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AERIAL SURVEYS OF LAKE ONTARIO WATER  
TEMPERATURE AND DESCRIPTION OF REGIONAL  
WEATHER CONDITIONS DURING IFYGL —  
JANUARY, 1972 TO MARCH, 1973

By:

J.G. IRBE and R.J. MILLS

CLI 1 — 76

DOWNSVIEW, 1976





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# AIRIAL SURVEYS OF LAKE ONTARIO WATER TEMPERATURE AND DESCRIPTION OF REGIONAL WEATHER CONDITIONS DURING WINTER JANUARY 1972 TO MARCH 1973

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**AERIAL SURVEYS OF LAKE ONTARIO WATER  
TEMPERATURE AND DESCRIPTION OF REGIONAL  
WEATHER CONDITIONS DURING IFYGL**

**JANUARY, 1972 TO MARCH, 1973**

**SUMMARY**

This publication contains 61 surface water temperature maps of Lake Ontario. The maps were produced from Airborne Radiation Thermometer (ART) survey flight data, obtained during the International Field Year for the Great Lakes (IFYGL) period, from January, 1972 to March, 1973. The survey flights were conducted at weekly intervals, whenever weather conditions permitted.

The surface water temperature maps are presented together with meteorological data and a narrative on the progression of weather systems through the Great Lakes region during IFYGL. The isotherm patterns of the surface water temperature, as determined by ART surveys, are discussed briefly, with reference to present and antecedent weather, and some conclusions and inferences are made on how the surface water temperature structure in Lake Ontario reacts to changes in meteorological conditions.

**LEVÉS AÉRIENS DE LA TEMPÉRATURE DE L'EAU  
DU LAC ONTARIO ET DESCRIPTION  
DES CONDITIONS MÉTÉOROLOGIQUES  
RÉGIONALES DURANT L'AIEGL'**

**Janvier 1972, au mois de mars 1973**

**Résumé**

Cet exposé contient 61 cartes de la température de la surface de l'eau du Lac Ontario. Ces cartes ont été tracées à partir des données obtenues des vols de thermomètre à rayonnement infrarouge aéroporté (TRA) qui ont eu lieu pendant l'année internationale pour l'étude des grands lacs (AIEGL) qui a duré du mois de janvier 1972, du mois de mars 1973. Ces levés aériens hebdomadaires eurent lieu lorsque les conditions météorologiques leurs étaient favorables.

Les cartes de la température de la surface de l'eau ainsi que les données météorologiques et un compte-rendu des systèmes météorologiques qui ont passé par la région des grands lacs durant l'AIEGL sont ci-inclus.

Les tracés des isothermes de la température de la surface de l'eau, tels que déterminés par les vols du TRA, sont discutés brièvement dans le contexte de la situation météorologique présente et antécédente. La réaction de la structure de la surface de l'eau dans le Lac Ontario aux changements dans les conditions météorologiques est aussi élaborée.



## INTRODUCTION

The Atmospheric Environment Service (AES) of Environment Canada has conducted monthly ART surveys on the Great Lakes bordering on Canada since 1966. During the six years of operation prior to IFYGL, the capability of the ART program to acquire temperature data of better than 1° Celsius accuracy from a large water surface, within a short (4 to 6 hour) survey time, had been demonstrated conclusively.

The basic concept of IFYGL called for simultaneous acquisition of diverse scientific data by all available means on Lake Ontario and its drainage basin. This required large and expensive programs that were carried out directly, or funded, by governmental agencies in USA and Canada. The agencies, including AES, undertook programs which lay within their areas of responsibility, and for which they already had the facilities and proven expertise. In line with this concentration of effort, AES suspended regular coverage of the other Great Lakes and committed its ART facilities to a program of weekly surveys of Lake Ontario for the duration of IFYGL.

On the whole the program achieved its objectives, although the schedule of evenly spaced weekly flights could not be always adhered to as planned. Flight postponements, caused by persisting bad weather, introduced several lengthy gaps between surveys.

Some surveys had to be terminated part way through the flight, due to weather or problems with equipment.

It was already known from past experience that poor (sometimes unpredictable) weather, malfunctioning equipment, and the physical stress imposed on the crew in low level turbulent flight conditions are unavoidable difficulties inherent in ART operations. Furthermore, it was recognized in advance that, by setting the operational goal at a complete weekly survey over a fifteen month period, these difficulties would be augmented, and maximum effort and perseverance would be required to overcome them. Therefore, credit must be given to the people who, despite difficulties with weather and equipment, attained the maximum survey completion rate possible. The technicians in the Lakes and Marine Applications Section — Don Massey, Tom Cutler and Dave Barr worked hard to complete the program.

In this kind of a broad study of the complex interrelationships between the atmosphere and a large lake, all the salient (and interdependent) factors must be considered. This is usually a more difficult task than dealing with specific areas of the problem. Of necessity, completion of this study required the participation of many people. Mr. T. L. Richards, Chief of Hydrometeorology and Marine Applications Division, Mr. J.A.W. McCulloch, Head of Lakes and Marine Applications Section, and meteorologist M.E. Lalande contributed their knowledge in meteorology and hydrometeorology to make this work possible.



## HISTORICAL BACKGROUND

Two of the world's most precious life-sustaining resources are air and water. For many years now, as our awareness of their great importance has grown, so has the quest for understanding the processes governing the dynamics of the atmosphere and hydrosphere and the interaction between the two. We also want to assess the quantity and quality of the two resources, and how man's activities are depleting and degrading them.

During the past two decades, concern for the environment and the need for better water resources management has grown perhaps nowhere else as much as in the Laurentian Great Lakes region. This concern has generated a rapid expansion in scientific research related to the Great Lakes, and a growing commitment by governmental agencies to the task of collecting and processing the data necessary for that research.

In nearly all studies of the physical and biological factors that determine the nature of the air/water environment of the Great Lakes, the temperature of the large water masses is a significant parameter.

In the early 1960's, pursuant to demands for a more accurate assessment of the water budget and for research of air/water interaction processes in the Great Lakes and their drainage basins, AES (at that time the Meteorological Branch, Department of Transport) established a Lakes Investigation Unit (now the Lakes and Marine Applications Section) in the Hydrometeorology Division. This Unit was charged with the responsibility to develop programs and instrumentation and to conduct research projects on the Great Lakes.

Water temperature data from the Great Lakes was a prerequisite for successful conduct of many of the studies initiated at that time. Real-time information on the lake — wide surface water temperature distribution in the Great Lakes was needed in order to assess the immediate results of day to day interaction between a changing atmosphere and the large water surfaces. Studies based on a longer time scale, such as the climatology of the Great Lakes basin, the general regimes of various parameters and hindcasts required several years of historical record of the water temperature

of the Great Lakes. In both types of application it was essential that the temperature data be collected synoptically and at regular intervals.

The conventional method of measuring the water temperature on one of the Great Lakes entailed an expensive monitor cruise of several days duration by a large ship. This method was obviously too expensive for regular coverage of all the Great Lakes. Furthermore, very little historical temperature data were available from the deep water regions of the Great Lakes. The only definitive work in this area had been done by Millar (1952), who used water intake temperature records of commercial ships plying the Great Lakes in the late 1930's and early 1940's.

A faster and less expensive method to measure water temperature of the Great Lakes had to be developed before a program of regular synoptic coverage could be realized. Fortunately, inexpensive portable infrared sensors were becoming available for civilian use at that time. The Lakes Investigations Unit obtained a Barnes Engineering model IT-2S infrared thermometer and tested it for airborne use over large water surfaces in 1964 and 1965. (Richards and Massey, 1966; Richards, 1966). Simultaneously with the airborne test, a reasonably accurate and simple method of correcting the infrared thermometer readings for atmospheric attenuation was developed by Shaw (Shaw, 1966; Shaw and Irbe, 1972).

After completion of the development phase, which proved that the airborne system is capable of lake — wide, nearly synoptic surveys of the surface water temperature to within 1°C absolute accuracy, the operational phase of the ART program was started in 1966. The program consists of monthly surveys of the Great Lakes bordering on Canada during the ice-free season.

The water temperature data accumulated during the first four years of operations have been published in two issues of the Climatological Studies series of AES (Richards, et al., 1969; Irbe, 1972a). These publications also describe the ART technique and list some of the data uses. The ART data have been used subsequently to develop maps of monthly mean surface water temperature of the Great Lakes (Webb, 1970, 1972, 1974, 1975), and to estimate monthly evaporation from the Great Lakes (Richards and Irbe, 1969).



## THE IFYGL PROGRAM

The IFYGL concept was born at the start of the International Hydrological Decade (IHD), which ran from 1965 to 1974. In many ways IFYGL was unique among the IHD – sponsored programs. The purpose of IFYGL was to carry out, on an unprecedented scale, an intensive and all – encompassing environmental study on one of the Great Lakes. Lake Ontario was selected for the study.

International co-operation between a large group of governmental agencies, universities and individual scientists in USA and Canada was required to set up and carry out this ambitious undertaking. The formation, growth and final results of the IFYGL program can be appreciated best by referring to the many reports on it, including those by Richards (1967a, 1967b), Richards and Drescher (1972), McCulloch (1973), Ludwigson (1974), and the numerous reports by the Canadian and USA IFYGL Centres on the findings of various scientific studies.

AES contributed to IFYGL through many different projects, one of which was the weekly ART surveys of Lake Ontario. Due to budgetary limitations, the commitment to weekly flights of Lake Ontario precluded coverage of the other Great Lakes during IFYGL. However, the benefits accruing from intensive coverage of Lake Ontario over a fifteen month period outweighed the loss of data from the other lakes. The officially designated data – gathering period of IFYGL extended from April, 1972 to March 31, 1973. But, because no ART surveys are flown on the other Great Lakes in the winter months, the weekly flights on Lake Ontario were started in January, 1972.

## TECHNICAL INFORMATION

The technical aspects of the ART program are given here in a summarized form. Detailed description of the instrumentation, in-flight procedures and data analysis techniques has been given by Irbe (1972b). The ART technique is also described by Richards and Massey (1966) and several other publications, referred to elsewhere in the text.

Briefly, a Barnes Engineering model PRT-5 infrared thermometer, coupled with a Honeywell model Elektronik 19 strip chart recorder were installed in a twin engine Aztec-C aircraft. Aircraft 12V DC power was converted to the required 115V 60HZ (standard line power) by a Powercon inverter.

The survey flights were staged from Buttonville airport, which is located about 25 kilometres north of Toronto, Ontario. Usually the surveys commenced near the west end of Lake Ontario, at Bronte. Occasionally, due to the dictates of weather, the flight track was reversed. The flight track approximated a north – south parallel line pattern, with a spacing of about 30 kilometres (Fig. 1). The average non-stop flight time required to complete the survey was six hours. Usually the flights started between 0800 and 0900 local time. The surveys were conducted at standard operating heights of 300 or 150 metres above the surface of the lake; the lower level was used only when the cloud base was too low for operating at the 300 metre height.

## GREAT LAKES WATER TEMPERATURE AND WEATHER

### Seasonal Relationship

The surface water temperature of the Great Lakes shows large seasonal changes. In the winter months the lakes are at least partially covered by ice; in the summer, maximum temperatures can exceed 25°C in shallow near-shore waters. The seasonal changes result mainly from the heating and cooling processes occurring at the lake surface (Hutchinson, 1957; Rodgers and Anderson, 1961).

The lakes gain heat mainly by absorption of solar radiation and to a much lesser degree by convective and conductive transfer from the atmosphere. Heat is lost at the surface by long wave radiation, evaporation, and by sensible heat transfer to the atmosphere. As a result, the seasonal variations in surface water temperature follow the seasonal variations in solar radiation and air temperature, although with a considerable time lag.

The seasonal water temperature regime of Lake Ontario has been described by several authors, including Millar (1952), and



Rodgers and Anderson (1963). More recently, Webb used ART survey data to generate monthly mean surface temperature isotherm maps of Lake Ontario (Webb, 1970).

### Migratory Weather Systems and Water Temperature

Although the annual long-term surface water temperature of a lake can be represented by a smooth curve, in actual fact, the daily rate of change in temperature can be very erratic and often contrary to the normal seasonal trend. The daily fluctuations in the surface water temperature in the Great Lakes are caused by the passage of different weather systems through the region.

The meteorological factors which produce an immediate effect on the surface water temperature are wind, cloud amount, air temperature and humidity. The degree to which any one of these factors, or a combination of several, affects the water temperature, depends on the season of the year and the thermal structure in the lake — at depth as well as on the surface.

The meteorological factors listed above are also the characteristics that describe the nature of an air mass or a weather system. Hence, they seldom remain constant for long periods of time, but rather, change from day to day, or even from one hour to the next, as the weather systems move across a region. Consequently, both the magnitude and the spatial distribution, or pattern, of the surface water temperature are also changing continuously.

### Lake Thermal Structure and Response to Weather Changes

The speed of response of the surface water temperature field to changes in atmospheric conditions varies with the time of year. During some seasons, even moderate changes in meteorological factors produce fast and noticeable responses in surface water temperature. At other times, a relatively small response occurs, and then only after a sustained period of extreme weather conditions, such as strong winds or abnormal air temperature.

The varying degree of sensitivity of the surface water temperature to meteorological factors is determined by the internal

temperature structure of the lake. Lakes located in the temperate zone have distinct winter and summer thermal structures, with intervening periods of spring heating and fall cooling. The four seasonal phases in thermal structure are particularly well defined in the Great Lakes (Millar, 1952; Rodgers and Anderson, 1963).

Late in the cooling phase and during the winter the horizontal and vertical temperature gradients in Lake Ontario are small. In the surface layer the temperature ranges from 0° to 3°, and in the deeper layer it remains near 3°. During this phase changes in meteorological factors produce only minimal changes in surface water temperature. However, meteorological factors do determine the nature and extent of ice cover, which is not constant or permanent, but varies considerably through the winter.

During the spring heating phase water in shallow coastal regions warms up faster than the deep mid — lake water, due to the fact that, given equal amounts of solar energy, the smaller volume of water heats up faster than the large one. While the temperature of the shallow water rises to 4° and more, the deep water remains at less than the temperature of maximum density (4°). A very steep temperature gradient, confined to a narrow zone, is set up along the boundary between the two masses of water. This interface zone, known as the "thermal bar" (Rodgers, 1965), is a common spring feature in the Great Lakes.

As the heating season progresses, the thermal bar moves toward mid — lake and finally disappears from the surface, when the surface temperature of the deep water areas rises above 4°. However, the steep temperature gradient zone, now called the thermocline, continues to exist at some depth below the surface during summer and fall, separating the warm surface layer (epilimnion) from the cold bottom water (hypolimnion), which remains near 4°. This thermal structure is commonly called summer stratification.

During the spring, summer and fall seasons, while the thermal bar and the thermocline are present, the surface water temperature field in the Great Lakes is influenced to a much greater degree by meteorological factors. The temperature of the surface water and the epilimnion has a wide range and a gradient structure. Temperature gradients in a lake are associated with density differences in



the water mass which produce density gradient currents. Generally speaking, the water mass contains more energy than in winter. Some of this energy is dynamic — the water is in constant motion, both in the horizontal and vertical sense.

The surface water temperature pattern is indicative of the large and small scale circulations, and at times, large internal oscillations in a lake. In addition, the surface water temperature, like air temperature, is subject to diurnal variations. Meteorological factors influence the circulation (and thus the surface temperature pattern), as well as the diurnal water temperature range.

### Wind Effects

Wind exerts the major control on the surface water temperature field in the Great Lakes. It is the primary mechanism for setting up and maintaining the large scale general circulation of the water masses and is responsible for variations in the smaller short duration surface currents. The major currents can, in turn, create significant temperature gradients.

The theoretical aspects of wind-driven circulation in lakes are presented by Hutchinson (1957). Circulation, currents and the associated temperature gradients have been studied extensively in the Great Lakes, and much of this work has been reported on in the proceedings of the annual Conferences on Great Lakes Research, sponsored by the International Association for Great Lakes Research (IAGLR). With reference to Lake Ontario in particular, G.T. Csanady and J.T. Scott have contributed many papers on this subject in IAGLR conferences. A simple summary of the relationship between wind direction and surface currents in Lake Ontario can be found in a report by Casey, Fisher and Kleveno (1965).

Wind is also responsible for creating zones of upwelling cold water (tilting and exposure of the thermocline) along the upwind shorelines, and for piling up of warm surface water on the downwind shores in the Great Lakes. Similarly, distribution of winter ice cover is governed mainly by wind.

Wind provides the energy for mixing in the surface layer of water, thus contributing to the downward or upward transport of

heat, depending on the season. The surface water temperature can be lowered in the summer by mixing of cooler sub-surface waters into the warm upper layer, and raised in the winter by mixing the warmer sub-surface waters into the cold upper layer. Conversely, the absence of wind slows down the transport of heat through the top layer of water. The very surface (or "skin") temperature can be unusually high on a calm sunny day in summer; and the surface cools faster on a calm, clear and cold night, accelerating ice formation in the winter.

### Cloud Cover

As stated before, the lake surface is heated mainly by absorption of solar energy. On a daily basis, the maximum amount of solar radiation available under a clear sky varies with the season. The actual amount of radiation reaching the lake surface can be considerably reduced by cloud cover, and the surface water temperature is affected accordingly. Cloud cover reduces the diurnal range of water temperature by inhibiting daytime heating and night-time cooling. A prolonged period of overcast sky depresses the temperature in spring and summer months, but in the late fall and winter it may reduce heat loss from the surface and keep the temperature above normal.

Besides the cloud cover that is associated with the passage of atmospheric fronts and low pressure systems, large bodies of water, such as the Great Lakes, often generate their own local convective cloud cover by processes of heat and moisture exchange with the overlying atmosphere. Locally generated cloud cover and precipitation occurs frequently over the Great Lakes in winter as the result of cold air passing over the relatively warm water surface. In spring and early summer condensation fog is often produced when a warm moist air mass comes into contact with the relatively cold water surfaces.

Under a different set of conditions the Great Lakes create a locally cloud-free environment, as opposed to the surrounding land surfaces. This occurs mainly in the summer, during periods of generally fair weather. Formation of the typical fair weather cumulus clouds that occurs over land, due to daytime heating and convection, is inhibited over the lake surface which remains relatively cool.



## Air Temperature and Humidity

The temperature and moisture content of the air mass overlying a lake determine the amount and the direction of transfer of energy between the water surface and the atmosphere. As different air masses migrate across the Great Lakes region, the temperature and humidity change, changing the rate and direction of energy transfer as well.

The energy transfer processes are: sensible heat transfer (generally from the water to the atmosphere and mainly in the winter), evaporation (from the water to the atmosphere), and occasionally condensation (from the atmosphere to the water and mainly in the spring). The mean monthly rates of energy exchange between Lake Ontario and different air masses vary considerably, as shown by Phillips (1973). Therefore, air temperature and humidity have a direct and considerable effect on the surface water temperature.

## THE IFYGL STUDY

### Weather History

At the outset of this study a systematic analysis of the meteorological parameters observed at three stations located near Lake Ontario was performed at 3-hourly intervals, for the entire study period, from January 1, 1972 to March 31, 1973. In addition, the mean air temperature and its departure from normal was calculated for each day, and also the 5-day and 30-day air temperature means and departures from normal for the respective periods preceding an ART survey.

Afterwards, when the weather history was structured into a continuous narrative format, the meteorological conditions were summarized whenever there were no significant changes in the weather pattern, or when there was no specific need to go into details. More detailed descriptions, with reference to wind, cloud amount, precipitation and air temperature are often given for days on which ART surveys were made.

The daily, 5-day and 30-day air temperature means and departures from normal serve as useful indices of present and antecedent weather conditions. They provide a qualitative measure of the relative warmth or coldness for specific periods of time. If the departures are large, they may have special significance, when taken in context with other meteorological parameters, with respect to trends in surface water temperature.

### Comments on Water Temperature

Considering the fact that the surface water temperature field of a lake is changing almost continuously, the isothermal map of any one ART survey of Lake Ontario is only a spot sample in time, representative of conditions during a six hour period. Taking the isothermal maps of two surveys which are separated in time by several days, no definite conclusions can be drawn concerning the manner or rate of change, if any, in the surface water temperature field; unless, additional information is available on the temporal variations in water temperature during the intervening period. Perforce, descriptions of surface water temperature patterns and comments on the probable effects of weather conditions on water temperature are very general and brief. In cases where additional data on the temporal variations in water temperature between surveys were available from other IFYGL projects, more concrete statements could be made on the time and magnitude of change in water temperature and the causative meteorological factors.

The mean surface water temperature and departure from normal are given for completed surveys. As is the case for air temperature, the water temperature departure from normal is a qualitative indicator of normalcy or severity. The magnitude of the departure has no particular quantitative significance, except that in a broad sense, it can be considered as small or large. The comments made here on the magnitude of change in mean surface water temperature from one survey to the next, comparisons with normal seasonal changes and references to similarities in air and water temperature departures from normal should, likewise, be considered as qualitative statements.



## Data Sources and Methods of Analysis

The Daily Weather Maps published in weekly series by the United States National Oceanic and Atmospheric Administration and the six-hour synoptic weather maps produced by the Weather Office, AES, at Toronto International airport were used to describe the weather systems that traversed the Great Lakes region during the period of study.

Meteorological observations taken at Toronto International, Trenton and Rochester airports were used to estimate wind speed and direction, cloud amounts and air temperature at three-hourly intervals. Six hour precipitation amounts were taken from the reports of the same stations. The estimates of wind, cloud and air temperature, although not necessarily representative of conditions over Lake Ontario, do provide an index of the three parameters. The time of passage of major weather systems and duration periods of extreme conditions are identified more precisely. Similarly, fair weather periods, with light variable winds and clear sky, are more apparent.

Over — lake wind speeds and directions were estimated rather subjectively. Wind directions, as reported by the three airport stations, together with the general isobar patterns on the weather maps, were used to estimate the average wind direction. When wind directions appeared uncertain, or when weather conditions indicated that a lake breeze was present (Munn and Richards, 1964), wind directions were assumed to be variable. Wind speeds were estimated from speeds reported at the airport stations. Since the winds over the Great Lakes are generally stronger than over land (Lemire, 1961; Richards, 1964; Richards, et al., 1966), the higher reported wind speeds were favoured in making the estimates.

Estimation of cloud amounts over the lake is also uncertain, because, as previously noted, the lake itself can modify cloud cover. In this study a weighted average of the station reports, favouring Rochester observations, was used to estimate cloud amounts over the lake. Because high cloud (cirrus) does not appreciably reduce incoming or outgoing radiation, it was not considered in making the estimates.

Air temperature was calculated by averaging the temperatures reported at the three airport stations. Again it should be noted that, because the lake surface modifies the temperature of the overlying airmass (Phillips, 1972), these averages are not truly representative of air temperature over the lake. The 5-day and 30-day average air temperatures were calculated from the daily values.

The method used to derive the air and water temperature normals is described in Climatological Studies No. 19 (Irbe, 1972). The normal air temperature is an average of the Toronto International, Trenton and Rochester airport normals. The Lake Ontario water temperature normals are based on Millar's (1952) figures, updated according to calculations by Webb (1970). For the same reasons as stated above, these normals are only index values, but they can be used in a comparative sense to identify periods of warm and cold weather.

Other IFYGL projects provided water temperature data that proved very valuable in the determination of the time and the nature of water temperature response to changes in meteorological conditions. With the assistance of these data the interpretation of many surface water temperature patterns could be made with greater ease and much more certainty.

The IFYGL projects that provided the data are:

Canadian

Project No. 97 BL

Canada Centre for Inland Waters (CCIW) Deep Water Meteorological Buoy Network

Project Leader — F.C. Elder

Project No. 40 WM

The Coastal Jet Project

Project Leader — G.T. Csanady

United States

Task No. 59

U.S. IFYGL Coastal Chain Program

Project Leader — J.T. Scott

The data from these projects are available from the IFYGL Data Banks in Canada and U.S.A.



## Units of Measurement

In this study air and water temperature is given in degrees Celsius. Wind direction is given with reference to eight compass points, wind speeds in metres per second. Cloud amounts are estimated in tenths of sky obscured. "Scattered" denotes five tenths or less of sky obscured, and "broken" — six to nine tenths, when these words are used to describe cloud amounts. Precipitation amounts are given in millimetres; frozen precipitation has been converted to the water equivalent. Eastern Standard Time is used throughout the study.

## Terminology and Abbreviations

In the narrative description of the weather history certain meteorological terms are used repeatedly. It is assumed that through common usage all readers are familiar with their meaning. Description of weather systems has been kept as simple as possible, but the use of terms like High Pressure, Low Pressure, Cold Front, etc. is unavoidable.

Precipitation is referred to in descriptive words, such as very light, light, or heavy, and duration of precipitation as continuous or showery. Again it is assumed that the meaning of these words is known to the reader.

In order to shorten the text and conserve space the following abbreviations and symbols are used:

Abbreviation/Symbol	Meaning
01/01/72	day/month/year
HR	hour, E.S.T.
CLD	cloud amount
W <sub>DRN</sub>	wind direction
W <sub>SPD</sub>	wind speed
T <sub>a</sub>	air temperature
PPTN	precipitation
YYZ	Toronto International airport
YTR	Trenton airport
ROC	Rochester airport

T	trace precipitation
r	liquid precipitation
*	frozen precipitation
T <sub>a5</sub>	five day mean air temperature
T <sub>a30</sub>	thirty day mean air temperature
T <sub>w</sub>	mean lake surface water temperature, determined from ART survey
(+2.7)	departure from normal of air or water temperature
temp.	temperature

## Presentation of Data

In the next section the 3 — hour meteorological data are tabulated in six-day blocks per page. The weather description for the corresponding six days appears below the tabulated data. The record has been divided up in this fashion for the sake of economy and convenient presentation.

The ART survey maps appear in chronological order, interspersed with the weather record. Below each map are comments on the operational history of the survey, with reference to weather conditions. This is followed by a discussion on the effects that antecedent and present meteorological conditions have had on the state of the lake-wide mean surface water temperature and on the temperature distribution pattern.

Hopefully, this arrangement, as opposed to a compilation of the meteorological and ART data in separate sections, will make it easier for the reader to refer back to significant meteorological events, occurring before or on the day when an ART survey was made. For convenience of access to any particular survey, a list giving the number and date for all surveys and the page on which each appears has been prepared.



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LAKE ONTARIO

METEOROLOGICAL DATA

WEATHER HISTORY

ART SURVEY SURFACE WATER TEMPERATURE MAPS

JANUARY, 1972 to MARCH, 1973



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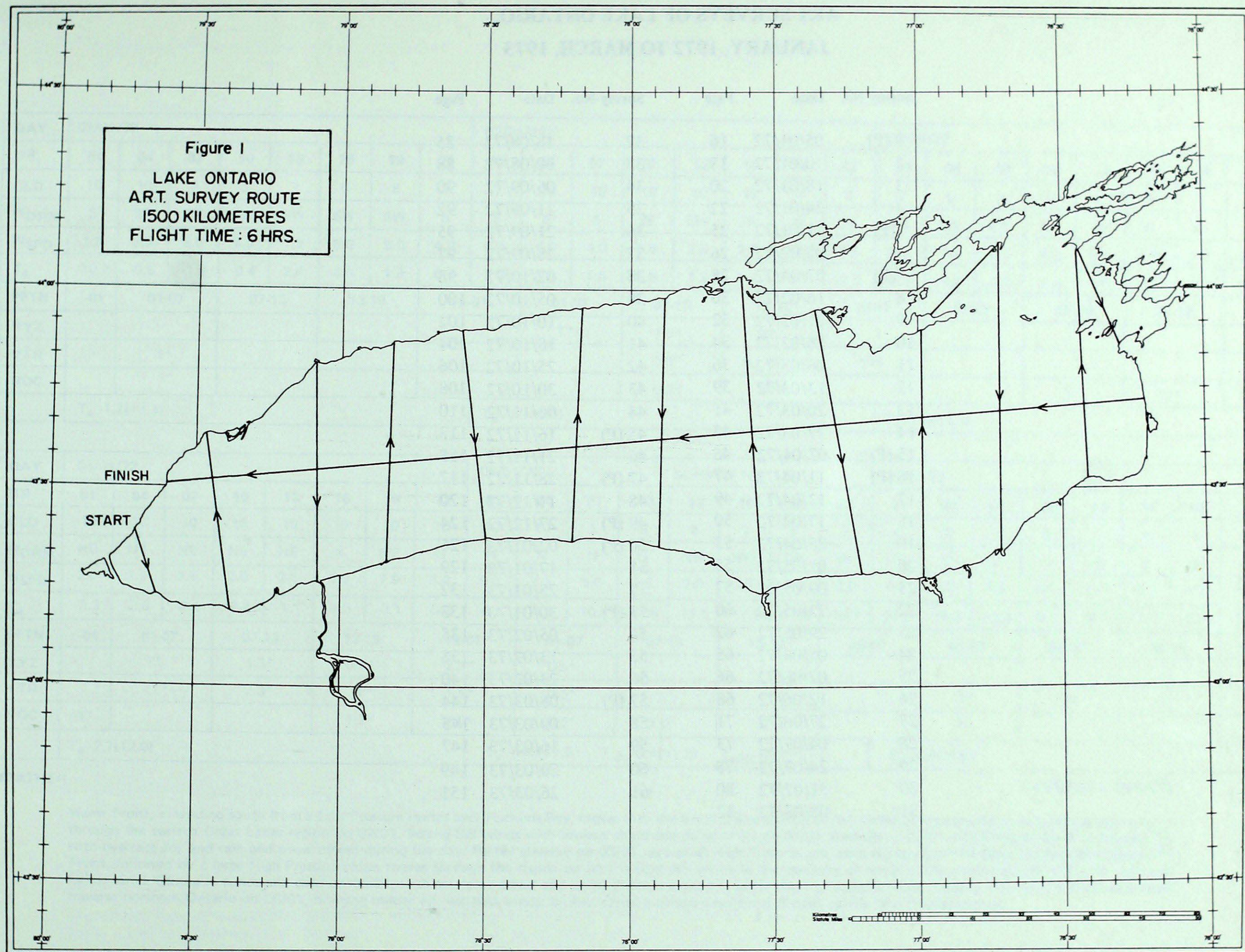
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LAKE ONTARIO

WEATHER HISTORY  
METEOROLOGICAL DATA  
ART SURVEY SURFACE WATER TEMPERATURE MAPS  
JANUARY, 1972 to MARCH, 1973







**ART SURVEYS OF LAKE ONTARIO,  
JANUARY, 1972 TO MARCH, 1973**

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DAY	01/01/72								02/01/72								03/01/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	4	5	7	6	8	7	9	10	10	10	10	10	8	5	0	0	3	5	6	8	9	8
WDRN	S	SE	SW	SW	SW	SW	SW	S	S	S	S	SE	SW	SW	W	W	SW	SW	SW	SW	W	W	W	V
WSPD	1.5	3.5	8.0	7.0	7.5	6.0	5.0	4.0	6.5	4.0	4.0	3.5	3.5	7.0	10.0	7.5	8.0	7.0	7.5	5.0	6.5	4.0	3.0	2.5
T <sub>a</sub>	-10.2	-5.6	-1.5	-0.4	2.4	3.3	1.9	0.2	2.6	2.4	1.5	0.6	1.3	1.3	0.7	-0.9	-2.1	-2.8	-3.0	-0.4	1.0	0.2	-2.0	-3.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ										T*r		1.5*		T*r										
YTR		T*										0.8*		0.3 0.3*		T*r								
ROC												5.3*		T*r						T*		T*		
	T <sub>a</sub> -1.2(+3.3)								T <sub>a</sub> 1.2(+5.8)								T <sub>a</sub> -1.5(+3.1)							

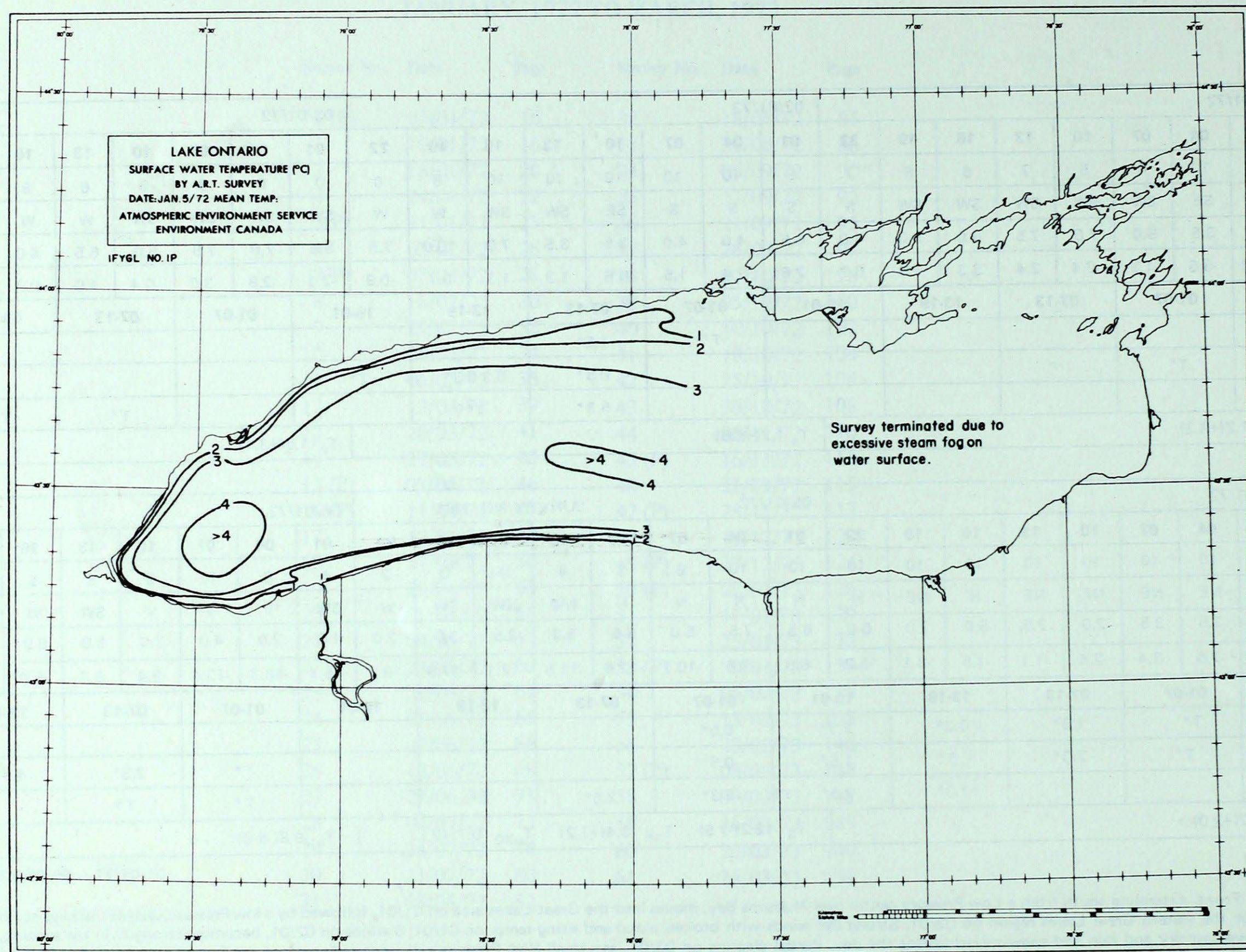
DAY	04/01/72								05/01/72								06/01/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	10	10	10	10	6	3	4	0	0	2	4	8	10	9	5	5	5	9
WDRN	NE	NE	NE	NE	NE	N	NE	N	N	N	N	N	NW	NW	SW	W	SW	V	V	V	SW	W	SW	V
WSPD	2.0	3.5	3.5	2.0	2.5	5.0	7.0	6.0	6.5	7.5	5.0	6.5	5.0	3.5	3.0	2.0	1.0	2.0	4.0	3.0	5.0	6.0	5.0	4.5
T <sub>a</sub>	-3.3	-2.6	-2.4	-2.4	-1.1	-1.5	-3.1	-5.2	-6.5	-7.6	-10.7	-12.6	-11.5	-12.1	-17.6	-18.7	-16.7	-16.3	-13.4	-9.4	-5.7	-5.0	-5.9	-5.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		T*		1.3*		0.3*		2.3*		0.5*														
YTR		T*		2.3*		T*		1.5*		0.5*								T*		2.3*		4.1*		
ROC	T*					1.3*		2.5*		5.3*		2.0*		T*				T*		T*				
	T <sub>a</sub> -2.7(+2.0)								T <sub>a</sub> -12.2(-7.5)    T <sub>a5</sub> -3.4(+1.2)    T <sub>a30</sub> -0.7(+2.8)								T <sub>a</sub> -9.8(-5.0)							

## WEATHER

01/01/72 – 06/01/72

Warm Front, extending south from a Low Pressure centre over Hudsons Bay, moves into the Great Lakes area on 01/01, followed by a low Pressure system tracking north through the eastern Great Lakes region on 02/01. Strong SW winds with broken cloud and rising temp. on 01/01; S winds on 02/01, becoming strong W in the evening, with overcast sky and rain and snow mixed during the day. Partial clearing on 03/01, as a small High Pressure cell, centered south of the Great Lakes, moves east. Cold Front, followed by a large High Pressure ridge, moves through the region on 04/01; light NE winds in the morning, strong N in the afternoon; overcast with snow and falling temp. Strong N winds and cold on 05/01, with scattered cloud and snow showers along the south shore of Lake Ontario. Rapidly moving Low Pressure centres traverse northern Ontario on 06/01, bringing milder air, variable winds, broken cloud and scattered snow flurries to the Great Lakes region.





