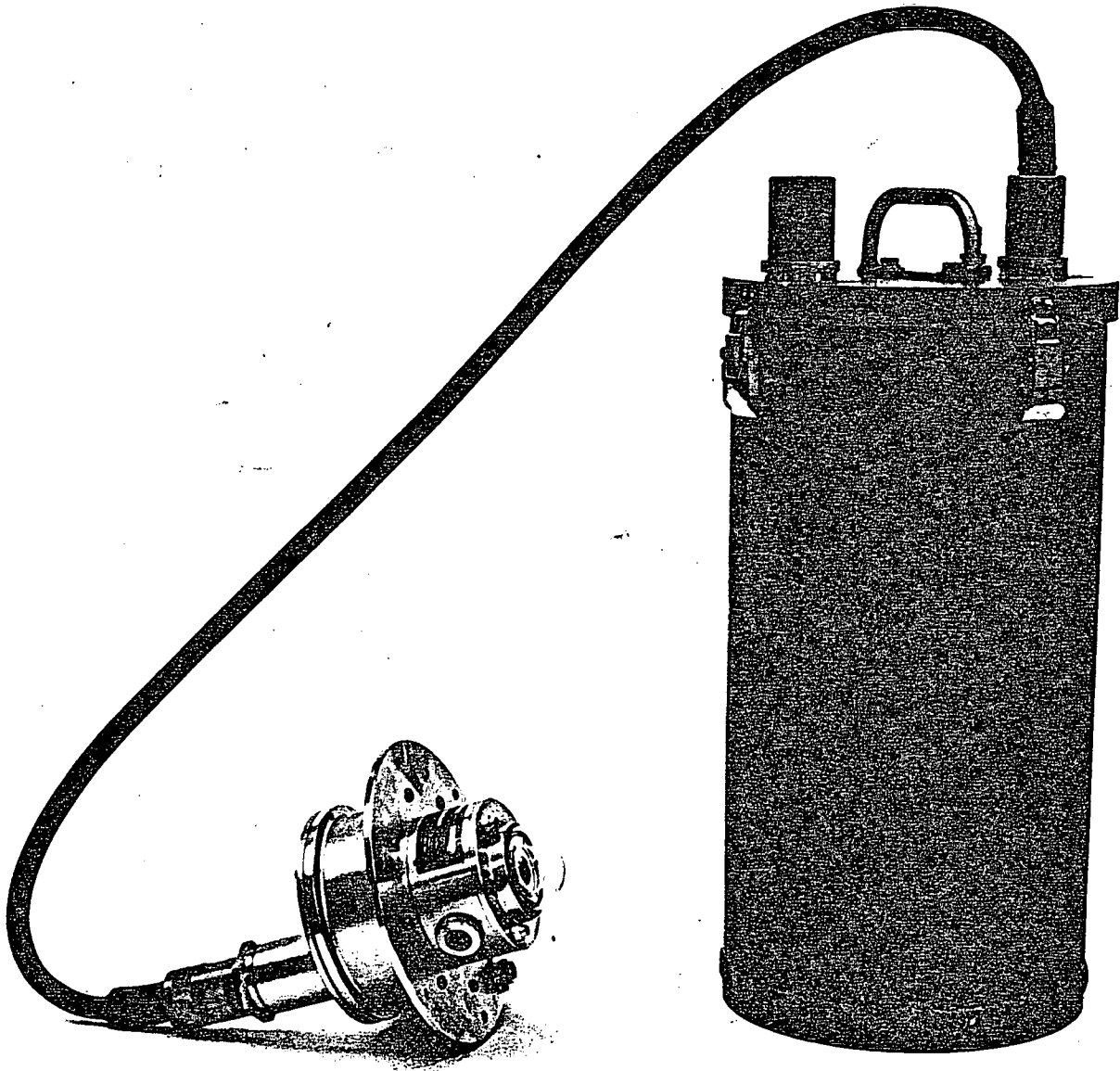


Fig. 8

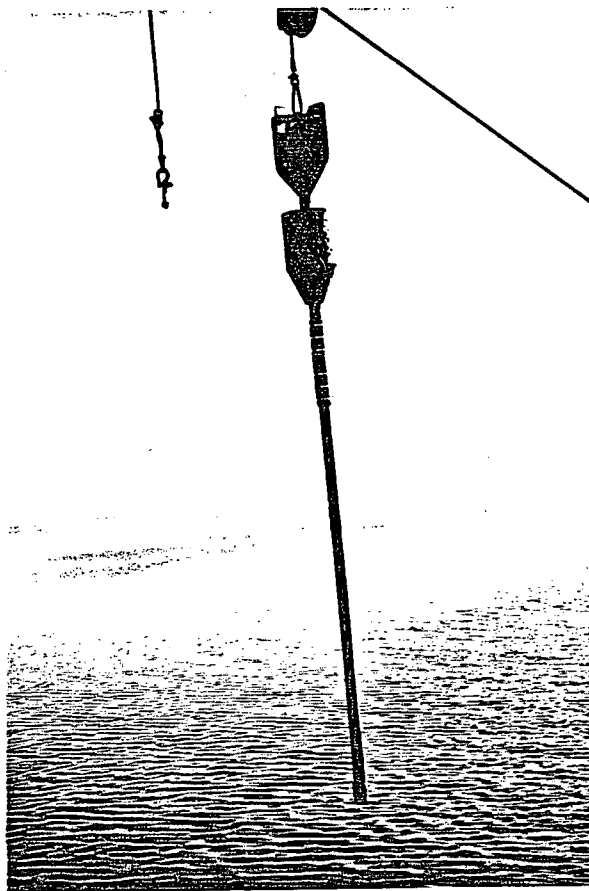


Figure 9. 1200 pound Alpine Corer

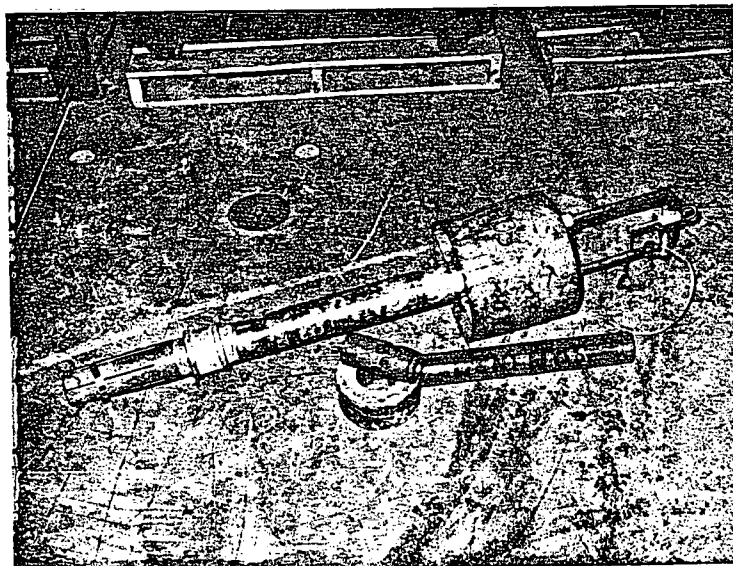


Figure 10. Benthos Corer

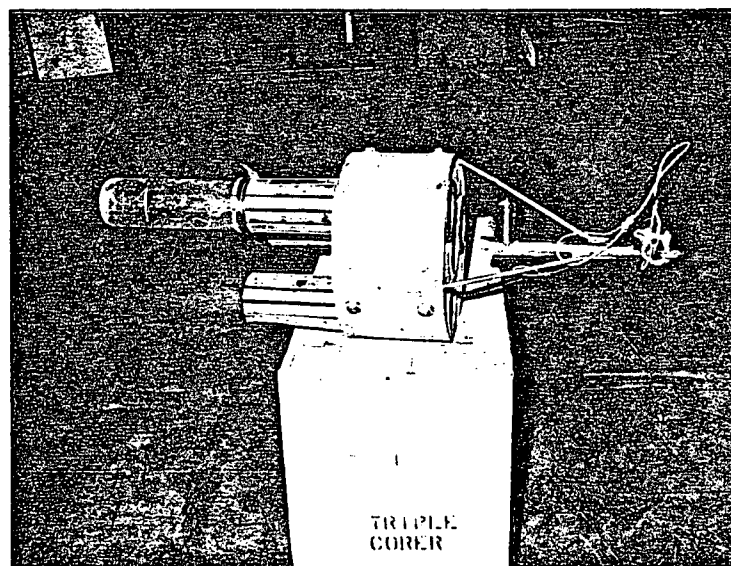


Figure 11. Triple Corer

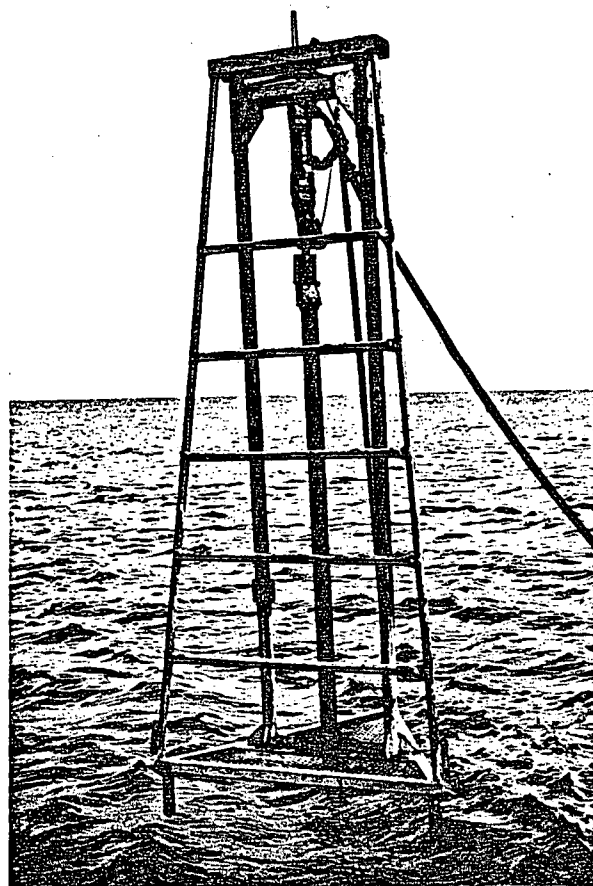


Figure 12. Impact Corer. (Experimental)



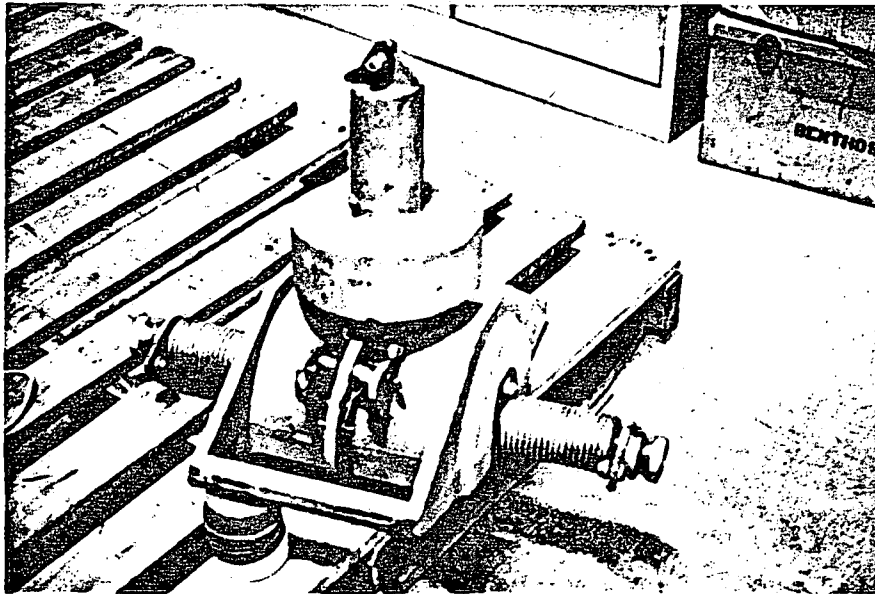


Figure 13  
Shipek

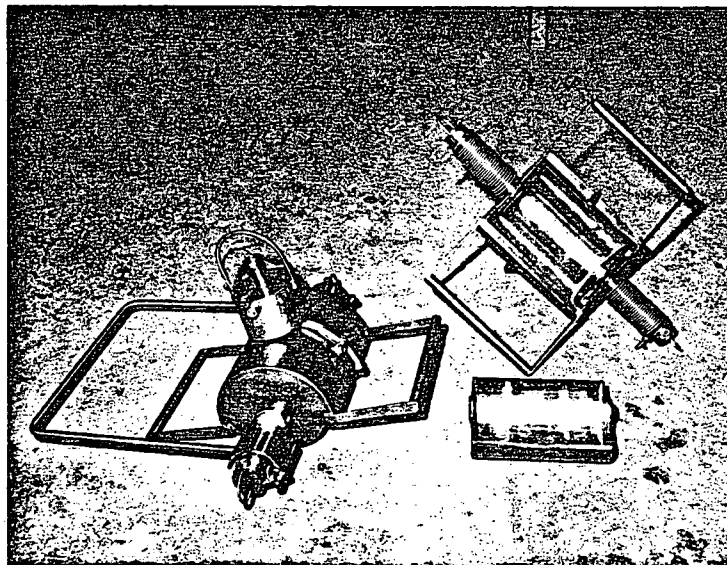


Figure 14  
Mini-Shipek

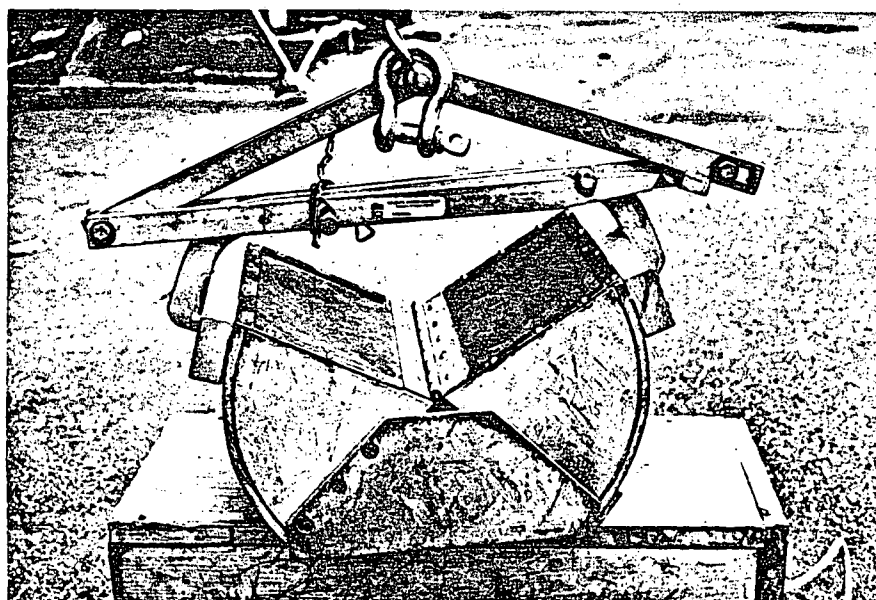


Figure 15  
Mini-Ponar

### RIGGING SHOP

A rigging foreman and a staff of two riggers maintained and supported all equipment used by Technical Operations. Primary basic maintenance of winches, generators, vehicles and sampling equipment are carried out over the winter months as well as ongoing support that continues throughout the year.