SURVEY NO. 1 (P)

05/01/72

Scheduled for 04/01, the survey is postponed due to bad weather. On 05/01 the survey is terminated half way because of adverse conditions over the lake. After a long period of mild weather, the arrival of cold arctic air causes excessive evaporation from the warm lake surface in the form of "steam fog", or "sea smoke", and lake-effect snow showers along the south shore.



DAY	07/01/72								08/01/72								09/01/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	9	10	10	9	8	8	6	6	4	8	6	8	3	4	3	2	8	10	10	10	10	10	9	7
WDRN	SW	SW	SW	SW	W	NW	W	NW	NW	NW	NW	NE	NE	SE	SE	SE	S	S	S	SW	SW	SW	SW	SW
WSPD	4.5	7.5	6.5	7.5	10.0	11.0	9.0	10.0	6.5	4.5	3.0	0.5	1.5	5.5	6.0	3.5	6.5	7.0	9.0	9.5	8.5	7.5	6.0	5.5
T <sub>a</sub>	-5.0	-3.0	-3.0	-1.0	0.8	-0.2	-2.6	-4.5	-7.9	-11.3	-15.2	-11.7	-8.7	-7.2	-7.6	-6.3	-0.7	1.8	2.2	2.8	3.9	3.9	3.9	3.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		0.3*		T*		T*		T*				0.5*		T*				0.3		0.5		T		
YTR	1.8*	0.5*		1.0*		T*		T*												2.3* 0.8		6.4		
ROC		T*		0.3*		0.3*		T*		T*		T*								T				
	T <sub>a</sub> -2.3(+2.6)								T <sub>a</sub> -9.5(-4.6)								T <sub>a</sub> 2.7(+7.7)							

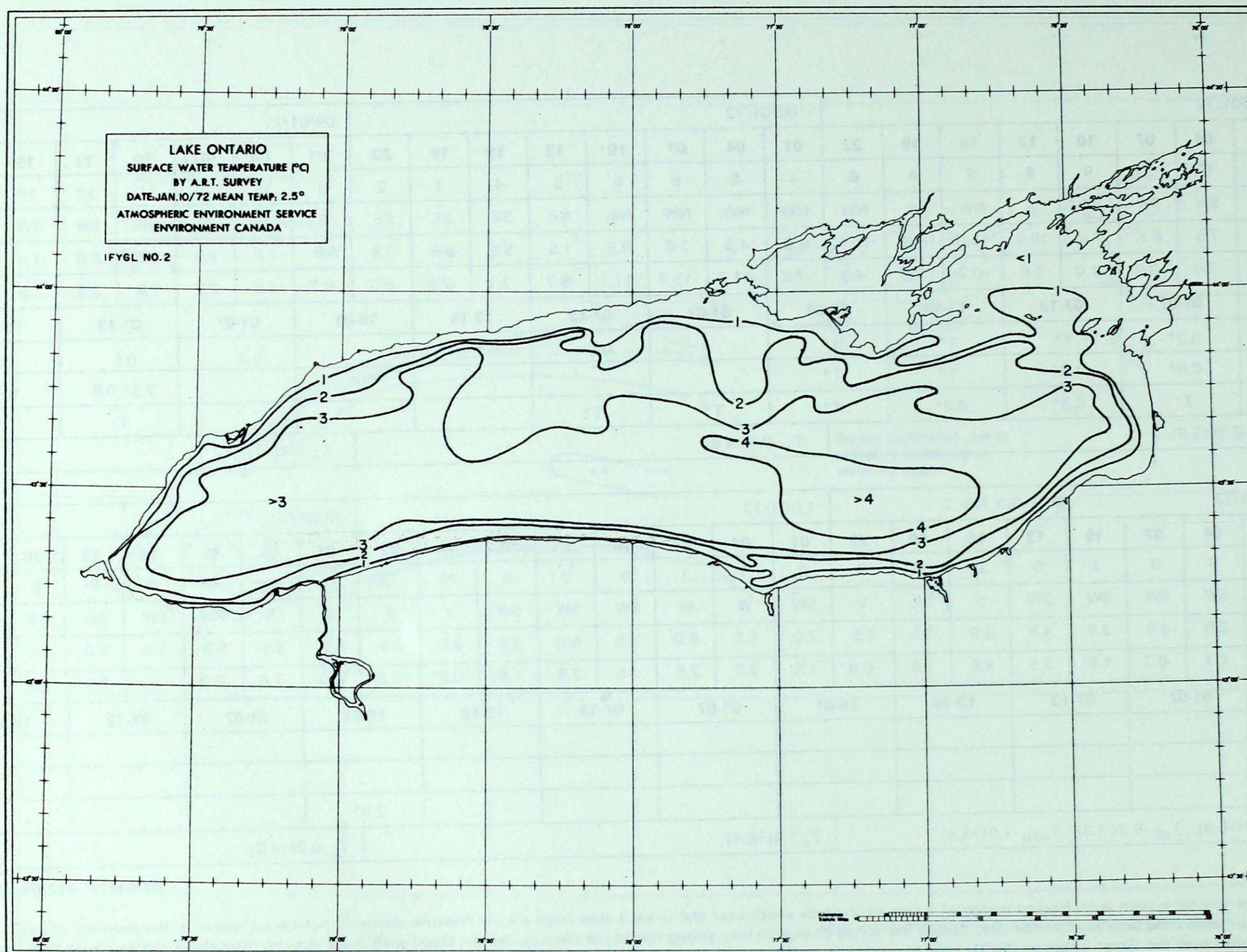
DAY	10/01/72								11/01/72								12/01/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	3	0	0	3	0	0	0	0	0	7	1	0	0	8	10	10	0	0	0	0	8	8	9	7
WDRN	SW	SW	SW	SW	SW	S	SE	V	SW	W	W	SW	SW	SW	V	S	S	S	SW	SW	SE	SE	SE	SE
WSPD	5.0	3.5	3.0	3.5	4.5	3.0	3.5	1.5	2.0	5.0	8.0	7.0	6.0	3.0	2.0	2.0	1.5	3.5	5.5	3.0	2.0	5.5	6.0	6.0
T <sub>a</sub>	3.1	1.3	-0.3	1.8	3.9	4.6	1.9	-0.9	1.1	2.2	2.8	1.5	2.6	1.8	0.2	-0.9	-2.9	-1.6	-2.2	-1.3	0.9	1.5	1.3	3.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC	T															2.0*								
	T <sub>a</sub> 1.9(+6.9) T <sub>a5</sub> -6.2(-1.3) T <sub>a30</sub> -2.5(+1.5)								T <sub>a</sub> 1.4(+6.4)								T <sub>a</sub> -0.2(+4.9)							

## WEATHER

07/01/72 - 12/01/72

Complex frontal system with leading wedge of warm air extends south over the Great Lakes from a Low Pressure centre in northern Ontario in the morning of 07/01. Colder air enters the area later in the day. Strong SW winds change to very strong NW in the evening; broken cloud with snow showers throughout the day. High Pressure ridge builds over the Great Lakes on 08/01; light to moderate easterly winds, variable cloud cover with scattered snow showers and cold. Warm air wedge, extending south from a Low Pressure centre in northern Ontario, swings through the Great Lakes area on 09/01; overcast with rain and snow mixed, strong S and SW winds and rising temp. High pressure prevails over the Great Lakes region from 10/01 to 13/01. Very warm with light to moderate SW winds and scattered cloud during this period. Increasing cloud and moderate to strong SE winds in the afternoon of 12/01 ahead of an approaching Warm Front.





SURVEY NO. 2

10/01/72

 $T_w$  2.5 (-0.3)

Survey is completed as scheduled. Weather conditions are good for the time of year — above freezing temp., moderate SW winds and clear sky.

Mean surface water temp. is slightly below normal, probably due to the relatively cold weather of the preceding five days [ $T_{a5}$  -6.2 (-1.3)].

Typical of the cooling phase, the surface water temperature pattern mirrors the bottom contours of the lake.  $>4^\circ$  water overlies the deepest portion of the lake and a tongue of  $<2^\circ$  water extends southward over the shallow Scotch Bonnet Shoal area.



DAY	13/01/72								14/01/72								15/01/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	2	5	5	3	5	10	10	9	8	1	2	2	2	2	7	8	6	3	3	4	0	2	1	8
WDRN	SE	S	S	S	V	NW	NW	NW	NW	N	NW	V	S	S	SW	W	NW	W	W	W	W	W	W	W
WSPD	6.0	6.5	7.5	4.5	8.5	8.0	7.0	7.5	5.0	4.0	2.5	2.5	4.0	4.0	5.0	6.0	7.5	9.0	7.0	6.5	9.5	8.5	5.5	4.0
T <sub>a</sub>	4.1	5.5	6.7	8.1	8.7	0.2	-2.8	-4.4	-6.3	-8.9	-12.6	-8.5	-5.0	-4.3	-5.0	-7.0	-11.5	-15.0	-17.2	-14.9	-15.4	-15.6	-17.6	-18.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ				0.3		3.6*		T*				T*				T*								
YTR				T		0.5 0.3*		0.5*						0.3*		T*		T*						
ROC						2.5*		0.8*		T*				T*		T*		T*						
	T <sub>a</sub> 3.3 (+8.4)								T <sub>a</sub> -7.2 (-2.0)								T <sub>a</sub> -15.6 (-10.4)							

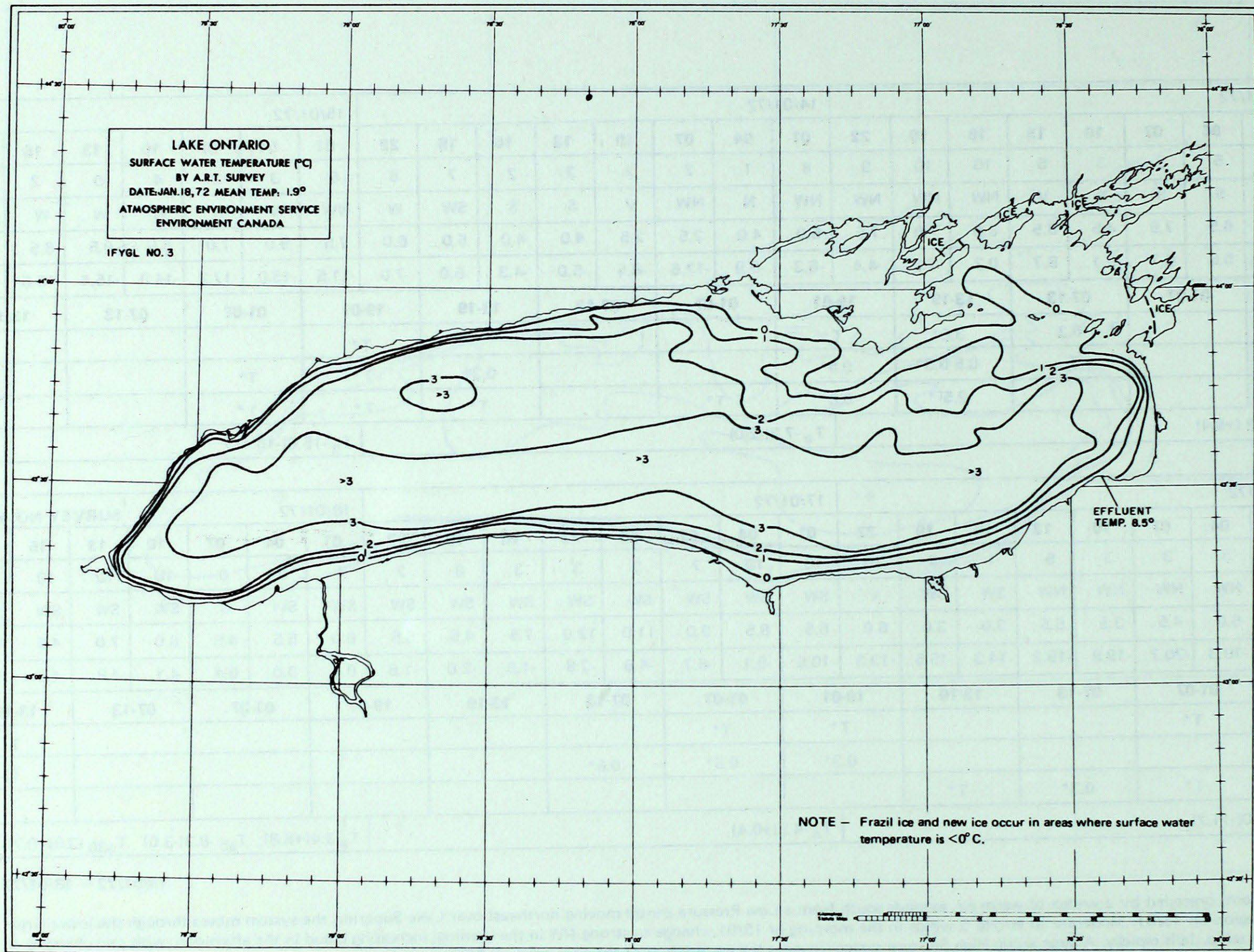
DAY	16/01/72								17/01/72								18/01/72								SURVEY NO. 3				
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	6	3	3	3	5	1	2	10	10	10	7	3	3	3	3	2	4	5	0	10	10	10	10	10					
WDRN	W	NW	NW	NW	NW	SW	SW	V	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	S	SW	SW	SW	SW	SW					
WSPD	5.5	6.0	4.5	3.5	5.5	3.0	3.0	6.0	6.5	8.5	9.0	11.0	12.0	7.5	4.5	5.5	6.0	5.5	4.5	6.0	7.0	4.5	5.5	8.0					
T <sub>a</sub>	-18.1	-19.3	-20.7	-19.8	-15.2	-14.3	-15.5	-13.3	-10.5	-9.1	-6.7	-4.6	-2.8	-1.9	-2.0	-1.6	0.4	0.0	0.4	4.1	4.8	4.6	5.7	6.8					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ		T*						T*		T*												T							
YTR								0.3*		0.5*		0.5*										T							
ROC	T*	T*		0.3*		T*																							
	T <sub>a</sub> -17.0(-11.7)								T <sub>a</sub> -4.9(+0.4)								T <sub>a</sub> 3.4(+8.8) T <sub>a5</sub> -8.3(-3.0) T <sub>a30</sub> -3.9(+0.7)												

## WEATHER

13/01/72 – 18/01/72

Cold Front, preceded by a wedge of warm air, extends south from a Low Pressure centre moving northeast over Lake Superior; the system moves through the lower Great Lakes region on 13/01. Moderate to strong S winds in the morning of 13/01, change to strong NW in the evening; increasing cloud in the afternoon, with rain changing to snow as temp. falls rapidly. A large arctic High Pressure system invades the eastern half of the continent on 14/01 and dominates until 18/01. Very cold with strong W and NW winds on 15/01 and 16/01; strong SW winds and rising temp. on 17/01, as the High Pressure centre moves southeast to the Atlantic coast. Variable cloud cover with lake – effect snow showers occur during this period. Warm air continues to stream over the lower Great Lakes on 18/01, while a Cold Front with associated Low Pressure centre enters the upper Great Lakes region; strong SW winds, rapidly rising temp. and overcast, with scattered rain showers in the afternoon.





SURVEY NO. 3

18/01/72

 $T_w$  1.9 (-0.4)

Scheduled for 17/01, the survey is postponed, due to very strong SW winds and lake — effect snow showers along the north shore. On 18/01 the survey is completed under more favourable conditions — warm and overcast, wind SW 5 — 7.

Because of the very cold weather from 14/01 to 17/01, the mean surface water temperature has decreased  $0.6^\circ$  since 10/01. This is near the normal seasonal decrease.

The surface water temperature field shows the effects of the preceding cold weather. The  $>4^\circ$  pool of water has disappeared from the surface and the  $>3^\circ$  region has decreased considerably. New ice and floating frazil ice occur in the northeast basin and along most of the shoreline.



DAY	19/01/72								20/01/72								21/01/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	9	8	8	6	6	7	7	10	10	8	10	10	10	10	10	9	5	5	5	5	2	2	3
WDRN	SW	SW	W	W	W	W	W	W	W	SW	SE	SE	E	E	NW	NW	NW	NW	NW	NE	V	E	E	E
WSPD	9.5	9.5	8.5	10.0	10.0	7.0	4.0	5.0	3.0	1.5	1.5	3.5	4.0	3.0	2.5	6.5	9.0	5.0	4.5	4.0	3.5	3.0	3.5	5.0
T <sub>a</sub>	7.0	6.5	4.5	1.5	0.0	-0.9	-2.2	-2.0	-2.8	-3.1	-3.1	-2.0	-1.7	-1.3	-1.3	-1.3	-2.8	-8.9	-12.8	-12.6	-10.6	-9.2	-10.7	-10.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	0.8	T		T*								4.6*		6.1*								T*		
YTR	1.8	T		T*								2.0*		4.8*		T*		T*						
ROC		1.0		T*								2.0*		4.1*		T*		T*		0.3*		T*		
	T <sub>a</sub> 1.8(+7.2)								T <sub>a</sub> -2.0(+3.4)								T <sub>a</sub> -9.8(-4.3)							

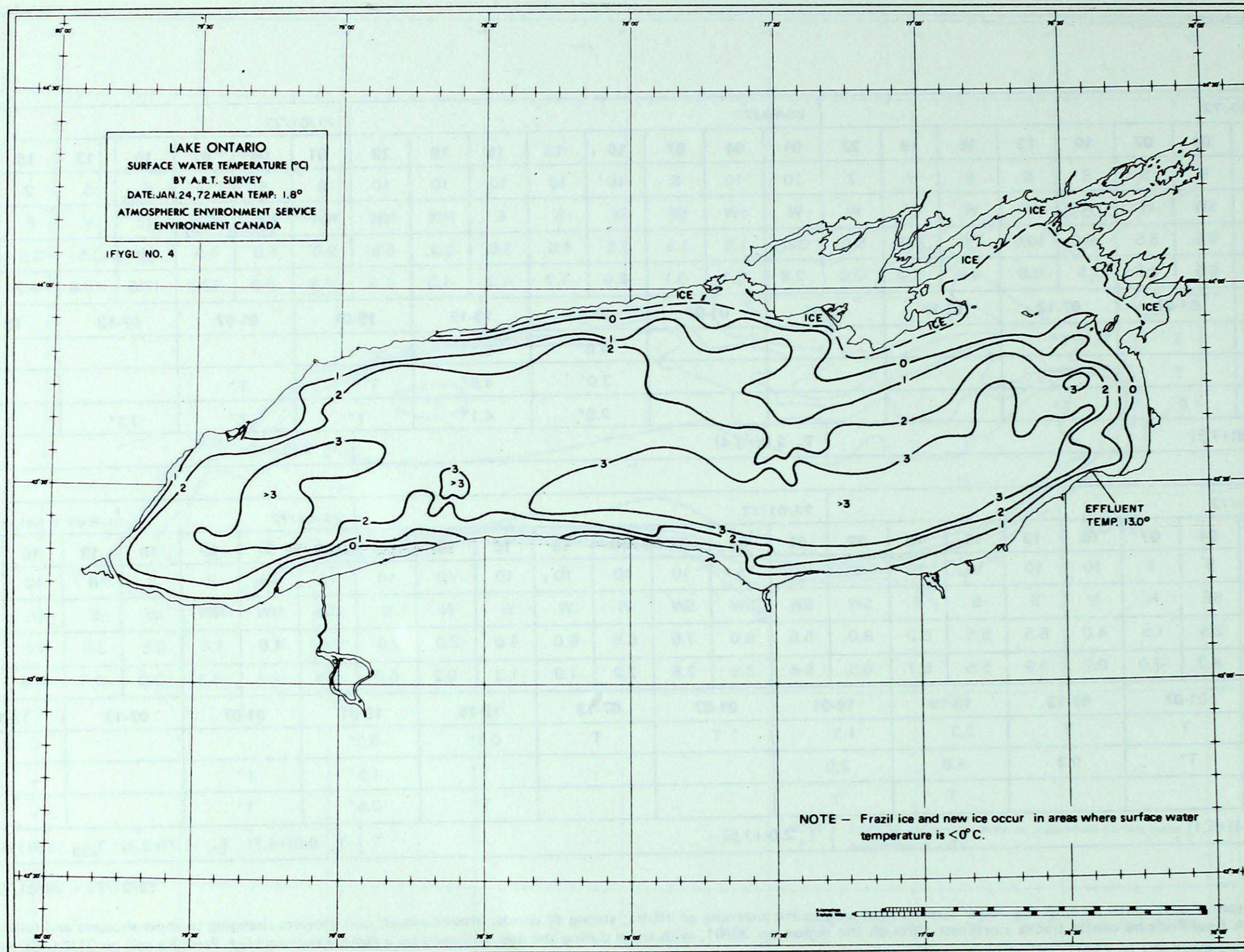
DAY	22/01/72								23/01/72								24/01/72								SURVEY NO. 4				
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	4	5	7	10	10	10	10	9	10	5	10	10	10	10	10	10	10	10	8	8	6	10	10	10					
WDRN	E	SE	N	V	S	S	S	SW	SW	SW	SW	W	W	W	N	N	NW	NW	NW	NE	E	SE	SE	SE					
WSPD	3.5	2.5	1.5	4.0	6.5	5.5	6.0	8.0	5.5	6.0	7.5	6.5	6.0	4.0	2.0	2.0	2.0	4.0	1.5	0.5	3.0	6.0	7.0	7.0					
T <sub>a</sub>	-9.6	-8.7	-7.0	0.2	3.9	5.5	5.7	6.5	5.6	3.5	2.8	2.2	1.9	1.3	-0.2	-0.9	-1.5	-2.1	-3.3	-2.0	-0.5	-0.6	0.0	3.2					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ	T*	T		T		2.3		1.3		T		T		0.3*		0.3*						T							
YTR	T*	T*		0.3		4.8		2.0						T*		1.5*		T*											
ROC						T		T						T*		0.5*		T*											
	T <sub>a</sub> -0.4(+5.1)								T <sub>a</sub> 2.0(+7.5)								T <sub>a</sub> -0.9(+4.7) T <sub>a5</sub> -1.7(+3.8) T <sub>a30</sub> -3.5(+1.4)												

## WEATHER

19/01/72 – 24/01/72

Cold Front moves south through the lower Great Lakes area in the morning of 19/01; strong W winds, broken cloud, rain showers changing to snow showers and falling temp. A Low Pressure centre tracks northeast through the region on 20/01, with snow during the day, followed by a rapidly moving High Pressure cell on 21/01. Strong NW winds overnight to 21/01, falling temp. and clearing sky with some snow showers and winds becoming moderate E on 21/01. A large Low Pressure system develops west of the Great Lakes and moves east on 22/01, with associated strong S winds, rapid rise in temp., overcast sky and rain decreasing to showers. A High Pressure cell traverses the region on 23/01; strong W winds change to light N; falling temp. and overcast with snow in the evening. Rapidly moving Low Pressure system approaches the Great Lakes from the southwest on 24/01, causing a wind shift to strong SE in the afternoon and a gradual rise in temp.





## SURVEY NO. 4

24/01/72

 $T_w 1.8 (-0.3)$ 

Survey is completed as scheduled. Weather conditions are fair — relatively mild temp., broken cloud and very light NE winds, becoming moderate E in the afternoon.

Mean surface water temp. has decreased only  $0.1^{\circ}$  since 18/01. This is in line with the slow ( $0.2^{\circ}$ ) seasonal decrease at this point in the cooling phase. The weather has been changeable, but relatively mild in the intervening period [  $T_{a5} -1.7 (+3.8)$  ].

The surface water temperature field shows a very small increase in ice cover in the northeast basin, while shore ice has disappeared in the Rochester — Oswego area. However, the  $>3^{\circ}$  zone of water has broken up in the west end of the lake, perhaps due to the influx of colder Niagara R. waters into this region.



DAY	25/01/72								26/01/72								27/01/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	9	7	9	7	8	1	2	2	5	8	6	1	1	0	5	5	0	6	7	10	10
WDRN	SW	SW	SW	SW	W	W	W	W	W	W	W	W	W	SW	SW	SW	SW	W	W	SW	SW	SW	SW	SW
WSPD	8.0	12.0	14.5	16.0	14.5	13.0	11.5	11.0	10.0	6.5	7.0	8.0	8.0	7.0	6.0	6.0	5.0	7.0	6.5	5.5	5.0	5.5	4.5	3.0
T <sub>a</sub>	6.7	4.8	-0.7	-5.7	-6.6	-7.2	-9.8	-11.5	-13.1	-13.7	-14.1	-12.2	-10.5	-10.8	-12.8	-13.0	-13.1	-11.7	-11.3	-9.4	-7.0	-6.5	-7.0	-8.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	5.6	T*		0.3*		T*		T*				T*										T*		
YTR	1.0	1.0		T*		0.8*		0.5*		T*		T*												
ROC		3.6		0.3*		T*		T*						T*				T*		T*				
	T <sub>a</sub> -3.8(+1.8)								T <sub>a</sub> -12.5(-6.9)								T <sub>a</sub> -9.3(-3.6)							

DAY	28/01/72								29/01/72								30/01/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	8	7	6	6	1	0	0	2	2	2	4	3	3	3	8	9	8	7	6	2	1
WDRN	W	NW	SW	SW	W	W	W	W	W	SW	W	SW	SW	SW	V	V	S	S	W	SW	W	W	W	SW
WSPD	2.0	0.5	1.0	3.5	7.0	8.0	6.5	7.0	6.0	5.0	4.5	3.5	4.5	3.5	1.0	2.0	1.5	2.0	3.0	5.0	7.5	7.5	5.0	5.5
T <sub>a</sub>	-8.5	-9.1	-9.1	-8.2	-6.3	-6.5	-8.0	-9.6	-10.8	-12.0	-13.0	-9.8	-7.6	-7.8	-9.6	-11.7	-12.6	-11.7	-9.7	-7.6	-6.7	-7.4	-9.3	-11.1
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	2.3*	3.0*		T*		T*												T*		T*		T*		
YTR	T*	2.3*		0.5*		T*		T*				T*		T*		T*		T*		T*		T*		
ROC	1.3*	2.3*		T*		T*												T*		0.3*		T*		
	T <sub>a</sub> -8.2(-2.5)								T <sub>a</sub> -10.5(-4.8)								T <sub>a</sub> -9.5(-3.8)							

## WEATHER

25/01/72 – 30/01/72

Arctic High Pressure system advances into the Great Lakes region on 25/01, as Low Pressure centre moves east; very strong SW winds in the morning change to W in the afternoon; overcast to broken cloud cover with rain changing to snow, as temp. falls rapidly. High pressure prevails over most of the continent for the next seven days. Light to moderate winds, below normal temp. and scattered to broken cloud with lake – effect snow showers prevail in the Great Lakes region. Thermal troughs develop over the Great Lakes on 28/01 and 30/01, causing wide-spread light snow showers.



DAY	31/01/72 SURVEY NO. 5(P)								01/02/72								02/02/72 SURVEY NO. 6							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	4	6	1	1	3	7	9	10	8	10	10	2	1	7	6	6	8	10	10	8	6	9	10	10
WDRN	W	W	SW	SW	W	SW	SW	V	SW	SW	SW	SW	V	SW	NW	V	NE	NE	NE	E	E	E	E	E
WSPD	5.5	6.0	4.0	5.5	6.5	5.5	3.0	1.5	4.0	2.5	4.0	3.5	3.0	2.0	2.0	2.0	4.0	4.5	4.5	5.5	6.5	6.5	6.5	5.5
T <sub>a</sub>	-11.3	-12.4	-14.1	-10.2	-8.0	-8.0	-9.6	-9.4	-8.9	-8.5	-8.3	-6.5	-3.0	-2.9	-5.7	-7.8	-6.1	-5.9	-5.7	-5.5	-3.0	-2.4	-3.1	-3.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ						T*		T*					T*								T*		T*	
YTR	T*	T*						T*		T*			T*		T*									
ROC						T*		T*		T*			T*											
	T <sub>a</sub> -10.4(-4.7) T <sub>a5</sub> -10.0(-4.3) T <sub>a30</sub> -4.4(+0.8)								T <sub>a</sub> -6.5(-0.8)								T <sub>a</sub> -4.4(+1.4) T <sub>a5</sub> -9.0(-3.3) T <sub>a30</sub> -5.0(+0.3)							

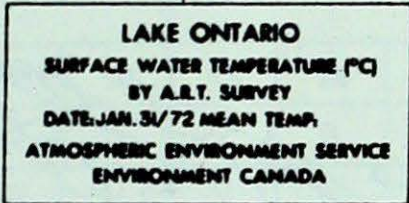
DAY	03/02/72								04/02/72								05/02/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	10	10	10	9	10	10	8	7	5	6	4	3	3	1	1	0	3	10
WDRN	E	SE	SE	SE	SE	SE	SE	V	W	W	W	W	W	W	W	W	W	W	SW	W	W	W	W	SW
WSPD	6.0	5.5	8.0	7.0	7.5	4.5	4.0	4.0	7.0	11.0	11.5	10.5	12.5	10.5	11.0	8.5	10.0	10.0	8.5	9.5	9.5	8.0	4.5	4.5
T <sub>a</sub>	-2.4	-1.7	0.4	1.1	2.0	1.9	0.6	0.6	-0.4	-2.8	-6.3	-6.9	-7.8	-8.7	-8.9	-10.0	-11.1	-12.6	-13.5	-13.1	-11.7	-11.7	-12.8	-11.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	0.3*	3.6*		6.4*		9.7*		1.0*		T*		0.5*		0.3*		0.3*		T*						
YTR	T*	4.1*		2.0*		8.6*		14.0*		1.3*		0.5*				0.8*		0.5*		0.3*				
ROC	T*	T				1.5* <sup>r</sup>		5.8*		0.8*		2.5*		0.8*		T*								
	T <sub>a</sub> 0.3(+6.1)								T <sub>a</sub> -6.5(-0.8)								T <sub>a</sub> -12.3(-6.6)							

## WEATHER

31/01/72 – 05/02/72

High pressure continues over the Great Lakes on 31/01 and 01/02, with light to moderate SW winds, variable cloud cover and scattered snow showers. Low Pressure system develops in central U.S.A. and approaches the Great Lakes on 02/02; moderate to strong E winds, broken to overcast cloud cover and moderating temp. Low Pressure system deepens as it enters the Great Lakes region on 03/02; moderate to strong SE winds and overcast with snow and rising temp. Strong flow of cold arctic air sets in over the region, as the Low Pressure system moves eastward to combine with a deep Low Pressure centre moving north along the Atlantic coast. Very strong W winds, overcast to broken cloud cover and snow on 04/02. Continuing strong W winds on 05/02 with clearing sky. Temp. falls on both days.





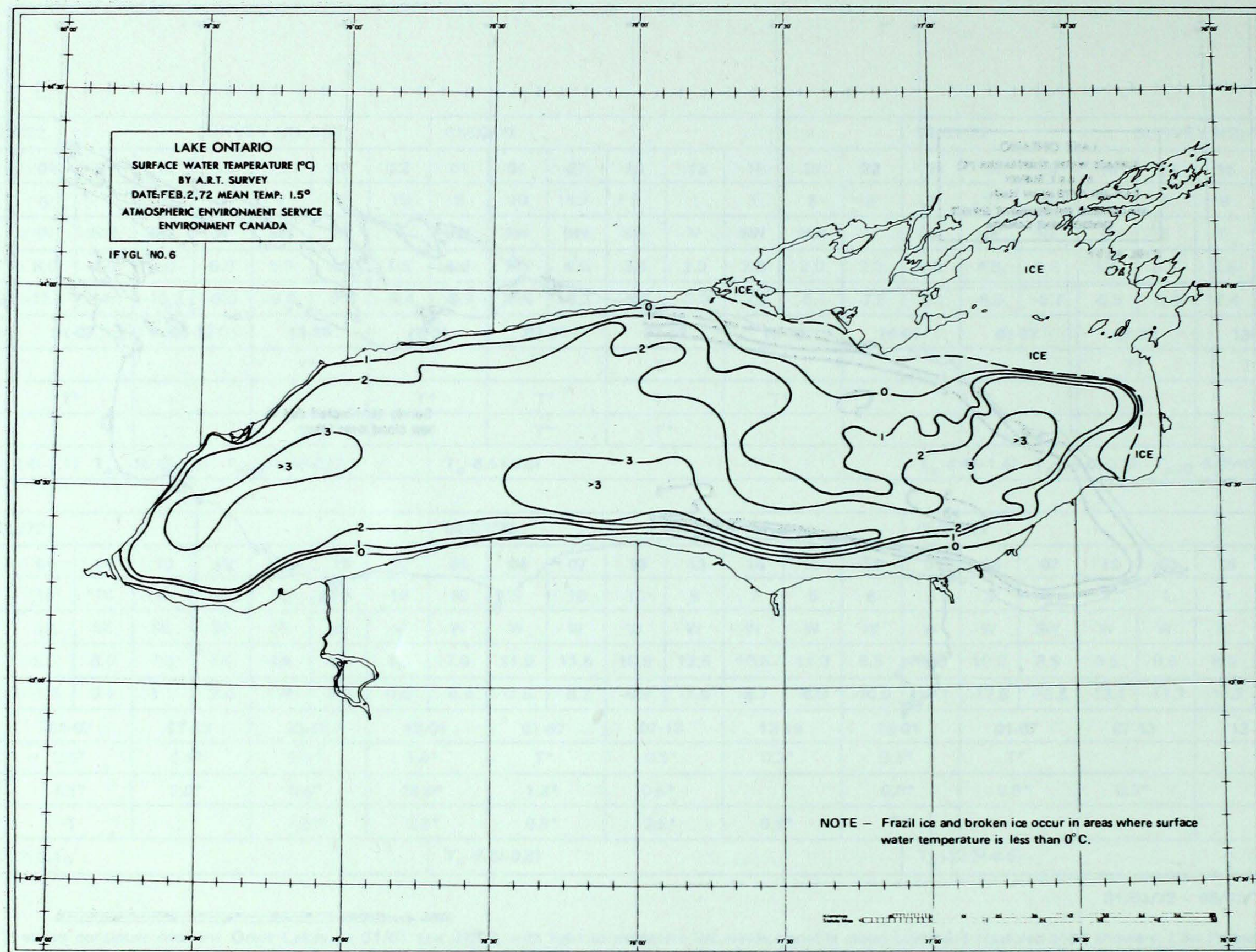
**SURVEY NO. 5 (P)**

**31/01/72**

Although weather conditions are fair over land, low cloud forms over the eastern half of the lake, due to the low air temp. ( $-10^{\circ}$  to  $-8^{\circ}$ ). Survey flight has to be terminated about half way.

Rapid cooling of the lake surface has occurred during the previous six days of cold weather. Only small patches of  $>3^{\circ}$  water remain in the western end of the lake and extensive zones of ice are found along the south and north — central shores.





## SURVEY NO. 6

02/02/72

 $T_w$  1.5 (-0.3)

Survey flight is postponed on 01/02, due to continuing low cloud and snow showers over the lake. Survey is completed on 02/02 in marginal weather conditions. However, snow shower activity over the lake ceases, as winds change to E 5 – 6 and air temp. moderates ahead of a Low Pressure system approaching the region from the southwest.

Mean surface water temp. has decreased  $0.3^\circ$  since 24/01 and ice cover in the northeast basin has grown considerably, as a result of the very cold weather during the intervening period [ $T_{a5}$   $-9.0$  ( $-3.3$ )].

The strong E winds are moving broken pan ice into the lake from the northeast basin and off the Prince Edward County shore, causing the tightly packed isotherm pattern between the ice edge and the  $>3^\circ$  water in the east end and the encroachment of  $<1^\circ$  water into mid – lake.