Considerable support to both ship programs and major field programs is provided in the assembly, erection and transportation of moorings and other heavy equipment to various localities in the Great Lakes basin. Support to other agencies is also provided, including transportation of equipment to Halifax and return, pick up and delivery of equipment to Fort George and hauling of boats to various locations for Ocean & Aquatic Sciences, Central Region.

Trailers were hauled to Sault Ste. Marie and return, Kingston and return, Lake St. George, Whitby and other locations in support of CCIW Projects, and Water Quality Branch, Ontario Branch.

In order to provide this support a shop, outside storage area, an enclosed work area, three trucks and a fork-lift truck are used routinely. Fiberglassing, some machining and mechanical facilities are also available for use.

### SUMMARY OF THE SHIP OPERATIONS

The CSS LIMNOS, MV NORTHERN SEAL and the tug boat MV LAC ERIE carried out a major portion of the Great Lakes Studies in 1975. The ships were staffed on a continuing basis with Technical Operations personnel who planned, coordinated and implemented the logistical and field support aspects of the multi-disciplinary programs conducted at CCIW.

The LIMNOS, owned by Environment Canada, is operated by the Ocean & Aquatic Sciences, Central Region. During 1975, she carried out a large variety of cruises including lower lakes surveillance, regional sediment survey of Lake Michigan, moorings in Lake Huron and Georgian Bay, and other limnogeological surveys. In addition several short cruises such as engineering trials, side-scan trials, seismic survey and piston coring in Hamilton Harbour were carried out. Technical Operations personnel also assisted the Research & Development Section, Ocean & Aquatic Sciences, Central Region on the mooring installation and recovery on the lower St. Lawrence River.

The Magnavox Satellite Navigation System installed the previous year on the LIMNOS was successfully used for the recovery of the winter moorings in mid-Lake Huron. This system has since been removed for use in the Hudson Bay Survey.

The MV NORTHERN SEAL was chartered by the Ship Division, Ocean & Aquatic Sciences, Central Region to support the 1975 lower lakes surveillance program. The vessel was staffed by personnel from the Technical

Operations Section who coordinated and implemented the logistical and field support for the program. A more detailed description of the ship-board aspects of the surveillance program is found elsewhere in this report.

In addition to specific surveillance cruises, the MV NORTHERN SEAL was used for a special meteorological cruise for the Atmospheric Environment Service, specific sampling for University support and optic cruises for the Remote Sensing Section, ARD.

Similarly the MV LAC ERIE was chartered by the Ship Division, Ocean & Aquatic Sciences, Central Region to support various projects throughout the year. Although many minor projects were supported on a day-to-day basis, several large projects were supported as listed.

1. Land Drainage, Project 5-IW-PR-001, from April to June at Lake Superior.
2. Geophysical Studies, Project 5-IW-PR-016, August, at the Kingston Basin, Lake Ontario.
3. Coastal Climatology, Project 5-IW-AR-009, from December, 1975 to March, 1976 at Pickering, Lake Ontario.
4. TROV trials, Project 5-IW-PR-046, from October to November, 1975 at western Lake Ontario.

Some minor projects supported include: NTA sampling, Eh profiling trials, underwater camera trials, plankton sampling for GLBL and the photologger trials.

#### CSS LIMNOS OPERATIONS

The CSS LIMNOS is owned by Environment Canada and is operated by Ocean & Aquatic Sciences, Central Region. During 1975, Technical Operations liaised between scientific staff and ship's crew to coordinate and conduct a large variety of projects including surveillance, moorings, sediment surveys, coring, seismic and side-scan cruises and several "special" day trips, making a total of 24 cruises for the season. A full list follows:

St. Lawrence River	- 2 mooring cruises
Lake Ontario	- 2 surveillance cruises
	- 1 mooring cruise
	- 1 seismic side-scan sonar cruise
	- 2 geochemistry cruises
	- 1 sedimentology cruise
Lake Erie	- 2 surveillance cruises
	- 1 seismic, side-scan cruise
	- 2 sedimentology cruises
Lake Huron	- 2 mooring cruises
Georgian Bay	- 1 mooring cruise
Lake Michigan	- 1 sedimentology cruise
Lake Ontario Day Trips	- 3 batfish trials
	- 3 sand/till corer trials

The ship, although being in dry dock four times this year, had very little down time due to equipment failure, and those that did arise were quickly rectified by ship's and/or ESS systems' personnel.

The LIMNOS conducted a Lake Michigan cruise; a joint Canada-U.S. effort (CCIW-EPA, Grosse Ile, University of Illinois). The cruise, which was a sediment survey, was the largest ever undertaken on Lake Michigan by the U.S. and the first ever by CCIW. A great deal of data was collected, and it was only the second known time that piston cores were taken in Lake Michigan. Sixty foot piston cores were collected, and that was 20 feet longer than any other known cores ever attempted.

The LIMNOS also played a major part in locating the "Hamilton" and the "Scourge", the two warships lost in 1813. This was accomplished during a side-scan sonar cruise in June when she confirmed the position of the first vessel and discovered the position of the second ship. After making several passes to exactly pinpoint the two positions, a pinger mooring was established so that the ships could be relocated at a later date when further investigations were conducted.

Another first for the LIMNOS this year was the ship being used in salt water. There were two mooring cruises on the Lower St. Lawrence River. The LIMNOS and Technical Operations expertise were loaned to the Hydrodynamics Section of Ocean & Aquatic Sciences, Central Region for the two cruises. Science Fair winners were taken on the second cruise which they all enjoyed immensely.

The LIMNOS conducted two sedimentology cruises on Lake Erie; one being a nearshore sediment survey concentrating on the Western Basin, and the other cruise gave full coverage of the lake. These cruises were in support of Projects 5-IW-HR-035 and 5-IW-PR-002 respectively.

The LIMNOS was used for surveillance cruises on Lakes Erie and Ontario. There were two cruises on each lake; once on each in the spring and once in the late fall.

Throughout the year, the LIMNOS was used on Lakes Huron and Ontario to retrieve winter current meter moorings. While retrieving the winter moorings on Lake Huron, the ship established rain sampling and meteorological moorings. Winter current meter mooring was established in Georgian Bay in the fall and will be removed in the spring of 1976.

The LIMNOS participated in an Open House at Windsor, Ontario during the last week of July. The Open House was in conjunction with the International Joint Commission's Conference. Two short demonstration cruises were conducted on the Detroit River for the members from Canada and the U.S.

Special day trips were conducted from Burlington for trials on the Engineering Batfish (Project 5-IW-SS-008) and for various tests on different types of sand/till corers (Project 5-IW-HR-035).

- 10 -  
1975  
CSS LIMNOS

	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
FEB	26	27	28	29	30	31	
	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
MAR	23	24	25	26	27	28	
	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
APR	23	24	25	26	27	28	29
	30	31	1	2 Depart CCIW 0907	3 Surveillance	4 Lake	5 Erie
	6 Lake	7 Erie	8 Surveillance	9 Lake Erie	10 Transit Welland Canal	11 Surveillance	12 Lake
	13 Ontario	14 Arrive CCIW 1113	15 CCIW	16 Depart CCIW 0800	17 Transit	18 Welland Canal	19 Lake Erie
MAY	20 Arrive Sarnia 1730	21 Depart Sarnia 0345	22 Lake Huron Moorings	23 Arrive Collingwood 0855	24 Depart Collingwood 2000	25 Moorings	26 Lake
	27 Huron	28 Moorings	29 Arrive Sarnia 1259	30 In	1 Transit	2 Arrive CCIW 0329	3 CCIW
	4 CCIW	5 Depart CCIW 1600	6 Lake Ontario Moorings	7 Depart Lake Ontario 1316	8 St. Lawrence	9 River	10 Moorings
	11 St. Lawrence	12 Moorings	13 Arrive Lake Ontario 0730	14 Moorings	15 Arrive CCIW 1300	16 CCIW	17 CCIW
JUNE	18 CCIW	19 CCIW	20 CCIW	21 CCIW	22 CCIW	23 CCIW	24 CCIW
	25 CCIW	26 Depart CCIW 1200	27 Arrive CCIW 2235	28 CCIW	29 Depart CCIW 0833	30 Arrive Pt. Stanley 0917	31 Pt. Stanley
	1 Pt. Stanley	2 Depart Pt. Stanley 1200	3 Sediment	4 Survey	5 Lake Erie	6 Arrive Pt. Stanley 2025	7 Pt. Stanley
	8 Pt. Stanley	9 Pt. Stanley	10 Pt. Stanley	11 Depart Pt. Stanley 0515	12 Seismic Survey Lake Erie	13 Arrive CCIW 1935	14 CCIW
JULY	15 CCIW	16 Depart CCIW 1200	17 Lake Ontario	18 Seismic	19 Arrive CCIW 1630	20 CCIW	21 CCIW
	22 Depart CCIW 1600	23 St.	24 Lawrence	25 Moorings	26 Cruise	27 Moorings	28 St. Lawrence
	29 Arrive CCIW 1225	30 CCIW	1 CCIW	2 CCIW	3 CCIW	4 CCIW	5 CCIW
	6 CCIW	7 Depart CCIW 0900	8 Lake Ontario	9 Geochemistry	10 Cruise	11 Geochemistry	12 Arrive CCIW 0230
AUG	13 CCIW	14 Trials	15 Sedimentation	16 Bottles	17 Batfish	18 CCIW	19 CCIW
	20 CCIW	21 CCIW	22 CCIW	23 CCIW	24 CCIW	25 CCIW	26 CCIW
	27 CCIW	28 Depart CCIW 0910	29 Arrive Windsor 1615	30 Open House	31 Depart Windsor 0715	1 Transit Lake Huron	2 Arrive Waukegan 1722
	3 Depart Waukegan 0106	4 Lake	5 Michigan	6 Sediment	7 Survey	8 Lake	9 Michigan
SEPT	10 Sediment	11 Survey	12 Phase I	13 Lake	14 Michigan	15 End Survey Phase I 2030	16 Transit St. Mary's River
	17 Depart Sault Ste. Marie 0800	18 Arrive Harbour Springs 1830	19 Engine Repair	20 Depart Harbour Springs 1134	21 Lake	22 Michigan	23 Sediment
	24 Survey	25 Phase II	26 Arr. Waukegan 0055 Dep. 0119	27 In transit Sarnia	28 Arrive Sarnia 1730	29 Sarnia	30 Sarnia
	31 Sarnia	1 Sarnia	2 Depart Sarnia 1330	3 Lake Erie	4 Sediment Survey	5 Arrive Port Colbourne 1808	6 Port Colbourne
OCT	7 Port Colbourne	8 Depart Port Colbourne 1110	9 Lake Erie	10 Sediment Survey	11 Arrive Port Colbourne 0825	12 Port Colbourne	13 Port Colbourne
	14 Port Colbourne	15 Depart Port Colbourne 1224	16 Lake Erie	17 Particle	18 Settling Rate	19 Arrive Port Colbourne 0430	20 CCIW
	21 CCIW	22 Piston	23 Coring	24 Hamilton	25 Harbour	26 Sediment Trials Lake Ontario	27 CCIW
	28 CCIW	29 CCIW	30 CCIW	1 CCIW	2 CCIW	3 CCIW	4 CCIW
NOV	5 CCIW	6 CCIW	7 CCIW	8 Depart CCIW 1000	9 Whitby Dry Dock	10 Whitby Dry Dock	11 Whitby Dry Dock
	12 Whitby Dry Dock	13 Whitby Dry Dock	14 Whitby Dry Dock	15 Whitby Dry Dock	16 Whitby Dry Dock	17 Whitby Dry Dock	18 Whitby Dry Dock
	19 Whitby Dry Dock	20 Depart Whitby Dry Dock	21 CCIW	22 Eng. Trials Lake Ontario	23 CCIW	24 CCIW	25 CCIW
	26 CCIW	27 Depart CCIW 1000	28 In transit to Lake Huron	29 Depart Sarnia 0500	30 Mooring	31 Cruise	1 Lake Huron
DEC	2 Georgian Bay	3 Transit	4 To CCIW	5 Arrive CCIW 2000	6 CCIW	7 CCIW	8 CCIW
	9 CCIW	10 CCIW	11 CCIW	12 Sand/Till Corer Trials	13 Sand/Till Corer Trials	14 CCIW	15 CCIW
	16 CCIW	17 Batfish	18 Trials	19 Lake Ontario	20 CCIW	21 CCIW	22 CCIW
	23 CCIW	24 Depart CCIW	25 Lake	26 Erie	27 Surveillance	28 Lake	29 Erie
DEC	30 In Transit	1 Whitby Dry Dock	2 Whitby Dry Dock	3 Whitby Dry Dock	4 Whitby Dry Dock	5 Lake Ontario	6 Surveillance
	7 Lake Ontario	8 Surveillance	9 Lake Ontario	10 Arrive CCIW	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27