DAY	06/02/72								07/02/72								08/02/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	9	8	10	10	7	8	10	10	10	8	1	1	1	1	7	5	6	6	7	2	1	1	1	5
WDRN	SW	SW	SW	V	V	N	N	NW	NW	NW	W	W	W	W	W	W	W	W	W	W	SW	SW	SW	SW
WSPD	4.0	4.0	2.0	2.0	1.5	2.0	3.0	4.5	5.5	5.0	3.5	3.5	5.0	6.5	7.0	6.0	5.0	5.0	4.5	5.5	7.5	7.5	5.5	5.5
T <sub>a</sub>	-11.3	-10.2	-10.6	-9.1	-7.4	-7.4	-8.7	-10.0	-11.3	-13.5	-17.4	-15.0	-11.3	-11.1	-14.3	-15.2	-16.3	-16.7	-16.1	-13.9	-11.1	-10.8	-12.9	-13.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T*	T*		0.8*												T*								
YTR	T*	T*		T*																				
ROC	0.3*	0.5*		1.5*		0.5*		0.8*		T*		T*		0.3*		1.3*		0.3*		T*				
	T <sub>a</sub> -9.3(-3.6)							T <sub>a</sub> -13.6(-7.9)							T <sub>a</sub> -13.9(-8.2)									

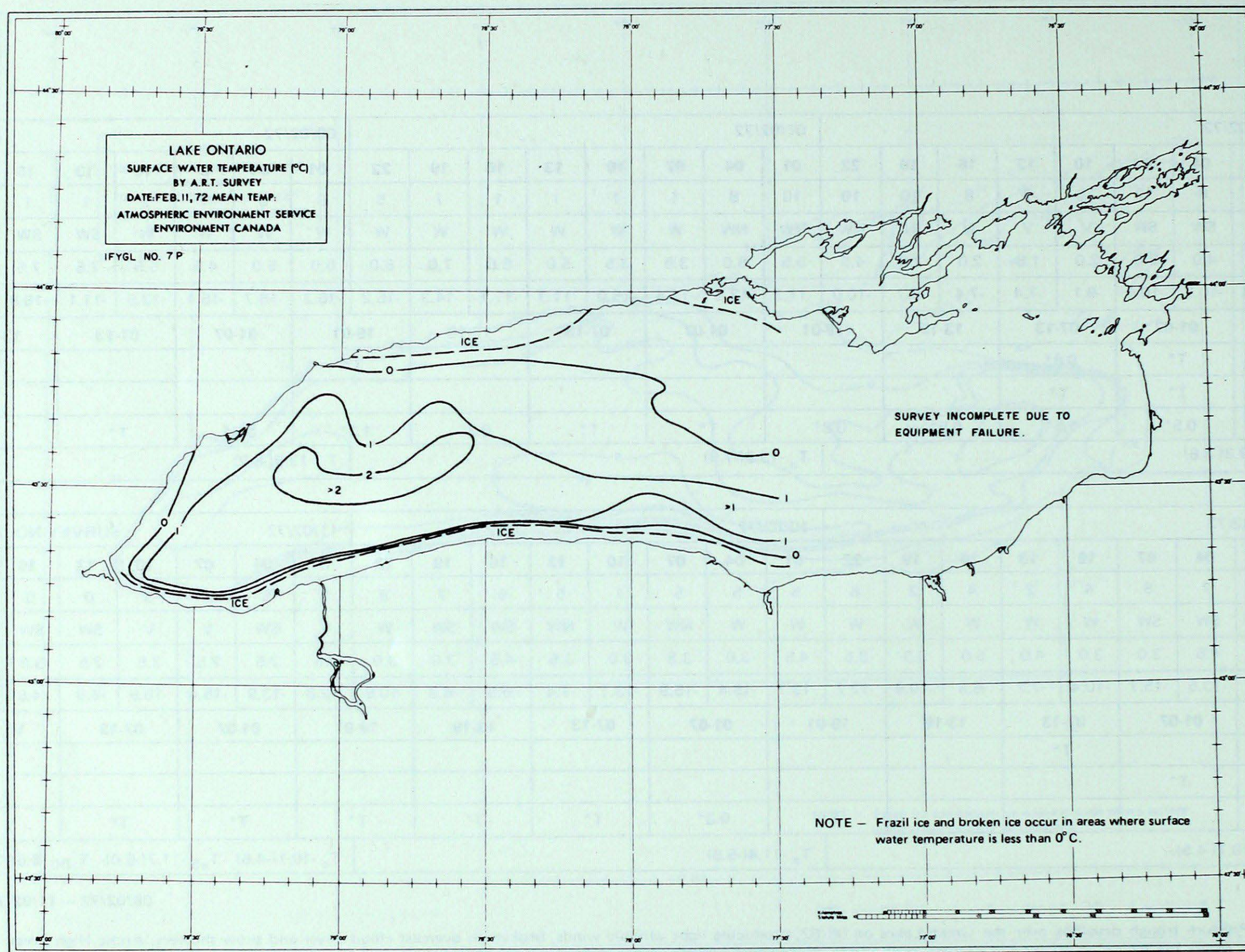
DAY	09/02/72								10/02/72								11/02/72								SURVEY NO. 7(P)				
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	5	7	8	4	2	4	2	6	5	5	5	1	5	6	7	8	5	5	5	3	0	0	1	1					
WDRN	SW	SW	SW	W	W	W	W	W	W	W	NW	W	NW	SW	SW	W	V	SW	V	V	SW	SW	SW	S					
WSPD	4.0	4.5	3.0	3.0	4.0	5.0	3.5	3.5	4.5	3.0	3.5	3.0	3.5	4.5	3.0	3.0	2.5	2.5	2.5	3.5	2.5	3.5	1.5	1.0					
T <sub>a</sub>	-14.1	-13.5	-15.7	-10.4	-7.2	-6.8	-10.9	-12.2	-13.7	-15.4	-15.9	-13.1	-7.4	-6.5	-8.3	-10.9	-12.8	-13.9	-15.4	-10.9	-5.9	-4.6	-7.1	-10.2					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ				T*																									
YTR		T*																											
ROC		T*		T*				T*		0.3*		T*		T*		T*		T*		T*									
	T <sub>a</sub> -10.1(-4.5)								T <sub>a</sub> -11.4(-5.8)								T <sub>a</sub> -10.1(-4.6) T <sub>a5</sub> -11.7(-6.0) T <sub>a30</sub> -6.6(-0.9)												

## WEATHER

06/02/72 – 11/02/72

Low Pressure trough develops over the Great Lakes on 06/02, producing light variable winds, broken to overcast cloud cover and snow showers. Arctic High Pressure system enters the region on 07/02 and persists until 12/02. Strong NW and W winds on 07/02, strong SW in the afternoon of 08/02, continue light to moderate westerly from 09/02 to 12/02. Variable cloud cover with lake – effect snow showers along the south shore of Lake Ontario and well below normal temp. continue throughout this period.





## SURVEY NO. 7 (P)

11/02/72

Initially scheduled for 07/02, the survey is postponed due to the outbreak of cold air over the region that generates steam fog, low cloud and snow showers over Lake Ontario and along the south shore. Due to continuing low air temp., conditions remain marginal on 11/02, but snow shower activity decreases, as winds become light and variable. However, equipment failure forces termination of the survey.

The surface conditions in the western half of the lake show the effects of the persisting cold weather. A large portion of the lake is covered by frazil ice and broken pan ice (indicated as  $<0^\circ$ ).  $>2^\circ$  water is confined to a small lens.



DAY	12/02/72								13/02/72								14/02/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	2	10	10	10	9	7	2	1	2	8	9	10	10	10	10	10	10	10	9	8	10	8	8	6
WDRN	V	V	S	S	SW	S	SE	V	V	V	V	E	NE	NE	NE	N	NW	NW	NW	W	W	SW	SW	SW
WSPD	1.0	2.5	4.5	5.0	3.0	3.5	2.5	2.5	1.5	2.5	2.5	3.5	5.0	7.5	8.5	7.5	7.0	7.5	8.5	7.5	7.5	8.0	4.5	5.5
T <sub>a</sub>	-11.5	-7.6	-1.8	-0.2	2.0	3.0	1.1	-2.6	-4.1	-4.5	-3.5	0.0	1.3	1.1	1.5	1.5	1.3	1.7	1.9	2.2	1.5	1.0	0.2	0.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ												0.5*	6.4*	1.3*	0.8	1.3*	0.3		T*					
YTR		T*		T*								2.0	14.0	0.5*	1.3*	3.6	0.5		T					
ROC												11.2	7.6*	2.8*	2.8		T*		T					
	T <sub>a</sub> -2.2(+3.3)								T <sub>a</sub> -0.8(+4.6)								T <sub>a</sub> 1.3(+6.7)							

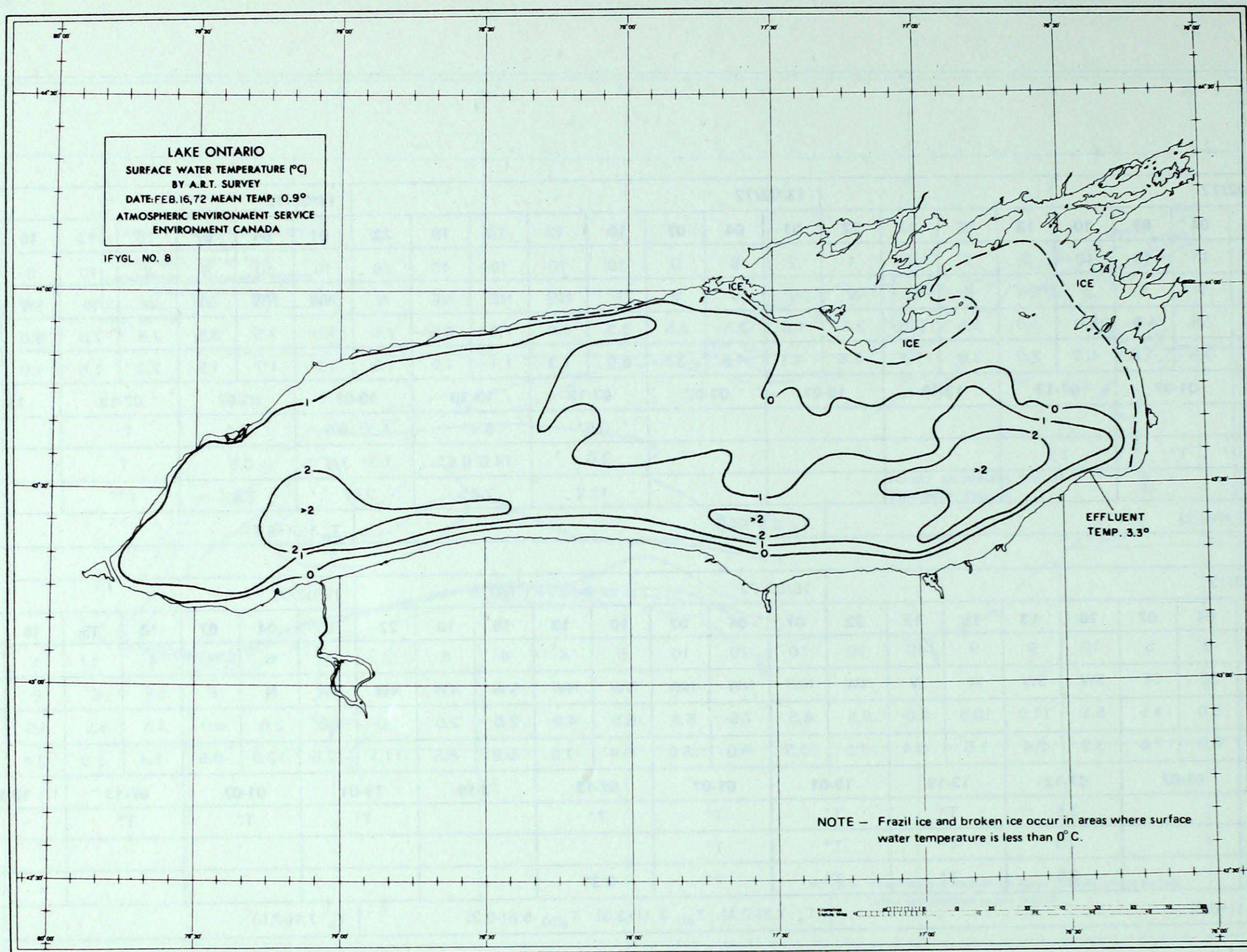
DAY	15/02/72								16/02/72								17/02/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	4	5	5	10	9	9	10	10	10	10	10	5	4	4	0	2	1	4	5	4	1	1	3	0
WDRN	S	SE	SE	SW	SW	W	W	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	N	E	SE	E	E	E	E
WSPD	4.5	5.0	4.5	5.5	11.0	10.5	8.0	8.5	6.5	7.5	6.5	5.5	4.0	2.0	2.0	1.0	2.0	2.0	4.0	4.5	5.5	5.5	5.5	5.5
T <sub>a</sub>	0.2	0.9	2.0	3.9	2.4	1.5	-0.4	-1.8	-3.3	-5.0	-8.0	-9.4	-7.6	-5.9	-8.5	-11.1	-12.6	-12.9	-9.5	-7.4	-3.0	-2.4	-3.9	-5.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ				3.8	T*	T*	T*	T*								T*	T*	T*						
YTR				7.1	T*	T*	T*	T*																
ROC				0.5	T*	T*	T*	T*				0.3*												
	T <sub>a</sub> 1.1(+6.3)								T <sub>a</sub> -7.3(-2.1) T <sub>a5</sub> -2.1(+3.3) T <sub>a30</sub> -5.8(-0.2)								T <sub>a</sub> -7.1(-2.0)							

## WEATHER

12/02/72 -- 17/02/72

High Pressure system moves east to the Atlantic coast on 12/02, bringing a flow of warm southern air to the Great Lakes region. Warm air continues in the Great Lakes area on 13/02, and 14/02, as a deep Low Pressure system develops in southern U.S.A. and moves northeast. Strong northerly winds, overcast to broken cloud and rain and snow mixed on 13/02 and early on 14/02. A weak trailing Low Pressure trough moves through the Great Lakes area on 15/02; moderate S winds in the morning, very strong W and NW in the afternoon; overcast with rain changing to snow showers in the evening, as temp. falls with the arrival of an arctic High Pressure ridge. High Pressure ridge drifts slowly eastward across the region on 16/02 and 17/02. Strong NW winds on 16/02, decrease overnight and become moderate E in the afternoon of 17/02. Cold with scattered cloud and isolated snow showers on both days.





SURVEY NO. 8

16/02/72

 $T_w$  0.9 (-0.3)

Scheduled for 14/02, the survey is delayed by poor flying conditions, as Low Pressure systems move through the area. The survey is completed on 16/02 in marginal conditions, as cold arctic air enters the area.

The decrease of  $0.6^\circ$  in the mean surface water temperature since 02/02 is equal to the normal seasonal decrease.

In comparison with the survey on 02/02, the surface water temperature field shows a reduced ice cover in the northeast basin. However, the  $0^\circ$  isotherm is in nearly the same position, now bounding a large area of frazil and broken ice between it and the ice edge. In the deep water regions the temperature is lower by at least  $1^\circ$ . In the west half of the lake the surface water on 16/02 is warmer than on 11/02; along the north shore the  $1^\circ$  isotherm is located in the area occupied by the  $0^\circ$  isotherm on 11/02.

It appears that the lake — wide surface temperature has increased from a low point reached at the end of a long period of cold weather on 11/02. The above freezing air temp., periods of heavy rain and strong winds from 13/02 to 16/02 have caused break — up and melting of ice. However, the surface temperature of the deeper water and the heat content of the sub — surface layers would be reduced in the melting process.



DAY	18/02/72								19/02/72								20/02/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	1	7	9	10	9	10	10	10	10	10	10	10	10	10	9	10	10	8	5	5	4	4	1	8
WDRN	E	E	SE	E	SE	SE	SE	SE	SE	V	V	NE	N	N	N	N	NW	NW	NW	NW	NW	NW	W	NW
WSPD	4.0	3.5	5.5	7.0	7.5	7.0	6.0	5.5	3.5	4.0	4.0	7.0	11.0	11.0	12.0	14.0	12.5	12.5	13.0	11.5	11.5	8.5	5.5	4.0
T <sub>a</sub>	-6.1	-5.5	-3.9	-1.3	1.3	1.7	0.6	0.4	0.2	-0.7	-1.5	-1.3	-1.3	-2.6	-3.9	-7.8	-10.9	-13.9	-16.8	-18.0	-15.7	-13.9	-16.1	-15.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ				0.8*		5.8*		0.8*		T*		T*		T*		4.3*		1.5*						
YTR				T*		0.8*		5.1*		1.5*		0.3*		1.0*		1.3*								
ROC						2.3*		2.5*		2.3*		6.4*		15.7*		5.6*		5.8*		T*				
	T <sub>a</sub> -1.6(+3.4)								T <sub>a</sub> -2.4(+2.5)								T <sub>a</sub> -15.1(-10.3)							

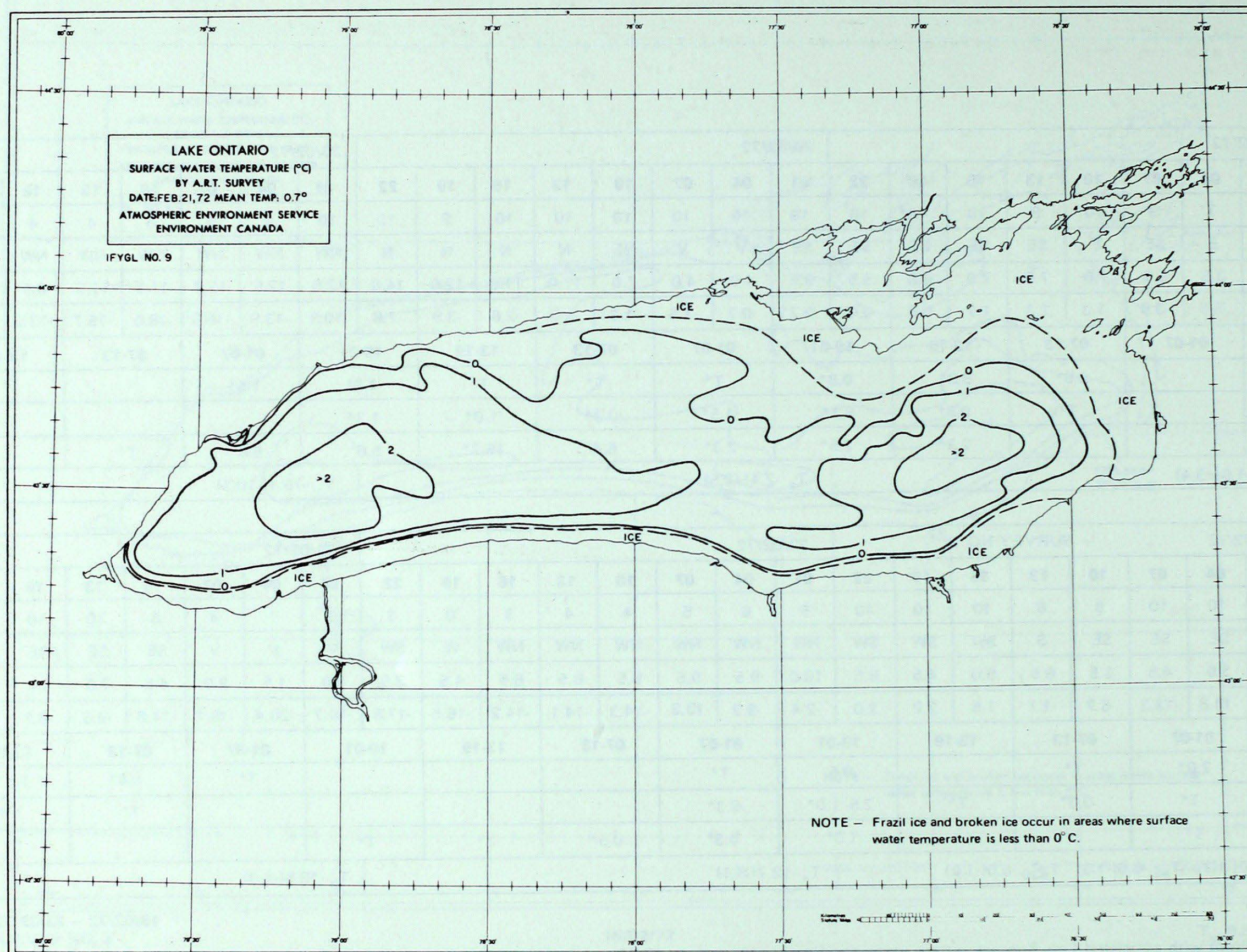
DAY	21/02/72								22/02/72								23/02/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	8	10	10	8	8	10	10	10	9	6	5	4	4	3	0	3	5	7	4	8	10	10	10	10
WDRN	V	SE	SE	SE	S	SW	SW	SW	NW	NW	NW	NW	NW	NW	W	SW	V	V	V	SE	SE	SE	E	V
WSPD	3.0	3.0	4.5	3.5	6.5	5.0	4.5	8.5	10.0	9.5	9.5	8.5	8.5	6.5	4.5	2.5	2.0	1.5	2.0	4.5	7.5	8.0	5.0	5.0
T <sub>a</sub>	-15.7	-14.8	-13.3	-8.7	-1.1	1.5	2.2	2.0	-2.4	-9.2	-13.3	-14.3	-14.1	-14.2	-16.5	-17.6	-18.7	-20.4	-19.1	-14.8	-9.6	-8.7	-8.5	-7.9
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T*	2.0*		T*				0.5		T*								T*		0.8*		1.0*		
YTR		T*		0.3*		T*		2.5 1.0*		0.3*										T*		T*		
ROC	T*	T*						1.3*		0.3*		0.5*		T*		T*						T*		
	T <sub>a</sub> -6.0(-1.3) T <sub>a5</sub> -6.0(-1.3) T <sub>a30</sub> -6.5(-1.0)								T <sub>a</sub> -12.7(-8.1)								T <sub>a</sub> -13.5(-9.0)							

## WEATHER

18/02/72 – 23/02/72

Warm Front with associated Low Pressure system enters the Great Lakes area on 18/02 and moves slowly east on 19/02. Strong SE winds, rising temp. and overcast with snow on 18/02. Overcast with snow continuing on 19/02, as winds become very strong N and temp. falls rapidly in the afternoon. Deep Low Pressure centre on the Atlantic coast moves north on 20/02, drawing cold air over the eastern part of the continent and causing very strong NW winds and very low air temp. in the Great Lakes area. Warm air trough passes through the region in the evening of 21/02, followed by a Cold Front and a High Pressure cell on 22/02. Moderate southerly winds on 21/02, change to strong NW on 22/02. Overcast with snow showers on 21/02, rapid rise in temp. and rain and snow mixed overnight, broken to scattered cloud with lake – effect snow showers on 22/02, as temp. falls during the day. High Pressure cell drifts east on 23/02, as a Warm Front with associated Low Pressure centre enters the area in the afternoon; light variable winds, become strong SE in the afternoon, with gradual rise in temp., increasing cloud and snow showers.





SURVEY NO. 9

21/02/72

T<sub>w</sub> 0.7 (-0.4)

Survey is completed as scheduled in marginal weather conditions ahead of an approaching Warm Front. Temp. rises from -9° in the morning to +2° in the afternoon, winds increase from SE 4 to SW 6, and scattered snow showers occur under broken to overcast cloud cover.

Mean surface water temp. has decreased 0.2° since 16/02 — a normal drop for this time of year.

The surface water temperature pattern shows an increase of ice cover in the northeast basin. Frazil ice and broken pan ice occur in a zone of irregular width and shape in the northern region of the lake and a wide band of piled up ice is found along the south shore. The central zone of >1° water has separated into two portions.

These features suggest that broken pan ice, as well as new ice forming in the presence of low air temperatures (-10° to -18°) of the previous 36 hours, has been transported southward across the lake under the very strong northerly winds.



DAY	24/02/72								25/02/72								26/02/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	8	8	8	8	5	3	7	5	9	8	10	10	10	10	10	10	8	5	6	1	5
WDRN	V	N	V	N	N	V	V	NE	NE	NW	V	V	E	SE	E	E	NE	NE	N	N	NW	NW	W	W
WSPD	4.0	5.5	3.5	3.0	2.5	2.5	3.0	4.0	3.5	1.0	2.0	3.0	1.5	4.0	3.5	5.0	4.0	4.0	4.0	5.5	5.0	7.5	4.5	4.5
T <sub>a</sub>	-8.0	-7.4	-8.0	-8.0	-6.3	-6.1	-7.2	-11.3	-13.2	-13.7	-13.9	-10.4	-5.6	-4.1	-4.5	-4.6	-4.8	-6.1	-6.3	-5.6	-3.1	-2.0	-6.3	-8.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	1.3*	0.8*		0.3*										T*		0.8*		0.3*						
YTR	3.6*	1.3*		T*														1.3*		T*				
ROC	2.3* <sup>r</sup>	0.5*		1.8*		0.3*		T*								0.5*		6.6*		2.8*				
	T <sub>a</sub> -7.8(-3.4)							T <sub>a</sub> -8.8(-4.5)							T <sub>a</sub> -5.3(-1.1)									

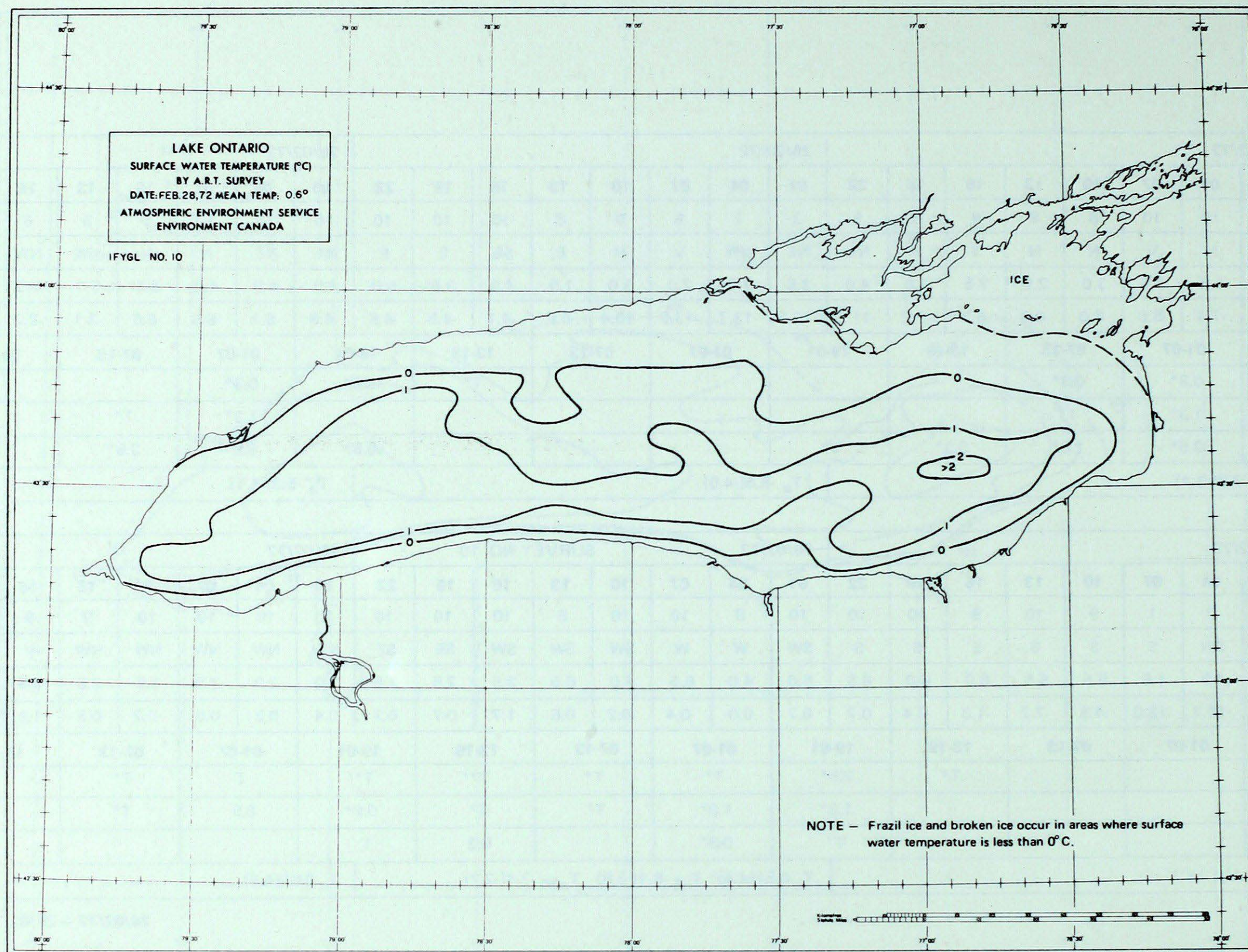
DAY	27/02/72								28/02/72								29/02/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	5	0	1	9	10	9	10	10	10	8	10	10	8	10	10	10	10	10	10	10	9	9	10	10
WDRN	SW	SW	S	S	S	S	S	S	SW	W	W	SW	SW	SW	SE	SE	NW	NW	NW	NW	NW	V	V	SE
WSPD	4.0	4.5	1.5	5.5	5.5	6.0	5.0	6.5	5.0	4.0	6.5	7.0	6.5	3.5	2.5	1.5	1.0	2.0	3.5	3.5	2.5	3.5	2.5	4.5
T <sub>a</sub>	-9.1	-10.7	-13.0	-4.5	-2.2	-1.3	-0.4	0.7	0.7	0.0	-0.4	-0.2	0.6	1.7	0.7	0.7	0.4	0.3	0.0	-0.2	0.8	1.3	0.9	0.9
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ						T*		2.5*		T*		T*		T*r		T*r		T		T*				
YTR								1.3*		1.0*		T*		T*		0.8*		0.5		T*				
ROC								T*		0.8*				0.3		T								
	T <sub>a</sub> -5.1(-1.1)								T <sub>a</sub> 0.5(+4.4) T <sub>a5</sub> -8.1(-3.8) T <sub>a30</sub> -7.4(-2.2)								T <sub>a</sub> 0.6(+4.5)							

## WEATHER

24/02/72 – 29/02/72

Low Pressure centre and a complex frontal system move through the Great Lakes area on 24/02, followed by a High Pressure system late in the day; moderate variable winds and overcast with snow in the morning, broken cloud with scattered snow showers during the day. High pressure prevails over the region on 25/02, with light to moderate variable winds and broken cloud cover. Quasistationary frontal system lies south of the Great Lakes on 26/02, spreading cloud and snow showers into the lower Great Lakes area. A rapidly moving High Pressure cell traverses the region on 27/02, followed by a warm air trough; moderate S winds and clear sky in the morning, overcast with rapidly rising temp. in the afternoon. A quasistationary frontal system overlies the Great Lakes on 28/02 and 29/02; warm with variable winds, overcast sky and mixed rain and snow showers.





## SURVEY NO. 10

28/02/72

 $T_w$  0.6 (-0.5)

Survey is completed as scheduled in very marginal conditions. A quasistationary front overlies the region, with overcast sky, snow showers and strong SW winds. But air temp. remains at or above freezing, minimizing lake — effect cloud and precipitation.

Mean surface water temp. is well below normal, due to the generally cold winter.

$T_{a5}$  -8.1 (-3.8),  $T_{a30}$  -7.4 (-2.2).

A large portion of the lake surface, identified as at  $<0^\circ$ , contains frazil ice and pan ice. However, the  $>1^\circ$  mid-lake zone is again unbroken (compare to Survey No.9). This suggests that, although new ice has been forming, there has been no southward transport of ice from the northeast basin and the Prince Edward County shore during the preceding days of relatively light winds.



DAY	01/03/72								02/03/72								03/03/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	3	3	4	10	10	10	10	10	10	10	10	10	10	10	10	10	10	8	8	6	6	4	5	5
WDRN	V	SW	V	NE	NE	NE	NE	NE	NE	V	NE	V	NW	NW	NW	NW	NW	N	NW	N	N	NW	NW	V
WSPD	2.5	4.0	4.0	4.0	5.0	7.0	6.0	5.5	3.0	2.5	2.5	5.0	7.5	7.0	5.0	6.0	5.5	5.5	4.5	6.0	5.5	4.5	3.0	3.5
T <sub>a</sub>	1.1	3.0	4.1	3.0	0.9	-1.5	-3.1	-2.1	-2.8	-3.1	-3.3	-3.3	-3.5	-7.4	-8.9	-9.6	-10.4	-11.1	-12.0	-11.8	-10.7	-9.3	-10.9	-12.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T			0.3		3.3 7.6*		0.5 15.2*		0.5		1.0 4.6*		0.8*										
YTR	T*r			T		2.5 1.8*		0.8 7.4*		0.3 2.3*		0.3 4.3*		0.3 0.5*										
ROC						0.3		5.3*r		0.8		1.0		4.8*		T*		0.5*		0.8*		T*		
	T <sub>a</sub> 0.7(+4.5)								T <sub>a</sub> -5.2(-1.5)								T <sub>a</sub> -11.1(-7.6)							

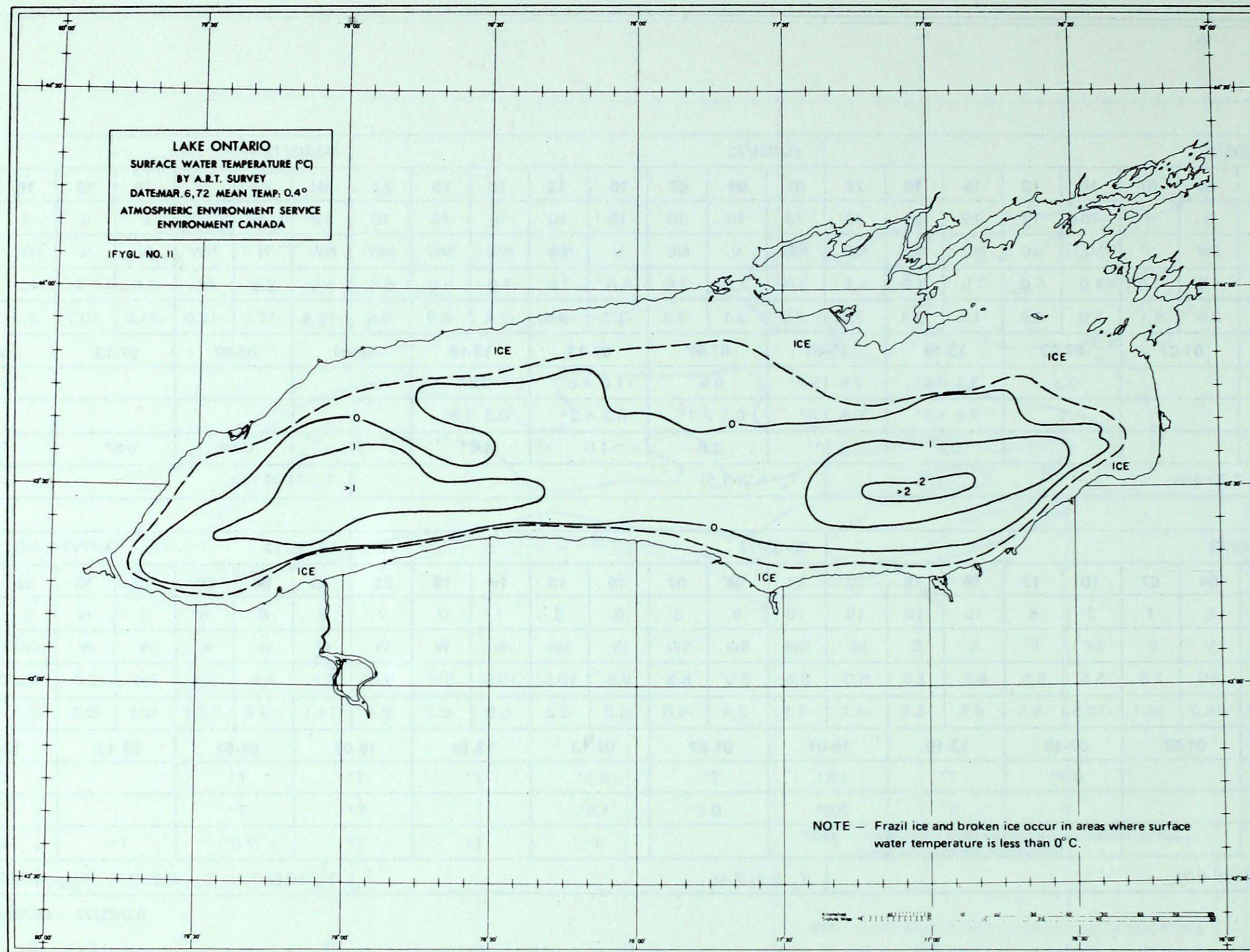
DAY	04/03/72								05/03/72								06/03/72								SURVEY NO. 11				
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	5	6	1	2	8	10	10	10	10	9	8	9	9	7	7	7	8	6	6	6	6	5	8	10					
WDRN	V	V	E	SE	E	E	E	SE	SW	SW	SW	W	SW	W	W	W	W	W	W	W	W	SW	S	SE					
WSPD	2.5	2.0	2.5	5.5	5.5	6.5	7.0	5.0	6.5	8.0	8.5	9.5	10.5	10.5	8.5	9.0	7.5	7.5	7.0	7.0	7.0	6.5	1.5	4.5					
T <sub>a</sub>	-14.8	-15.0	-16.1	-10.5	-8.3	-6.5	-5.0	-4.1	-1.5	-2.4	-5.0	-5.9	-5.6	-5.9	-8.2	-9.4	-11.1	-12.8	-13.9	-12.6	-9.6	-8.0	-8.7	-8.2					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ				0.3*		T*		1.8*		T*		0.3*		T*		T*		T*				T*							
YTR						T*		3.0*		0.5*		1.8*				T*		T*											
ROC	T*	T*						T*				T*		T*		T*		2.0*		T*		T*							
	T <sub>a</sub> -10.0(-6.7)								T <sub>a</sub> -5.5(-2.4)								T <sub>a</sub> -10.6(-7.7) T <sub>a5</sub> -6.2(-2.7) T <sub>a30</sub> -6.8(-2.0)												

## WEATHER

01/03/72 – 06/03/72

A quasistationary front with associated Low Pressure centres remains over the Great Lakes on 01/03 and 02/03; overcast and mild, with moderate to strong NE winds and snow mixed with rain. High Pressure ridge enters the area behind a Cold Front late on 02/03 and remains on 03/03. Strong NW winds and falling temp. in the afternoon of 02/03, cold with moderate N winds, broken cloud and lake — effect snow showers on 03/03. High Pressure ridge moves east on 04/03, followed by a Low Pressure system with associated warm air wedge; light and variable winds, become strong E in the afternoon; rising temp. and increasing cloud with snow showers in the evening. Low Pressure system moves slowly through the region on 05/03; strong SW winds change to W in the evening; broken cloud with scattered snow showers. High Pressure ridge moves into the area on 06/03; cold, with strong W winds, broken cloud and scattered snow showers.





SURVEY NO. 11

06/03/72

 $T_w$  0.4 (-0.7)

Survey is completed on schedule, as a High Pressure ridge enters the region. Conditions are marginal — air temp.  $-13^{\circ}$  to  $-8^{\circ}$ , wind W 7, and broken cloud with a few snow showers.

Mean surface water temp. has decreased  $0.2^{\circ}$  since 28/02 and remains much below normal, reflecting the continuing very cold weather.

The surface water temperature pattern shows large changes. The zone of  $>1^{\circ}$  water has separated and the two halves have shrunk considerably. Ice cover has grown and shore ice occurs everywhere. The lake surface demonstrates the effects of the persisting severe winter — air temperatures have remained well below freezing since 01/03;  $T_{a5}$   $-6.2$  ( $-2.7$ ),  $T_{a30}$   $-6.8$  ( $-2.0$ ).



DAY	07/03/72								08/03/72								09/03/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	4	9	10	10	9	8	1	7	6	6	2	7	9	8	2	4	8	6	1	0
WDRN	SE	E	SE	S	SW	SW	SW	SW	SW	W	W	W	W	W	NW	NW	NW	NW	NW	W	W	SW	SW	S
WSPD	6.5	5.0	6.0	8.0	9.5	7.5	7.5	6.5	9.5	9.5	7.0	11.5	10.5	10.5	8.5	7.5	7.0	5.0	3.0	3.0	4.0	4.5	3.0	1.5
T <sub>a</sub>	-7.6	-3.5	-1.7	4.8	7.2	8.2	6.7	4.8	2.2	-0.9	-3.9	-4.6	-4.7	-7.0	-9.3	-10.7	-11.5	-12.0	-13.2	-10.4	-8.3	-6.7	-7.8	-9.8
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	7.1*	2.5*				0.3		T		T*		0.3*		T*				T*				T*		
YTR	0.5*	1.3*		T*		T		0.8				T*		T*										
ROC	0.5*	1.3*						0.2				T*		T*		0.8*		0.3*		T*		T*		
	T <sub>a</sub> 2.4(+5.1)								T <sub>a</sub> -4.9(-2.5)								T <sub>a</sub> -10.0(-7.8)							

DAY	10/03/72								11/03/72								12/03/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	4	7	6	5	1	6	0	4	0	2	10	9	10	10	9	10	10	8	9	7	5	0	0	0
WDRN	W	SW	W	NW	W	NW	W	SW	SW	V	E	S	SE	SE	S	V	V	V	N	NW	N	NE	NE	NE
WSPD	2.0	1.5	3.5	5.5	6.5	6.0	3.0	2.5	0.5	2.0	2.0	6.5	5.5	6.0	6.0	4.5	4.0	3.0	2.0	5.0	5.0	5.5	4.5	2.5
T <sub>a</sub>	-11.5	-11.5	-11.3	-8.7	-6.8	-5.7	-7.6	-9.1	-11.5	-12.6	-10.9	-4.2	-1.6	0.5	1.5	1.5	1.8	2.0	0.5	1.9	3.1	4.3	1.9	0.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T*	T*																						
YTR										T*														
ROC		0.3*		T*																				
	T <sub>a</sub> -9.0(-7.0)								T <sub>a</sub> -4.7(-2.9)								T <sub>a</sub> 2.0(+3.6)							

## WEATHER

07/03/72 – 12/03/72

Very large Low Pressure system moves in from the west, drawing warm air into the Great Lakes region on 07/03; strong SE wind changes to SW in the afternoon. Overcast with snow showers changing to rain showers as temp. rises rapidly. Cold Front, followed by a large High Pressure system, enters the area on 08/03; very strong W wind, becomes strong NW in the evening; variable cloud cover with scattered snow showers and falling temp. High Pressure centre moves southeast of the Great Lakes on 09/03 and another large arctic High Pressure system enters the region on 10/03. Cold, with light to moderate winds, variable cloud cover and a few snow showers on both days. High Pressure system moves to the Atlantic coast on 11/03, setting up a flow of warm southern air over the Great Lakes; strong SE winds, overcast sky and rapidly rising temp. A quasistationary frontal system develops over the Great Lakes on 12/03; mild, with light and variable winds in the morning, moderate NE in the afternoon; broken cloud, clearing in the afternoon.



DAY	13/03/72 SURVEY NO. 12								14/03/72								15/03/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	5	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
WDRN	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	E	SE	E	E	E	E	E	E	SE	V	V	SE
WSPD	4.5	6.0	6.0	6.0	5.5	7.5	6.0	7.0	5.5	7.5	9.0	8.0	7.5	6.5	6.0	5.0	4.0	4.0	3.0	2.5	0.5	1.0	1.0	3.0
T <sub>a</sub>	-0.8	-1.7	-3.0	-2.0	-0.7	-0.7	-2.0	-2.2	-1.3	-1.7	-0.9	-0.4	-0.2	-0.2	-0.4	-0.6	-0.6	-1.3	-1.3	-0.2	1.5	1.1	0.6	0.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ						6.4*		3.0* 0.3		3.3		0.3 4.1*		5.6*		0.3		T		T*				
YTR								T		2.0*		3.8*		1.3*		T*		T*		T*				
ROC						2.0*		3.0		1.5		5.6*		8.4*		T*								
	T <sub>a</sub> -1.6(-0.3) T <sub>a5</sub> -5.3(-3.3) T <sub>a30</sub> -5.3(-1.3)								T <sub>a</sub> -0.7(+0.5)								T <sub>a</sub> 0.0(+0.9)							

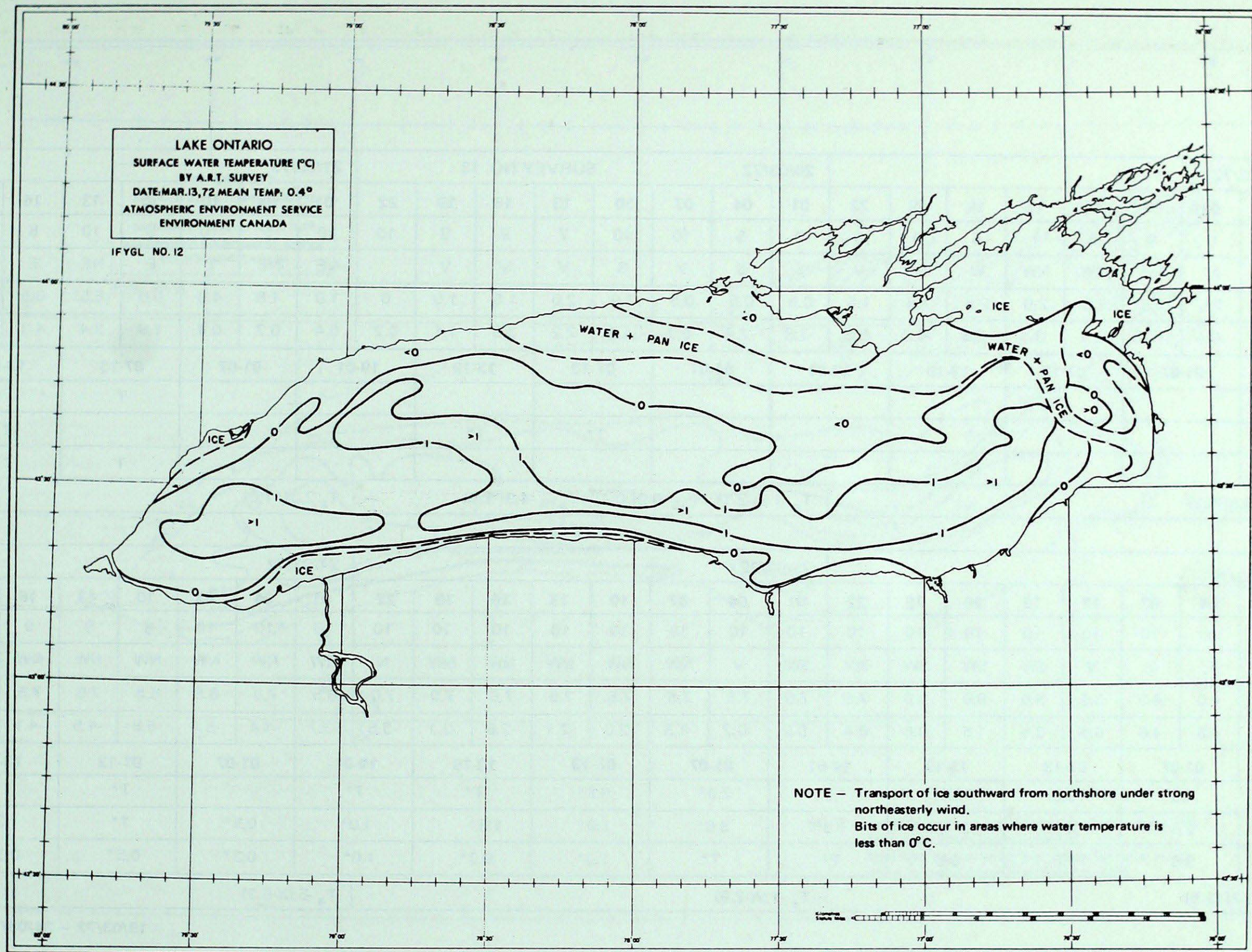
DAY	16/03/72								17/03/72								18/03/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	9	7	5	7	1
WDRN	SE	SE	SE	SE	SE	SE	V	V	SW	W	SW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	W	NW
WSPD	2.0	3.0	5.5	4.0	3.5	3.5	2.5	2.0	2.0	2.0	2.5	2.0	4.0	4.5	3.0	5.0	4.5	7.0	7.5	6.5	8.0	7.0	5.0	4.0
T <sub>a</sub>	0.0	0.6	0.7	1.8	2.8	2.8	2.6	2.6	1.9	1.5	1.5	2.4	3.3	3.1	2.6	2.2	2.0	0.5	-1.8	-3.2	-2.4	-2.2	-4.3	-6.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T*	T*		T*r		8.6		0.3		T				T		T <sup>r</sup> *		T <sup>r</sup> *						
YTR				T*r		10.4		1.0								T		0.5		T*		T*		
ROC		T		T		2.8										T*		T*		T*		T*		
	T <sub>a</sub> 1.7(+2.4)								T <sub>a</sub> 2.3(+2.8)								T <sub>a</sub> -2.2(-2.0)							

## WEATHER

13/03/72 – 18/03/72

A High Pressure system moves east across Quebec on 13/03, while the quasistationary front remains in the lower Great Lakes area; strong NE winds with overcast sky, snow and rain mixed in the late afternoon. Low Pressure trough prevails over the Great Lakes from 13/03 to 17/03. Strong E winds, mild and overcast with snow and rain mixed on 14/03; light to moderate E and SE winds on 15/03 and 16/03 with overcast sky and mixed rain and snow showers. Cold Front enters the upper Great Lakes area on 17/03, but lower Great Lakes remain in warm air; overcast with light SW winds in the morning, moderate NW in the afternoon. Cold Front passes through the lower Great Lakes area on 18/03, followed by a High Pressure system; strong NW winds, falling temp. and gradual clearing during the day.





SURVEY NO. 12

13/03/72

 $T_w$  0.4 (-0.8)

The survey is completed as scheduled. Weather conditions are good during the day — air temp.  $-2^{\circ}$  to  $-0.5^{\circ}$ , broken cloud, winds NE 6 — 7.

Mean surface water temp. continues to decrease and is much below normal.

The weather conditions of the preceding 48 hour period have created an unusual surface water temperature pattern. Air temp. has remained above freezing from the afternoon of 11/03 through to late in the evening of 12/03, and winds have been NE 5 — 6 since the afternoon of 12/03.

As a result, a narrow twisting zone of  $>1^{\circ}$  water has reappeared throughout most of the mid — lake region. Large amounts of ice have broken up along the north shore and along the edge of the ice pack in the northeast basin. The strong NE winds are moving the broken ice southward into areas of warmer water and a temporarily chaotic temperature pattern is created in the eastern region of the lake.



DAY	19/03/72								20/03/72								21/03/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	0	0	1	5	0	0	0	5	10	10	7	9	9	10	10	5	10	9	10	8	9	10
WDRN	NW	V	NW	NW	NW	W	V	V	S	S	V	S	V	V	V		NE	NE	E	E	NE	E	E	E
WSPD	3.5	2.5	2.5	2.0	2.0	2.5	2.5	1.5	0.5	0.5	0.5	3.0	2.0	1.5	1.0	0	1.0	1.5	4.0	5.0	5.5	5.5	5.0	5.0
T <sub>a</sub>	-8.4	-9.4	-10.6	-6.1	-3.5	-2.6	-4.2	-5.6	-7.8	-7.4	-5.7	-1.1	2.2	3.5	1.1	0.2	0.4	0.2	0.4	1.8	3.4	4.3	3.9	3.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																				T				
YTR												T*		T*								T		
ROC	T*																			T		T		
	T <sub>a</sub> -6.3(-6.3)								T <sub>a</sub> -1.9(-2.1) T <sub>a5</sub> -0.9(-0.4) T <sub>a30</sub> -4.9(-2.0)								T <sub>a</sub> 2.3(+1.8)							

DAY	22/03/72								23/03/72								24/03/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	8	9	9	7	7
WDRN	E	E	E	V	SW	SW	SW	SW	SW	V	NW	NW	NW	NW	NW	N	NW	NW	NW	NW	NW	NW	NW	NW
WSPD	2.5	4.0	4.0	3.5	8.0	9.0	8.0	7.5	7.0	7.5	7.5	7.5	7.5	7.0	7.0	7.0	6.5	7.0	6.5	6.5	7.5	7.5	6.0	4.5
T <sub>a</sub>	3.7	4.8	4.8	6.5	3.5	1.5	0.6	0.4	-0.2	-0.2	-1.5	-2.0	-2.1	-2.6	-3.1	-3.5	-3.7	-4.4	-5.4	-5.8	-4.5	-4.1	-5.4	-6.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	4.6	4.3		3.0		T2.0*		1.3*		2.0*		0.8*		T*		T*				T*		T*		
YTR	1.5	1.8		13.5		3.6 0.8*		1.3*		3.0*		1.0*		1.3*		1.0*		0.5*		T*		1.3*		
ROC		3.6		1.8		0.5		T*		T*		1.3*		0.3*		1.0*		0.3*		0.5*		0.3*		
	T <sub>a</sub> 3.2(+2.5)								T <sub>a</sub> -1.9(-2.9)								T <sub>a</sub> -5.0(-6.3)							

## WEATHER

19/03/72 – 24/03/72

High Pressure system prevails over the Great Lakes on 19/03 and 20/03. Light NW winds, clear sky and cold on 19/03. Light and variable winds, broken cloud and moderating temp. on 20/03. A quasistationary frontal system develops in the region on 21/03, as a complex Low Pressure system approaches from the southwest; moderate E winds, broken cloud and rising temp. with scattered showers in the afternoon. Complex Low Pressure system deepens over the Great Lakes on 22/03; moderate E winds in the morning, strong SW in the afternoon; overcast with continuous rain changing to snow in the afternoon. Low Pressure system moves slowly east on 23/03, as a large arctic High Pressure ridge builds over the region. Strong NW winds and falling temp. on 23/03, with overcast to broken cloud cover and snow showers.



$T_w 0.3 (-1.0)$ 

Overnight to 20/03 conditions are ideal for rapid cooling of the lake surface – air temp.  $-6^{\circ}$  to  $-8^{\circ}$ , clear sky and very light winds. As a result, a thin layer of ice forms over the northern third of the lake, and in the open water areas the surface temperature is very low.



DAY	25/03/72								26/03/72								27/03/72								SURVEY NO. 14				
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	4	5	1	4	4	6	1	0	0	0	0	0	0	0	0	0	0	0	0	6	6	7	2	3					
WDRN	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	W	W	W	W	NW	NW	NW	NW	NW	NW					
WSPD	3.5	3.5	3.5	3.5	6.5	7.0	4.5	5.0	4.0	5.0	5.0	7.5	9.5	10.5	7.5	6.5	6.5	5.0	4.5	5.5	6.0	6.0	4.5	3.5					
T <sub>a</sub>	-8.0	-9.6	-10.0	-5.4	-3.3	-2.2	-4.5	-6.7	-7.4	-7.8	-8.5	-3.7	-2.0	-1.1	-3.0	-4.2	-4.4	-5.4	-6.6	-3.3	-1.7	-1.3	-2.8	-4.3					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ																													
YTR	1.0*																												
ROC	1.0*	0.8*		T*		T*																							
	T <sub>a</sub> -6.2(-7.7)								T <sub>a</sub> -4.7(-6.5)								T <sub>a</sub> -3.7(-5.7) T <sub>a5</sub> -2.9(-4.2) T <sub>a30</sub> -3.2(-1.6)												

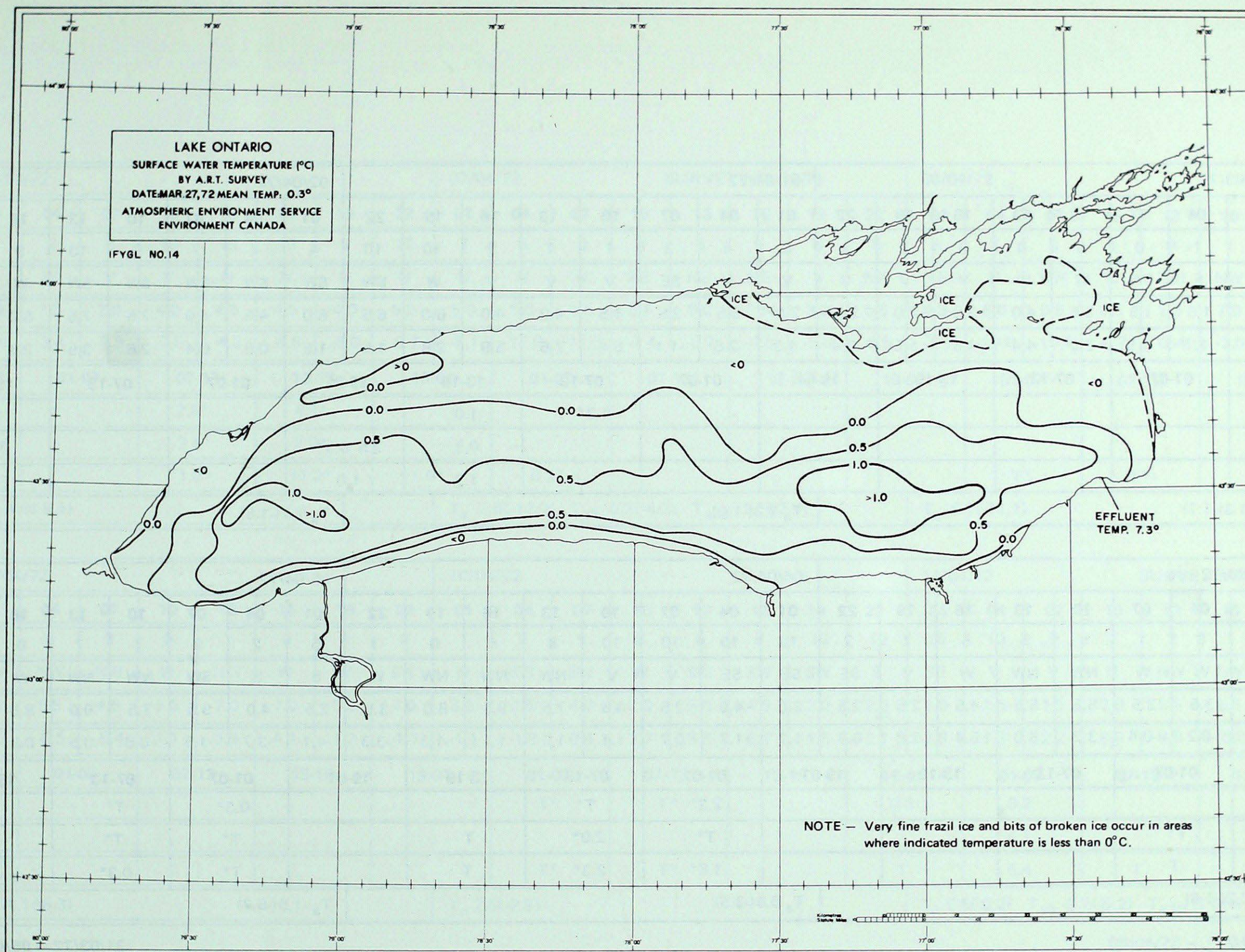
DAY	28/03/72								29/03/72								30/03/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	9	8	4	4	0	0	0	0	0	0	0	1	5	9	9	9	10	10	10	8	9	9	7	4
WDRN	N	N	NW	N	NW	NW	V	V	V	V	V	NE	E	E	E	E	SE	SW	SW	V	SW	W	SW	SW
WSPD	4.0	3.0	3.5	4.5	4.0	4.0	3.5	2.5	3.0	2.5	2.5	2.0	5.5	5.5	6.0	5.5	6.5	6.5	5.0	5.0	6.5	7.0	4.0	3.5
T <sub>a</sub>	-3.9	-4.5	-6.1	-1.6	0.6	2.0	-0.2	-2.4	-3.3	-4.8	-3.7	1.8	5.7	5.6	3.5	3.5	3.5	3.7	1.7	2.8	3.9	3.7	2.0	1.1
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																0.5		T		T*				
YTR																T		0.3		T*				
ROC		T*		T*												1.0		T		0.3				
	T <sub>a</sub> -2.0(-4.3)								T <sub>a</sub> 1.0(-1.5)								T <sub>a</sub> 2.8(0.0)							

## WEATHER

25/03/72 – 30/03/72

Large High Pressure system enters the Great Lakes region on 25/03 and prevails until 29/03; moderate to strong NW winds, mostly clear sky with short cloudy periods, scattered lake — effect snow showers and continuing below normal air temp. Large Low Pressure system with a warm air trough approaches the Great Lakes from the south on 29/03; light and variable winds, become strong E in the afternoon, as temp. rises rapidly and cloud cover develops. Low Pressure system moves into the region on 30/03; strong SW winds with overcast to broken cloud cover and rain showers in the morning.





SURVEY NO. 14

27/03/72

 $T_w$  0.3 (-1.1)

Survey is completed as scheduled. Weather conditions are fair — broken cloud, winds NW 6, air temp.  $-3^\circ$  to  $-1^\circ$ .

Mean surface water temp. remains much below normal, due to the continuing very cold weather. Air temp. has remained below freezing since 23/03.

Ice cover in the northeast basin has decreased. Break — up of the solid ice cover has occurred due to the generally strong winds prevailing since 22/03. But the low air temp. has prevented melting of the ice at the lake surface. Fine frazil ice and bits of broken ice occur in the northern half of the lake, where the surface temperature is indicated to be  $<0^\circ$ .



DAY	31/03/72								01/04/72								02/04/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	9	1	0	0	0	0	2	1	6	4	3	1	7	9	10	10	4	4	7	9	10	9	8	10
WDRN	SW	S	SW	W	W	V	V	V	V	N	SE	V	V	V	W	SW	SW	SW	SW	SW	SW	W	SW	SW
WSPD	4.5	1.5	1.5	3.5	4.0	3.0	2.0	2.0	2.0	0.5	2.5	4.5	4.0	4.0	6.0	6.5	6.0	4.5	4.0	7.5	7.5	6.0	5.5	5.5
T <sub>a</sub>	0.7	-1.1	-1.5	2.0	4.4	4.8	1.5	-0.4	-1.3	-2.6	-1.1	5.4	7.6	5.9	2.8	1.5	1.5	0.6	0.4	2.6	3.5	2.8	1.5	0.8
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ												1.3* T		1.0								T*		
YTR														0.3		2.5 0.3*						T*		
ROC														1.3		1.0								
	T <sub>a</sub> 1.3(-1.7)								T <sub>a</sub> 2.3(-1.0)								T <sub>a</sub> 1.7(-1.8)							

DAY	03/04/72								04/04/72								05/04/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	8	1	5	5	8	7	2	10	10	10	10	8	4	0	1	5	2	9	7	7	0	1	0
WDRN	SW	W	W	NW	NW	W	V	SE	SE	SE	V	V	NW	NW	NW	W	S	S	SW	NW	NW	W	W	SW
WSPD	4.5	3.5	3.5	5.5	5.5	4.5	2.5	2.5	3.0	4.0	2.5	4.5	7.5	9.5	8.0	3.5	2.5	4.0	5.5	7.5	9.0	9.5	5.5	3.5
T <sub>a</sub>	0.6	-0.2	-0.4	3.2	5.0	5.4	2.8	0.8	1.7	1.7	0.7	1.1	1.9	1.1	-1.3	-3.3	-4.1	-3.7	-1.5	-0.8	0.5	0.9	-1.1	-2.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T*									2.3*		T*						0.3*		T*				
YTR	T*	T*								T*		2.0*		T				T*		T*				
ROC		T								1.8*		2.3*		T				T*		0.3*				
	T <sub>a</sub> 2.2(-1.6)							T <sub>a</sub> 0.5(-3.5)								T <sub>a</sub> -1.5(-5.7)								

## WEATHER

31/03/72 – 05/04/72

Unsettled weather prevails over the Great Lakes from 31/03 to 04/04, as weak Low Pressure centres drift northeasterly through the region, producing cloud, some precipitation and occasionally strong winds. Cold Front, extending south from a Low Pressure centre over Hudsons Bay, moves east through the area on 04/04; light and variable winds in the morning, strong NW in the afternoon; overcast with snow showers during the day, clearing with falling temp. in the evening. A weak trough drifts across the Great Lakes on 05/04, causing broken cloud with snow showers; temp. remains well below normal.



DAY	06/04/72								07/04/72								08/04/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	7	8	9	10	10	10	9	10	7	6	0	4	5	5	6	5	5	5	3	4	0	1	1	0
WDRN	W	W	V	V	N	N	N	N	N	N	N	NE	NE	NE	V	NW	NE	N	NW	N	NW	NW	NW	W
WSPD	1.0	1.5	2.0	4.0	4.5	4.5	4.0	5.5	5.0	5.5	5.5	8.0	5.0	3.5	3.0	5.5	6.5	5.0	5.5	5.5	5.5	7.0	5.5	5.5
T <sub>a</sub>	-2.8	-3.4	-2.8	-2.5	-4.3	-4.8	-5.0	-6.7	-8.1	-11.9	-11.5	-7.4	-5.7	-4.6	-5.0	-6.5	-7.6	-10.0	-10.2	-6.7	-3.4	-2.0	-3.3	-5.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ				2.8*		4.1*																		
YTR				2.8*		2.0*																		
ROC				1.8*		11.2*		1.0*		0.3*						T*		T*		T*				
	T <sub>a</sub> -4.0(-9.5)								T <sub>a</sub> -7.6(-12.3) T <sub>a5</sub> -0.2(-4.2) T <sub>a30</sub> -1.6(-2.5)								T <sub>a</sub> -6.1(-11.1)							

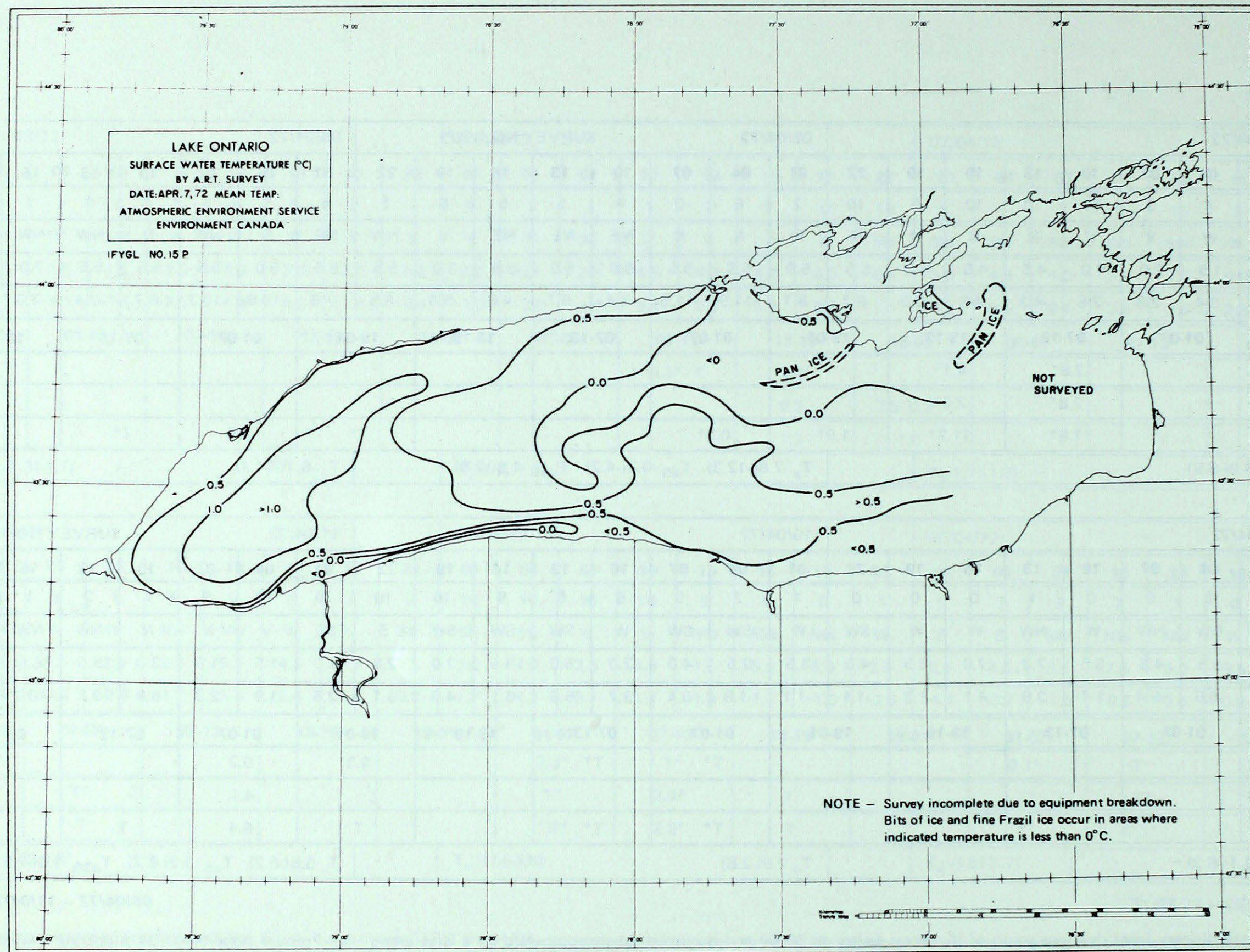
DAY	09/04/72								10/04/72								11/04/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	0	0	1	0	0	0	1	2	9	6	6	8	10	10	10	10	9	7	2	1	1	4
WDRN	NW	NW	NW	W	NW	W	W	SW	W	SW	SW	W	SW	SW	SW	S	SE	V	V	N	NW	NW	NW	NW
WSPD	6.0	5.5	4.5	5.5	7.0	7.0	5.5	4.0	3.5	2.5	4.0	2.0	5.0	4.5	2.0	2.0	1.0	1.5	1.5	3.0	5.5	6.5	3.5	2.5
T <sub>a</sub>	-6.3	-6.5	-5.4	1.1	3.9	4.1	1.3	-1.1	-1.1	-1.9	0.4	3.7	5.8	6.1	4.5	3.1	2.8	1.9	2.2	6.9	9.8	10.2	6.7	3.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ										T*		T*				0.3		0.2						
YTR																		4.1						
ROC										T*		T*				T		6.4		T				
	T <sub>a</sub> -1.1(-6.3)								T <sub>a</sub> 2.6(-2.8)								T <sub>a</sub> 5.5(-0.2) T <sub>a5</sub> -3.2(-8.2) T <sub>a30</sub> -1.0(-2.9)							

## WEATHER

06/04/72 – 11/04/72

A quasistationary front develops south of the Great Lakes on 06/04 and is pushed slowly southward by a large arctic High Pressure ridge on 07/04. Moderate N winds, overcast with snow and falling temp. on 06/04; strong N and NE winds, scattered cloud and very cold on 07/04. High Pressure continues to dominate over the region on 08/04 and 09/04, with strong NW winds, low temp. and scattered cloud. High Pressure centre moves to the southeastern U.S.A. on 10/04, bringing warmer southerly air to the Great Lakes region; light to moderate SW winds and broken cloud with a few snow showers. Weak Low Pressure systems traverse the area on 11/04, followed by a High Pressure cell moving in from the north in the afternoon; light and variable winds and overcast with rain in the morning; moderate NW winds and clearing sky in the afternoon.





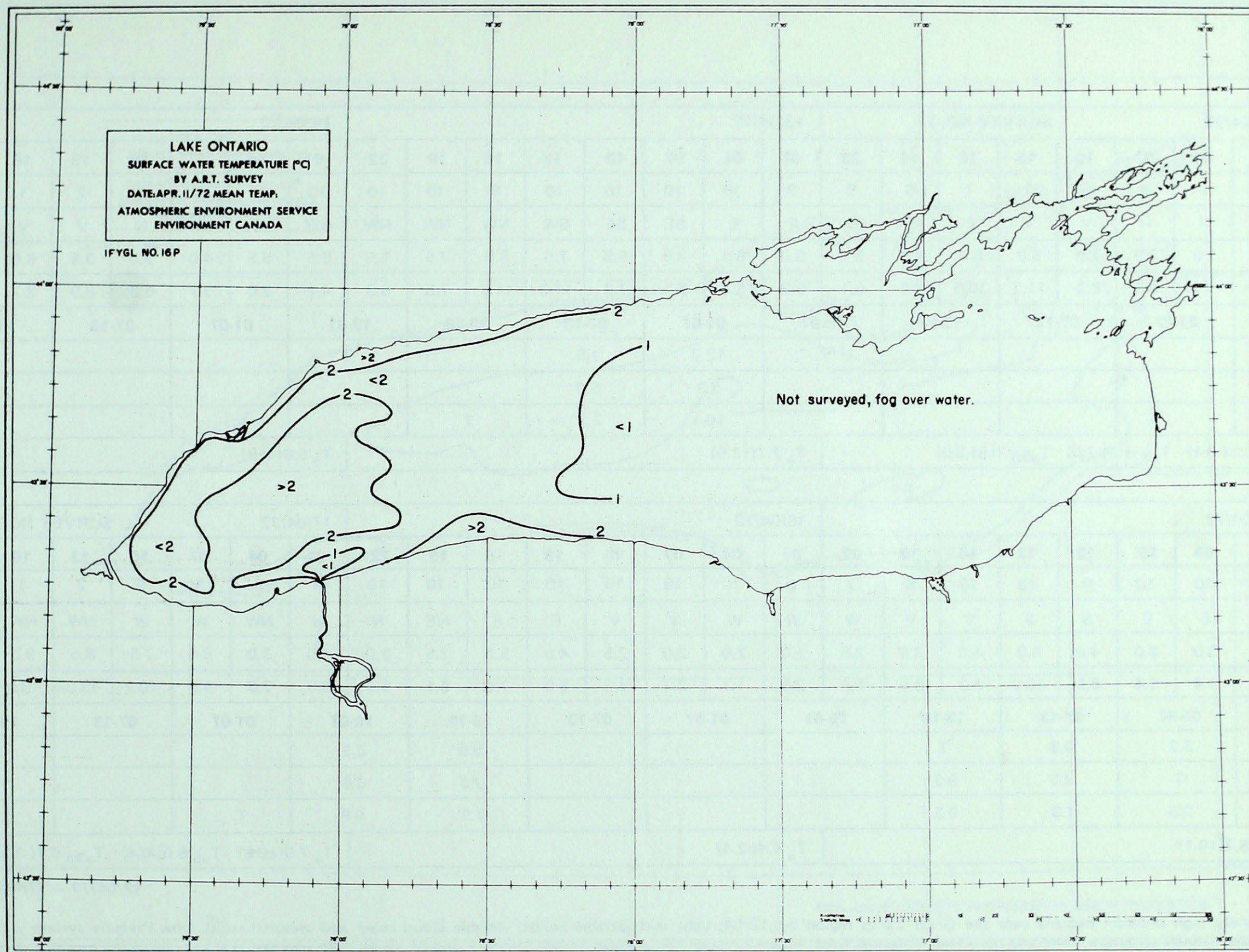
SURVEY NO. 15 (P)

07/04/72

Scheduled for 04/04, the survey is delayed until 07/04 by bad weather. The flight on 07/04 is incomplete, due to equipment failure.

After an outbreak of arctic air on 06/04, severe winter conditions prevail over the region — strong NE winds and air temp.  $-8^{\circ}$  to  $-5^{\circ}$ . Surface water temp. remains very low because of the abnormally late persistence of winter. Fast ice cover has decreased, but due to the low air temp. and lack of solar radiation, energy for melting the ice comes largely from the lake waters. Overnight air temp. of  $-12^{\circ}$  and freezing daytime temp. is causing the formation of new frazil ice.