1975

# NORTHERN SEAL

	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
FEB	26	27	28	29	30	31	1
	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
MAR	23	24	25	26	27	28	1
	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
APR	23	24	25	26	27	28	29
	30	31	1	2	3	4	5
	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
MAY	20	21	22	23	24	25	26
	27	28	29	30	1	2	3
	4	5	6	7	8	9	10
	11	Depart CCIW 0915	12 Lake Erie	13 Surveillance	14 Lake Erie	15 Surveillance	16 Lake Erie
JUNE	17	18 Lake Erie	19 Surveillance	20 Lake Erie	21 Surveillance	22 Arrive Port Colborne 0245	23 Depart CCIW 1020
	24	25 Surveillance	26 Lake Ontario	27 Arrive CCIW 0430	28 CCIW	29 CCIW	30 CCIW
	31	1 CCIW	2 Depart CCIW 1230	3 Lake Ontario	4 Surveillance	5 Lake Ontario	6 Surveillance
	7	8 Arrive CCIW 0330	9 Depart CCIW 1020	10 Lake Erie	11 Surveillance	12 Lake Erie	13 Arrive Erieau 0005
JULY	14	15 Erieau	16 Transit	17 CCIW	18 CCIW	19 CCIW	20 CCIW
	21	22 CCIW	23 Depart CCIW 0915	24 Lake Erie	25 Surveillance	26 Lake Erie	27 Surveillance
	28	29 Arrive Port Colborne 1115	30 CCIW	1 CCIW	2 Depart CCIW 1000	3 Lake Ontario	4 Surveillance
	5	6 Arrive CCIW 0405	7 CCIW	8 CCIW	9 CCIW	10 CCIW	11 CCIW
AUG	12	13 CCIW	14 CCIW	15 Depart 0900 Arrive 1835	16 CCIW	17 CCIW	18 CCIW
	19	20 CCIW	21 Depart CCIW 0957	22 Lake Ontario	23 Surveillance	24 Lake Ontario	25 Arrive CCIW 0705
	26	27 CCIW	28 CCIW	29 CCIW	30 CCIW	31 CCIW	1 CCIW
	2	3 CCIW	4 Depart CCIW 0915	5 Depart Port Colborne 1100	6 Lake Erie	7 Surveillance	8 Lake Erie
SEPT	9	10 Lake Erie	11 Arrive CCIW 1920	12 Depart CCIW 1000	13 Lake Ontario	14 Surveillance	15 Lake Ontario
	16	17 CCIW	18 CCIW	19 Depart 0900 Arrive 1100	20 Depart 1330 Arrive 1440	21 CCIW	22 CCIW
	23	24 CCIW	25 CCIW	26 Hamilton Harbour	27 CCIW	28 CCIW	29 CCIW
	30	31 CCIW	1 CCIW	2 Depart CCIW 1000	3 Lake Ontario	4 Surveillance	5 Lake Ontario
OCT	6	7 Arrive CCIW 0645	8 Hamilton Harbour	9 Lake Ontario	10 Meteorological	11 Study	12 CCIW
	13	14 CCIW	15 Hamilton Harbour	16 CCIW	17 Arrive 1830	18 CCIW	19 CCIW
	20	21 CCIW	22 Depart CCIW 0935	23 Lake Ontario	24 Surveillance	25 Lake Ontario	26 Surveillance
	27	28 CCIW	29 Hamilton Harbour	30 CCIW	1 CCIW	2 Depart 0900 Arrive 1315	3 CCIW
NOV	4	5 Transit	6 Depart Port Colborne 1000	7 Lake Erie	8 Surveillance	9 Lake Erie	10 Surveillance
	11	12 Transit	13 CCIW	14 Depart CCIW 1105	15 Lake Ontario	16 Surveillance	17 Lake Ontario
	18	19 Lake Ontario	20 Arrive CCIW 1500	21 CCIW	22 Depart CCIW 0850	23 Lake Ontario PCBs	24 Arrive CCIW 0525
	25	26 Transit	27 Depart Port Colborne 1030	28 Lake Erie	29 Surveillance	30 Lake Erie	31 Arrive Port Colborne 2015
DEC	1	2 Arrive CCIW 1030	3 Depart CCIW 1115	4 Lake Ontario	5 Surveillance	6 Lake Ontario	7 Arrive CCIW 0550
	8	9 CCIW	10 CCIW	11 TRANSFER OF	12 EQUIPMENT	13 Departed CCIW	14
	15	16	17 OFF Charter	18	19	20	21
	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	2	3
	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24

# STATISTICS SUMMARY - 12 -

Cruise No. \_\_\_\_\_ Consec. No. \_\_\_\_\_

Ship CSS LIMNOS

Dates From April to December, 1975

Lake \_\_\_\_\_

Cruise Type 19 Cruises

Miles Steamed 16,537.8

Description	Total	Description	Total
Secchi	153	Moorings Established (CM)	12
Stations Occupied	1229	Moorings Retrieved (CM)	17
Bathythermograph Casts	58	Moorings Established (Met.) (Rain Gauge)	5
E.B.T. Casts	387	Moorings Retrieved (Met.) (Rain Gauge)	5
Transmissometer Casts	369	Moorings Established ( Spar )	6
Reversing Thermometer Obs.	31	Moorings Retrieved ( FTP )	4
Water Samples Collected (Chemistry)	2528	Moorings Serviced (CM)	
Water Samples Collected (Microbiology)	206	Moorings Serviced (Met.)	
Water Samples Collected (Biolimnology)	500	Moorings Serviced ( )	
Water Samples Collected ( Chlorides )	190	Cores Taken (Gravity).	122
Water Samples Collected (POC & Suspended Minerals)	347	Cores Taken (Piston)	11
Water Samples Collected (Radiochemistry)	15	Grab Samples Taken	1470
Water Samples Collected (Total Phosphorus)	213	Drogues Tracked	
Water Samples Filtered (Chlorophyll)	440	Dye Releases	
Water Samples Treated (Phytoplankton)	36		
Zooplankton Hauls	18	Observations (Weather)	183
Zooplankton Hauls (Mysis)		Observations ( )	
Primary Productivity Moorings	14		
Bottom Samples (Fauna)	293	Continuous Observations (Days)	
Integrator (10m)	24	Air Temperature	
Integrator (20m)	376	Relative Humidity	
Total Number of Depths Sampled	1902	Water Temperature (In-Hull)	
Total Number of Water Samples Collected	4004	Water Temperature (Towed)	
		Integrated Printout	
		Solar Radiation	141
		Long Wave (IR) Radiation	
<u>ONBOARD ANALYSIS</u>			
Geolimnology			
Manual Chemistry (Tech. Ops.)	2268	Water Samples Collected (WQB Special)	5
Nutrients (W.Q.D.)	1945	Water Samples Collected (GLBL)	88
Microbiology	792	Water Samples Collected (Interstitial Water Samples)	66

## MARKS

Ground Water Outflow

19

Water Samples Collected (Asbestos)	168
Water Samples Collected (Zooplankton)	20
Water Samples Collected (Rain water)	4
Water Samples Filtered (Radiochemistry)	12
Air Filter Samples	2

- 13 -

Ship MV NORTHERN SEAL

Lakes ERIE & ONTARIOMiles Steamed 10,386

## ONBOARD ANALYSIS

## MARKS



### LOWER LAKES SURVEILLANCE

The Surveillance Program on both Lakes Ontario and Erie was successfully run in 1975 and onboard sampling and analyses were promptly performed.

The program was carried out to meet the requirements of the International Joint Commission for information on areas of improving or deteriorating water quality, general lakewide conditions and responses to the impact of management procedures.

Sampling and analytical methods used in surveillance work were basically the same as those employed in survey cruises (see Annex K, IFYGL Technical Plan, Volume 3), although improved technology and factors such as available laboratory space dictated some changes.

Whereas the 1975 Surveillance Program included only those key parameters reflecting the impact of eutrophication, the present 1975 program was expanded to include more intensive microbiological and water quality parameters for a broader scientific understanding of the lakes' ecological conditions.

The key parameters measured on all cruises were: dissolved oxygen, conductivity, chlorophyll a, particulate organic carbon, suspended minerals and percent transmission. Sampling depth was based on the lakes' temperature structure and a vertical temperature profile (EBT) was obtained at all stations occupied.

More specialized studies in support of specific research projects were carried out in conjunction with the 1975 surveillance cruises. These projects included: the ATP Program for GLBL, the Lake Optics Program for the Remote Sensing Section, the PCB Sampling Program, the special Meteorological Cruise by AES, and chemical sampling for McMaster University.

Shortly after the completion of each cruise, usually within two weeks, a descriptive report was produced representing the time and effort of the Technical Operations Section's personnel who were responsible for the data collected, and recorded, in these reports. This represents a major improvement compared to the 1974 program where only a few descriptive reports were prepared and issued at the end of the field season.

Six staff members from Technical Operations Section were assigned to the Surveillance Program. The ships worked on a 24 hour basis and the cruises were generally completed within the allotted time periods.

### LAKE ONTARIO SURVEILLANCE

A total of 12 cruises were accomplished in 1975. Eleven cruises were regular surveillance cruises and one special cruise to assess the impact of PCB's. Of the eleven surveillance cruises two were carried out on board the CSS LIMNOS and nine cruises on board the chartered vessel MV NORTHERN SEAL.

The cruises were conducted on an approximately biweekly basis from April to December. Data were collected from 89 stations (compared to 85 for 1974) located at fixed positions in the lake. The positions were arranged to place the main emphasis on the regions of major materials input (e.g. Toronto-Hamilton-Niagara, Rochester, Oswego, Kingston Basin) and to permit reasonably representative contouring of the measured parameters in these regions.

### LAKE ERIE SURVEILLANCE

A total of 8 cruises were completed in 1975. Six cruises were carried out on board the MV NORTHERN SEAL and two on board the CSS LIMNOS. One of the six cruises by the NORTHERN SEAL was only partially completed as a result of ship's engine trouble.

The cruises were conducted on an approximate monthly basis from April to November. Data were collected from 106 stations located at fixed positions in the lake. The positions have been arranged to place emphasis on areas previously identified as having impaired water quality as well as to permit reasonably representative contouring of the measured parameters in these regions. Bottom water samples were obtained by the pump sampler.

On Lake Erie, an intercomparison study was undertaken in June. Three ships participated in this effort: the RV DANBACH, the RV HYDRA (both from the U.S.) and the MV NORTHERN SEAL. The purpose of the intercomparison was to compare sampling methods and analytical techniques with American Surveillance Personnel under identical conditions.

BRIEF DESCRIPTION OF THE CHARTERED VESSEL

MV NORTHERN SEAL

Built in 1966 by E.F. Barnes Ltd., St. John's, NEWFOUNDLAND  
Length 94 feet  
Draft 8 feet  
Speed 10 knots (cruising)  
Gross tonnage 208 tons

Complement

Crew 8  
Scientific staff 11

Electric Power

440V, 220V, 110V, 60 cycle

Navigation Equipment

Marconi radar, FM radio telephone, depth sounder and Loran.  
Magnetic compass and standard ship spot light.

Added in 1975: Sperry radar, Sperry gyro compass,  
additional magnetic compass and Marconi AM radio telephone.

Hydrographic Winches and Equipment

One light duty portable oceanographic and hydraulic  
winch J. Swann. Free-fall clutch with brake. Rotatable,  
automatic spooling, remote control available, 10 hp.

20 m and 10 m integrated samplers.

1 pump sampler.

1 HAP/2 articulate crane.

1 EBT system.

1 transmissometer winch, cable - 100 m capacity.

1 analogue recorder for continuous measurement of  
solar radiation.

Knudsen bottles, fitted with reversing thermometers, to  
obtain water samples and temperatures.

Van Dorn bottles, to obtain water samples.