SURVEY NO. 16 (P)

11/04/72

Scheduled for 10/04, the survey flight is delayed by equipment malfunction. On 11/04 weather conditions are marginal, as a Low Pressure system moves through the area in the morning. The survey is terminated half way, due to low - lying condensation fog over the lake, produced by moist warm air in contact with the cold water.

Surface water temp. appears to be too high. It is possible that the sensor is detecting heat from very thin fog immediately above the water surface.



DAY	12/04/72 SURVEY NO. 17								13/04/72								14/04/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	8	7	8	5	1	1	8	9	9	10	10	10	10	8	10	10	10	10	7	9	2	1	2	2
WDRN	N	N	N	V	V	E	E	E	E	E	SE	SE	SW	NW	NW	NW	NW	N	NW	N	V	V	S	E
WSPD	1.5	1.0	2.0	2.5	3.0	6.0	4.5	6.0	6.0	6.5	8.0	5.5	7.5	8.0	7.5	7.5	6.5	5.5	4.0	2.5	3.5	6.0	3.0	4.5
T <sub>a</sub>	1.5	0.4	0.9	8.0	11.7	10.5	7.6	6.1	5.8	5.7	6.1	7.4	11.3	11.6	7.8	5.9	4.1	3.0	3.7	6.3	8.9	8.7	5.4	4.3
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ								T		12.2		1.8				T								
YTR										5.3		5.6		T										
ROC										10.4		2.3		T										
	T <sub>a</sub> 5.8(-0.1) T <sub>a5</sub> -1.3(-7.0) T <sub>a30</sub> -0.9(-3.0)								T <sub>a</sub> 7.7(+1.5)								T <sub>a</sub> 5.6(-0.8)							

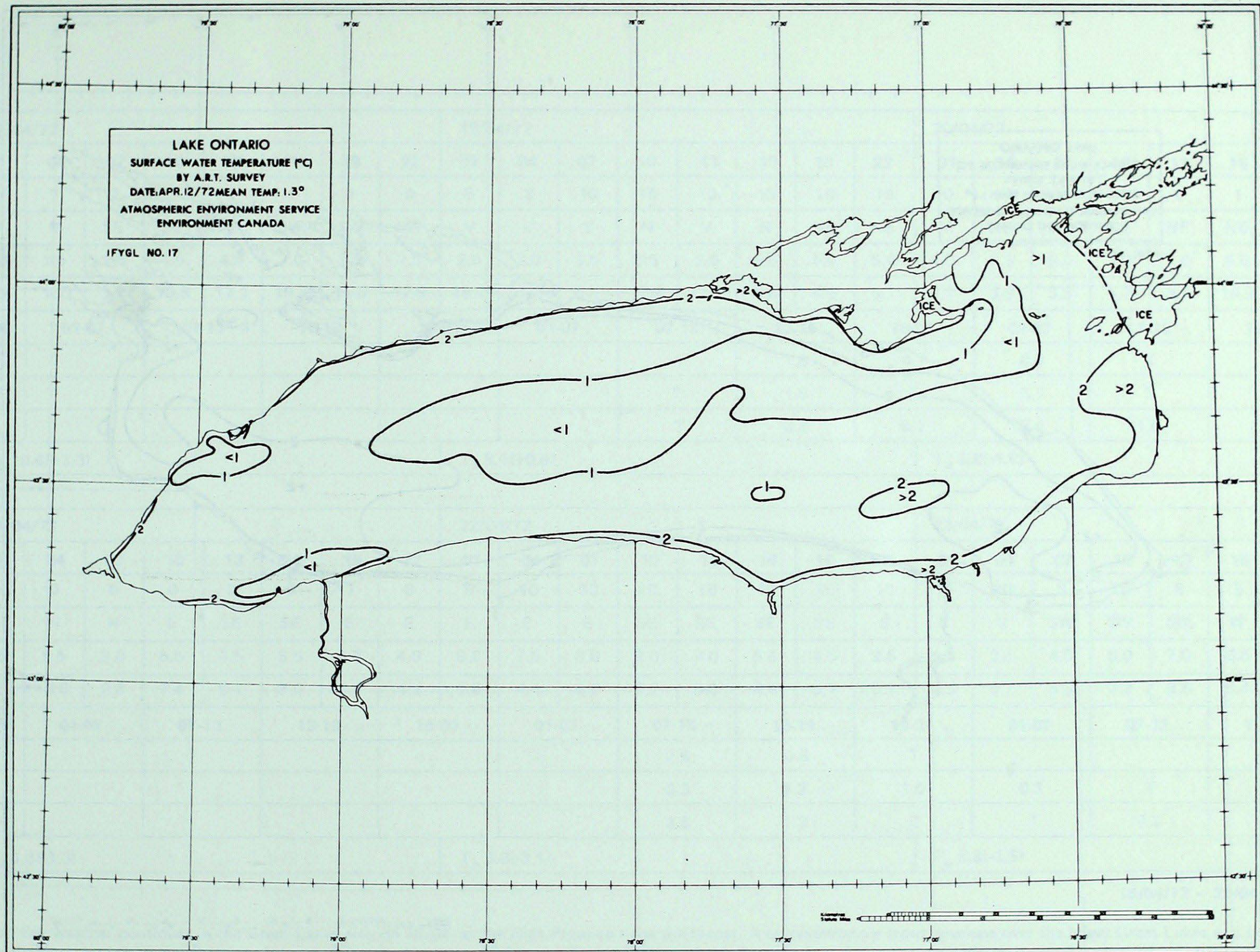
DAY	15/04/72								16/04/72								17/04/72								SURVEY NO. 18				
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	8	10	10	9	10	10	8	7	0	5	10	10	10	10	10	10	5	5	5	2	2	1	1	0					
WDRN	E	E	E	S	S	V	V	W	W	W	V	V	E	E	NE	N	N	NW	W	W	NW	NW	W	NW					
WSPD	3.5	3.0	3.0	4.0	4.0	4.0	3.0	2.5	1.0	2.0	2.0	2.5	4.5	5.5	3.5	5.0	4.0	3.0	6.0	7.5	8.5	9.5	7.0	3.5					
T <sub>a</sub>	3.9	5.4	5.4	8.5	10.0	8.3	6.9	5.0	2.6	1.1	2.1	4.3	6.9	7.0	6.1	5.0	3.9	2.8	5.0	10.2	13.3	13.0	9.1	5.6					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ		3.3		0.8		T								5.6		5.3													
YTR		T		2.0		0.3								0.3		6.6													
ROC		2.3		1.3		0.3								7.9		0.8		T											
	T <sub>a</sub> 6.7(+0.1)							T <sub>a</sub> 4.4(-2.4)								T <sub>a</sub> 7.9(+0.8) T <sub>a5</sub> 6.0(-0.4) T <sub>a30</sub> 0.1(-3.3)													

## WEATHER

12/04/72 – 17/04/72

Generally high pressure prevails over the Great Lakes region on 12/04; light and variable winds, variable cloud cover and seasonal temp. Low Pressure system with a complex frontal structure, followed by a High Pressure ridge, moves through the area on 13/04. Strong E and SE winds with overcast sky and rain in the morning, strong NW winds with overcast sky and scattered showers in the afternoon. High Pressure ridge moves east on 14/04 and is replaced by a Low Pressure system on 15/04. Moderate winds with broken to overcast cloud cover and rain on 15/04. Another Low Pressure system passes through the lower Great Lakes area late on 16/04, with associated overcast sky and rain. High pressure builds over the Great Lakes from the southwest on 17/04; strong NW winds, scattered cloud and seasonal temp.





SURVEY NO. 17

12/04/72

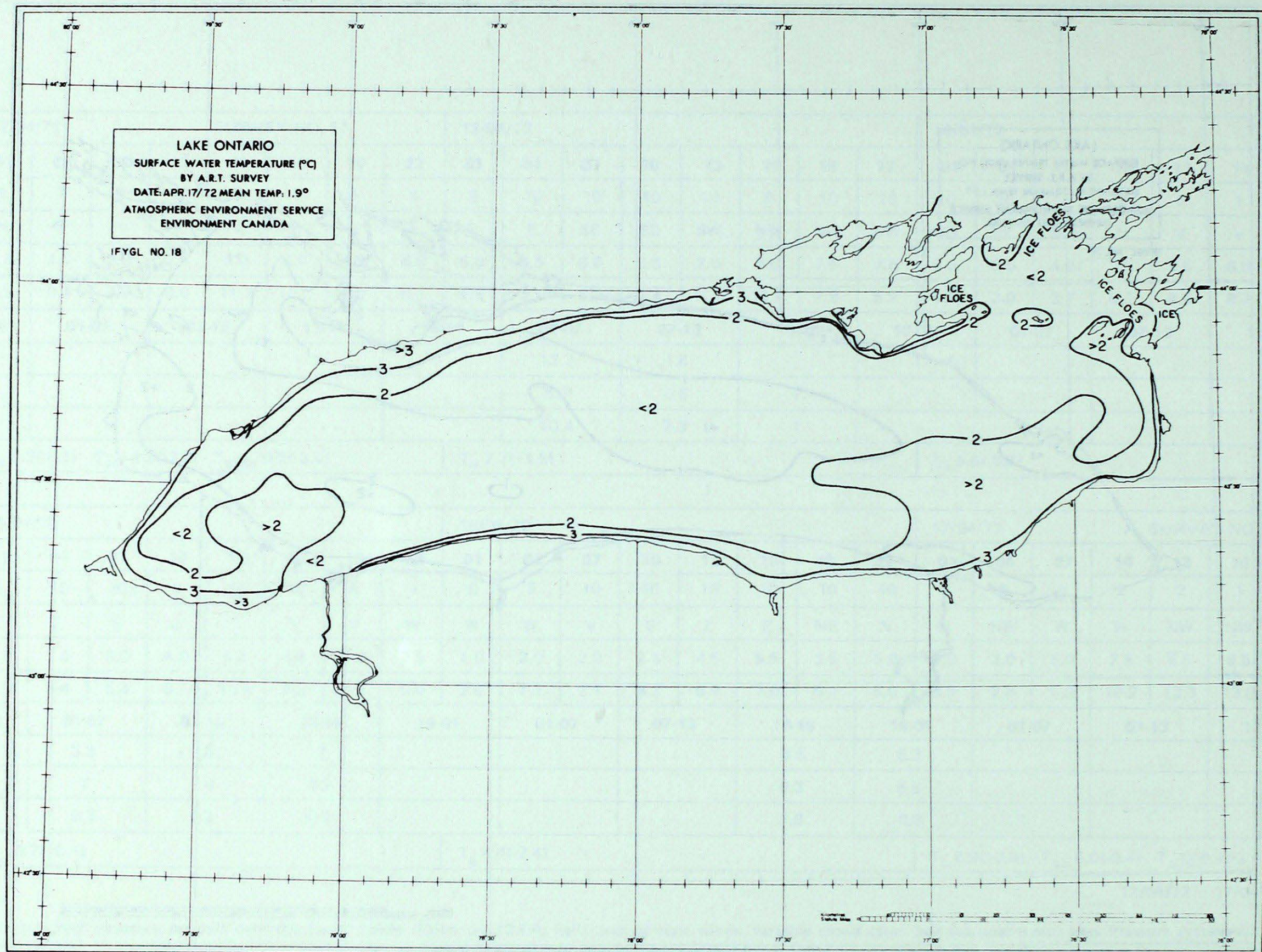
 $T_w$  1.3 (-0.9)

After two partial surveys, this survey is flown in order to obtain complete coverage of the lake. Weather conditions on 12/04 are fair — light and variable winds, scattered cloud, air temp. 8° to 12°.

Mean surface water temp. remains well below normal and some ice is still present in the northeast basin.

Near — shore shallow water warming has started in response to the milder weather of the preceding three days. A long tongue of  $< 1^\circ$  water protrudes from the northeast basin into the central region of the lake. This suggests recent melting of ice that has been carried out into the lake from the northeast basin.





SURVEY NO. 18

17/04/72

 $T_w$  1.9 (-0.7)

Survey is completed as scheduled. Weather conditions are fair, as a High Pressure centre builds southwest of the region.

Mean surface water temp. has increased  $0.6^\circ$  since 12/04. The weather during the preceding five days has been seasonal, but mainly cloudy. Therefore, much of the increase (slightly greater than the seasonal normal of  $0.4^\circ$ ) can be attributed to the relatively high air temp. and clear sky on 17/04.

The surface water temperature gradient is very flat, typical of early spring. Shallow water warming is evident along the shores. However, remnant ice floes and some fast ice are still present in some bays in the northeast corner of the lake.



DAY	18/04/72								19/04/72								20/04/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	1	2	1	1	4	4	0	8	3	10	10	10	10	10	10	10	10	10	10	9	1	0	0
WDRN	V	V	SE	SE	S	SW	SW	SW	V	V	V	N	V	N	NE	NE	NE	NE	NE	NE	NE	NE	NE	W
WSPD	2.0	1.5	1.5	4.5	4.5	7.0	3.5	2.5	2.5	2.0	3.5	3.5	3.0	6.5	5.0	5.0	4.0	5.5	6.0	7.0	7.0	6.0	2.5	2.5
T <sub>a</sub>	3.9	1.7	3.7	10.9	17.1	19.4	15.0	12.9	10.2	8.4	8.9	12.8	11.7	6.8	4.6	4.1	4.1	3.9	3.9	5.7	8.7	10.9	8.1	1.3
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ												T		1.8		4.1		0.8		T				
YTR												T		1.5		T		5.1		T				
ROC												T		0.3		0.3		8.4		1.0				
	T <sub>a</sub> 10.6(+3.3)								T <sub>a</sub> 8.4(+0.9)								T <sub>a</sub> 5.8(-1.9)							

DAY	21/04/72								22/04/72								23/04/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	0	0	0	0	7	8	9	10	10	10	10	10	10	10	10	10	9	10	8	5	8	4
WDRN	V	N	N	E	SE	SE	E	E	E	E	E	SE	SE	SE	SE	S	S	V	SW	SW	SW	W	W	V
WSPD	3.5	2.5	3.0	5.5	4.5	5.5	4.5	4.0	6.0	7.5	8.0	9.0	7.0	6.5	4.5	3.5	3.5	3.5	4.5	5.0	7.0	6.5	2.0	3.0
T <sub>a</sub>	0.5	-0.6	2.8	7.4	9.1	8.0	5.4	4.3	3.9	4.4	5.6	5.2	5.0	4.4	5.7	5.7	5.3	5.7	5.6	7.2	9.5	9.4	7.2	4.8
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ												2.5		0.8		T						T		
YTR												0.3		4.3		1.0		0.3		T		T		
ROC												3.6		1.3		T		T		0.3				
	T <sub>a</sub> 4.6(-3.3)								T <sub>a</sub> 5.0(-3.1)								T <sub>a</sub> 6.8(-1.5)							

## WEATHER

18/04/72 – 23/04/72

Warm fair weather continues in the Great Lakes area on 18/04, as the High Pressure ridge drifts east. A quasistationary front develops over the lower Great Lakes and small Low Pressure centres travel through the area along the front on 19/04 and 20/04. Light and variable winds in the morning of 19/04, become strong NE in the afternoon and continue on 20/04. Overcast with rain during this period. High Pressure ridge moves in late on 20/04 and remains over the region on 21/04; cool with variable moderate winds and clear sky. Low Pressure system with a warm air trough approaches the Great Lakes from the southwest on 22/04 and remains in the area on 23/04. Strong SE winds on 22/04, moderate S overnight, then strong SW on 23/04. Overcast to broken cloud cover with rain diminishing to showers in the afternoon of 23/04.



DAY	24/04/72								25/04/72								26/04/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	4	9	10	9	9	2	5	0	3	0	0	0	0	0	0	1	3	2	3	7	5	2	5
WDRN	SW	W	NW	NW	NW	NW	NW	V	N	N	N	N	N	NW	NW	N	W	W	W	W	W	NW	V	NE
WSPD	3.0	2.5	1.0	4.5	4.0	5.0	5.0	4.0	3.5	3.5	5.5	5.0	5.5	5.5	4.0	4.0	2.0	2.5	3.0	4.0	5.5	6.5	3.0	2.5
T <sub>a</sub>	4.6	2.6	3.2	6.3	7.4	6.8	5.2	2.6	0.7	-0.9	0.2	2.6	5.9	6.5	3.7	1.3	-0.5	-1.5	0.3	7.8	9.6	9.7	6.7	2.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T			T																				
YTR	T	T		T		0.5																		
ROC						T																		
	T <sub>a</sub> 4.8(-3.7)								T <sub>a</sub> 2.5(-6.2) T <sub>a5</sub> 5.4(-2.7) T <sub>a30</sub> 2.4(-2.9)								T <sub>a</sub> 4.3(-4.6)							

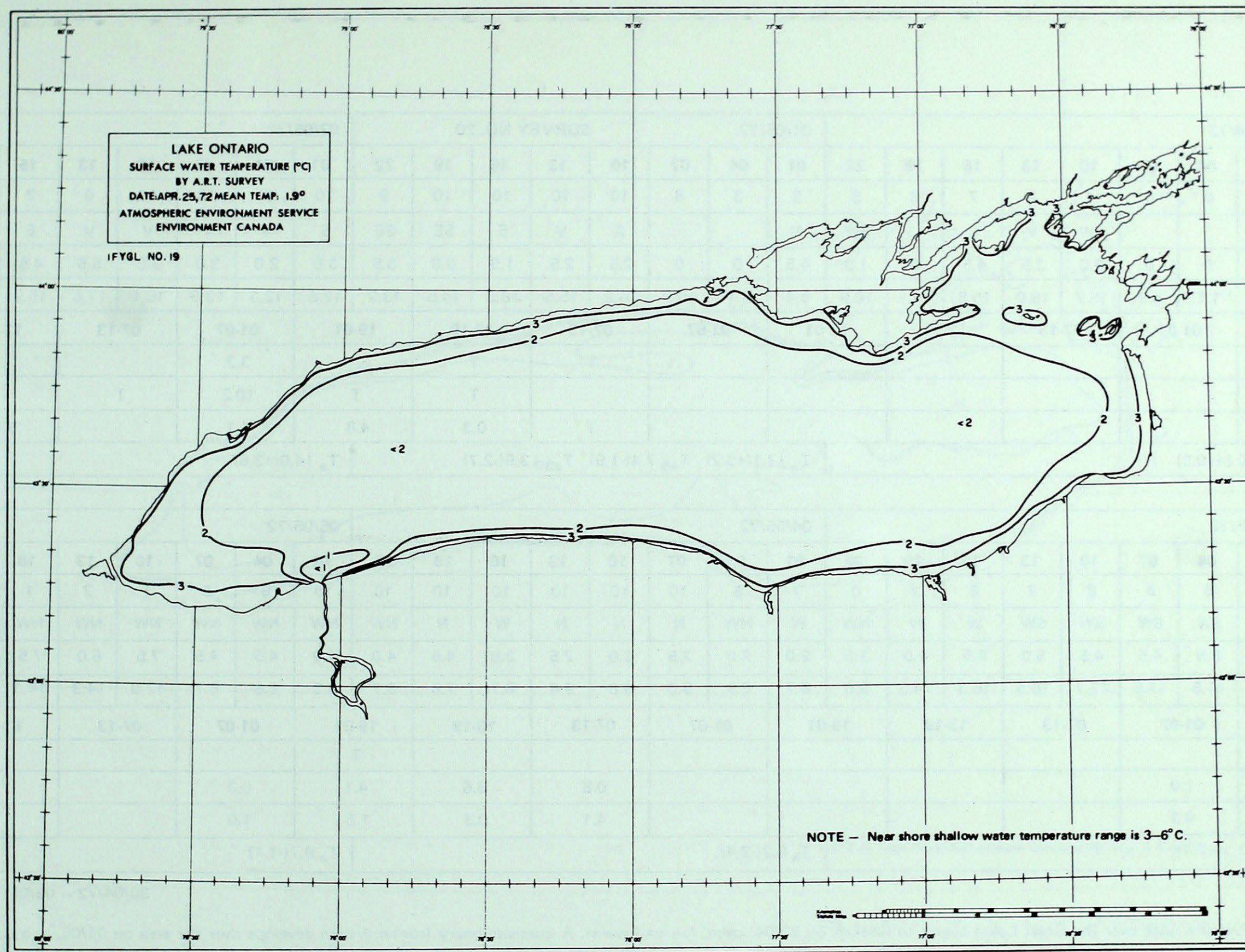
DAY	27/04/72								28/04/72								29/04/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	4	0	0	0	0	0	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	0
WDRN	N	N	N	NE	V	W	SW	W	W	W	W	SW	W	W	W	NW	N	V	V	V	V	V	S	
WSPD	2.0	2.5	3.5	3.0	3.0	4.0	2.5	2.0	2.5	2.5	3.0	5.5	6.0	8.5	5.5	4.0	3.0	2.0	2.0	3.0	3.5	4.0	3.0	0
T <sub>a</sub>	1.5	-1.3	2.4	7.6	9.6	9.8	7.2	3.5	0.9	-0.9	3.0	10.4	13.9	16.5	13.1	7.9	5.2	2.4	6.3	12.6	14.6	14.6	11.7	6.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC																								
	T <sub>a</sub> 5.0(-4.1)								T <sub>a</sub> 8.1(-1.2)								T <sub>a</sub> 9.2(-0.3)							

## WEATHER

24/04/72 – 29/04/72

Very large High Pressure ridge moves into the eastern half of the continent on 24/04; light to moderate NW winds and broken cloud with scattered showers. High pressure continues over the eastern part of the continent until 01/05. Mostly clear sky and below normal temp. during this period.





SURVEY NO. 19

25/04/72

 $T_w$  1.9 (-1.3)

Survey is postponed from 24/04 due to weather. On 25/04 conditions are very good — clear sky, wind N 5, air temp. 3° to 6°.

Mean surface water temp. shows no increase from 17/04. Mostly cool and cloudy weather, prevailing since 19/04, has retarded warming of the water. Furthermore, overnight from 24/04, air temp. has been at or near freezing, with a clear sky and N winds.

The surface water temperature field shows very little advance in shallow water warming. Near shore the water temp. ranges from 3° to 6°, which is comparable to the air temp. range. Most of the lake surface remains at <2°. The Niagara R. plume is very cold, at <1°.



DAY	30/04/72								01/05/72								SURVEY NO. 20								02/05/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22								
CLD	0	0	0	1	2	7	8	6	3	3	8	10	10	10	10	9	10	10	10	10	9	7	10	10								
WDRN	NW			SW	V	V		SW	N			S	V	E	SE	SE	S	V	V	V	V	E	E	E								
WSPD	0.5	0	0	2.0	3.5	4.5	0	1.5	0.5	0	0	2.5	2.5	1.5	3.0	3.5	3.0	2.0	3.0	3.5	5.5	4.5	4.5	4.5								
T <sub>a</sub>	3.7	1.1	5.9	15.7	18.0	15.5	14.1	10.9	9.4	8.1	10.9	16.3	15.5	16.3	14.6	13.2	12.6	12.3	13.0	16.1	17.6	15.9	13.2	11.3								
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-								
YYZ												T		T		6.1		3.3														
YTR														T		T		10.2		T												
ROC												T		0.3		4.8		4.1			3.0											
	T <sub>a</sub> 10.6(+0.9)								T <sub>a</sub> 13.1(+3.2) T <sub>a5</sub> 7.4(-1.9) T <sub>a30</sub> 3.9(-2.7)								T <sub>a</sub> 14.0(+3.8)															

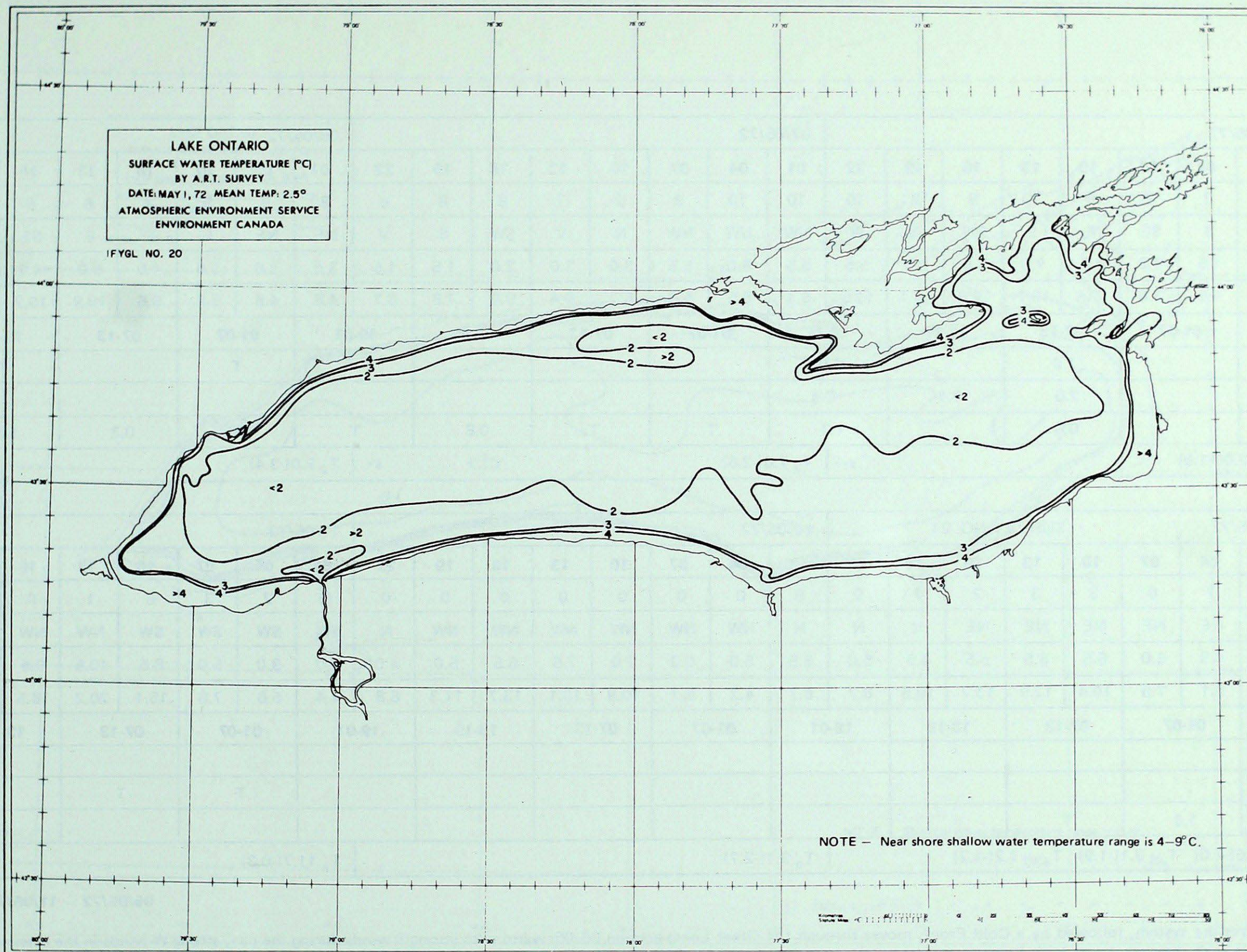
DAY	03/05/72								04/05/72								05/05/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	8	8	8	7	6	7	0	7	6	10	10	10	10	10	10	10	8	5	1	2	1	0	0
WDRN	V	SW	SW	SW	SW	W	W	NW	W	NW	N	N	N	W	N	NW	NW	NW	NW	NW	NW	NW	V	W
WSPD	3.5	3.5	4.5	4.5	5.0	6.5	4.0	3.0	2.0	2.0	2.5	3.0	2.5	3.5	4.5	4.0	4.0	4.5	4.5	7.5	6.0	7.5	3.0	2.0
T <sub>a</sub>	11.1	11.5	11.5	13.7	16.5	16.3	14.3	9.6	8.7	6.9	8.0	9.6	9.4	8.7	7.6	6.7	6.3	5.6	6.7	12.0	14.3	14.3	11.5	6.9
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	5.6															T								
YTR	19.3	1.0										0.8		6.6		4.1		0.3						
ROC	6.9	0.3										4.1		0.3		1.5		1.0						
	T <sub>a</sub> 13.1(+2.7)								T <sub>a</sub> 8.2(-2.4)								T <sub>a</sub> 9.7(-1.1)							

## WEATHER

30/04/72 – 05/05/72

High Pressure ridge over the Great Lakes begins to weaken on 30/04; calm, fair and warm. A quasistationary frontal system develops over the area on 01/05, as a Low Pressure system approaches from the west; calm with increasing cloud in the morning; warm and overcast with showers and light E winds in the afternoon. Low Pressure system moves slowly through the area on 02/05 and 03/05. Moderate variable winds, becoming moderate E on 02/05, then moderate SW on 03/05. Warm with overcast to broken cloud and heavy showers on both days. Overcast sky, light N winds, showers and cooler on 04/05, as Low Pressure system moves slowly eastward. Large High Pressure system builds over the eastern part of the continent on 05/05, bringing moderate to strong NW winds and clearing sky to the Great Lakes region.





SURVEY NO. 20

01/05/72

 $T_w$  2.5 (-1.2)

Survey is completed as scheduled in deteriorating weather conditions, ahead of an approaching Low Pressure system.

Mean surface water temp. has increased  $0.6^\circ$  since 25/04. This is close to the normal seasonal increase of  $0.5^\circ$ . The weather has been relatively cold during the preceding six days [ $T_{a5}$  7.4 (-1.9)], but the lake surface has absorbed a large amount of solar radiation under a mainly clear sky. However, the mean surface water temp. remains well below normal, in line with the generally cold weather of the previous month [ $T_{a30}$  3.9 (-2.7)], and the late dissipation of ice.

Shallow water warming has progressed considerably since 25/04. The  $4^\circ$  isotherm, with the associated development of a strong temperature gradient, is present along the entire shoreline. Near the shore the water temperature ranges from  $4^\circ$  to  $9^\circ$ . The  $<2^\circ$  surface water area has decreased. Niagara R. waters, at  $<2^\circ$ , indicate that ice may still be melting in Lake Erie.



DAY	06/05/72								07/05/72								08/05/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	2	9	9	10	9	9	10	10	10	9	9	7	6	8	6	8	9	9	4	6	8	10	10
WDRN	SW	S	SE	S	S	SW	W	W	NW	NW	NW	N	V	SW	S	V	NE	NE	E	E	E	SE	E	E
WSPD	1.0	1.5	3.0	6.5	7.0	6.5	6.0	5.5	5.5	6.0	5.5	3.0	3.0	2.0	1.5	1.5	3.0	3.0	3.5	4.5	6.0	4.5	4.5	5.5
T <sub>a</sub>	5.7	4.6	7.8	12.6	13.7	19.6	18.1	13.5	9.4	6.5	5.0	6.7	9.4	9.0	7.8	6.7	4.8	4.6	5.8	9.6	10.9	10.2	9.1	8.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ				1.0				1.0										T				T		
YTR				2.5		7.1		T																
ROC				0.8				1.8		T		T		0.8		T		2.0		0.3		5.1		
	T <sub>a</sub> 12.0(+1.0)								T <sub>a</sub> 7.6(-3.6)								T <sub>a</sub> 8.0(-3.4)							

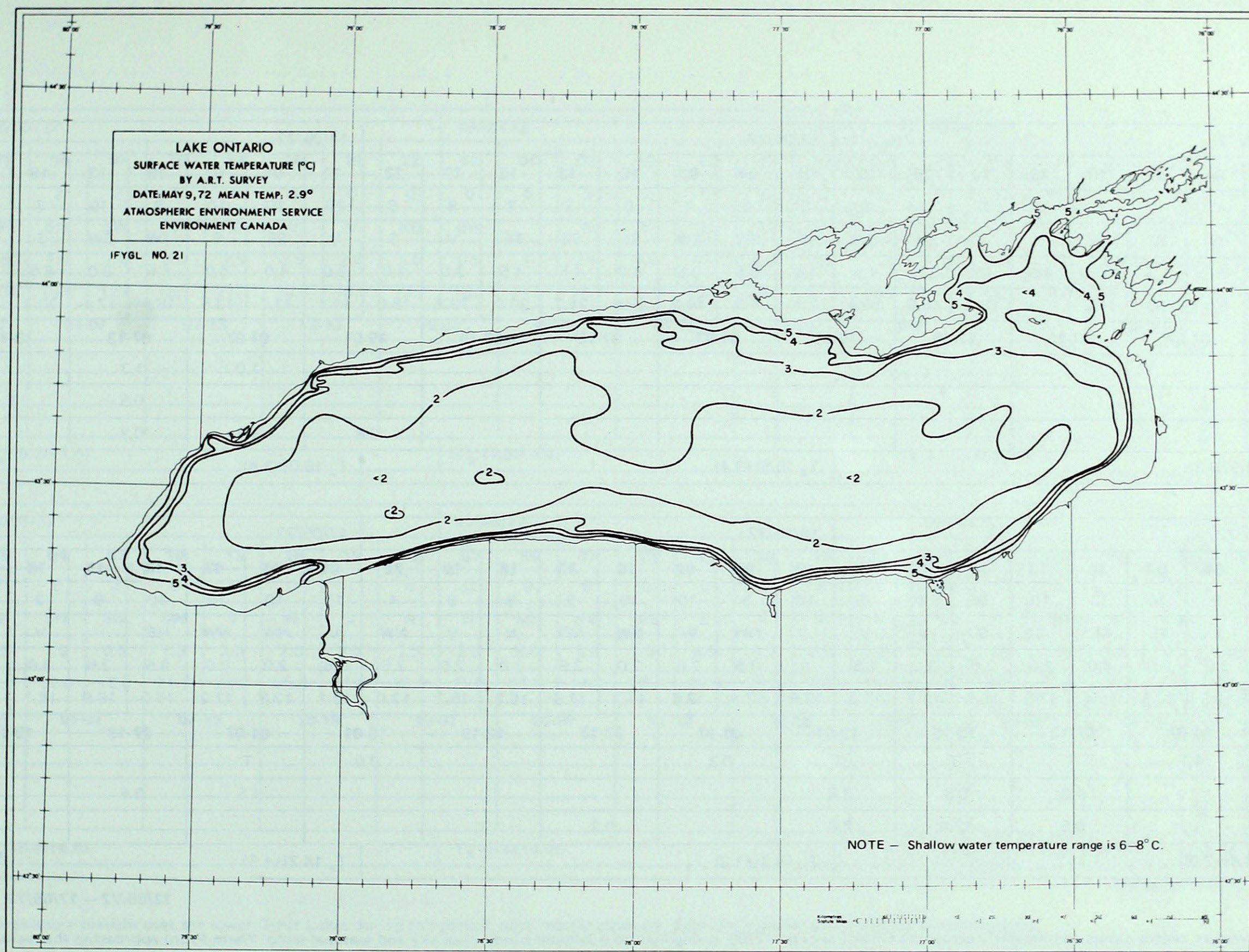
DAY	09/05/72								10/05/72								11/05/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	7	6	3	3	3	7	9	6	0	0	0	0	0	0	0	0	2	3	6	1	0	0	0
WDRN	NE	NE	NE	NE	NE	NE	N	N	N	NW	NW	NW	NW	NW	NW	N	SW	SW	SW	SW	NW	NW	N	NW
WSPD	6.0	4.5	6.0	6.5	6.5	5.5	4.5	5.0	5.5	5.0	5.0	7.0	7.5	6.5	5.0	4.0	3.0	3.0	5.0	8.5	10.5	9.5	6.5	3.0
T <sub>a</sub>	6.8	6.1	7.6	10.4	12.9	13.7	10.5	8.7	6.7	4.2	5.7	10.9	13.1	13.7	11.3	6.8	4.4	5.6	7.6	15.1	20.2	18.5	14.8	7.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																		T		T				
ROC	2.5	1.3		T																				
	T <sub>a</sub> 9.6(-2.0) T <sub>a5</sub> 9.1(-1.9) T <sub>a30</sub> 7.2(-1.2)								T <sub>a</sub> 9.1(-2.7)								T <sub>a</sub> 11.7(-0.3)							

## WEATHER

06/05/72 – 11/05/72

Low Pressure system, followed by a Cold Front, moves through the Great Lakes area on 06/05; warm with strong S winds during the day, strong W winds in the evening; overcast with showers. Large High Pressure system builds over northern Ontario on 07/05, as weak Low Pressure centres traverse east along a quasistationary front just south of the lower Great Lakes. Strong NW winds in the morning of 07/05, light and variable during the day, become moderate E on 08/05. Cool, with broken cloud and showers along the south shore of Lake Ontario during this period. High Pressure system moves slowly south on 09/05; cool, with strong NE winds and scattered cloud. High Pressure centre is situated over the Great Lakes on 10/05; cool and clear with strong NW winds. A weak frontal disturbance moves south through the region on 11/05; moderate to strong SW winds in the morning, strong NW in the afternoon; scattered cloud with isolated showers.





SURVEY NO. 21

09/05/72

 $T_w$  2.9 (-1.5)

Scheduled for 08/05, the survey is delayed by showers over the south half of the lake. Weather conditions improve on 09/05 — scattered cloud, winds NE 6 – 7, air temp. 8° to 14°.