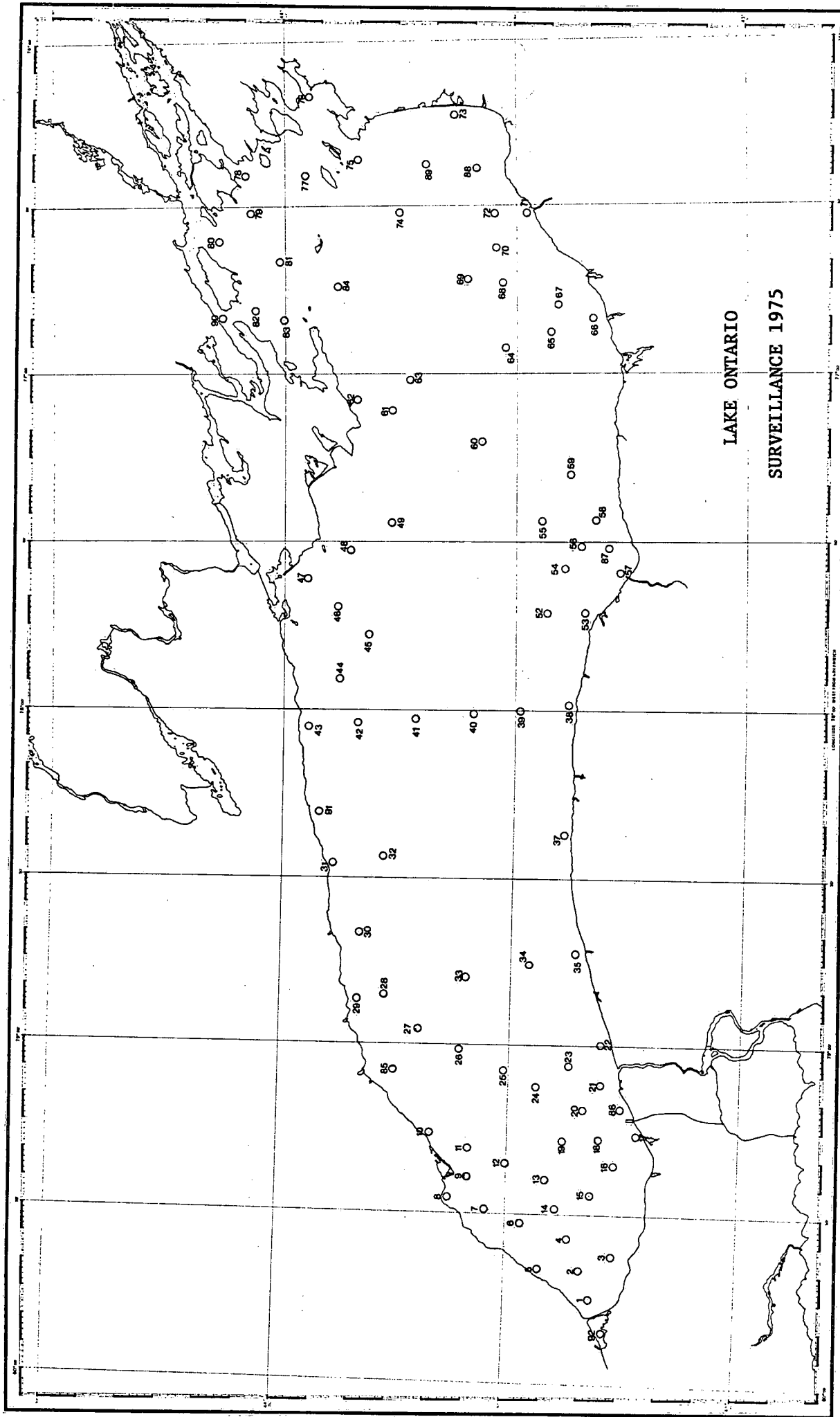
Instruments for the analyses of dissolved oxygen,  
specific conductance and pH.

Secchi disc for the measurement of water transparency.

Filtration equipment.

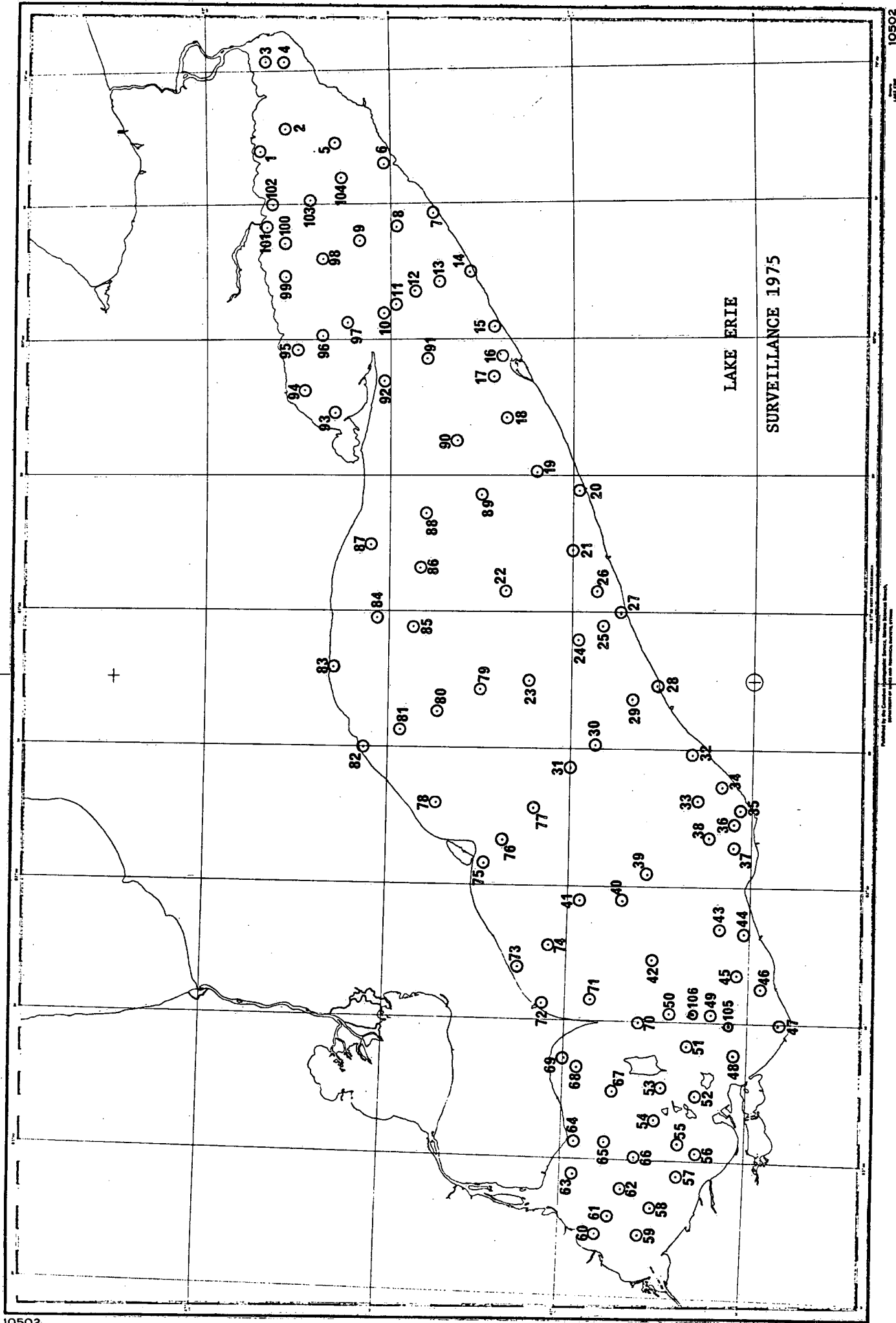
Water Quality (auto-analyzers) equipment and Microbiology  
equipment were carried on certain cruises.

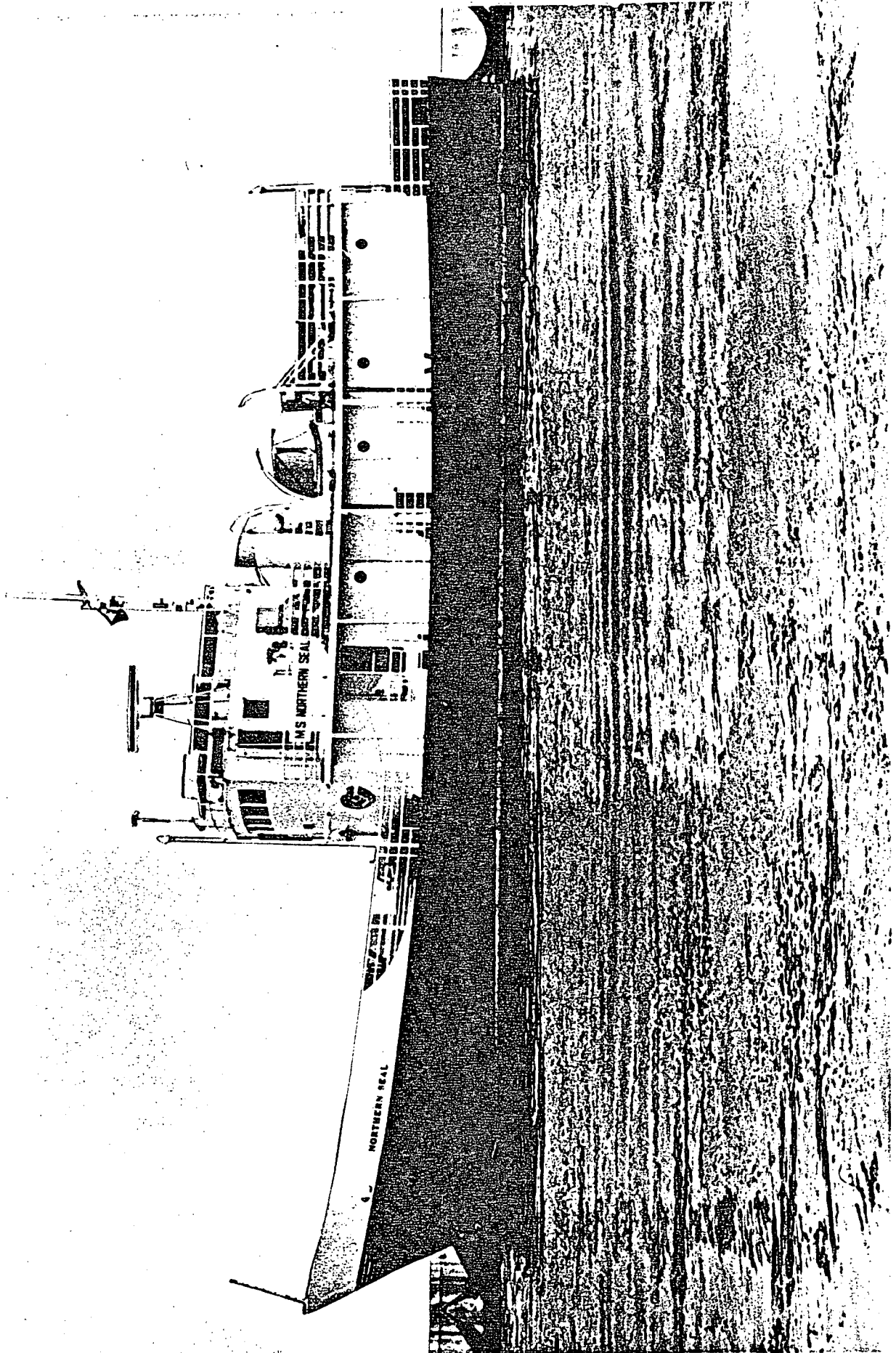
Meteorological measuring instruments.



LAKE ONTARIO  
SURVEILLANCE 1975

Published by the Canadian Hydrographic Service, Marine Sciences Branch,  
Department of Fisheries and Forestry, Ottawa.





PROJECT 5-IW-AR-009

SINKING PLUME PHENOMENON

This is a study of the Sinking Plume Phenomenon being conducted by Mr. G.K. Sato and supported by the Technical Operations Section. Data obtained from this project may provide engineers, planning and water resource managers with advice based on existing knowledge of the strength, duration and configuration of the Sinking Plume Phenomenon under different environmental conditions.

Current and temperature staff self recording systems (CATSS moorings) were developed and tested by the Engineering Services Section (SSD) and four were installed in the Pickering area of Lake Ontario adjacent to the Nuclear Generating Station for the winter months. The systems were established in December, 1975, refurbished once, and recovered at the end of March, 1976, by the Technical Operations Section.

Further support was provided by the full time commitment of the MV LAC ERIE, based at Whitby, and three Technical Operations personnel. On alternate weeks full EBT surveys were conducted on a daily basis and the systems were monitored weekly. Inclement weather has adversely affected the project so that a full field sampling effort is basically being conducted every day that weather permits.

In addition to the sampling, records and plotting of the station positions (based on two mini-ranging systems) is being done as well as digitization of the very large number of EBT profiles also obtained. The data reduction of the records from the CATSS moorings is planned after their recovery.

The following support was required to conduct this project:

1. MV LAC ERIE
2. Dell Quay Dory
3. Two mini-ranging systems
4. Office trailer
5. Two portable EBT systems
6. Three Technical Operations personnel full time
7. One vehicle
8. Q-15 current meters
9. Series of marker buoys
10. Dive Unit support for refurbishment of CATSS moorings

Further detailed information for this project is available in the "Operational Plan" dated November 25, 1975.

PROJECT 5-IW-AR-060

TRITIUM SAMPLING

The objective of sampling Lake Ontario at the Pickering Nuclear Station was to determine the impact of emissions of cooling water from the station on the level of radionuclides in Lake Ontario and, particularly, the radionuclide of Tritium. The project was under the leadership of Dr. R. Durham of the Analytical Methods Research Section and assisted in the field by one of his staff. These levels are interesting in their long term effect on the lake and as a possible means of following the plants heat plume. The project was carried out on a daily basis with the scientific group returning with samples to CCIW each day. Sampling was done during seven different weeks from June 10, 1975 until October 30, 1975.

The sampling consisted of taking surface samples of water in 250 ml bottles and a surface temperature using a bucket thermometer of each station. Along with these samples, current and weather observations were taken. A grid system using 1000 ft. intervals was set up originating from the reactor outflow, and the points of intersection used as sampling positions. Which points to sample were determined by surface temperature as the samples were taken from inside the thermal plume. The launch CSL SURF a coxswain and seaman from Ship Division, Ocean & Aquatic Sciences, Central Region, was used as the survey vessel, and radar was used to locate the sampling positions. Depending on weather conditions and reactor activity, between 40 and 70 samples were taken daily from the site. These samples were processed back at CCIW by the Analytical Methods Research Section.

PROJECT 5-IW-AR-071

MICROBIOLOGICAL POINT SOURCE EFFLUENT STUDY

In order to ascertain bacteriological conditions in a lake through a Point Source type "Zonal Grid" sampling project, two cruises in each of Lakes Ontario and Lake Erie were conducted through the summer. The surveys were conducted at Nanticoke (Lake Erie) during June 23-27 and October 6-15 and at Niagara-on-the-Lake during June 2-6 and October 20-27.

At each survey a series of stations were occupied within approximately one mile of the effluent discharge and samples were obtained for microbiological analyses, temperature and dissolved oxygen. Except for temperature, samples were returned daily to CCIW for analyses, Technical Operations doing the dissolved oxygen, the microbiological technician doing the microbiological analyses. These surveys were timed to coincide with the open lake surveillance cruises in order to compare the Point Source values with the open lake.