Mean surface water temp. has increased 0.4° since 01/05; this is only half the normal seasonal increase expected at this time in the heating phase. The retarded warming up of the lake is due to the cool weather [ $T_{a5}$  9.1 (-1.9),  $T_{a30}$  7.2 (-1.2)], and the mostly cloudy conditions that have inhibited solar radiation.

The surface water temperature pattern is relatively unchanged from 01/05. The 4° isotherm has advanced slightly further into deeper water, and the shallow water temperature range is nearly the same. One significant development is the impending separation of the <2° zone of water into two portions.



DAY	12/05/72								13/05/72								14/05/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	0	0	0	0	0	0	0	0	1	0	2	2	8	9	10	10	10	9	10	2	8	6
WDRN	N	N	W	SW	V	V	SW	SW	W	SW	SW	SE	SE	SE	V	S	V	SE	S	SW	SW	S	SE	SE
WSPD	3.0	1.0	1.5	3.0	4.0	4.5	3.5	1.5	1.5	0.5	0.5	4.0	4.5	4.5	3.0	4.0	3.0	4.0	4.0	4.5	5.0	6.5	3.0	3.0
T <sub>a</sub>	6.3	5.0	8.0	14.2	17.0	18.3	15.6	10.4	7.8	4.8	10.0	19.6	21.7	23.9	20.2	18.0	14.1	13.7	13.5	16.5	17.4	20.0	17.6	14.8
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																T		1.0		1.3				
YTR																				0.5		T		
ROC																0.8		3.3		0.3				
	T <sub>a</sub> 11.9(-0.3)								T <sub>a</sub> 15.8(+3.4)								T <sub>a</sub> 16.0(+3.4)							

DAY	15/05/72								16/05/72								17/05/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	4	9	10	10	10	9	7	8	10	5	10	10	9	9	9	4	10	10	10	10	9	2	6	2
WDRN	S	E	SE	SE	S	S	V	V		NW	W	NW	NW	N	V	NW	V	NW	NW	NE	V	V	V	SE
WSPD	2.5	3.0	3.0	4.0	1.0	2.0	2.0	1.5	0	0.5	2.0	2.0	3.5	3.0	2.0	2.5	1.5	2.0	2.0	0.5	2.5	3.0	2.0	1.5
T <sub>a</sub>	14.1	13.9	14.3	15.4	17.6	16.9	13.7	12.8	12.6	12.4	12.6	14.3	17.6	16.5	15.2	13.0	13.1	12.8	12.2	15.2	16.9	18.7	15.6	13.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	2.5	4.1		T		T		T		0.3						3.6		T						
YTR				4.3		0.8		3.8										1.5		3.6				
ROC				0.5		12.4		2.8				0.3		T										
	T <sub>a</sub> 14.8(+2.0)								T <sub>a</sub> 14.3(+1.3)								T <sub>a</sub> 14.7(+1.5)							

## WEATHER

12/05/72 – 17/05/72

High Pressure centre moves southeasterly across the Great Lakes on 12/05, giving light to moderate winds, clear sky and seasonal temp. Warm Front approaches the region from the west on 13/05; warm, with light to moderate SE winds and increasing cloud in the evening. Low Pressure centre enters the area on 14/05 and stalls over the Great Lakes on 15/05. Generally unsettled weather persists in the area on 16/05 and 17/05 also. Above normal temp., light and variable winds, broken to overcast cloud cover and scattered showers during this period.



DAY	18/05/72								19/05/72								20/05/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	3	2	1	1	6	0	0	0	0	3	0	0	0	0	0	0	0	3	2	6	8	6	2
WDRN	NW	SW	SW	S	V	V	V	NE	SW		N	E	E	E	E	NE	NE	N	NE	E	SE	SE	SE	SW
WSPD	0.5	1.0	2.0	3.0	3.5	3.5	2.0	1.5	0.5	0	2.5	4.0	4.0	4.0	3.0	1.0	1.0	1.0	2.0	3.0	3.5	3.5	2.5	1.0
T <sub>a</sub>	10.0	10.0	12.6	16.1	21.1	20.4	18.0	13.7	12.2	11.5	14.1	18.9	22.4	24.0	21.3	16.3	13.7	13.1	15.6	19.4	20.6	19.4	17.1	13.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T																							
YTR							3.0																	
ROC																				T		T		
	T <sub>a</sub> 15.2(+1.8)								T <sub>a</sub> 17.6(+4.0)								T <sub>a</sub> 16.6(+2.8)							

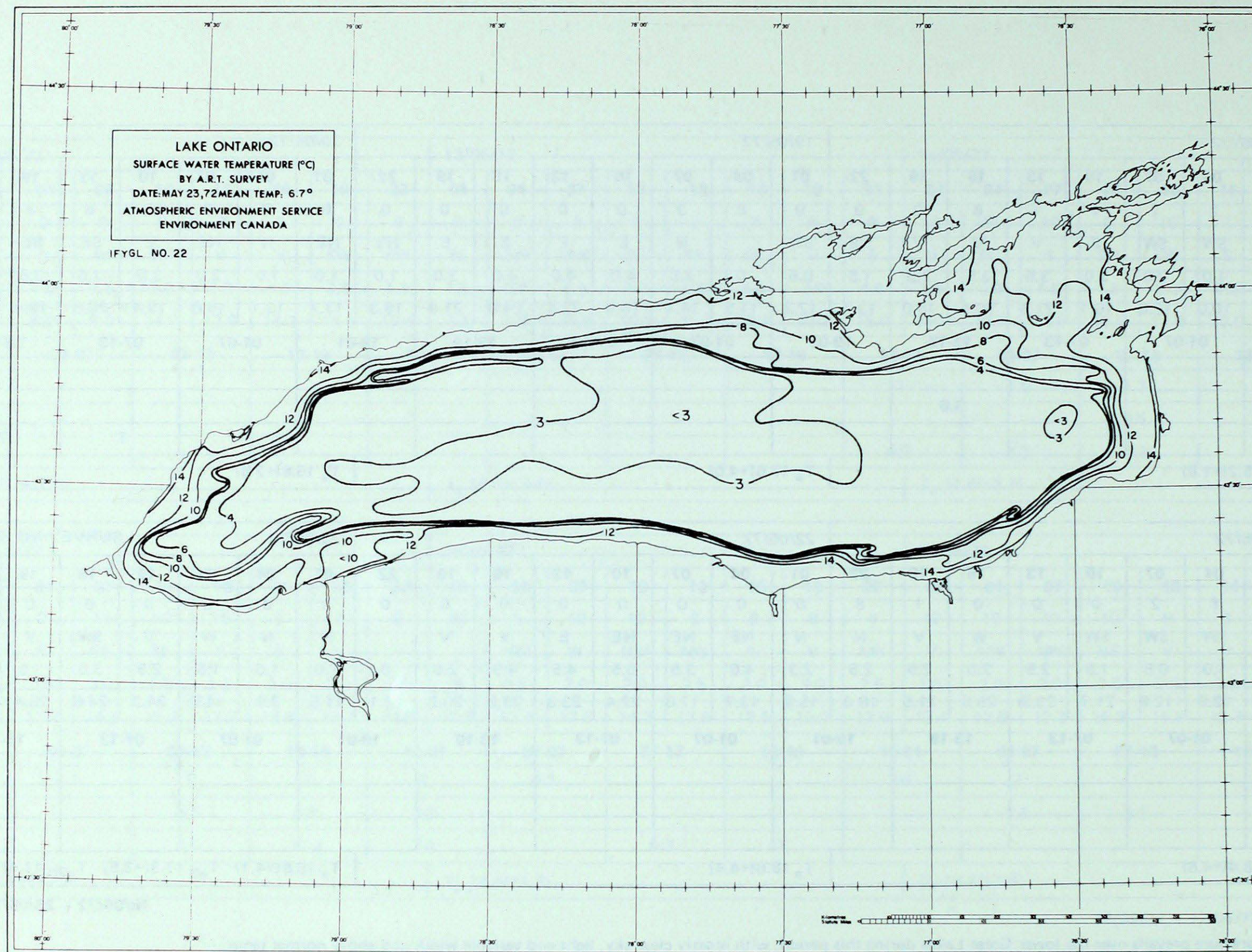
DAY	21/05/72								22/05/72								23/05/72								SURVEY NO. 22	
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22		
CLD	7	8	2	0	0	0	1	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
WDRN	W	SW	SW	SW	V	W	V	N	N	NE	NE	NE	E	V	V		N	N	W	V	SW	V	V	W		
WSPD	0.5	1.0	0.5	1.5	2.5	2.0	2.5	2.5	2.5	4.0	3.5	5.5	4.5	4.5	2.0	0	2.0	1.0	1.5	2.5	3.0	3.5	2.0	1.5		
T <sub>a</sub>	13.1	12.8	12.9	21.7	23.9	25.0	21.5	18.0	15.9	13.7	17.0	22.4	23.3	23.3	20.2	13.1	11.5	8.9	14.5	24.3	24.6	25.4	22.8	15.7		
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-		
YYZ																										
YTR																										
ROC																										
	T <sub>a</sub> 18.4(+4.6)								T <sub>a</sub> 18.6(+4.4)								T <sub>a</sub> 18.5(+4.1) T <sub>a5</sub> 17.3(+3.5) T <sub>a30</sub> 11.4(+0.1)									

## WEATHER

18/05/72 – 23/05/72

High pressure prevails over the lower Great Lakes during this period, with mostly clear sky, light and variable winds and above normal temp.



**SURVEY NO. 22****23/05/72** **$T_w$  6.7 (+0.2)**

The survey is initially scheduled for 15/05. Poor weather conditions delay the flight until 18/05. On 18/05 and 19/05 conditions are good over land, but the survey has to be postponed, due to low – lying condensation fog formed over the lake by warm air. After a three day holiday weekend the survey is completed on 23/05.

Mean surface water temp. has increased  $3.8^\circ$  since 09/05, and is slightly above normal. The large increase is due to the generally warm weather prevailing since 13/05. Particularly strong heating of the lake surface by solar radiation has occurred during the preceding five days of clear sky, high air temp. and light winds.

The surface water temperature pattern shows rapid warming of near – shore waters and the development of a strong thermal bar structure in most regions. In some places the surface temperature pattern is quite complex within the thermal bar zone (in – shore from the  $4^\circ$  isotherm), indicating the presence of density gradient currents. The Niagara R. plume remains distinctly cooler than the near – shore lake waters.



DAY	24/05/72								25/05/72								26/05/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	1	2	2	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WDRN	W	NW	V	NE	V	E	V	SE	NE	NE	E	NE	E	V	E	NE	E	E	S	S	V	V	V	
WSPD	2.0	2.5	3.0	2.5	2.0	3.0	1.5	0.5	1.5	2.5	3.5	4.5	5.0	3.5	6.0	5.0	1.5	1.0	3.0	4.0	5.0	3.5	3.0	0
T <sub>a</sub>	12.2	12.3	16.7	22.6	23.7	23.3	19.6	15.6	13.5	11.1	14.8	18.5	20.4	20.9	18.0	14.1	9.8	7.6	12.6	18.1	20.5	22.2	18.7	12.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC				T																				
	T <sub>a</sub> 18.3(+3.7)								T <sub>a</sub> 16.4(+1.6)								T <sub>a</sub> 15.2(+0.2)							

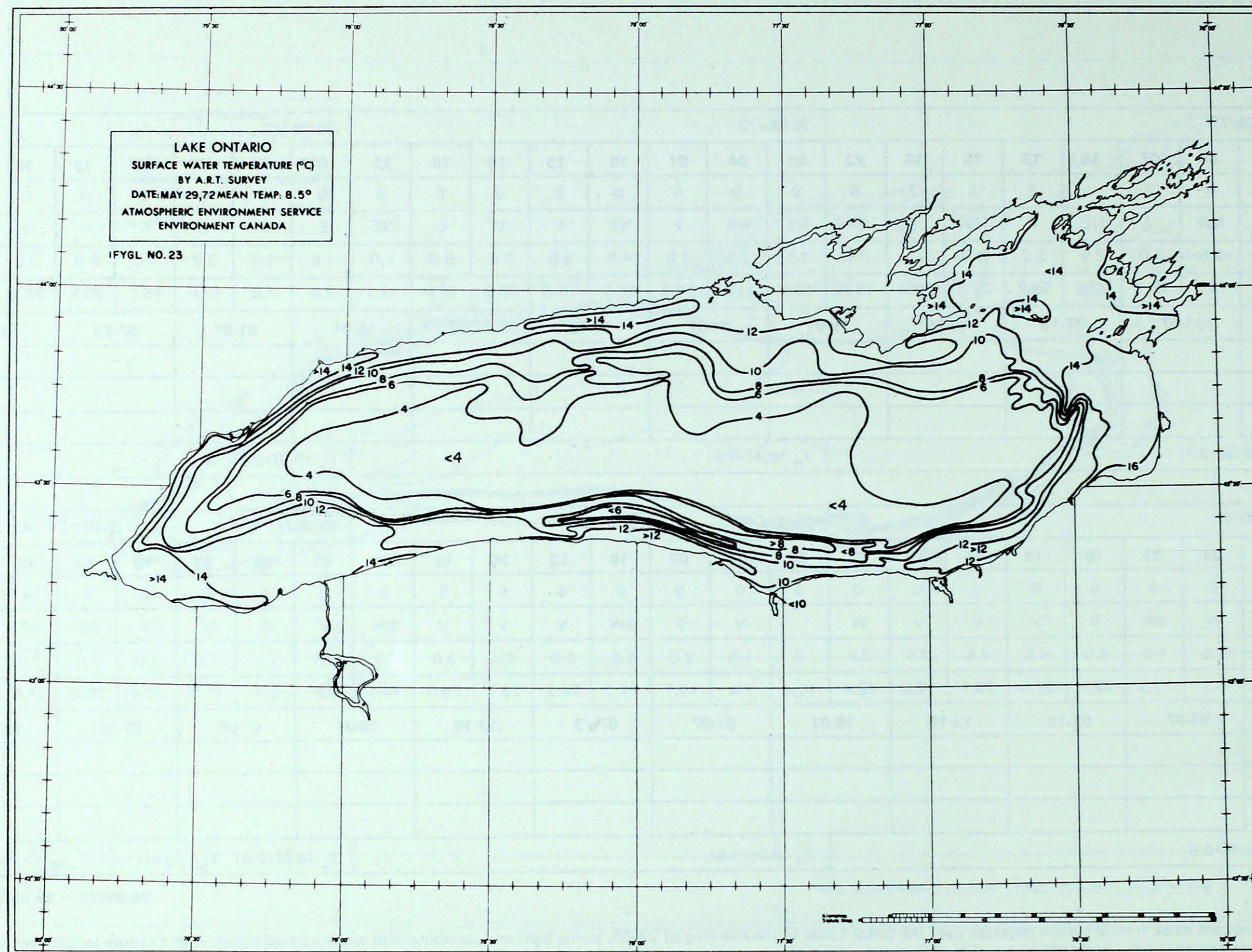
DAY	27/05/72								28/05/72								29/05/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
WDRN	V	W	SW	S	V	V	V	W		V	V	SW	V	V	V	SW	V	S	SE	S	SE	SE	SE	SE
WSPD	0.5	1.5	1.0	4.0	4.0	4.5	2.5	0.5	0	1.0	2.0	3.5	3.0	4.5	3.0	1.0	1.0	1.5	1.0	1.5	2.5	3.0	3.5	3.0
T <sub>a</sub>	9.1	6.7	12.9	19.1	21.5	23.1	19.6	13.4	10.4	7.4	14.1	21.1	24.3	23.7	20.0	14.1	9.6	8.7	15.0	22.4	25.2	24.6	21.8	17.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC																								
	T <sub>a</sub> 15.7(+0.5)								T <sub>a</sub> 16.9(+1.5)								T <sub>a</sub> 18.0(+2.4) T <sub>a5</sub> 16.5(+1.5) T <sub>a30</sub> 13.7(+1.2)							

## WEATHER

24/05/72 – 29/05/72

A diffuse and weak frontal system develops over the Great Lakes in the morning of 24/05, giving light and variable winds and scattered cloud. High Pressure builds over the region in the afternoon of 24/05 and eventually develops into a large system, centered on the Atlantic coast and persisting until 30/05. Clear sky, light and variable winds and above normal temp. during this period.





SURVEY NO. 23

29/05/72

 $T_w 8.5 (+0.4)$ 

Survey is completed as scheduled in very good weather conditions — clear sky, wind SE 2 — 3, air temp. 20° to 25°.

Mean surface water temp. has increased 1.8° since 23/05. This is slightly more than the normal seasonal increase of 1.6°. Very strong heating of the lake surface has continued during the preceding six days of ideal weather conditions — clear sky, near — seasonal air temp. and light to moderate winds.

The strong surface heating, combined with internal circulation, have created a very complex surface water temperature pattern, particularly along the south shore between Olcott and Rochester. This pattern is found to occur every spring and is by no means unusual.



DAY	30/05/72								31/05/72								01/06/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	1	6	7	10	10	10	10	10	8	10	10	9	9	9	10	10	10	10	10	10	10	10	10	9
WDRN	V	S	S	S	S	SE	V	S	W	NW	V	W	W	W	NW	N	NW	NW	W	W	SW	SW	SW	W
WSPD	3.0	4.0	2.5	5.0	3.5	3.0	3.0	3.5	3.5	3.5	2.5	2.5	2.0	3.0	3.5	4.0	4.0	4.0	5.0	6.0	6.5	5.0	4.5	4.5
T <sub>a</sub>	17.2	18.0	18.7	20.5	18.9	20.9	17.8	16.3	14.8	13.5	13.0	14.8	17.8	15.4	13.9	12.0	11.7	10.9	9.6	10.6	11.3	11.1	10.9	10.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		T		2.3		2.8						0.3						12.2		0.5		0.5		
YTR		T		13.5		4.8		1.3						T		T		21.8		14.5		1.0		
ROC		T		1.5		18.5				5.8				0.3		T		T		T		T		
	T <sub>a</sub> 18.5(+2.7)								T <sub>a</sub> 14.4(-1.6)								T <sub>a</sub> 10.8(-5.3)							

DAY	02/06/72								03/06/72								04/06/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	7	2	8	6	3	5	3	0	0	6	3	1	2	4	5	4	6	5	4	5	7	3	1	0
WDRN	W	W	W	W	SW	SW	SW	SW	SW	SE	SE	E	E	S	SW	SW	SW	V	NW	W	NW	N	N	NW
WSPD	3.5	2.5	3.0	3.0	4.0	4.5	4.0	3.0	2.0	1.5	3.0	2.5	2.5	3.5	3.0	3.0	2.5	3.0	3.5	3.5	4.5	4.0	3.5	3.5
T <sub>a</sub>	9.5	8.0	10.9	15.4	19.5	20.6	18.9	15.2	12.2	11.1	14.4	20.7	24.8	24.3	20.7	19.4	18.0	17.4	17.8	22.2	23.2	22.6	20.0	15.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ														T				5.6						
YTR	T			1.0										T		T								
ROC	T	0.3												T		T		1.0						
	T <sub>a</sub> 14.8(-1.5)								T <sub>a</sub> 18.5(+1.9)								T <sub>a</sub> 19.6(+2.8)							

## WEATHER

30/05/72 – 04/06/72

A Low Pressure centre on a frontal wave enters the Great Lakes area from the west on 30/05; warm, with moderate S winds, overcast sky and heavy showers. Low Pressure centre tracks east across Lake Ontario on 31/05 and is replaced by a weak High Pressure ridge on 01/06. Moderate W and NW winds, broken to overcast cloud cover and scattered showers on 31/05. Strong W and SW winds, falling temp. and overcast with rain on 01/06. Low Pressure trough moves slowly across the region on 02/06, giving moderate W and SW winds, scattered to broken cloud and a few showers. Low Pressure trough moves through the Great Lakes area on 03/06; warm, with light southerly winds, scattered cloud. Cold Front, followed by a High Pressure system, advances southward through the lower Great Lakes region on 04/06, causing broken cloud with showers in the morning, moderate NW winds and scattered cloud in the afternoon.



DAY	05/06/72								06/06/72								07/06/72							
	SURVEY NO. 24																SURVEY NO. 25							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	1	1	0	0	2	1	0	2	5	8	6	9	9	5	6	5	0	0	1	1	3	6	2	8
WDRN	NE	NE	NE	V	V	V	V	V	V	V	V	SW	W	W	N	N	NW	NW	NW	NW	W	SW	W	SW
WSPD	4.5	4.5	4.0	2.0	2.5	1.5	2.0	2.0	1.5	1.0	1.5	2.5	3.0	4.0	6.0	3.5	3.0	4.0	3.5	3.0	3.5	3.5	5.0	3.5
T <sub>a</sub>	13.3	11.3	13.5	18.2	20.4	21.3	19.1	14.4	12.0	13.0	15.2	18.5	20.3	20.2	18.7	14.5	11.1	9.3	14.3	19.6	22.6	23.0	20.8	15.9
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ										T														
YTR												T												
ROC												T		T										
	T <sub>a</sub> 16.6(-0.4) T <sub>a5</sub> 15.6(-0.8) T <sub>a30</sub> 14.9(+1.0)								T <sub>a</sub> 16.6(-0.6)								T <sub>a</sub> 17.1(-0.3) T <sub>a5</sub> 17.2(+0.4) T <sub>a30</sub> 15.4(+1.1)							

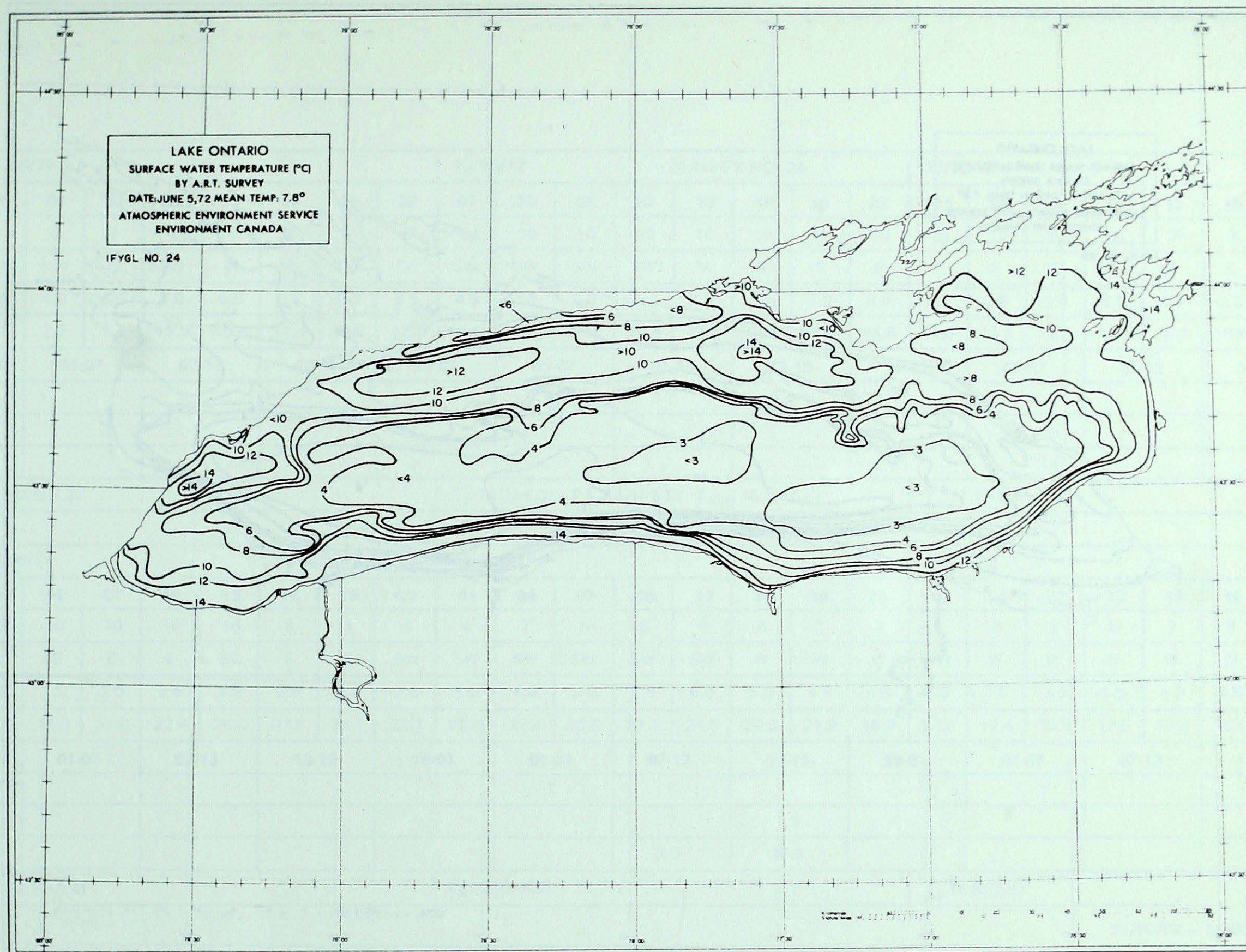
DAY	08/06/72								09/06/72								10/06/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	8	8	9	10	10	9	9	10	10	4	4	8	8	5	5	9	9	8	3	6	6	4	3	1
WDRN	W	W	SW	SW	W	NW	V	W	W	W	NW	W	W	NW	N	N	N	N	N	N	N	N	NW	NW
WSPD	5.0	6.5	7.0	7.0	4.0	2.5	2.0	3.5	4.5	4.0	3.5	2.5	4.0	4.5	6.0	7.5	6.5	7.0	7.5	7.5	7.0	6.0	6.0	4.5
T <sub>a</sub>	16.5	15.9	18.1	20.4	20.7	21.3	20.2	16.7	16.9	15.7	15.5	17.6	18.3	19.2	14.6	10.4	8.9	7.4	7.6	10.0	10.9	11.7	10.4	5.9
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ				T				2.0																
YTR	T	1.3		5.3		1.0		3.0						0.8										
ROC		0.3		T				4.8		T								T						
	T <sub>a</sub> 18.7(+1.1)								T <sub>a</sub> 16.0(-1.8)								T <sub>a</sub> 9.1(-8.9)							

## WEATHER

05/06/72 – 10/06/72

High Pressure ridge overlies the Great Lakes on 05/06; moderate NE winds in the morning, light and variable during the day; scattered cloud and seasonal temp. Diffuse frontal trough passes through the area on 06/06 causing broken cloud and a few showers. A High Pressure cell moves into the region in the evening of 06/06 and dominates over the area on 07/06. Moderate NW to SW winds and scattered cloud during this period. Low Pressure cell moves rapidly eastward across the upper Great Lakes on 08/06, bringing strong SW winds, broken cloud and scattered showers to the lower Great Lakes. Cold Front, in advance of a large arctic High Pressure system, moves slowly southward through the area on 09/06; High Pressure dominates the region on 10/06. Moderate NW winds on 09/06, strong N on 10/06. Scattered to broken cloud and falling temp. on both days.





SURVEY NO. 24

05/06/72

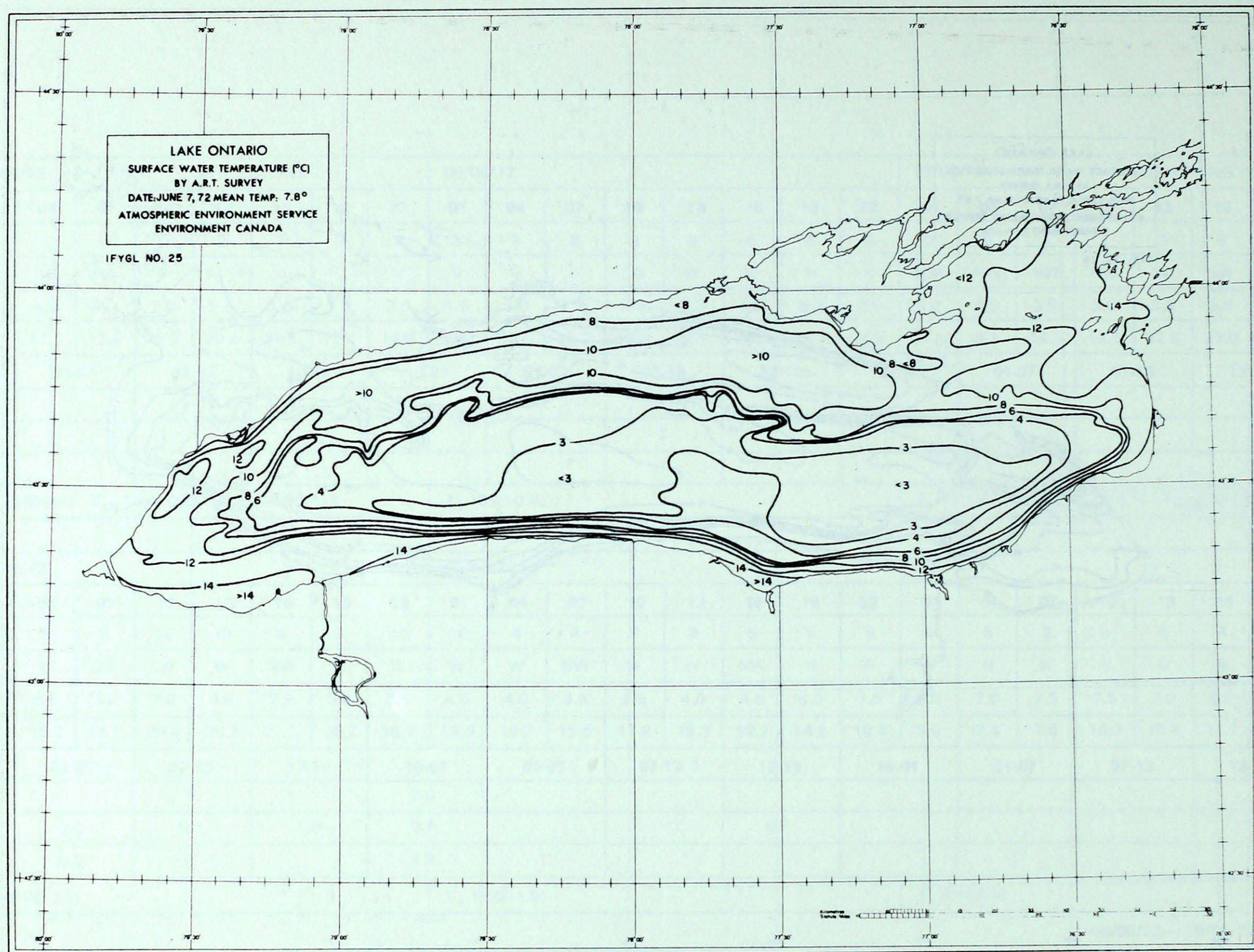
 $T_w$  7.8 (-2.0)

Survey is completed as scheduled. Weather conditions are good — almost clear sky, light and variable winds, air temp. 15° to 21°.

Mean surface water temp. has decreased 0.7° since 29/05 and is much below normal. The weather has been relatively cool since 31/05 [ $T_{a5}$  15.6 (-0.8)]. Overcast skies with long periods of heavy rain have prevailed from 30/05 to 02/06. Cold Fronts with associated moderate to strong NW winds have passed through the area on 01/06 and 04/06. The cloudy periods have reduced incoming solar radiation and the strong winds have caused mixing of heat from the surface into the deeper layers of the lake, thus reducing the surface water temp.

The surface water temperature field shows significant changes from the 29/05 survey. Areas of <3° water have reappeared in the central region of the lake. The temperature in the northeast basin has decreased by about 1°, and along the north shore by 6° to 8°. The Coastal Jet Project data confirm that in the north shore regions cold water first emerges at the surface on 01/06, in response to the strong NW winds associated with Cold Front passage. The volume of warm water (appearing as a closed area of >10°) has shifted south and the thermocline has changed from a wedge shape to a lens shape.





SURVEY NO. 25

07/06/72

 $T_w$  7.8 (-2.4)

This is a special survey, flown during a designated "alert period" of IFYGL. Weather conditions are good — scattered to broken cloud, wind NW 3 to W 4, air temp.  $16^\circ$  to  $23^\circ$ .

Mean surface water temp. remains unchanged from 05/06.

The surface water temperature pattern indicates that further mixing in the surface layers has occurred, lowering the temperature in the central core region of the lake (the  $<3^\circ$  area has enlarged). The warm water zone off the north shore has also been cooled further (no  $>12^\circ$  water is present). This is confirmed by Coastal Jet Project data. Most of the surface cooling has taken place during the preceding 24 hours under strong to moderate NW winds and clear sky overnight, with air temp. down in the  $9^\circ$  to  $11^\circ$  range. At the same time, the area of warm water has enlarged in the southwestern end of the lake, suggesting transport of surface water southward under the northerly winds.



DAY	11/06/72								12/06/72								13/06/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	1	1	1	2	2	6	10	10	10	10	10	10	10	10	10	10	10	10	10	9	10	10
WDRN	NW	NW	W	SW	W	W	SW	SW	SW	SW	SW	SW	V	V	S	E	E	E	E	E	E	E	E	NE
WSPD	4.5	4.0	4.0	5.0	5.5	6.5	6.5	5.5	4.5	3.5	3.0	2.5	1.5	2.5	2.0	2.5	3.0	2.5	3.0	3.5	3.5	3.5	2.5	2.5
T <sub>a</sub>	4.1	2.2	7.4	13.3	15.6	17.4	14.8	12.2	11.7	12.0	12.6	14.4	15.5	16.3	15.7	14.8	14.3	14.4	15.0	17.4	19.1	19.8	19.3	17.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ										T		T		0.3								T		
YTR																								
ROC																							T	
	T <sub>a</sub> 10.9(-7.3)								T <sub>a</sub> 14.1(-4.3) T <sub>a5</sub> 14.4(-3.4) T <sub>a30</sub> 16.1(+0.8)								T <sub>a</sub> 17.1(-1.4)							

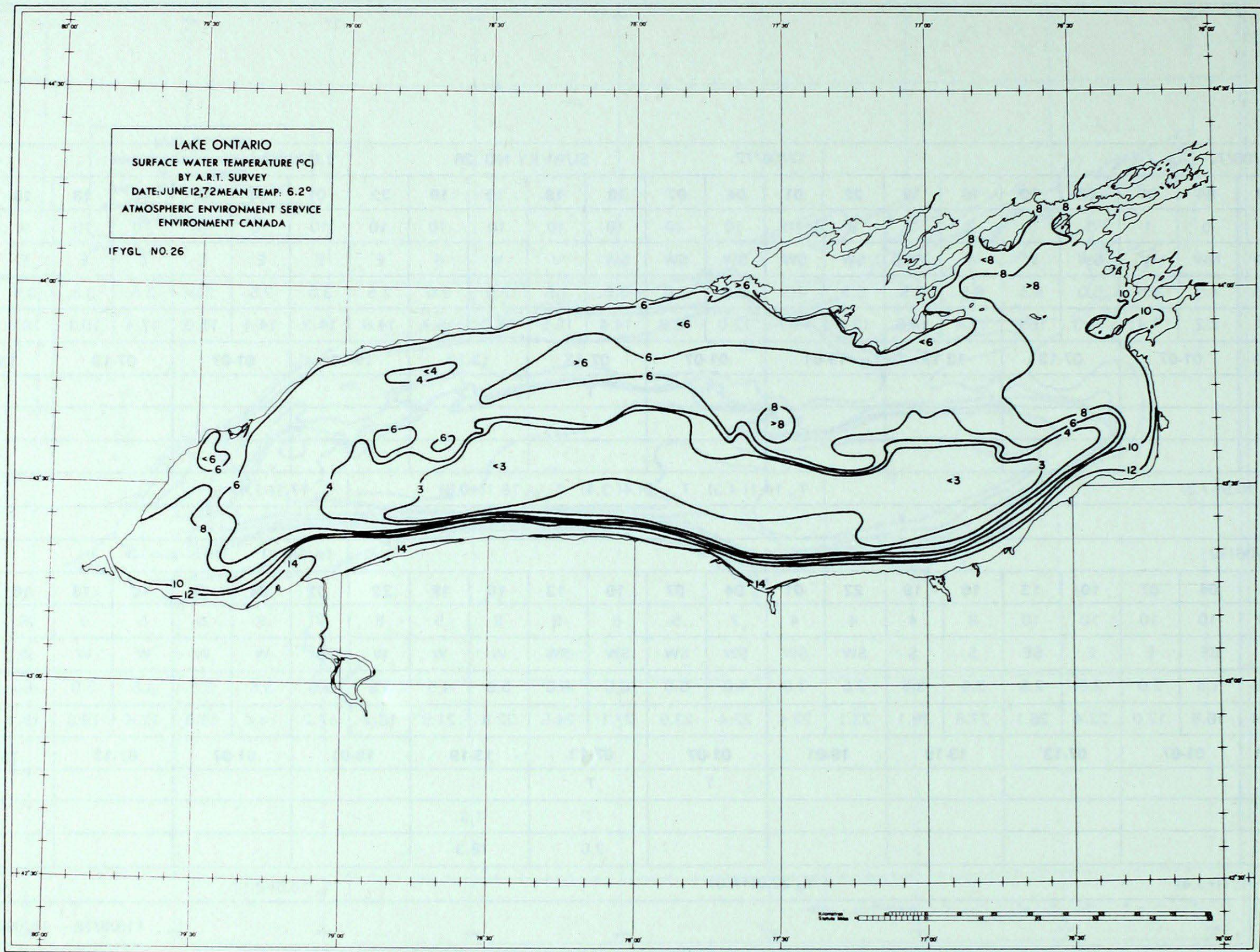
DAY	14/06/72								15/06/72								16/06/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	8	4	4	4	7	5	6	9	8	5	8	7	8	5	5	7	8	5	4
WDRN	E	SE	E	E	SE	S	S	SW	SW	SW	SW	SW	SW	W	W	W	NW	W	W	W	W	W	NW	N
WSPD	1.5	1.5	2.0	2.5	2.5	2.5	3.5	2.5	3.0	4.0	5.0	6.5	6.0	5.0	4.5	3.5	3.0	3.5	3.5	3.5	5.0	4.5	4.5	4.0
T <sub>a</sub>	17.4	16.8	17.0	22.4	26.1	27.8	26.1	23.1	22.4	22.4	23.9	27.1	24.5	22.6	21.9	18.2	17.2	14.4	13.9	17.6	19.8	19.1	17.6	13.1
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T									T		T												
YTR												T		1.3										
ROC												2.0		18.3										
	T <sub>a</sub> 22.1(+3.4)								T <sub>a</sub> 22.9(+4.0)								T <sub>a</sub> 16.6(-2.5)							

## WEATHER

11/06/72 – 16/06/72

High Pressure system moves southeasterly through the Great Lakes region on 11/06; moderate to strong NW to SW winds, clear sky and cool. A frontal trough advances slowly from the southwest on 12/06 and passes through the lower Great Lakes area during 13/06 and 14/06. Moderate to light variable winds on 12/06, light E on 13/06 and 14/06. Overcast with some showers and gradually rising temp. Cold Front enters the Great Lakes area from the west on 15/06, but Lake Ontario remains in warm air during the day; strong SW winds in the morning, moderate W in the afternoon; broken cloud with scattered showers. Cold Front, followed by a large High Pressure system, moves through the area on 16/06; light to moderate W and NW winds, broken cloud and cool.





SURVEY NO. 26

12/06/72

 $T_w$  6.2 (-5.0)

Survey is completed as scheduled in marginal weather conditions, as a frontal trough approaches the region from the southwest.

Mean surface water temp. has decreased  $1.6^\circ$  since 07/06. This is a drastic reversal of the normal seasonal trend.

The surface water temperature field shows the severe effects on the lake — wide temperature produced by recent meteorological events. The cause of the drastic changes in the surface water temp. is a Cold Front that passes through the region in the afternoon of 09/06, followed by an arctic High Pressure system on 10/06. Winds at N 6 — 8 in the afternoon of 09/06 continue unabated during 10/06, and air temp. falls during the two days, reaching a low of  $2^\circ$  in the morning of 11/06.

The CCIW buoy network indicates that a large drop in surface water temp. occurs in the northern third of the lake from 09/06 to 10/06, while in mid — lake and southern regions the water temp. remains unchanged. The Coastal Jet Project data confirm that the spring thermocline in the northern portion of the lake is almost entirely destroyed during this period.



DAY	17/06/72								18/06/72								19/06/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	1	4	2	1	1	0	1	0	0	0	1	0	2	3	3	3	1	6	10	3	2	0	0	3
WDRN	N	NE	NE	NE	S	V	NW	N	NE	NE	NE	E	E	SE	E	E	E	E	V	E	E	E	E	E
WSPD	3.5	4.0	4.5	3.0	3.5	3.0	2.0	2.5	2.5	2.5	3.0	3.5	4.0	4.0	4.0	4.0	3.5	3.5	2.5	2.5	3.5	3.0	3.0	3.0
T <sub>a</sub>	11.5	9.8	13.2	17.2	18.7	17.8	17.2	12.9	9.8	7.8	13.1	20.7	23.5	23.5	22.4	19.6	18.5	16.3	18.3	23.5	26.1	27.0	23.7	20.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC																								
	T <sub>a</sub> 14.8(-4.5)								T <sub>a</sub> 17.6(-1.8)								T <sub>a</sub> 21.8(+2.2)							

DAY	20/06/72								21/06/72								22/06/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	3	6	7	1	2	4	7	9	10	10	10	10	10	10	10	10	10	10	10	10	9	9	9	10
WDRN	E	E	E	S	S	S	SW	W	V	SE	S	V	E	NE	V	N	NE	NE	NE	NE	NE	NE	N	N
WSPD	3.0	3.0	3.5	2.5	3.5	3.0	4.0	3.5	2.5	3.0	2.5	2.5	2.5	4.5	3.5	5.5	5.0	5.5	5.5	6.5	8.0	9.5	11.0	10.5
T <sub>a</sub>	18.3	19.2	21.1	25.4	28.3	28.2	23.9	21.9	19.6	19.6	19.4	20.0	19.6	18.9	16.7	15.4	14.2	13.2	13.1	12.0	13.3	14.0	15.0	15.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ										5.6		0.3		11.9		0.5		T		6.1		3.0		
YTR								2.3		2.0				13.5		15.0		3.0		4.3		T		
ROC								4.1		1.0		T		5.1		25.1		7.6		15.5		4.3		
	T <sub>a</sub> 23.3(+3.5)								T <sub>a</sub> 18.7(-1.2)								T <sub>a</sub> 13.8(-6.3)							

## WEATHER

17/06/72 – 22/06/72

Large High Pressure system remains over the Great Lakes on 17/06 and 18/06. Light and variable winds on 17/06, moderate E on 18/06. Cool with scattered cloud on both days. Warm air trough enters the area from the south on 19/06; light E winds, variable cloud cover and warm. Low Pressure centre with complex frontal system enters the Great Lakes region on 20/06, keeping Lake Ontario in the warm air sector; light E winds change to light S in the afternoon; variable cloud cover and above normal temp. Complex frontal system shifts slowly southeast on 21/06, bringing light and variable winds, overcast sky and rain to the Lake Ontario region. On 22/06 a large High Pressure system builds over Hudsons Bay; but the complex frontal system persists over the lower Great Lakes, and Hurricane Agnes moves north along the Atlantic coast into the New England states region. Strong NE winds in the morning of 22/06, become very strong N in the afternoon. Temp. is much below normal with overcast sky and heavy rain.



DAY	23/06/72								24/06/72								25/06/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	9	6	7	9	10	10	10	10	10	10	10	10	9	10	8	10	10	8	9	7	2	3	8
WDRN	N	E	E	E	E	E	NE	E	SE	E	E	E	E	E	V	V	V	W	W	V	SE	SE	SE	V
WSPD	13.0	10.0	7.5	7.5	7.0	6.0	3.5	4.5	4.0	5.0	5.0	4.0	3.0	2.5	2.0	1.5	1.5	2.0	2.5	2.5	2.5	2.5	2.0	1.5
T <sub>a</sub>	14.8	14.4	15.6	18.3	18.9	15.9	14.4	13.9	12.8	12.4	12.4	14.3	15.0	16.1	14.3	13.1	13.0	12.2	13.7	14.5	17.2	19.1	16.3	13.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	0.5	2.5				8.4		7.9		3.3		0.5		3.6		0.3		T						
YTR	3.6	3.6		T		19.1		2.0		0.5		T				T		1.5						
ROC	27.2	0.3		3.8		6.9		1.0		0.3		T		3.3		0.8								
	T <sub>a</sub> 15.8(-4.4)								T <sub>a</sub> 13.8(-6.6)								T <sub>a</sub> 14.9(-5.6)							

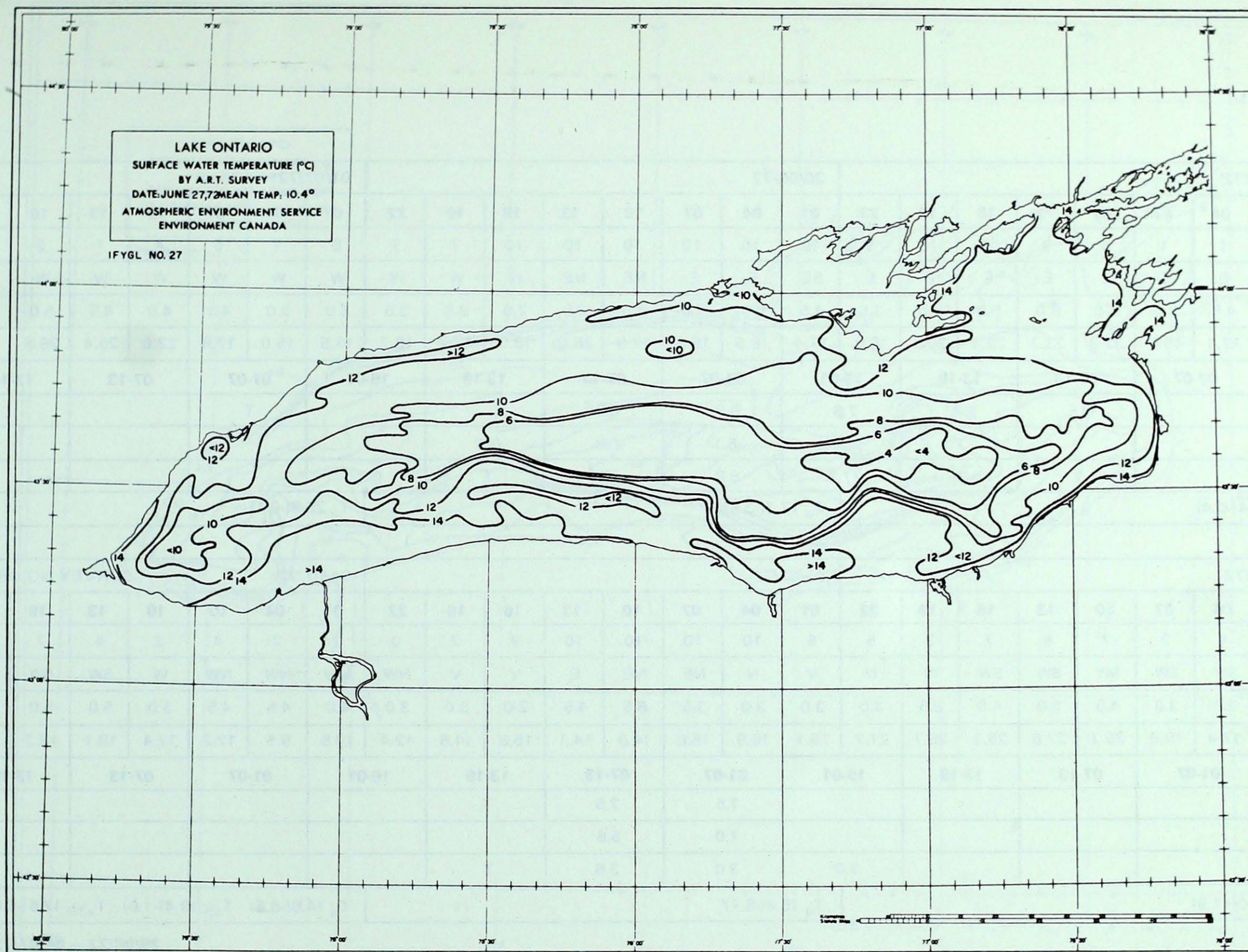
DAY	26/06/72								27/06/72								28/06/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	8	9	2	8	7	7	7	3	2	4	4	6	6	6	8	3	3	5	3	2	1	2	1	0
WDRN	N	V	W	W	SW	W	W	W	W	W	W	W	SW	W	W	W	SW	W	V	W	V	E	E	E
WSPD	2.0	1.5	2.0	2.5	3.0	3.0	2.5	2.5	3.0	3.5	3.5	4.0	5.0	4.0	3.0	3.5	2.5	2.5	2.0	1.0	1.0	2.0	3.5	4.0
T <sub>a</sub>	12.6	12.0	12.6	17.6	19.6	20.4	18.7	15.8	13.7	12.6	15.4	20.9	22.6	23.7	20.4	17.4	15.9	14.2	17.0	22.6	25.0	25.9	23.5	19.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ						0.5		1.0						T		11.9								
YTR				T										4.1				T						
ROC																								
	T <sub>a</sub> 16.2(-4.3)								T <sub>a</sub> 18.3(-2.4) T <sub>a5</sub> 14.9(-5.4) T <sub>a30</sub> 16.7(-1.5)								T <sub>a</sub> 20.4(-0.4)							

## WEATHER

23/06/72 – 28/06/72

Hurricane Agnes arrives in the lower Great Lakes region on 23/06, stalls, and dissipates gradually. Low pressure prevails over the region until 27/06. Very strong E winds on 23/06, decreasing in the evening, with mainly overcast sky and heavy rain. Moderate E winds and overcast with showers on 24/06. Light and variable winds, broken cloud and widely scattered showers on 25/06 and 26/06. Temp. remains well below normal during this period. High Pressure ridge builds over the Great Lakes on 27/06 and remains in the area on 28/06, with a weak trough passing through during the night. Moderate W winds, scattered to broken cloud and gradual warming on 27/06. Isolated showers overnight to 28/06. Light and variable winds on 28/06, becoming moderate E in the evening, with scattered cloud and seasonal temp.





SURVEY NO. 27

27/06/72

 $T_w$  10.4 (-5.2)

The survey is initially scheduled for 19/06. Warm and humid air overlies the region on 19/06 and 20/06, forming fog over the cool lake surface and forcing postponement of the survey. From 21/06 to 27/06 the survey is delayed by bad weather, including Hurricane Agnes.

Mean surface water temp. has increased  $4.2^\circ$  since 12/06. This is nearly equal to the normal seasonal increase of  $4.4^\circ$ . However, the unusual weather conditions during the preceding six days (normally the period of maximum heating by solar radiation) have kept the surface water temp. much below normal.

The CCIW buoy network indicates that the surface water temp. rises until 21/06. On 21/06 the trend reverses and during 22/06 and 23/06 the temp. drops sharply. The period of falling water temp. coincides with the arrival and gradual dissipation of Hurricane Agnes over the region. The sky remains overcast with heavy rain from 21/06 to 25/06. Very strong winds on 22/06 and 23/06 cause mixing of the surface water with the cold ( $<4^\circ$ ) subsurface layer.

By 27/06 the surface layer of water has regained some of the heat lost during the storm, but the temperature field still retains a chaotic appearance.



DAY	29/06/72								30/06/72								01/07/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	2	1	1	4	6	10	10	9	10	10	10	10	10	10	7	7	6	4	5	4	1	2	1	1
WDRN	E	E	E	E	E	E	E	E	SE	E	E	NE	NE	W	W	W	W	W	W	W	W	W	W	W
WSPD	4.0	4.5	5.0	6.0	6.0	5.0	4.0	3.5	4.5	4.5	5.0	3.5	2.5	2.0	3.5	3.5	3.0	3.0	4.5	4.0	4.5	5.0	4.0	3.0
T <sub>a</sub>	18.2	17.4	19.6	22.8	23.7	22.4	20.8	18.0	17.4	16.5	16.3	17.0	18.0	18.5	18.2	16.7	16.5	15.0	17.8	22.0	25.4	26.8	23.9	19.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ				0.5		5.3		7.6		9.9		0.8						T						
YTR							T	2.0		5.1		0.8		0.8		T								
ROC				T		T		27.7		5.8		T		T		0.3								
	T <sub>a</sub> 20.4(-0.4)								T <sub>a</sub> 17.3(-3.6)								T <sub>a</sub> 20.9(-0.1)							

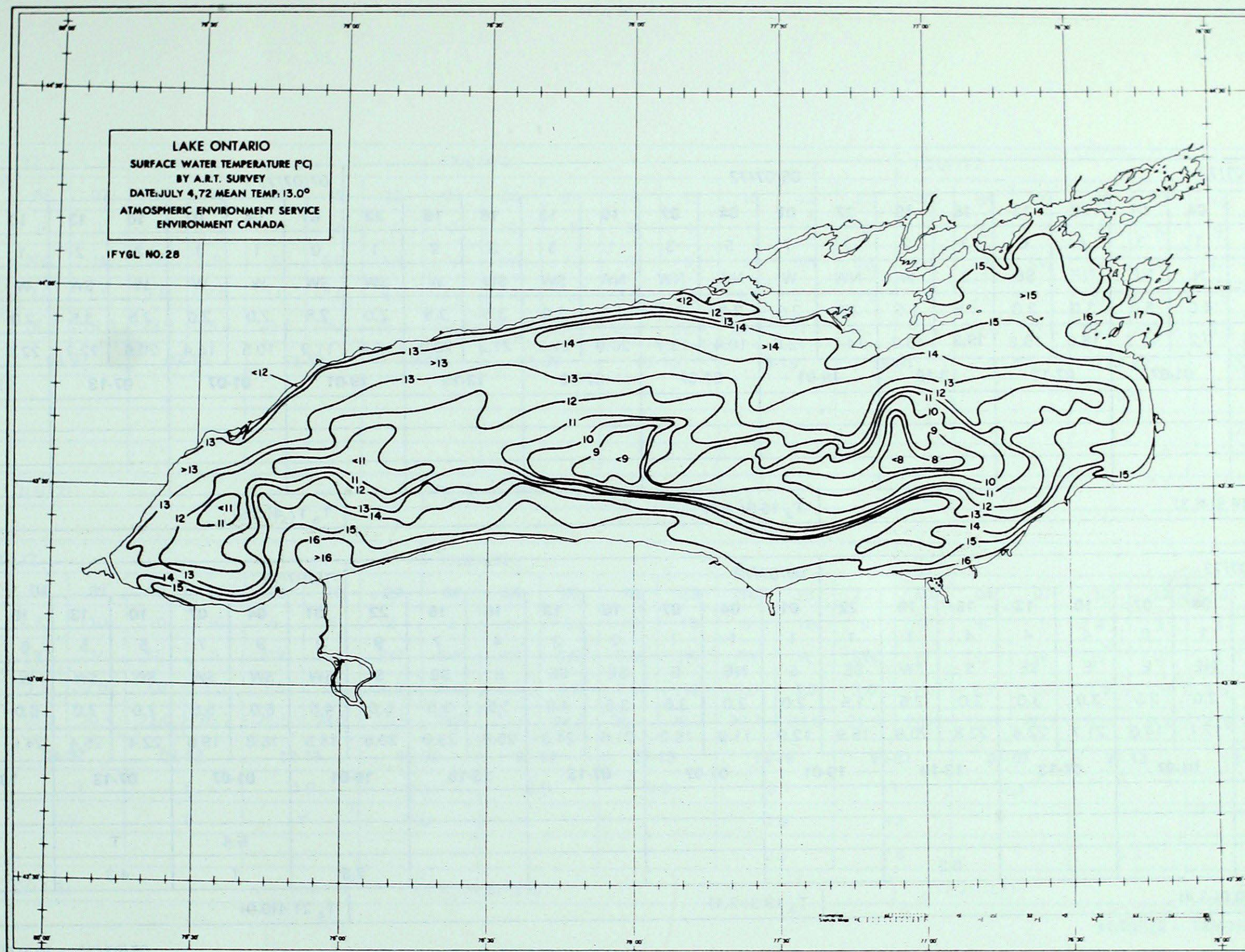
DAY	02/07/72								03/07/72								04/07/72				SURVEY NO. 28					
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22		
CLD	0	1	2	2	8	7	3	5	6	10	10	10	10	9	7	0	2	2	4	2	4	7	2	2		
WDRN	W	SW	SW	SW	SW	SW	W	N	V	N	NE	NE	E	V	V	NW	NW	NW	NW	W	SW	SW	W	W		
WSPD	3.5	3.0	3.0	4.5	5.0	4.5	3.5	3.0	3.0	3.0	3.5	6.5	4.5	2.0	3.0	3.0	4.0	4.5	4.5	3.0	5.0	5.0	3.5	3.0		
T <sub>a</sub>	17.6	17.4	19.8	25.7	27.6	28.3	25.7	21.7	19.1	16.9	15.6	14.3	14.1	15.6	14.8	12.4	10.5	9.5	12.2	17.4	19.1	18.3	17.0	12.6		
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-		
YYZ										1.5		2.5		T												
YTR										1.0		5.6														
ROC								3.0		3.0		3.6		T												
	T <sub>a</sub> 23.0(+1.9)								T <sub>a</sub> 15.4(-5.7)								T <sub>a</sub> 14.6(-6.6) T <sub>a5</sub> 19.4(-1.6) T <sub>a30</sub> 17.5(-1.8)									

## WEATHER

29/06/72 - 04/07/72

A weak Low Pressure system moves into the lower Great Lakes area on 29/06 and remains on 30/06. Strong E winds on 29/06 with increasing cloud and showers in the afternoon. Heavy rain overnight. Strong E winds in the morning of 30/06, become light W in the afternoon, with overcast sky, showers and below normal temp. Frontal System, extending south from a Low Pressure centre over James Bay, enters the upper Great Lakes area on 01/07, but fair seasonal weather continues in the Lake Ontario region. Frontal system moves slowly south on 02/07 and remains quasistationary in the lower Great Lakes area on 03/07. Moderate SW winds with scattered cloud and warm on 02/07. Variable winds, broken to overcast cloud cover and rain during the day on 03/07, caused by weak disturbances moving along the quasistationary front. High Pressure system, centered west of the Great Lakes, builds slowly over the region on 04/07; moderate to strong NW to SW winds, scattered cloud and cold.





**SURVEY NO. 28**

**04/07/72**

**T<sub>w</sub> 13.0 (-5.2)**

Scheduled for 03/07, the survey is delayed by poor weather. On 04/07 the weather is fair, but cool.

During the preceding 7 days of rather cool and windy weather the mean surface water temp. has increased only by the normal seasonal amount of 2.6° and remains much below normal.

Overnight cooling and/or transport of warm water southward by northerly winds is evident along the north shore and in the northeast basin. A tongue of warm water also protrudes from the Prince Edward County shore southwesterly into mid-lake. <4° water has at last disappeared from the surface and summer stratification exists throughout the lake.



DAY	05/07/72								06/07/72								07/07/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	2	1	3	4	6	7	7	7	7	5	3	1	3	3	2	1	0	1	1	2	2	1	0	0
WDRN	NW	N	NE	NE	SE	S	W	NW	W	NW	NW	NW	SW	SW	W	SW	SW	W	W	W	SW	W	V	S
WSPD	3.5	4.0	5.0	3.0	3.0	1.5	1.5	2.0	2.0	2.0	2.0	1.5	3.0	3.5	2.5	2.0	2.5	2.0	2.0	2.5	3.5	2.0	1.5	2.5
T <sub>a</sub>	10.4	9.2	11.7	18.0	19.8	19.3	16.7	14.1	12.8	10.4	13.7	20.0	21.5	21.3	20.0	15.4	11.9	10.5	14.4	20.6	22.2	22.9	20.9	15.8
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC																								
	T <sub>a</sub> 14.9(-6.3)								T <sub>a</sub> 16.9(-4.4)								T <sub>a</sub> 17.4(-3.9)							

DAY	08/07/72								09/07/72								10/07/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	1	0	4	4	4	1	1	1	1	7	2	3	4	7	9	9	9	7	5	5	6	6	5
WDRN	S	NE	E	E	SE	S	SW	SE	S	NE	E	SE	SE	E	SE	S	SW	SW	SW	SW	SW	W	W	W
WSPD	2.0	2.0	2.5	3.0	3.0	3.0	2.5	1.5	2.0	2.0	3.5	3.5	4.0	3.5	3.5	5.0	4.5	6.0	5.5	7.0	7.0	6.0	4.5	2.0
T <sub>a</sub>	13.9	12.1	14.6	21.7	22.4	22.8	20.6	15.9	12.9	11.9	15.2	21.6	24.3	25.0	23.0	20.5	18.5	16.8	19.6	22.4	25.4	24.6	23.1	20.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																T								
YTR																		6.4		T		T		
ROC						0.3										3.3		T		4.3				
	T <sub>a</sub> 18.0(-3.4)								T <sub>a</sub> 19.3(-2.1)								T <sub>a</sub> 21.4(0.0)							

## WEATHER

05/07/72 – 10/07/72

A High Pressure system dominates the eastern half of the continent from 05/07 to 10/07, giving scattered cloud, light to moderate variable winds and below normal temp. A weak Low Pressure centre moves easterly through the region on 10/07; strong SW winds in the morning, change to W in the afternoon; broken cloud with showers.



DAY	11/07/72								12/07/72								13/07/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	1	0	1	1	0	1	2	4	0	0	1	0	1	1	1	0	0	5	3	6	8	9	9	9
WDRN	N	NW	N	V	S	S	SE	SE	V	SW	S	S	S	S	SW	SW	SW	SW	SW	SW	SW	W	V	W
WSPD	2.0	2.0	1.5	1.5	2.0	3.0	3.0	2.5	1.5	1.0	1.5	1.5	1.5	3.5	3.5	3.5	4.5	3.0	2.5	3.0	3.0	3.5	2.5	2.5
T <sub>a</sub>	17.6	16.3	18.0	23.9	25.4	26.7	24.4	21.3	18.7	19.4	22.4	26.7	29.4	30.7	27.8	24.1	22.4	22.6	23.0	25.5	25.5	25.8	23.2	21.1
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																				0.5		T		
YTR	T																					2.3		
ROC	T																							
	T <sub>a</sub> 21.7(+0.2)								T <sub>a</sub> 24.9(+3.3)								T <sub>a</sub> 23.6(+2.0)							

DAY	14/07/72								15/07/72								16/07/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	7	7	10	10	10	5	5	6	3	0	5	10	10	8	10	9	9	6	1	4	3	3	4	1
WDRN	W	V	V	SE	S	SW	SW	SW	SW	SW	SW	SW	SW	SW	W	SW	W	W	W	W	V	S	S	S
WSPD	2.5	1.5	2.0	3.0	3.0	3.5	3.5	4.5	6.0	8.0	7.0	7.0	7.0	6.0	3.5	3.0	4.0	3.5	3.0	2.0	1.5	1.5	2.0	2.5
T <sub>a</sub>	20.4	19.6	20.4	23.0	25.7	26.5	24.8	23.5	23.5	23.1	24.3	26.7	26.7	26.1	24.8	21.9	20.6	19.6	20.7	22.6	25.0	25.0	23.5	20.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T	11.9		T		1.0		0.3		0.8		0.3		13.7		T		0.3						
YTR	2.5	0.5		T		T		0.5				T		2.5		3.8								
ROC														0.3		2.8				0.3		T		
	T <sub>a</sub> 23.0(+1.3)								T <sub>a</sub> 24.6(+2.9)								T <sub>a</sub> 22.2(+0.5)							

## WEATHER

11/07/72 – 16/07/72

Generally high pressure prevails in the Great Lakes region on 11/07 and 12/07; light and variable winds, scattered cloud and seasonal temp. From 13/07 to 24/07 a frontal zone, separating warm tropical and cooler dryer northern air masses, remains in the Great Lakes area. During this period Lake Ontario remains mostly in the warm air sector, or in the frontal zone. Several disturbances form along the front and traverse northeastward through the lower Great Lakes area, causing occasionally strong W and SW winds, broken to overcast cloud cover, showers and thunderstorms. Temp. remains above normal during this period.



DAY	17/07/72								18/07/72								19/07/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	2	1	0	0	1	1	0	0	3	0	1	2	5	4	5	6	7	8	9	9	9	7	2	5
WDRN	N	NW	NW	V	V	SE	SE	SE	E	SE	S	SW	S	S	S	SW	W	W	W	NW	W	SW	W	W
WSPD	1.5	1.5	1.5	1.5	2.0	3.0	3.0	3.0	3.5	3.0	2.0	3.5	3.0	3.0	3.5	2.0	3.5	4.5	2.5	2.5	1.5	2.5	2.0	1.0
T <sub>a</sub>	18.3	16.5	19.3	24.1	26.7	26.5	24.4	21.1	20.2	19.1	22.1	27.0	29.6	30.7	27.4	24.8	23.1	22.1	23.0	26.5	27.8	27.4	25.9	23.3
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ														0.3		0.3				T		T		
YTR																		T						
ROC																								
	T <sub>a</sub> 22.1(+0.4)								T <sub>a</sub> 25.1(+3.3)								T <sub>a</sub> 24.9(+3.1)							

DAY	20/07/72								21/07/72								22/07/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	6	5	8	1	9	6	2	0	2	3	5	3	2	2	1	1	0	2	7	5	5	1	4	2
WDRN	V	V	SE	SW	SW	S	S	W	W	W	W	W	W	W	NW	NW	NW	NW	W	W	SW	S	SW	W
WSPD	1.0	1.0	1.5	2.5	2.5	2.5	3.5	4.0	5.0	6.0	7.0	5.5	4.0	3.5	4.5	4.0	4.0	3.0	2.5	2.5	2.0	3.0	5.0	6.0
T <sub>a</sub>	22.0	20.7	22.8	27.4	29.8	29.8	27.8	25.6	25.0	24.3	26.3	28.3	30.3	30.9	27.4	22.4	19.6	18.9	21.1	26.7	28.9	30.7	28.1	26.1
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR							T															T		
ROC																								
	T <sub>a</sub> 25.7(+3.8)								T <sub>a</sub> 26.9(+5.3)								T <sub>a</sub> 25.0(+3.1)							

## WEATHER

17/07/72 – 22/07/72

Very warm and humid weather prevails in the lower Great Lakes region, as described before, from 11/07 to 24/07.



DAY	23/07/72								24/07/72								25/07/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	1	4	6	3	7	5	1	1	2	3	2	6	4	6	5	3	1	5	8	7	6	8	2
WDRN	W	W	W	W	SW	SW	W	W	W	W	W	SW	W	W	W	W	W	W	W	N	V	W	W	W
WSPD	5.0	4.5	3.0	3.0	4.0	8.0	7.0	4.5	5.0	5.0	4.5	5.0	5.5	6.0	5.5	4.0	2.5	3.0	3.5	3.0	3.5	5.0	5.5	5.5
T <sub>a</sub>	23.3	21.3	23.0	28.2	30.2	27.6	25.9	23.2	20.6	18.9	21.5	25.7	28.0	28.7	25.7	22.2	19.8	17.6	20.4	21.5	21.5	22.0	19.4	16.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ							1.0									0.3								
YTR	T						16.0							T		0.3				5.3		T		
ROC	5.8						T									0.5		0.3		8.9		T		
	T <sub>a</sub> 25.4(+3.5)								T <sub>a</sub> 23.9(+1.9) T <sub>a5</sub> 25.6(+3.7) T <sub>a30</sub> 20.6(-0.7)								T <sub>a</sub> 19.8(-2.2)							

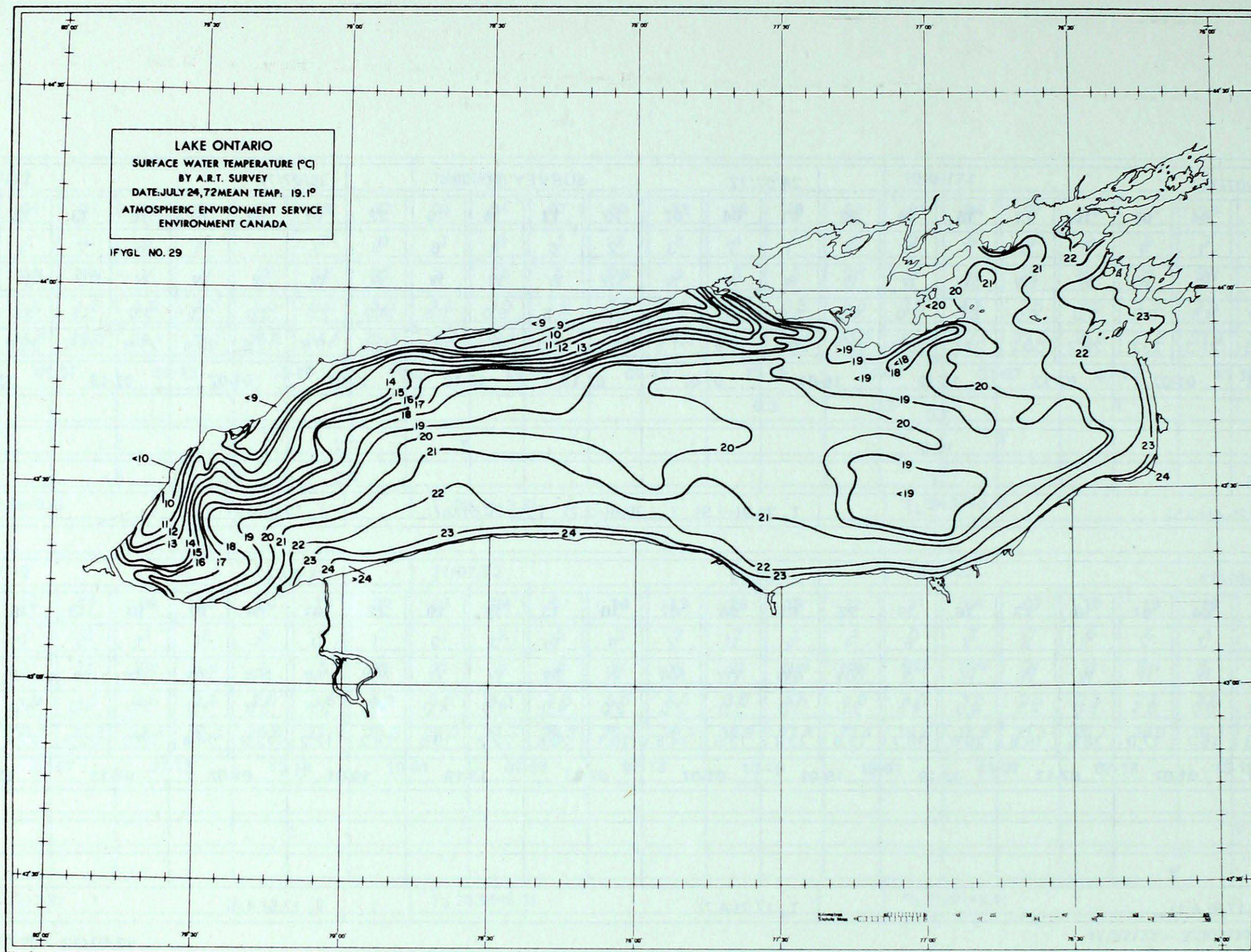
DAY	26/07/72								27/07/72								28/07/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	3	2	9	9	7	6	4	5	6	2	4	6	3	3	1	0	1	1	1	3	7	2	0
WDRN	W	W	W	W	W	W	W	NW	NW	NW	NW	W	SW	W	W	NW	NW	NW	NW	NW	W	W	W	NW
WSPD	5.5	5.0	5.5	5.0	4.5	4.5	4.5	3.5	3.0	3.0	2.5	2.0	4.0	4.0	4.0	4.0	3.5	3.0	3.0	2.0	4.0	5.0	4.0	3.0
T <sub>a</sub>	16.3	15.7	17.0	18.5	19.8	20.5	18.7	15.6	13.7	13.5	14.8	19.1	20.8	22.2	19.5	14.2	12.2	12.0	14.4	20.0	22.8	22.4	20.6	15.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC			T																					
	T <sub>a</sub> 17.8(-4.1)								T <sub>a</sub> 17.2(-4.7)								T <sub>a</sub> 17.5(-4.4)							

## WEATHER

23/07/72 – 28/07/72

Warm air remains over the lower Great Lakes on 23/07 with moderate W winds in the morning, strong SW in the afternoon, variable cloud cover and showers in the afternoon. Frontal zone moves south of the Great Lakes on 24/07; strong W winds, scattered cloud, seasonal temp., and a few showers in the evening. Frontal zone continues to push further south on 25/07, bringing the lower Great Lakes deeper into the cooler air; light W winds in the morning, strong W in the afternoon; scattered cloud with showers and falling temp. High Pressure ridge builds over the Great Lakes on 26/07 and persists over the region until 01/08. Light to moderate W and NW winds, scattered cloud and below normal temp. during this period.





SURVEY NO. 29

24/07/72

 $T_w$  19.1 (-0.8)

Initially scheduled for 10/07, the survey can not be completed until 24/07. On 10/07 warm and humid air enters the region and remains stagnant until 24/07. Condensation fog in the morning and heavy haze during the day persist over the cool lake waters during this period. Low level flights are impossible, due to very poor visibility. The survey is completed on 24/07 when the warm air begins to retreat southward.

Mean surface water temp. has increased  $6.1^\circ$  since 04/07. The normal seasonal increase for this period is  $1.7^\circ$ . The lake has absorbed a large amount of heat during the preceding 14 days of hot weather. The surface water temp. is below normal, largely due to the upwelling of cold water along the north shore.

The surface water temperature field is a typical example of the summer upwelling phenomenon. Under a strong westerly wind, warm surface water is transported southeastward. To compensate for the displaced mass, cold bottom waters push upward and emerge at the surface along the north shore, producing a tilt in the thermocline. The CCIW buoy network and the Coastal Jet Project data indicate that since 04/07 upwelling along the north shore has occurred on 10/07, 15/07 and 21/07, and that the present upwelling has started on 23/07. The corresponding winds on these days are: 10/07 SW 6 – 7, 15/07 SW 6 – 8, 21/07 W 5 – 7, 23/07 SW 7 – 8 (becoming W 5 – 6 on 24/07.).