The CSL LEMOYNE was used as the survey launch throughout the survey; its use was coordinated and the vessel was manned by Technical Operations personnel for this project. These two personnel obtained all the samples, and returned these samples to CCIW at the end of each day's sampling for analyses.



PROJECT 5-IW-HR-034

BLUFF EROSION STUDY

A survey of the Lake Erie shoreline near Port Burwell studies the problem of steep, unstable bluffs and high erosion rates. Two types of slope failure are being examined in detail - deep rotational landslips, in which chunks of a bluff break free because of undercutting by waves, and rapidly receding gullies produced by surface water flow and ground water seepage.

Technical Operations supplied full field support in which three personnel,

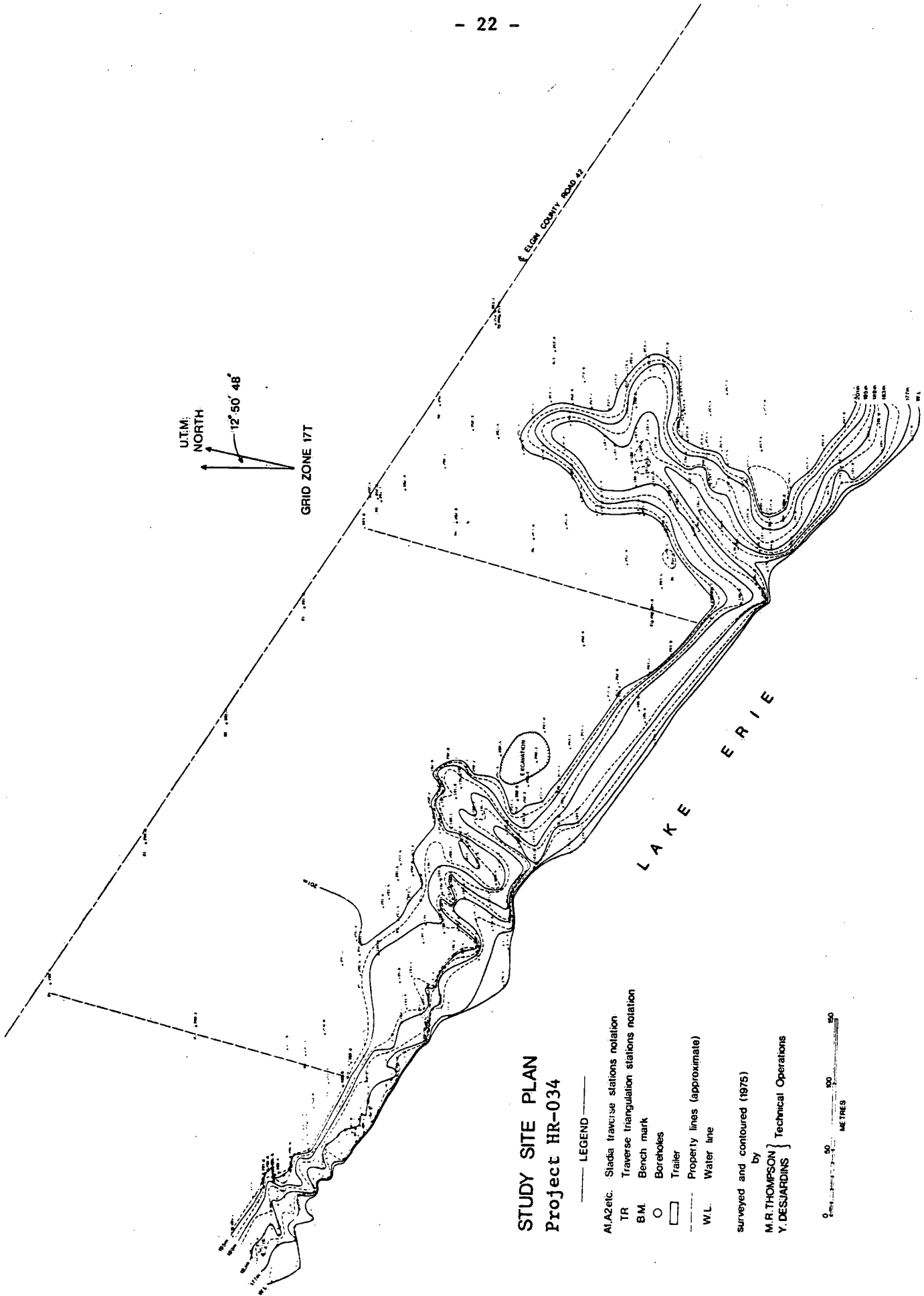
- a) photographed the bluffs from Port Burwell to Long Point as a pre-site investigation. This involved the use of a 14 ft. Starcraft with a 20 HP motor; while one person steered the boat, another took pictures (620 pictures were taken with 40 percent overlap), and the third technologist (on shore) placed 2 ft. high markers at convenient points for indication of bluff height.
- b) prepared a contour map of the site. A suitable site for study was selected 2.5 miles east of Port Burwell on Elgin County Road 42 at Lots 20, 21 and 22 in the Bayham Township. The technologists established a traverse using a theodolite and, with a level, found the elevation of points throughout the traverse. The technologists then computed and prepared all information for the CCIW computer to establish the survey points on a map using Universal Transverse Mercator Grid Coordinates and a scale 1 cm = 6 m. The contours were then drawn in by hand, and all vital information was recorded in the legend.

Because of the accessibility, high erosion rate (undercutting by waves and ground water) and location, Lot 22 was chosen as the area for future investigation. Private firms were contracted to drill boreholes at several locations within the lot and install piezometers and slope indicators at predetermined depths.

The Technical Operations Officer-in-Charge,

- a) obtained the owner's (Lot 22) signature on a land agreement contract for further study on his property,
- b) established a trailer on the property to house equipment and recorders for collecting data from the piezometers,
- c) finalized contracts - hydro installed to the trailer, trenches dug and instrument cables laid from the trailer to the boreholes,
- d) established a protective fence around the trailer, and
- e) is responsible for paying land rental agreement and having one personnel from Technical Operations (once every two weeks) check equipment and record readings.

This study will help in gaining an understanding of the mechanisms which cause the collapse of some bluffs and loss of prime agricultural land in the Port Burwell area. Its conclusion will describe many causes of erosion and recession, recommend further work and discuss possible remedial measures.



# STUDY SITE PLAN Project HR-034

- LEGEND —
- ALA261C. Slada traverse stations notation
  - TR Traverse triangulation stations notation
  - BM Bench mark
  - O Boreholes
  - Trailer
  - Property lines (approximate)
  - W.L. Water line
- surveyed and contoured (1975)  
by  
M.R. THOMPSON } Technical Operations  
Y. DESJARDINS }



PROJECT 5-IW-HR-038

WAVES '76

The construction of a permanent marine scientific platform or tower was approved for Project 5-IW-HR-038, WAVES. The tower, designed to facilitate the observation and measurement of the interrelationships between wave generation and meteorology, will be used by many scientific agencies during its anticipated lifetime of 10 to 30 years. Its site is one kilometre off shore in the Van Wagner's Beach area of western Lake Ontario, and the tower may eventually be known as, for example, "Surveillance Station Number One".

The tower was erected completely on CCIW property, during the winter of 1975-76. That winter, incidentally, was by far the coldest in the past 20 years, indicating the difficulty of the task, especially regarding painting and strain gauge installation.

The 35-ton structure, with overall dimensions of approximately 25 metres high, 9 metres wide at the top and 12 metres wide at the base, was moved to its permanent site at the end of March, 1976.

Technical Operations staff have been involved at all stages of the planning and fabrication of the Tower and have given direction on such aspects as acceptability and markings for such structures in navigable waters. Similarly the Dive Unit has conducted a bottom survey of the permanent location and has marked, by buoys, the precise location.

PROJECT 5-IW-PR-001

LAND DRAINAGE PROGRAM

The Land Drainage Program was designed to remedy the deficiency in knowledge concerning the quality and quantity of suspended particulate materials. The program involved specific river-mouth sampling to recover and analyse solids from all streams draining into the boundary waters of the Great Lakes whose annual discharge represents greater than 0.5% of the total river discharge to the recipient lake, excluding interconnecting channels.

Technical Operations outfitted the LAC ERIE, a minor chartered vessel, with a Boston Whaler, laboratory and accessories. The scientific staff on the LAC ERIE consisted of two personnel from Technical Operations and one from Process Research. A land party, consisting of two personnel from Process Research and frequently one from Technical Operations (off the LAC ERIE), during the same period sampled the rivers inaccessible by water and rivers conveniently sampled by land. Sampling was conducted during spring runoff and carried out over a two-year period. In 1975, Canadian Rivers in Lake Erie, Lake Huron, Georgian Bay and Lake Superior were sampled.

From the LAC ERIE, Technical Operations personnel safely piloted the Boston Whaler to each river mouth where all personnel participated in describing the terrain, recording Secchi disc readings and stream flow measurements and collection of shipek grab samples. Also, ten-litre water samples were collected separately and filtered through pre-weighted filters for quantitative estimates. At rivers determined by the Scientist-in-Charge and Technical Operations Officer, an integrated water sample (500 to 900 litres, depending on the yield in solids) was pumped into 50 litre containers, returned to the LAC ERIE and fed through a continuous flow centrifuge to recover the water outflow and the particles (approximately 5 grams) in excess of 0.05 microns. The Eh and pH of the water was measured on board the vessel, and the total solids were freeze-dried and, when returned to CCIW, were subjected to the following analyses:

- loss on ignition as a rapid assessment of organic content,
- major elements: Si, Al, Fe, Mn, K, Ca, Mg, P and S,
- carbon (organic and inorganic), nitrogen,
- trace metals: Hg, Pb, Cu, Zn, Ni, Co, Cr, Cd, Be, V, Sr, As, Se,
- particle size and mineralogy (mineralogy on selected watersheds only,
- pesticides. Ontario Pesticide Laboratories are to run scans on Organo-Chlorines and Organo-Phosphates on all samples.

#### PROJECT 5-IW-PR-008

##### WETLAND STUDIES

The object of the Wetland Studies Project is to study the effect of wetlands on changes in the Great Lakes with emphasis on improvement of water quality. This will show the feasibility of using wetlands as storage for sediment dredged from the Great Lakes and to what ability wetlands have for purifying water flowing through them. The Project is headed by Dr. A. Mudroch of the Process Research Division.

The areas of study in 1975 were the west end of Hamilton Harbour, known as Coote's Paradise, and Lake St. Clair Delta marshes near Wallaceburg. Technical Operations assisted in the field sampling for the project which included water, sediment and vegetation sampling as well as coring. The outfitting and operation of the different small craft needed for this project, as well as the operation of the sampling equipment for this project, was also handled by Technical Operations.

PROJECT 5-IW-PR-021

AUTECOLOGY OF SHELLED INVERTEBRATES

This project, "Autecology of Shelled Invertebrates - Baseline Inventory" was supported by three summer students hired by the Technical Operations Section to assist Dr. L.D. Delorme, the project leader. A large area of South Eastern Ontario was sampled for shelled invertebrates (Ostracodes and Molluscs) as well as the pond water for the chemical and physical habitants in which they live. The survey was conducted from various field bases throughout the summer, including Welland, London, Chatham, Orillia, North Bay, Pembroke, Cornwall, Kingston and Peterborough areas.

Trailerable boats and sediment sampling equipment were used to collect the samples and a trailerable lab set up at each base camp was used to separate the collected invertebrates and to measure some physical and chemical parameters of the samples. Water samples were also returned to CCIW for further analyses.

The following parameters were measured in the field:

Carbonate	Bottom water temperature
Bicarbonate	Surface water temperature
Dissolved oxygen	Air temperature
Carbon dioxide	Secchi depth
pH	Distance from shore to sampling site
	Depth of water at sampling site

PROJECT 5-IW-PR-024

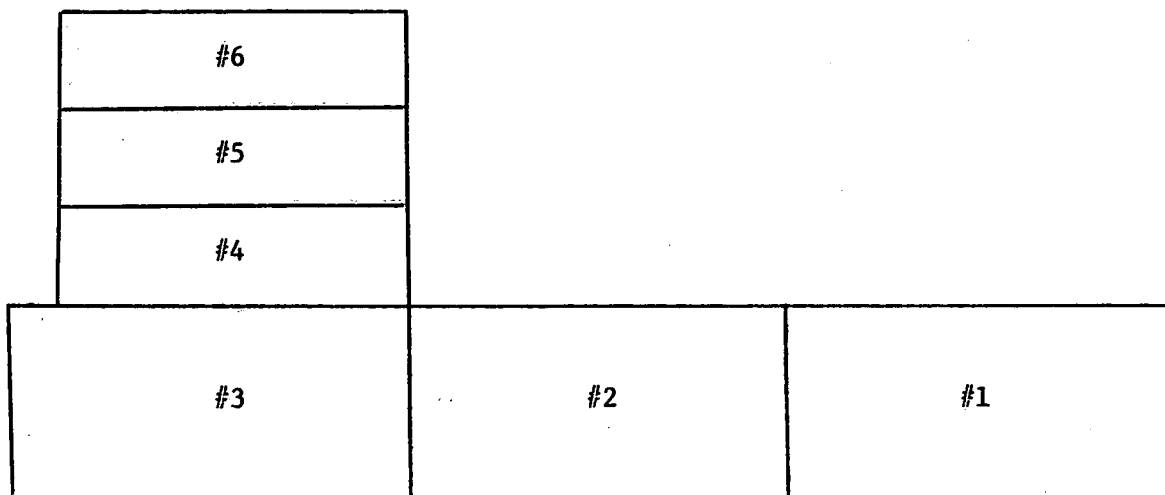
LAKE ST. GEORGE

The main objective of this program was to develop relationships between the movement of nutrients and the response of lake communities. The two previous years were spent in the Bay of Quinte on eutrophic waters that did not stratify and were without anoxic water over the sediments. These conditions are typical of nearshore conditions and much of Lake Erie. Since the effect of thermal stratification could not be predicted from the data in the Bay of Quinte the program was moved to Lake St. George (a small lake north of Toronto which is restricted to public use and owned by the Metro Toronto Conservation Authority).

Technical Operations Responsibilities

Technical Operations was assigned this program in early May whereupon the task was to establish a field site on the location as described above.

Three mobile lab trailers were moved to the site and set up with hydro facilities. Upon completion of the lab set-up a floating platform was set up in the lake. This was to house a generator for power, hut for electronic recorders, met. tower and D.O. profile system. The platform consisted of six floating docks situated as in the drawing below. Dock number one housed the met. tower, number two the dissolved oxygen profiler, four and five the electronic hut and number six the generator.

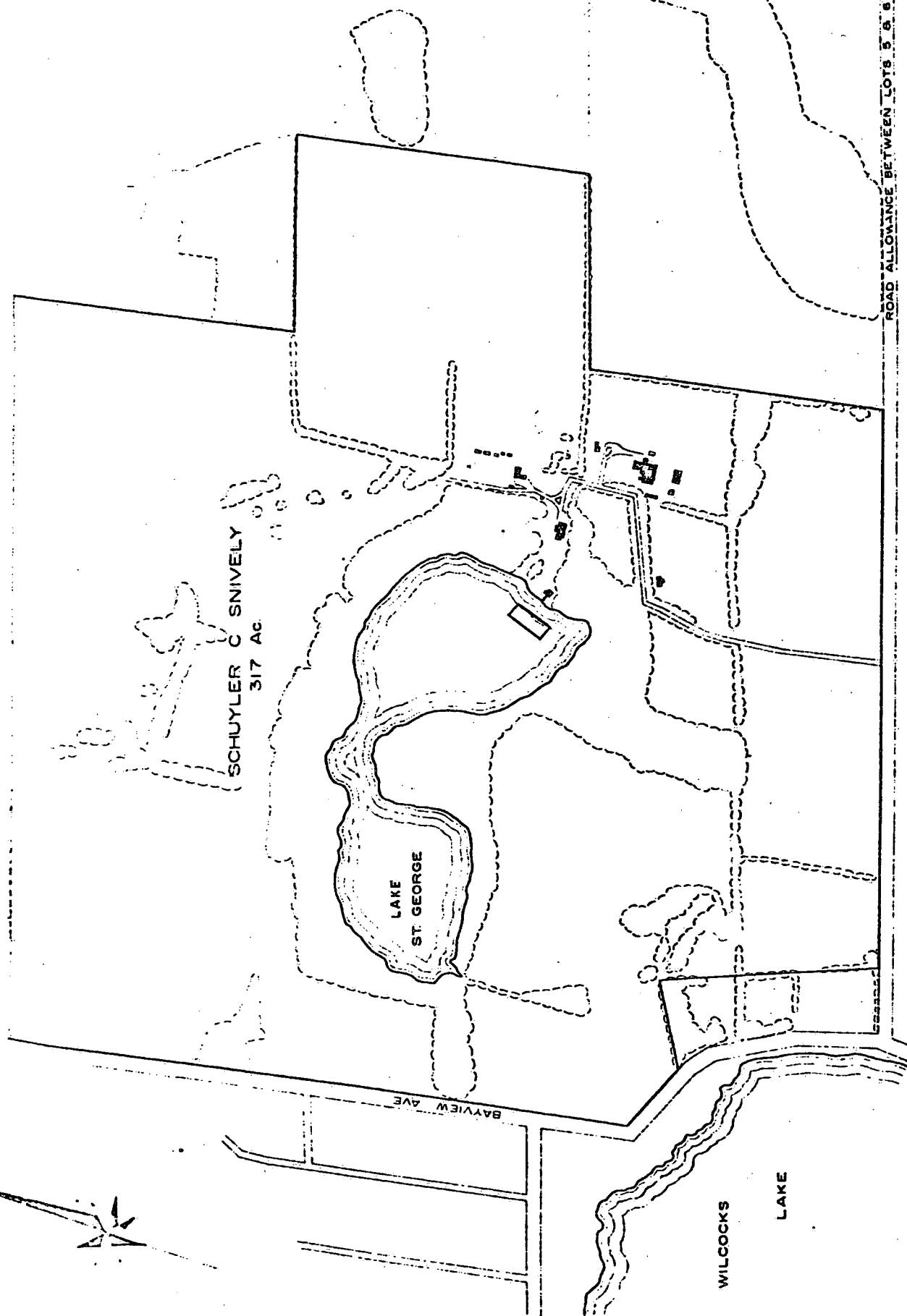


After the site was set up and working Technical Operations was responsible for the collection of all sediment and water chemistry samples plus running preliminary analyses. A weekly schedule was set up in the following manner:

- Monday: Pore water samples for filtered and unfiltered phosphorus. From depths of 1, 2, 4 and 6 metres cores are taken. The top six centimetres subdivided in two centimetre intervals and put in centrifuge tubes and run through the Sorval centrifuge for twenty minutes. The water drained from the tube and divided 5 ml for filtered and 5 ml for unfiltered and return to CCIW.
- Tuesday: Weekly samples taken at four major stations for Water Quality analyses of trace metals filtered and unfiltered, phosphorus filtered and unfiltered, major ions, sulfides, carbon and nitrogen from 1, 4, 7, 10, 14 metres. All samples are preserved and transported to CCIW the same day.
- Wednesday: Run Primary Production using  $C_{14}$  light and dark bottles and dissolved oxygen light and dark bottles.  $C_{14}$  incubated for six hours and dissolved oxygen incubated for twelve hours.
- Thursday: Eight sediment traps retrieved from one metre off bottom and run through Sorval centrifuge at a half hour per sample. Dissolved oxygen light and dark bottles titrated using the Winkler method for the Primary Production bottles used on Wednesday.

WHITCHURCH TWP  
CONCESSION III

- 27 -



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ROAD ALLOWANCE BETWEEN LOTS 5 & 6

Friday: Dissolved oxygen profile run using Y.S.I. dissolved oxygen meter and Winkler method on samples at one metre intervals down to 14 metres. Upon completion of this the lab is set up for the following week's samples.

#### Platform Modifications

As was found out the generator's power was too unstable for the instruments and hydro had to be installed. The power situation was explained to Ontario Hydro and the proper spec's picked up. The primary line and connectors were laid by a contractor and final inspection was completed by Ontario Hydro. The power hookups will be completed by February 1. Upon completion of the hookup the site will be in running order with the program following the weekly schedule.

#### PROJECT 5-IW-PR-032

#### ASBESTOS FIBRE REMOVAL

Asbestos is a generic term that applies to a number of hydrated mineral silicates. Chrysotile, a fibrous form of serpentine, which accounts for 95 percent of the world's asbestos consumption is the most common form found in the aquatic environment although relatively large amounts of cummingtonite have been detected in Lake Superior. Chrysotile consists of parallel bundles of submicroscopic fibres about 20 nm diameter which tend to separate on milling or abrading. Consequently, all sizes of fibres are found in the environment from the very finest to those visible with the naked eye. However, the majority of those found in surface water are less than 5  $\mu\text{m}$  long and about 0.1  $\mu\text{m}$  diameter. The crystal structure of the mineral enables it to be differentiated from other fibrous particulates present by electron diffraction.

The origin of the asbestos appears to be a combination of leaching from asbestos mineral deposits and contamination from a multitude of commercial applications, i.e., filters, automotive brake and clutch linings, floor coverings, cement and paper products, textiles, gasket materials. Applications such as these have to be responsible for the  $33.5 \times 10^6$  fibres/l found recently in the top 350 mm of melted snow in Ottawa (Cunningham and Pontefract, 1971).

With the growing concern that asbestos-like fibres in drinking water could be a potential health hazard, methods were developed for removing asbestiform fibres from potable water, based on modifications to conventional water treatment techniques. These included simple sand filtration, diatomaceous earth filtration, chemical coagulation, or combination of these, depending on the degree of removal required. One method, involving chemical coagulation with iron salts and polyelectrolytes followed by filtration, resulted in better than 99.8%, fibre removal from water containing  $12 \times 10^6$  fibres/l<sup>-1</sup>.



Sampling of lake water used for most of the research was carried out by Technical Operations personnel from Lake Superior about 8 km offshore from Silver Bay, Minnesota (CCIW station M203, 1973). It had been previously determined that the concentration of asbestos from a particular station varied with the time of year the sample was collected, the weather in the immediate area and the amount of turbulence from the ships propeller prior to sampling. To minimize these effects, the sample was integrated between 15 and 50 m and sufficient water collected at one time for all of the initial experiments.

Fibre determinations involved elaborate sample preparation, followed by tedious counting of the individual fibres using a transmission electron microscope (TEM). Both Mr. M. Ron Thompson and Mr. H.W. Zimmermann of Technical Operations received extensive training to carry out the determinations.

The concentration of asbestos fibres in the raw lake water was  $12.3 \times 10^6$  fibres/l. A comparison of the electron diffraction patterns of these fibres with those from standard asbestos samples showed the majority to be cummingtonite and the remainder chrysotile (Wagner, Berry and Timbrell, 1973).

Filtration of this water through a sand column comprising of 3 grades of sand reduced the fibre concentration to  $3.5 \times 10^6$  fibres/l. Filtration through a 250 mm column of "brick sand" reduced the fibre concentration to  $4 \times 10^5$  fibres/l. Diatomaceous earth filters were found to be equally or more effective than the very fine "brick" sand for removing the fibres and reasonable flow rates could easily be maintained. Filtration through a 6 mm layer of Hydro-super-cel diatomite reduced the fibre concentration from  $12.3 \times 10^6$  fibres/l.

Coagulation and flocculation was carried out using ferric chloride. Also, it was found that the addition of polyelectrolyte greatly increased the floc size which not only resulted in easier filtration, but better trapping of the asbestos. Lake water which was filtered, flocculated, and refiltered still contained  $9 \times 10^5$  fibres/l whereas water which was flocculated and then filtered contained less than the detectable limit (corresponding to 99.8% fibre removal).

The work described so far is described in the publication: "Removal of Asbestos Fibres from Potable Water by Coagulation and Filtration", J. Lawrence, H.M. Tosine and H.W. Zimmermann, Water and Wastewater Treatment Research Subdivision, and T.W.S. Pang, Physical Sciences Laboratory, Canada Centre for Inland Waters, Burlington, Ontario, Canada. Water Research Vol. 9, pp 397 to 400, Pergamon Press, 1975.

A more detailed study continued and a relationship established between the alum and polyelectrolyte dosages and the residual fibre concentration. The water used in this study was collected from areas known to have high concentrations of asbestos fibres in the water. These areas included: (a) Lake Superior, about 8 km offshore from Silver Bay (Minnesota), containing  $1.2 \times 10^7$  fibres/l mainly cummingtonite and (b) Thetford, Drummondville and Asbestos (Quebec) raw water supplies, all of which contained in the order of  $1 \times 10^9$  fibres/l chrysotile.

Results indicated that both the alum and polyelectrolyte concentrations significantly effect the quality of the treated water. Optimum results were obtained of 0.3-0.6 ppm. Rapid coagulation/direct filtration has been evaluated and the results found to be comparable to conventional treatment employing flocculation and sedimentation.

Work continued to find a relationship, if any, between turbidity and fibre concentration. Artificial asbestos suspensions were prepared which gave a size distribution very similar to that found in Canadian surface water. It was found that asbestos, when present in sufficient quantity does increase the turbidity of water; however, for a given mass concentration, a change in size and total number of fibres present did not result in an appreciable change in turbidity.

It was, therefore, concluded from the data that turbidity measurements cannot be used to monitor the asbestos content of natural or treated waters. This is unfortunate, but not an unexpected finding, as it means that water treatment plant personnel have no quick or easy method to monitor the asbestos content of their water. Details of the optimization turbidity study can be found in the following publication: "Potable Water Treatment for some Asbestiform Minerals: Optimization and Turbidity Data", J. Lawrence, Water Chemistry Section, and H.W. Zimmermann, Technical Operations Section, Canada Centre for Inland Waters, 867 Lakeshore Road, Burlington, Ontario. (In press)

Work continued, resulting in the following publication: "Asbestos in Water: Mining and Processing Effluent Treatment", by J. Lawrence, Water Chemistry Section, and H.W. Zimmermann, Technical Operations Section, Canada Centre for Inland Waters, 867 Lakeshore Road, Burlington, Ontario. Simple, low cost treatment methods, based on sedimentation and filtration, for removing most of the asbestiform fibres in mining processing plant effluents are described.

Initial experiments were carried out using synthetic asbestos suspensions containing approximately the same concentration and size distribution as typical asbestos mine effluents. Results were then substantiated with effluent water collected from specific asbestos mines. It was found that one of the simplest methods for treating effluents containing high concentrations of asbestos was sedimentation, since suspensions containing greater than  $5 \times 10^{10}$  fibres/l settle readily on standing. A small scale, flow-through sedimentation unit was built to evaluate sedimentation characteristics under continually operating conditions. Filtration was through sand, mixed media and diatomite filters. The initial results obtained indicated that with a concentration of  $4 \times 10^{12}$  fibres/l, which is as high as any case histories which have come to our attention, sedimentation followed by mixed media filtration reduced the fibre content to  $10^9$  fibres/l. Sedimentation followed by alum coated diatomite filtration reduced the concentration to  $1 \times 10^5$  fibres/l, and  $3 \times 10^6$  fibres/l for uncoated.

Having illustrated the effectiveness of these treatment methods on synthetic suspensions, the next concern was treatment of water from specific site locations. Sampling was done on several occasions at the Johns-Manville plant, Toronto, on lagoon waters and mine effluents.

Water samples were also obtained from Asbestos, P.Q. and Baie Verte, Newfoundland. By experimentation, it was demonstrated that sedimentation followed by mixed media filtration was very effective for removing most of the asbestos from both mining and processing plant effluent water. In the case of effluents containing  $10^9$  fibres/l or less sedimentation was ineffective in reducing the asbestos content and these waters should be filtered directly.

PROJECT 5-IW-PR-032

ELECTRON MICROSCOPY

(Continued from 1973-74)

Under the general supervision of Mr. T. Pang (presently with The Ontario Ministry of the Environment), the Physical Science Laboratories Section prepared and examined water samples for the enumeration of asbestos fibres by electron microscopy. Water samples from Lake Huron, Georgian Bay, rivers flowing into Lake Superior, Newfoundland, Quebec, Water and Wastewater Treatment Research Subdivision were examined for asbestos fibres, and a total count and size distribution was calculated.

The water samples (250 ml) were ultra-centrifuged. Asbestos fibres were re-suspended in 1 ml of distilled water by sonification, and a one microlite drop of this water was placed on a carbon coated specimen grid and dried in a desiccator. The samples were examined by electron microscopy and the fibres counted; size distribution was calculated by measuring approximately fifty fibres. A CCIW Technical Bulletin #94, "Procedure for Examination of Water and Sediment Samples for Total Asbestos Fibre Count by Electron Microscopy", by M. Ron Thompson, Technical Operations, explains in detail the preparation of samples and mathematical equations for determining the total fibre per litre.

PROJECT 5-FR-BL-017

WASTE HEAT PROGRAM

From April to November 1975, the Ecosystem Metabolism Studies of the Great Lakes Biolimnology Laboratories carried out a Waste Heat Program at Douglas Point Nuclear Generating Plant. The object of the study was to examine the effect of an electrical generating station operation, primarily waste heat discharge upon the Great Lakes ecosystem. The Douglas Point Power Plant is located between Kincardine and Port Elgin on the eastern shore of Lake Huron. The water intake and discharge for this station is fed directly from and back into the lake making it an ideal site for a waste heat study. Similar studies have been carried out at Pickering and Nanticoke Power Plants in 1973 and 1974.

The sampling program used in the 1975 season to examine the effect of the thermal discharge upon the ecosystem of the lake consisted of the following:

a) Acoustic Fish Census

This system was used on the past two waste heat work sites and, subsequently, each year is upgraded. This year, the system was used to give an overall picture of the quantity, size and distribution of the fish in the water column in and surrounding the discharge area.

b) Gill and Hoop Netting

Throughout the field season, one set of gill nets and a hoop net were set just off the discharge channel. Another set of gill nets were placed approximately one mile south of the discharge channel away from the influence of the plume. The species, size of individual fish and quantity of the overall catch was recorded. The most predominant species captured throughout the season was the "sucker".

c) Zooplankton

The Schindler trap was used to collect zooplankton samples to determine composition and population abundance of the species in and outside the effluent area. The "Haney" grazing chamber was used for the collection of animals in the study of the feeding habits of the zooplanktons. This study was taken at the intake/discharge of the power plant.

d) Phytoplankton

Samples were collected from the intake/discharge of the plant from which chlorophyll, plankton enumeration and  $C_{14}$  uptake work was accomplished.

e) Cladophora

A study of the colonization of the algae on natural substrates at the intake/discharge of the power plant and an examination of the effect of thermal history on  $C_{14}$  incorporation was carried out.

f) Larval Fish

Samples were collected from the intake/discharge with a metre net from the surface by towing two 1/2 metre nets from a Joe Boat, and from various depths by towing a metre net over the stern of the CSL AQUA. These samples were collected to determine the species of the fish, quantity of the fish at intake/discharge, density of the fish in and outside the effluent area, density of the fish nearshore and offshore, effect of the plant upon the fish and gut analysis on selected specimens.

g) Bottom Sediment Samples

A Ponar grab sampler was used in the collection of the sediment samples. Because of the bottom structure (rock and gravel), samples were difficult to obtain. The samples collected were sieved, pickled and transported to CCIW for analysis of macro invertebrates.

h) Thermographs

Five thermographs were placed throughout the work area in a depth of 3 - 4 metres of water. The instruments were serviced bimonthly until removed at the end of July.

Launch and Joe Boats

The CSL AQUA plus two Joe Boats were the crafts used to support this program. The CSL AQUA was used for acoustic fish census system, towing of the larval fish net for vertical sampling, bottom sediment sampling, positioning, placement of buoys and collection of plankton and water samples. The Joe Boats were used to: two 1/2 metre larval fish nets on the surface, gill and hoop netting, placement, retrieval and servicing the thermographs, nearshore placement of buoys and collection of water and plankton samples.

Technical Operations Section

Technical Operations coordinated and supported this program with one staff member assigned full time. The field support given consisted of assisting in the undertakings of: radar positioning and buoy placement, water and plankton sampling, collection of larval fish samples, operations of the gill and hoop netting, servicing of thermographs, collection of sediment samples and operation and maintenance of Joe Boats. Some laboratory support was given in the form of sorting and counting larval fish samples and coding of acoustic fish census data.

The transportation of equipment and the laboratory trailer to and from the camp site, Baie du Doré Research Station, was carried out by Technical Operations Rigging Shop. The shop also supplied necessary field equipment such as: generators, wire ropes, buoys, anchors, shackles, thimbles, assortment of sizes of polypropylene ropes and numerous other hardware to the success of the program.

WATER QUALITY BRANCH, ONTARIO REGION

INTERCONNECTING CHANNELS

During 1975 a monitor of major Canada-U.S. interconnecting channels was continued as requested by the International Joint Commission. There should be a knowledge of the chemical conditions and loadings upon the Great Lakes which may be influenced by industrial inputs of the major drainage channels. Stations were set up to isolate suspected inputs and outfalls to show relative differences between lake and river averages. A study of a proposed deep water harbour was also conducted to obtain background values prior to harbour construction. This was implemented so that consequent changes in the ecology of the area (White Fish Bay, Lake Superior) could more easily be understood. Sediment sampling stations were occupied along the major rivers to evaluate long term trends which may have influenced the environment. A comparison study between an automatic Rosette sampler and three monitor transects at Niagara-on-the-Lake was set up. The "Rosette" collected a pumped sample every 4 hours. Since it was on trial this system was to be cross-checked with the 16 monitor stations on the three transects. These studies were implemented by the Water Quality Branch at CCIW. Among the river systems monitored were:

<u>RIVERS</u>	<u># STNS.</u>	<u># OF TIMES/YR.</u>	<u>TOTALS</u>	<u>ANALYSES</u>
Sault Ste. Marie Upper	26	2	52	A - G
Sault Ste. Marie Lower	40	2	80	A - G
St. Lawrence	69	1	69	A - G + Micro. NTA, PCB
Niagara Upper	20	4	80	A - G + Micro. NTA, PCB
Niagara Lower	16	8	128	A - G + Micro. NTA, PCB
	—	—	—	
	171	17	409	

Sampling Parameters

The monitor plan was set up in groups A to G with each transect being a known distance from a reference point. The groups were:

Group A: Temperature, conductivity, pH, dissolved oxygen, turbidity and Secchi readings.

Group B: Total phosphorus filtered and unfiltered, orthophosphate, nitrate and nitrite, total kjeldahl nitrogen, particulate organic nitrogen, reactive silicate and ammonia.

- Group C: Potassium, sodium, calcium, magnesium, bicarbonate, chloride, sulphate and chlorophyll.
- Group D: Trace metals being iron, manganese, nickel, copper, lead, zinc, cadmium, arsenic, selenium and mercury.
- Group E: Nitrilo-tri acetic acid, pesticides and poly-chlorinated biphenols.
- Group F: Total coliform and fecal coliform.
- Group G: Cyanide and phenol.

#### Sediment Analyses

A U.S. river bed sampler was used to collect bottom samples during these studies.

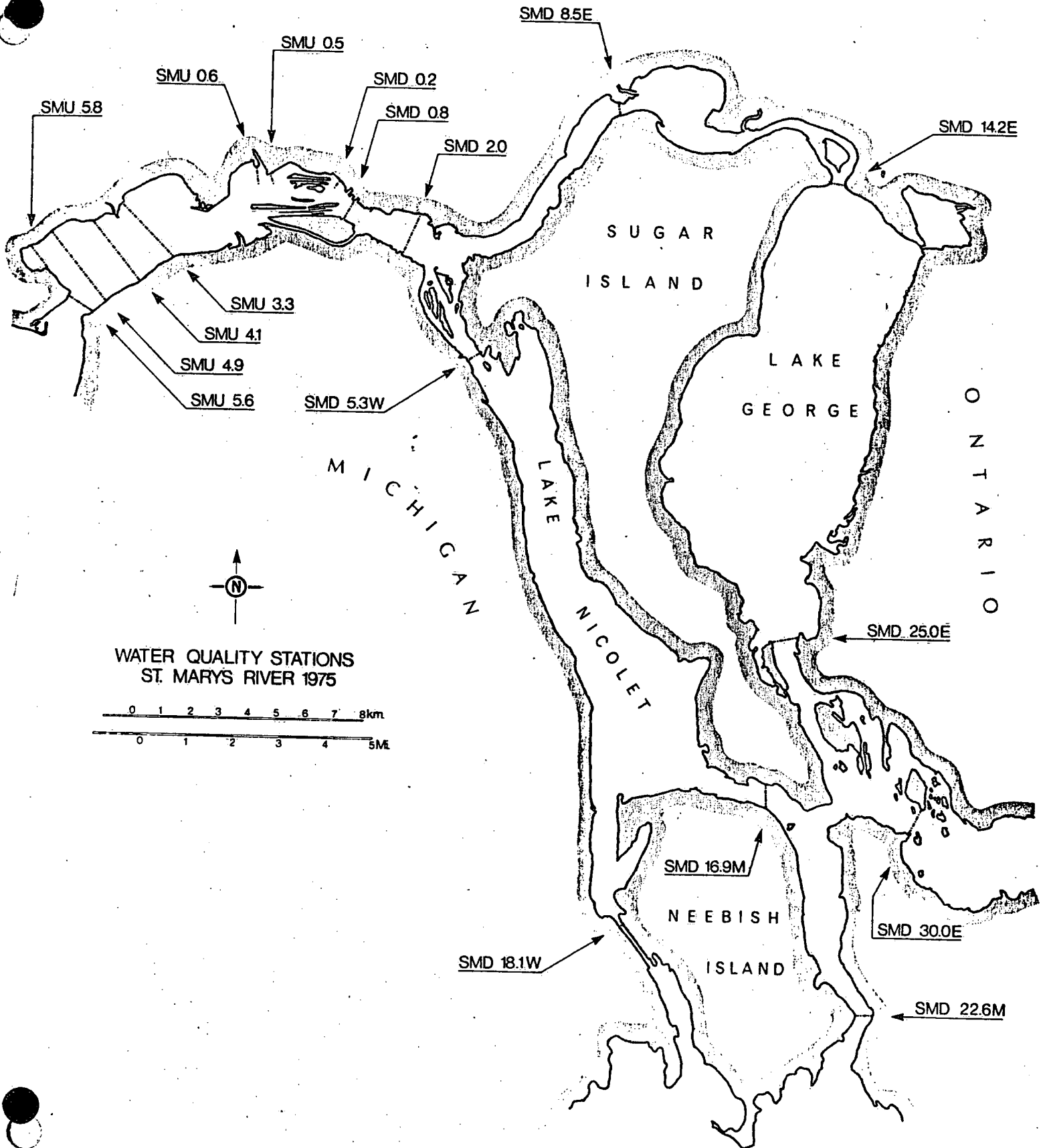
The analyses on these samples were:

- a) Total phosphorus,
- b) Chemical oxygen demand, volatile solids, radioactivity, oil and grease,
- c) Phenols, cyanide, pesticides and poly-chlorinated biphenols,
- d) Trace metals including mercury, lead, iron, copper, nickel, zinc, cadmium, arsenic, selenium, chromium and manganese.

#### Technical Operations Role

Support to this project was given in several ways:

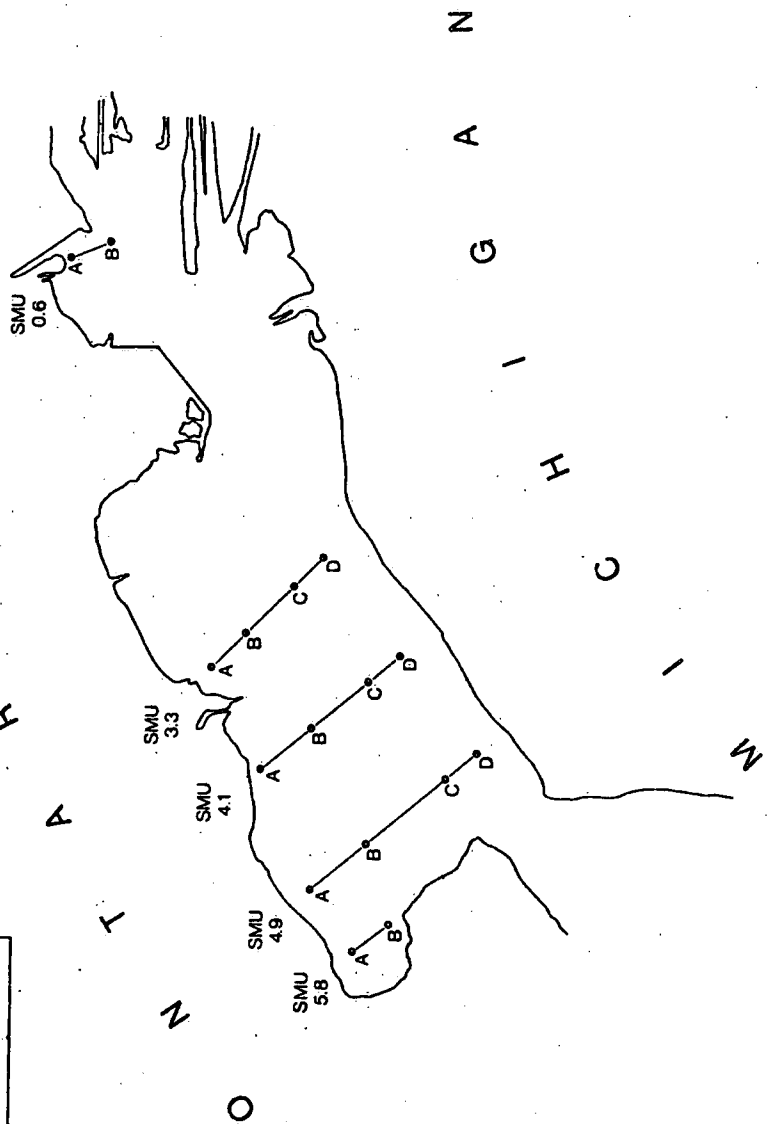
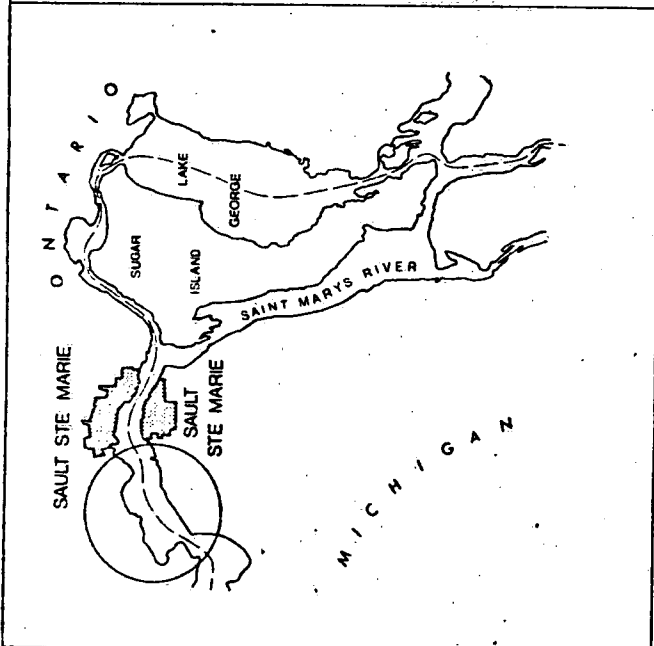
1. Logistic support was supplied for movement of both the Microbiology trailer and the Water Quality Branch trailer.
2. Operated the launch MONARK and maintained same.
3. Gave assistance in taking temperatures, phenols, Secchi's and sediment samples. Help was given with all other samples whenever possible.
4. Technical Operations supplied van for towing the MONARK and carrying water samples.
5. Gave advice and assistance at all times in cases of priority for re-scheduling of day's program, e.g. weather, safety matters.
6. Automatic Rosetté sampler station was set up by Technical Operations divers.





# SAULT STE MARIE DEEP WATER HARBOUR STATIONS

1975



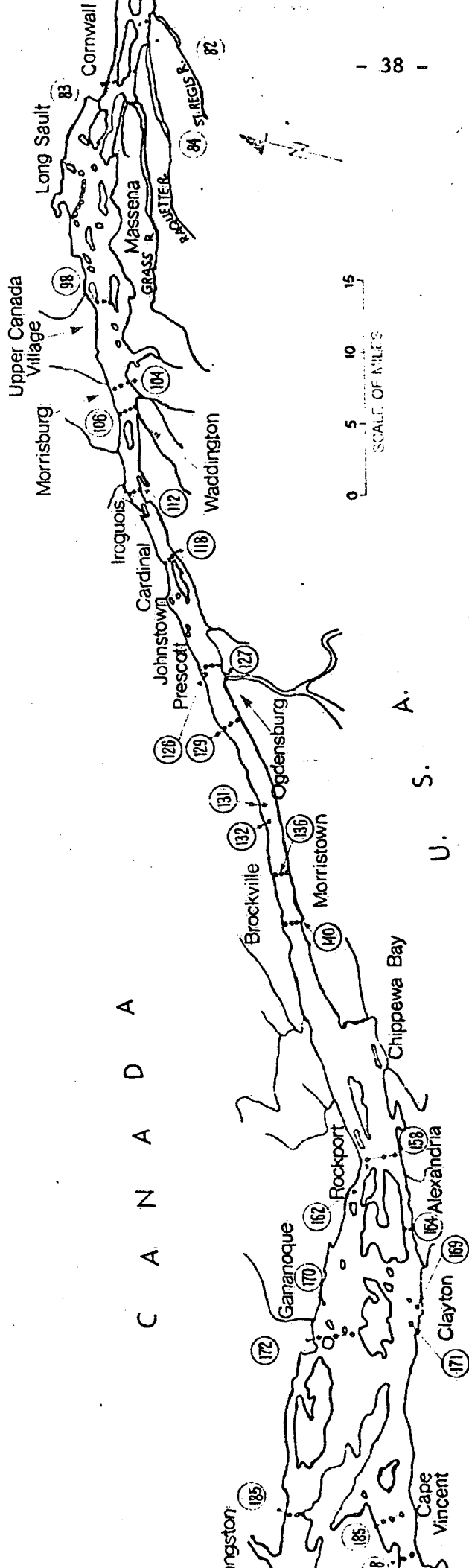
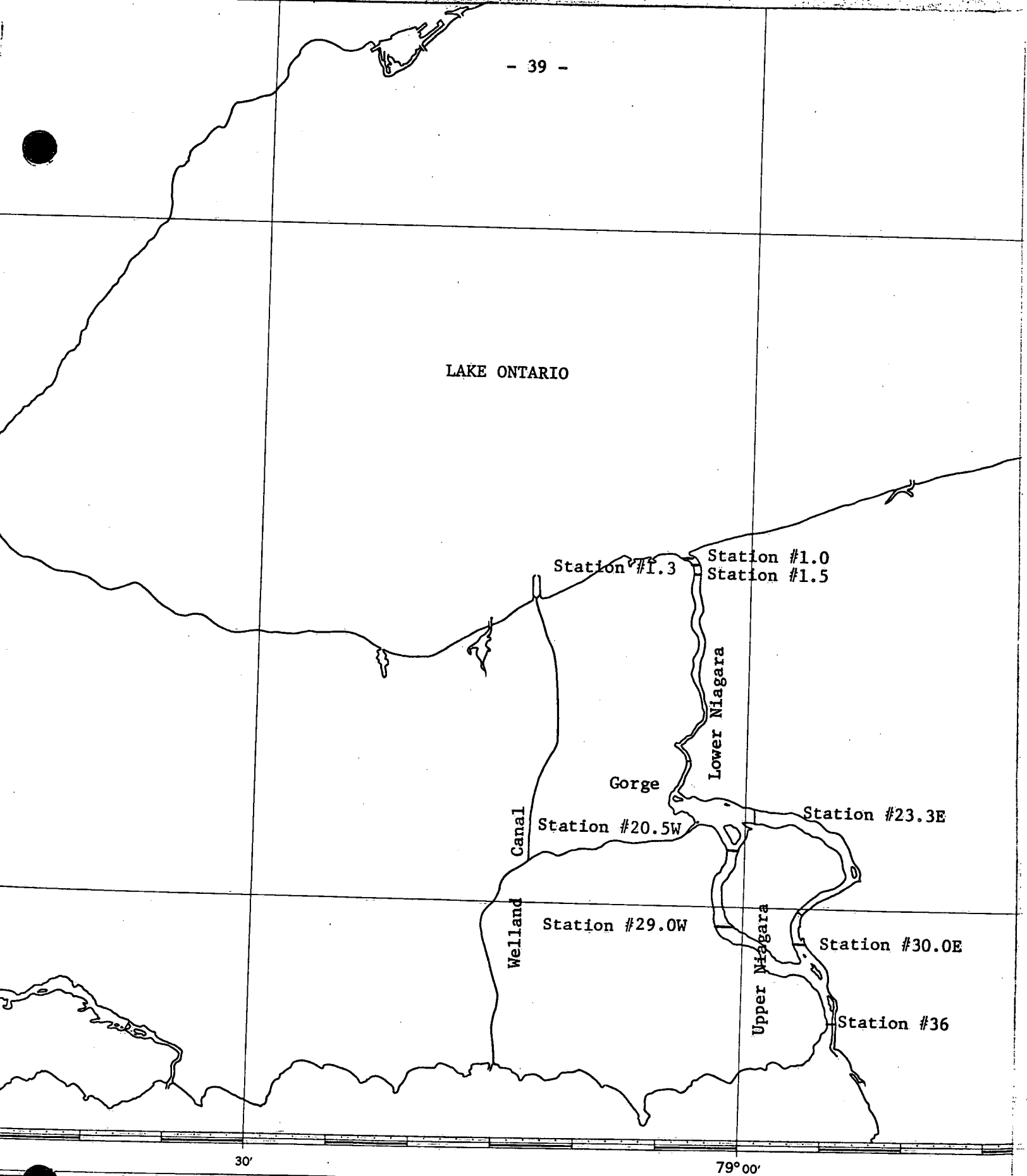


FIG. 4 LOCATION OF SAMPLING RANGES AND STATIONS, ST. LAWRENCE RIVER

LAKE ONTARIO



30'

79° 00'

OCEAN & AQUATIC SCIENCES, CENTRAL REGION

JAMES BAY PROJECT

The objective of this project was to examine mixing in the estuaries of the Eastmain and La Grande rivers, to provide a baseline for predicting changes caused by the diversions and large scale modifications of the fresh water discharges associated with the James Bay Hydro-Electric Project.

For the months of July, August and half of September one Technical Operations personnel was assigned to this project and worked the eastern part of James Bay, from Eastmain to Fort George. Temperature, salinity, current speed and direction were measured hourly at specific stations over a 13 hour period to cover one tidal cycle. The CSL STURDY was used to support this project.

Equipment was refurbished and modified as required at CCIW in Burlington, sent to Moosenee the beginning of July for the survey, and returned to CCIW in September. A truck was sent to return the gear from Fort George at this time, although some was stored for next year's project.

The survey was started in the Eastmain region and about half way through the period moved to the La Grande estuary (i.e. Fort George). Technical Operations coordinated the survey and performed many of the sampling and analyses. Breakdowns, malfunctions and weather adversely affected the schedule of observations, but all major observations were obtained.

SUMMARY OF PROJECTS REQUIRING MINOR

TECHNICAL OPERATIONS SUPPORT

Although this is not a complete listing of all the minor projects supported, it indicates the type of projects which Technical Operations have coordinated with other projects or have been fitted in around both the project needs and availability of personnel and equipment to provide the support. These are CCIW projects only.

Project 5-IW-AR-002, Radionuclides in the Upper Lakes, Dr. R. Durham. Water, plankton and fish samples were obtained at various times throughout the year and coordinated with both ships scheduling and shore based projects.

Project 5-IW-AR-027, Determination of Purines and Pyrimidines in Sediments, Dr. R.S. Tobin. Benthos cores were obtained from both Lakes Huron and Erie, coordinated with ship scheduling in these areas.

Project 5-IW-AR-051, Improvement of Optical Studies in both Process and Applied Research, Mr. H.W. MacPhail. A multiscan transmissometer was developed and built, and field trials were conducted over several days, the scheduling being coordinated with existing projects.

Project 5-IW-AR-054, Evaluation of Water Quality Instrumentation Using Satellite Data Collection Platform, Mr. H.W. MacPhail. The erection of a tower and installation of a water quality monitor was accomplished in the Bay of Quinte area of Lake Ontario by the Dive Unit.

Project 5-IW-AR-056, Development of Multi-Purpose Optical In Situ Instrument, Mr. H.W. MacPhail. This was strictly a development project in which Technical Operations input was provided through project meetings.

Project 5-IW-PR-015, Effect of Land Disposal on Physico-Chemical Properties of Fine Grained Spoil, Mr. A.J. Zeman. This two week project was supported by Technical Operations and consisted of sediment sampling in the area as well as collecting core samples from the island created by the dredging spoil. Samples were collected from "Toledo Island", the area of interest.

Project 5-IW-PR-016, Support Geophysics, Mr. R.K. McMillan. This included various support from both LIMNOS, and LAC ERIE primarily for Seismic and Side-scan trials. It was during side-scan sonar trials that the position of the "Hamilton-Scourge" wrecks of the war of 1812 were firmly located.

Project 5-IW-PR-018, Identification of Persistent Organics, Dr. W. Strachan. Samples were collected from various streams and rivers flowing into Lake Ontario. These samples were collected as required in spite of only 24 hours or so notice.

Project 5-IW-PR-023, Bay of Quinte Nutrient Study, Dr. D. Lean. This project, actually run by Dr. S. Guppy, involved one meteorological buoy system.

Project 5-IW-SS-001, In Situ Water Quality Measurement Package, REX, Mr. K. Birch. Support trials were conducted off the wall at the CCIW slip. A trailer was used for electrical and computer hook-ups and personnel from the Rigging Shop installed the package.

Project 5-IW-SS-008, Integrated Active Towed Body System Engineering, Mr. A.E. Pashley. Shipboard trials of this undulating towed body were conducted from the LIMNOS.

Project 5-IW-SS-010, Vertical Automatic Profiling System, VAPS, Mr. A.E. Pashley. This was a development project and Technical Operations were involved in the planning of this system. The immediate projected use of this system is Kootenay Lake, British Columbia.

Project 5-IW-SS-013, Limited Capacity Buoy Program, Mr. A.S. Atkinson. Mr. W.B. Taylor of the Technical Operations Section provided the operational expertise in this project through the CCIW Buoy Committee.

Although the previous description of Unit and project support provided by Technical Operations covers the majority of 1975's activity, there were many small tasks that have not been documented. These include such items as daily sampling trips, pick up and delivery of equipment by truck, boat and trailer hauling and contingency requirements from various sources. Technical Operations, due to its unique position of coordinating all field programs and having its own internal support facilities, has accomplished these tasks with dispatch.