DAY	29/07/72								30/07/72								31/07/72								SURVEY NO. 30	
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22		
CLD	0	2	1	1	2	2	2	4	0	1	1	1	2	1	0	0	0	0	0	1	1	1	0	2		
WDRN	NW	NW	W	W	SW	W	W	V	V	E	V	V	E	E	SE	SE	E	V	V	SW	S	S	S	S		
WSPD	3.0	3.0	3.0	2.5	3.0	2.5	2.5	1.5	2.0	1.0	1.5	1.5	2.0	2.5	3.0	2.5	2.5	2.5	2.0	1.5	2.0	2.5	3.0	3.5		
T <sub>a</sub>	13.3	11.5	15.4	22.2	23.9	24.4	21.7	16.3	14.4	12.0	15.4	23.3	25.4	25.9	22.6	18.2	14.4	12.6	16.5	23.9	25.6	25.8	23.9	20.2		
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-		
YYZ																										
YTR																										
ROC																										
	T <sub>a</sub> 18.6(-3.3)								T <sub>a</sub> 22.9(+1.0)								T <sub>a</sub> 20.4(-1.4) T <sub>a5</sub> 18.8(-3.1) T <sub>a30</sub> 21.2(-0.4)									

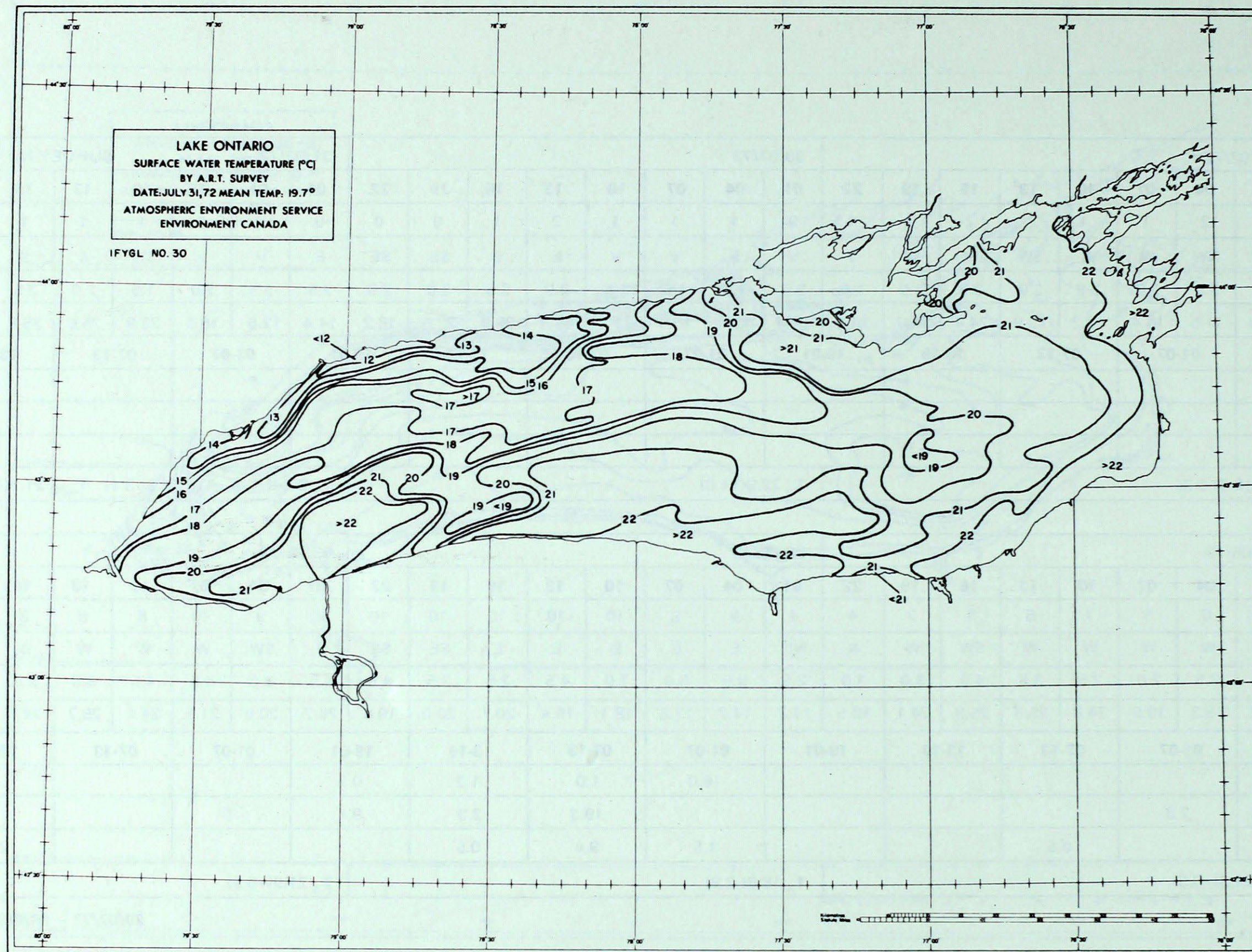
DAY	01/08/72								02/08/72								03/08/72									
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22		
CLD	10	6	5	7	6	5	2	4	4	6	9	10	10	10	10	10	10	9	10	8	6	8	9	4		
WDRN	SW	W	W	W	W	SW	W	N	NE	E	E	E	E	E	SE	SE	S	SW	W	W	W	W	NW	N		
WSPD	5.0	2.5	2.0	2.5	3.5	4.0	3.0	3.0	2.5	5.5	8.0	7.0	4.5	2.5	3.5	4.5	5.5	5.0	4.5	4.5	5.5	5.0	4.5	4.5		
T <sub>a</sub>	20.2	18.3	19.9	24.8	25.8	25.9	24.1	19.5	17.2	17.2	17.8	18.1	19.4	20.7	20.0	19.8	20.2	20.9	21.5	24.1	25.7	24.8	20.6	17.0		
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-		
YYZ										16.0		1.0		1.3		0.3							T			
YTR		2.3										19.3		2.3		9.4		T								
ROC				0.5						1.5		9.4		0.5									2.0			
	T <sub>a</sub> 22.3(+0.5)								T <sub>a</sub> 18.8(-2.9)								T <sub>a</sub> 21.9(+0.2)									

## WEATHER

29/07/72 – 03/08/72

High Pressure system persists over the Great Lakes until 01/08 with light and variable winds and mostly clear sky. Complex frontal system moves south through the upper Great Lakes region on 01/08 and remains quasistationary in the lower Great Lakes area on 02/08 and 03/08, as a Low Pressure system moves east along the front. Light to moderate W winds with broken cloud and isolated showers on 01/08. Strong E winds in the morning of 02/08, moderate in the afternoon, with overcast sky and heavy rain. Strong SW winds in the morning of 03/08, change to NW in the evening, as a Cold Front moves through the area, giving broken cloud with a few showers and rapidly falling temp. in the evening.





SURVEY NO. 30

31/07/72

 $T_w$  19.7 (-0.5)

Survey is completed as scheduled in very good weather.

Mean surface water temp. has increased  $0.6^\circ$  since 24/07 (twice the normal seasonal increase).

The surface water temperature field in the northwestern half of the lake appears to be in a transitional stage from a previously dominating upwelling structure to a flatter temperature gradient. The weather has been fair and cool during the preceding 5 days. Light to moderate NW and W winds have prevailed from 25/07 to 30/07, becoming light and variable on 30/07. The CCIW buoy network indicates that the water temp. in the northern region of the lake has remained in the  $11^\circ$  to  $14^\circ$  range until 30/07; i.e., the upwelling feature has persisted under the westerly wind regime. This is also substantiated by the Coastal Jet Project data. On 30/07 the buoy network shows a rapid rise in temp. in the northern region, and the Coastal Jet Project — a flattening of the thermocline, when winds become light and variable. The above events confirm the transitory surface water temperature pattern on 31/07, and further, imply that the mean surface temp. of the lake as a whole has remained at, or below  $19^\circ$  until 30/07.



DAY	04/08/72								05/08/72								06/08/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	1	0	0	2	4	1	0	0	0	0	0	2	1	1	0	1	0	2	9	8	10	8	10	10
WDRN	NE	NE	NE	E	V	SW	W	W	NW	N	V	W	SW	SW	SW	SW	SW	SW	SW	SW	S	SE	SE	SE
WSPD	5.5	8.0	7.5	5.0	3.0	3.0	3.0	3.5	3.5	2.0	2.0	2.5	3.0	3.5	3.5	4.5	4.5	3.5	3.0	2.5	2.0	2.5	3.0	3.0
T <sub>a</sub>	15.0	12.2	12.4	16.1	17.4	18.5	18.5	15.6	9.1	7.2	10.8	18.3	21.3	22.2	19.0	14.4	12.4	13.9	14.5	19.8	21.1	20.2	18.5	17.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																						T		
YTR																							T	
ROC	2.5																						1.0	
	T <sub>a</sub> 15.7(-5.9)								T <sub>a</sub> 15.3(-6.3)								T <sub>a</sub> 17.2(-4.3)							

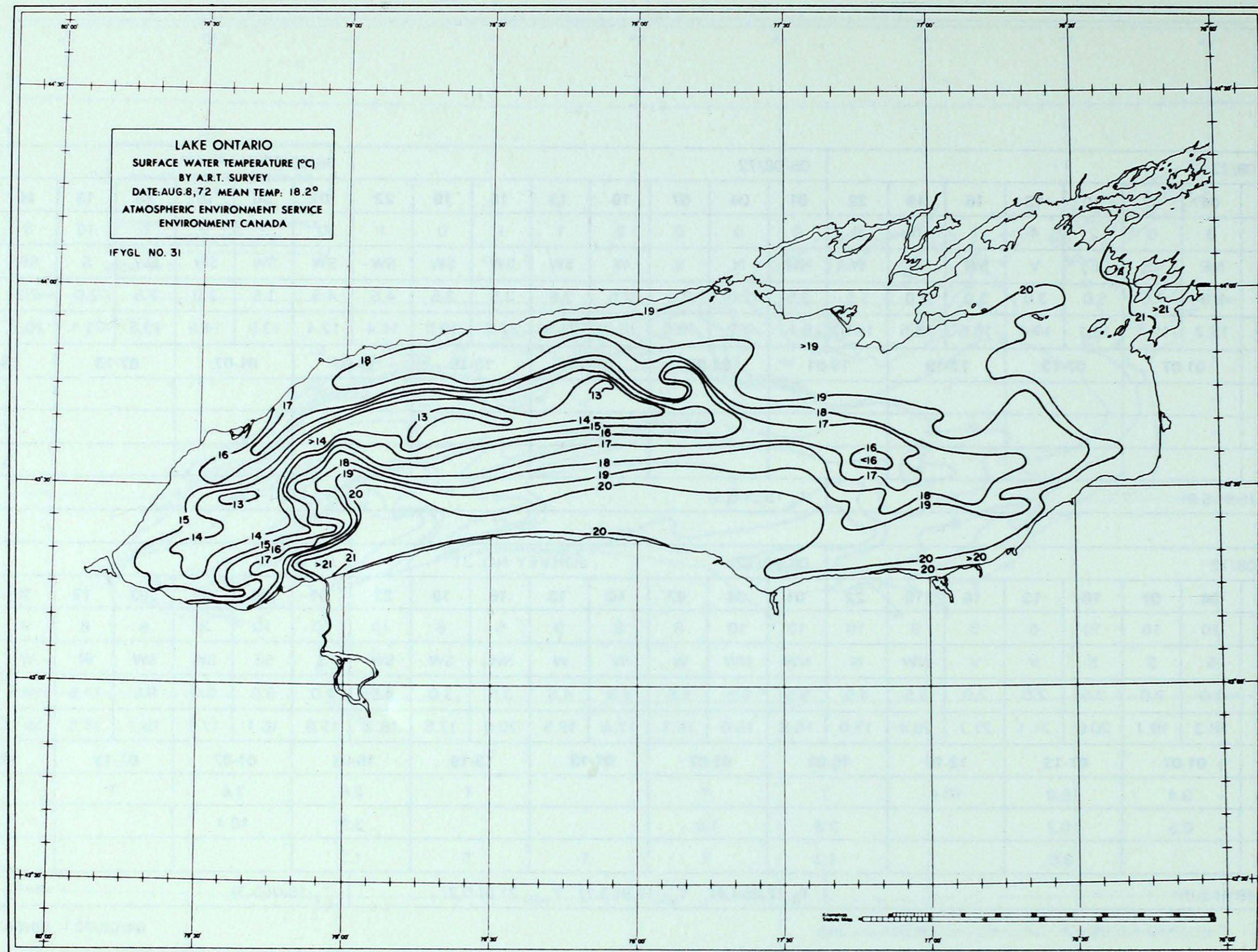
DAY	07/08/72								08/08/72								09/08/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	6	9	9	10	10	10	8	8	9	5	6	10	10	10	8	6	6	9	8	1
WDRN	SE	S	S	S	V	V	NW	N	NW	NW	W	W	W	SW	SW	SW	S	SE	SW	SW	W	W	W	W
WSPD	4.5	3.0	2.0	2.5	2.0	2.0	3.5	4.5	5.5	6.5	5.5	4.5	4.5	3.5	3.0	4.5	4.0	6.0	6.0	9.5	11.5	10.5	7.5	6.5
T <sub>a</sub>	18.0	18.3	19.1	20.0	21.1	21.7	20.4	17.0	15.8	15.0	15.3	17.4	18.5	20.0	17.8	16.2	15.6	16.1	17.8	18.7	18.5	15.9	14.3	10.8
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	0.3	9.4		15.0		10.4		T		T		T		T		2.8		3.6		T		T		
YTR	T	0.3		10.2		3.8		1.8		3.8		10.4		3.8		10.4		3.8		10.4		3.8		
ROC	9.4	3.0		4.3		T		T		T		1.3		T		T		T		T		T		
	T <sub>a</sub> 19.4(-2.0)								T <sub>a</sub> 17.0(-4.4) T <sub>a5</sub> 17.9(-3.7) T <sub>a30</sub> 21.5(-0.2)								T <sub>a</sub> 16.0(-5.3)							

## WEATHER

04/08/72 – 09/08/72

High Pressure system remains centered over the Great Lakes on 04/08 and 05/08. Strong NE winds in the morning of 04/08, light and variable in the afternoon and on 05/08. Mostly clear sky and cold on both days. Large Low Pressure system with associated frontal system approaches the upper Great Lakes area on 06/08; light SW winds in the morning, SE in the afternoon, with increasing cloud and showers in the evening. Low Pressure system deepens as it moves slowly east through the region on 07/08; light S winds, change to NW in the evening; overcast with heavy rain. A weak High Pressure ridge overlies the Great Lakes temporarily on 08/08, as another Low Pressure system approaches from the west; moderate to strong NW winds in the morning, moderate SW in the afternoon; cool, with broken cloud and scattered showers. Low Pressure system and associated Cold Front move through the Great Lakes area on 09/08, followed by a large High Pressure system. Strong SW winds in the morning with overcast sky and rain, very strong W winds in the afternoon with broken cloud and falling temp.



**SURVEY NO. 31****08/08/72****T<sub>w</sub> 18.2 (-2.5)**

Survey is completed as scheduled in marginal weather conditions — broken cloud with isolated showers, winds W 5, air temp. 16° to 20°.

In August the water temp. is at, or near the seasonal maximum. During this time it fluctuates according to weather conditions (mainly air temp.). Since 02/08 the weather has been cool [ $T_{a5}$  17.9 (-3.7)]. Mean surface water temp. has decreased 1.5° since 31/07. The surface water is about 1° cooler in the northeast basin and about 2° cooler along the south shore.

The surface water temperature pattern shows a long tongue of warm water extending west along the north shore. According to information provided by the Coastal Jet Project, this pattern is due to a westward current, set up by strong easterly winds on 02/08 and 04/08. This current is still in evidence on 08/08.



DAY	10/08/72								11/08/72								12/08/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	1	2	5	7	5	3	0	0	0	5	2	9	10	9	10	10	10	10	9	8	5	1	0
WDRN	W	NW	NW	W	SW	SW	W	NW	NW	W	W	S	S	SE	S	SW	SW	V	V	W	W	W	W	W
WSPD	7.0	7.0	6.0	5.0	6.5	6.5	5.0	3.0	2.5	2.0	1.5	2.5	2.5	3.0	4.0	3.5	3.5	3.0	2.5	2.0	3.5	4.5	3.5	3.0
T <sub>a</sub>	10.0	9.8	12.2	15.7	18.5	19.4	17.2	12.4	11.1	9.8	12.2	19.1	20.2	20.9	18.0	16.5	16.1	15.8	17.2	20.3	22.8	24.1	23.1	18.1
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T													0.5		0.8		T						
YTR																2.3		0.3						
ROC																0.3								
	T <sub>a</sub> 14.4(-6.8)								T <sub>a</sub> 16.0(-5.2)								T <sub>a</sub> 19.7(-1.4)							

DAY	13/08/72								14/08/72								15/08/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	4	9	6	8	7	7	8	10	10	10	10	10	10	9	8	1	0	0	1	2	2	1	1	0
WDRN	W	NW	V	E	E	SE	SW	SW	V	V	W	W	E	E	E	NE	NE	NE	NE	NE	E	SE	V	N
WSPD	2.0	2.0	1.0	3.0	3.5	2.0	2.0	2.0	1.5	2.5	4.0	4.0	4.5	6.0	3.0	4.0	5.0	5.5	5.5	4.5	3.5	3.5	2.0	2.0
T <sub>a</sub>	16.3	16.1	16.9	20.4	22.8	22.2	19.8	18.1	18.9	19.5	20.4	21.6	20.1	18.2	16.3	14.6	12.6	11.5	13.7	20.0	20.8	20.7	17.8	12.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ								T		T		8.1		1.0										
YTR								1.3		7.4		0.5		T										
ROC							T							21.1		T								
	T <sub>a</sub> 19.1(-1.9)								T <sub>a</sub> 18.7(-2.2)								T <sub>a</sub> 16.2(-4.6)							

## WEATHER

10/08/72 – 15/08/72

High Pressure system overlies the Great Lakes on 10/08; cold, with strong W winds and scattered cloud. High Pressure system moves east on 11/08 and a Low Pressure trough, extending south from Hudsons Bay, approaches the region in the evening. Light to moderate S winds and increasing cloud during the day with showers in the evening. Low Pressure trough passes through the area in the morning of 12/08; light and variable winds with overcast sky and rain in the morning, moderate W winds and clearing during the day. A quasistationary front develops in the Great Lakes area on 13/08 and weak disturbances move east along the front on 14/08. Light and variable winds with broken cloud on 13/08. Moderate W winds in the morning of 14/08, strong E in the afternoon, with overcast sky and showers. Large High Pressure system builds in northern Ontario and pushes south on 15/08; strong NE winds in the morning, light and variable in the afternoon; clear and cold.



DAY	16/08/72								17/08/72								18/08/72								SURVEY NO. 32				
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	0	0	4	4	8	10	10	10	10	10	10	10	10	10	10	8	10	9	5	6	4	4	2	1					
WDRN	NE	E	E	SE	SE	E	E	SE	SE	SE	E	E	E	E	E	E	V	W	W	W	W	NW	N	N					
WSPD	2.0	3.0	3.5	4.0	3.5	4.0	5.5	5.5	4.5	3.5	4.5	4.5	5.0	4.5	4.0	2.0	1.0	1.5	4.5	4.5	4.5	4.0	4.0	4.0					
T <sub>a</sub>	9.4	8.3	11.3	19.4	20.2	19.1	16.9	16.3	16.1	16.1	16.7	18.1	20.4	20.2	18.5	17.8	17.4	18.6	19.6	23.3	24.6	25.4	21.9	17.4					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ				T		1.3		T																					
YTR						1.5		T									T		5.1		T								
ROC						0.8		0.5				T																	
	T <sub>a</sub> 15.1(-5.5)								T <sub>a</sub> 18.0(-2.6)								T <sub>a</sub> 21.0(+0.5) T <sub>a5</sub> 17.4(-3.4) T <sub>a30</sub> 17.3(-3.5)												

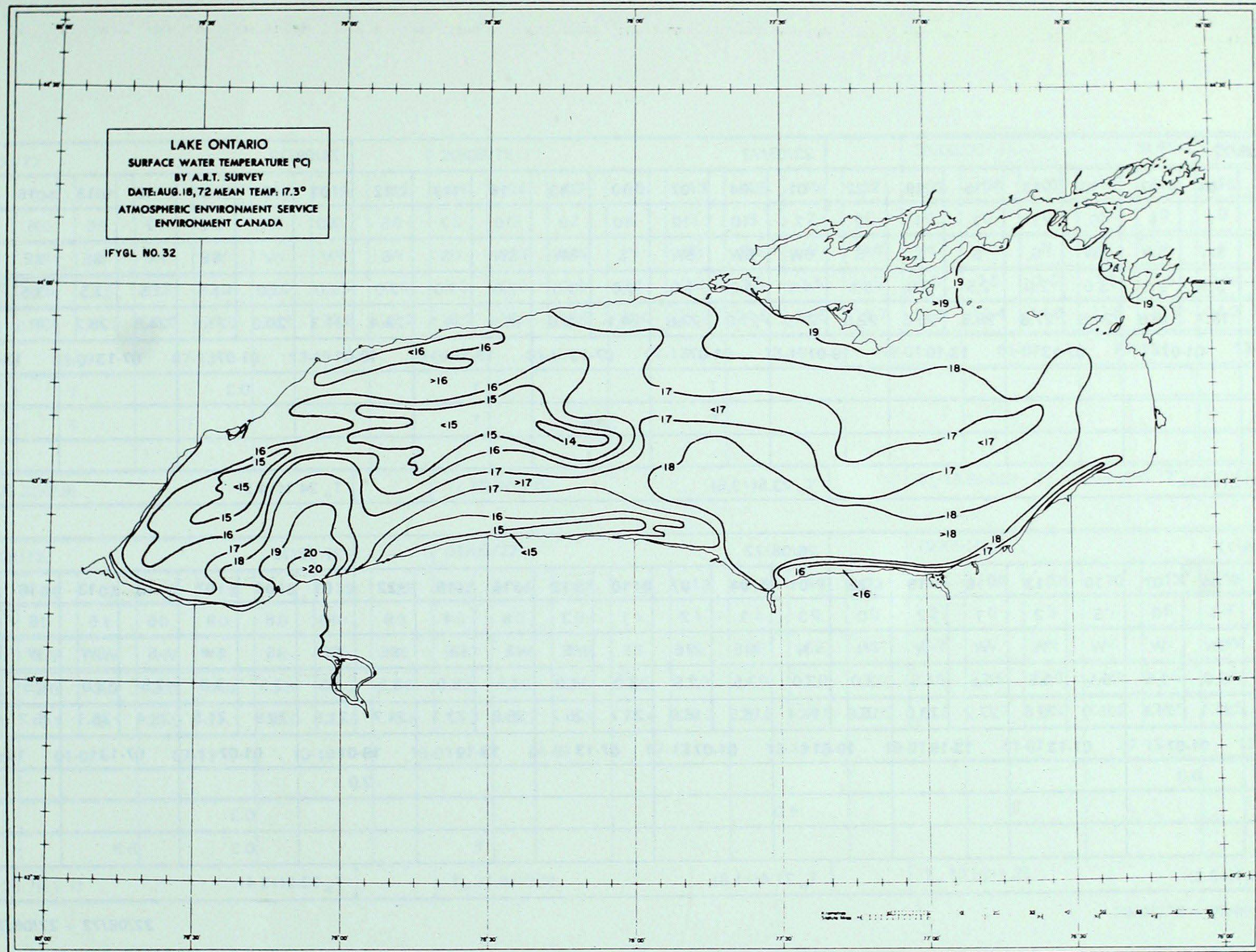
DAY	19/08/72								20/08/72								21/08/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	2	0	3	1	5	2	1	0	0	1	1	0	1	1	0	0	1	5	1	1	2	1	0	0
W <sub>DRN</sub>	N	N	NW	W	W	W	W	N	NE	NE	NE	E	SE	SW	S	S	SW	V	S	SW	S	S	SW	SW
W <sub>SPD</sub>	3.5	2.0	2.0	3.0	3.5	3.0	2.0	1.5	3.0	4.0	3.5	2.5	3.0	2.5	1.5	1.5	1.0	1.5	2.0	1.5	2.5	3.5	5.0	5.5
T <sub>a</sub>	16.1	14.4	16.7	24.1	25.9	26.3	22.6	17.2	14.8	12.6	14.6	22.8	24.6	24.6	20.6	17.4	13.9	12.4	14.6	20.3	25.7	27.0	23.3	20.9
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC																								
	T <sub>a</sub> 20.4(0.0)							T <sub>a</sub> 19.0(-1.3)							T <sub>a</sub> 19.8(-0.4)									

## WEATHER

16/08/72 – 21/08/72

High Pressure cell drifts south, as a Warm Front advances into the Great Lakes area on 16/08; moderate E winds with increasing cloud, becoming overcast with showers in the afternoon. Warm Front advances north and stalls over the Great Lakes on 17/08; overcast with moderate E winds and gradual rise in temp. Indistinct pressure pattern and unsettled weather prevail over the Great lakes on 18/08, while a High Pressure system builds in northern Ontario; gradual clearing with isolated showers as moderate W winds change to N in the evening. High Pressure system advances slowly southward across the Great Lakes on 19/08 and 20/08; scattered cloud and seasonal temp. on both days with light NW winds changing to NE, then SW. High Pressure system moves southeast to the Atlantic coast on 21/08, bringing a southerly flow of warm air to the Great Lakes region; scattered cloud with light S winds increasing to strong SW in the evening.





SURVEY NO. 32

18/08/72

 $T_w$  17.3 (-3.5)

Initially scheduled for 14/08, the survey is first delayed by poor weather on 14/08 and then by fog and poor visibility over the lake until 18/08. On 18/08 the survey is completed in marginal conditions — poor to fair visibility and fog patches along the south shore.

Due to the prevailing very cold weather [ $T_{a30}$  17.3 (-3.5),  $T_{a5}$  17.4 (-3.4)], mean surface water temp. has decreased 0.9° since 08/08 and is much below normal.

The surface water temperature pattern shows transport of warm surface water away from the south shore under the easterly wind that has prevailed since 16/08. The wind has also been favourable for the advance of the Niagara R. plume far into mid — lake.



DAY	22/08/72								23/08/72								24/08/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	1	5	6	1	3	1	2	7	10	10	10	9	10	7	5	10	10	10	7	6	6	3	8
WDRN	SW	SW	SW	SW	S	S	S	S	SW	SW	SW	S	SW	SW	S	S	V	V	SE	V	SE	SE	SE	S
WSPD	4.5	3.5	2.5	3.0	2.0	2.5	3.0	3.5	4.0	4.0	1.5	2.0	1.5	2.0	1.0	2.0	1.0	1.0	1.5	1.5	1.5	3.5	4.0	2.5
T <sub>a</sub>	19.1	18.7	19.6	24.6	27.6	28.5	25.6	22.8	21.5	21.9	22.6	24.1	25.8	25.9	24.1	22.4	21.3	20.6	21.5	24.8	28.2	28.5	25.5	22.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ										T				T				0.3						
YTR										T		3.6		T										
ROC																								
	T <sub>a</sub> 23.3(+3.2)								T <sub>a</sub> 23.5(+3.5)								T <sub>a</sub> 24.1(+4.2)							

DAY	25/08/72								26/08/72								27/08/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	5	4	0	3	2	1	2	0	3	1	2	1	3	5	4	9	10	8	9	6	6	6	9	9
WDRN	SW	SW	W	W	W	W	W	N	N	NE	NE	E	E	E	E	SE	SE	S	SW	S	SW	W	W	W
WSPD	2.0	3.0	3.5	5.5	6.5	5.5	4.5	3.0	3.0	2.5	2.5	3.0	4.0	4.5	5.0	5.5	3.5	2.5	3.0	2.5	3.0	6.5	8.5	7.0
T <sub>a</sub>	20.9	21.1	21.5	25.0	26.8	27.2	23.0	19.6	17.4	16.5	16.9	23.7	25.7	25.9	23.3	21.7	21.5	20.9	21.5	25.4	26.1	25.2	22.2	20.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	0.8	0.3														2.0						T		
YTR	1.8																	0.3						
ROC	14.2														T			0.3		5.8				
	T <sub>a</sub> 23.1(+3.3)								T <sub>a</sub> 21.4(+1.8)								T <sub>a</sub> 22.9(+3.4)							

## WEATHER

22/08/72 – 27/08/72

From 22/08 to 26/08 a quasistationary front extends east across the upper Great Lakes from a nearly stationary Low Pressure centre located in Wisconsin. The lower Great Lakes remain in very warm air during this period, while disturbances on the frontal system traverse the region with associated showers. Winds are light to moderate southerly. Quasistationary front shifts south of the Great Lakes late on 25/08, bringing moderate N winds and cooler air to the Lake Ontario region. Low Pressure centre with a frontal wave moves slowly northeast towards the lower Great Lakes on 26/08 and enters the region on 27/08. Moderate E winds with scattered cloud on 26/08. Light S winds in the morning of 27/08, change to strong W in the afternoon, with overcast to broken cloud cover and scattered showers.



DAY	28/08/72								29/08/72								30/08/72						SURVEY NO. 33					
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22				
CLD	8	10	6	1	2	0	0	0	3	3	2	2	3	6	2	0	0	0	0	0	0	0	0	0				
WDRN	W	W	W	W	W	W	W	W	W	NW	NW	N	SW	SW	W	NW	N	N	N	V	V	S	S	SW				
WSPD	7.0	8.5	7.5	5.5	7.0	8.0	7.5	6.0	5.0	3.0	2.5	1.5	2.0	3.0	3.5	4.5	4.0	2.5	2.0	1.5	1.0	1.5	3.0	3.0				
T <sub>a</sub>	19.8	19.4	19.7	23.0	27.0	26.5	22.8	20.2	18.5	16.1	16.5	22.0	25.9	24.6	21.5	16.7	13.9	12.4	14.6	22.8	24.8	24.3	20.4	15.5				
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-				
YYZ		T																										
YTR	T	T		T																								
ROC	1.3																											
	T <sub>a</sub> 22.3(+2.9)								T <sub>a</sub> 20.2(+1.0)								T <sub>a</sub> 18.6(-0.5) T <sub>a5</sub> 22.0(+2.5) T <sub>a30</sub> 19.4(-1.3)											

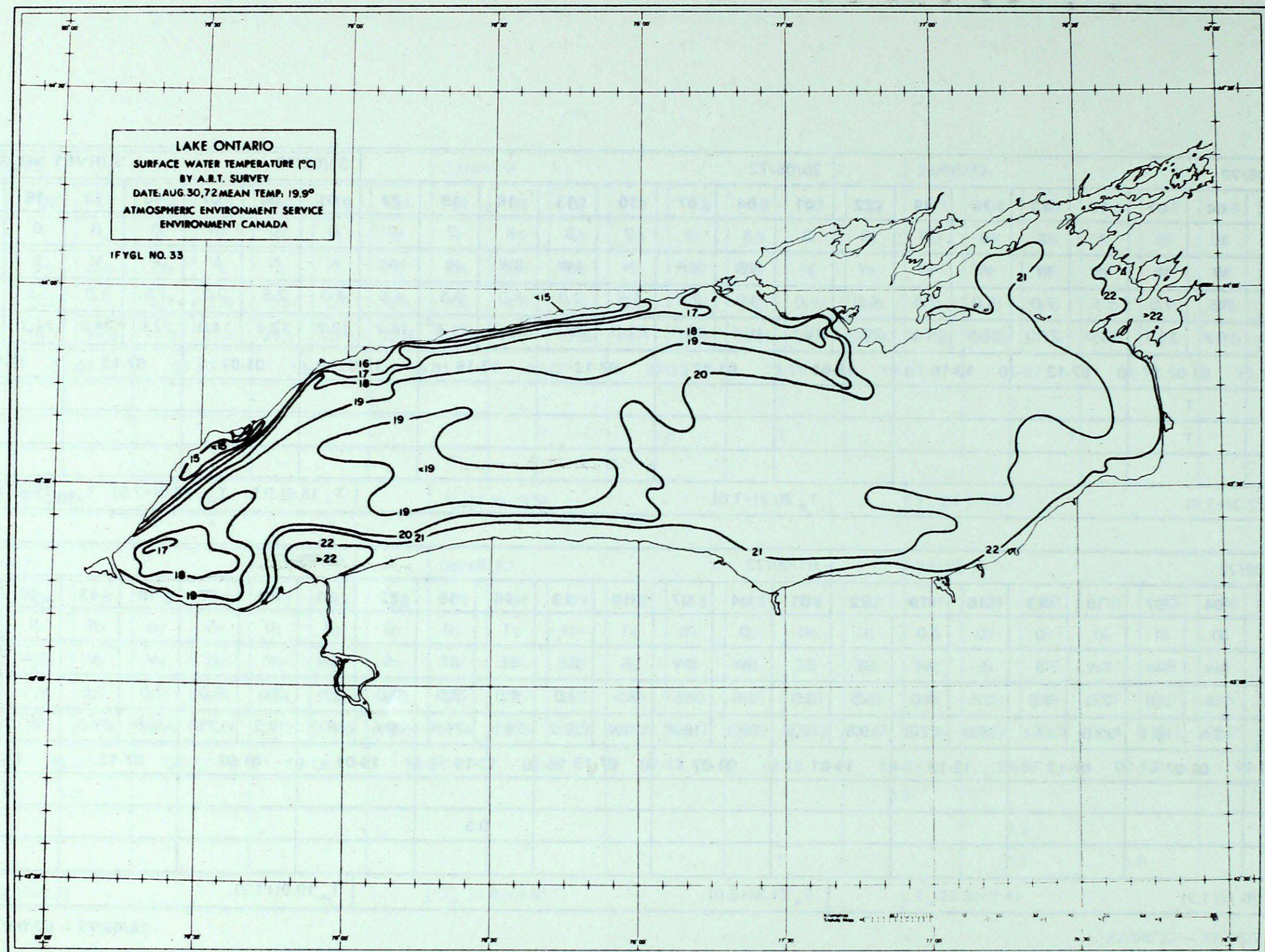
DAY	31/08/72								01/09/72								02/09/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	2	0	5	5	6	9	10	10
WDRN	SW	SW	SW	SW	S	E	SE	SE	SE	SW	SW	S	SE	SE	SE	S	SW	V	N	V	V	NW	N	NE
WSPD	2.5	2.0	2.0	2.0	2.0	3.5	4.0	3.5	3.0	2.5	2.5	2.5	3.0	4.0	3.0	3.0	2.5	3.5	2.0	2.0	2.5	4.5	6.5	8.0
T <sub>a</sub>	14.6	13.5	16.1	23.9	27.1	28.0	22.8	19.8	17.0	15.2	16.8	24.4	27.2	28.5	24.8	20.6	18.0	17.2	17.0	22.8	24.5	23.3	19.5	17.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																						T		
YTR														0.5										
ROC																								
	T <sub>a</sub> 20.7(+1.7)								T <sub>a</sub> 21.8(+3.0)								T <sub>a</sub> 19.9(+1.2)							

## WEATHER

28/08/72 – 02/09/72

Large High Pressure system builds over central U.S.A. on 28/08; strong W winds with broken cloud and scattered showers in the morning, clearing in the afternoon. Cold Front, extending south from a Low Pressure centre over Labrador, passes through the Great Lakes area on 29/08; slightly cooler, with scattered cloud and variable winds becoming moderate NW in the evening. High Pressure system remains centered over the Great Lakes on 30/08 and moves to the Atlantic coast on 31/08. Light winds, clear sky and seasonal temp. on both days. Cold Front, extending south from a Low Pressure centre over Hudsons Bay, enters the upper Great Lakes area on 01/09 and moves slowly south on 02/09, but lower Great Lakes remain in warm air. Light to moderate SW and SE winds and clear sky on 01/09. Light and variable winds on 02/09, becoming strong N in the evening; increasing cloud during the day.





SURVEY NO. 33

30/08/72

 $T_w$  19.9 (-0.3)

Initially scheduled for 22/08, the survey is delayed by poor visibility resulting from warm and humid air over the region. The survey is completed on 30/08 after the passage of a Cold Front.

Mean surface water temp. has increased  $2.6^\circ$  since 28/08 and is near normal. The increase is due to the warm weather prevailing during the intervening period. The CCIW buoy network data show a rapid rise in temp. from 18/08 to 24/08, followed by a six day period when the temp. remains in the  $20^\circ$  to  $21^\circ$  range.

The surface water temperature pattern shows upwelling along the north shore that has been initiated by the strong W winds on 28/08.



DAY	03/09/72								04/09/72								05/09/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	9	10	8	7	5	3	1	2	4	3	2	2	1	0	0	0	1	2	6	3	6	8
WDRN	NE	NE	N	N	N	N	N	N	N	N	N	NW	NW	W	NW	N	NW	NW	NW	W	SW	SW	SW	W
WSPD	7.0	7.5	6.5	6.5	5.0	5.5	5.0	5.5	4.5	5.0	5.5	4.0	4.0	5.5	5.5	6.0	5.0	5.0	3.5	3.5	6.0	7.0	7.5	8.5
T <sub>a</sub>	15.6	15.2	14.8	16.0	16.9	17.8	15.6	13.3	11.8	11.1	11.2	18.0	20.2	20.8	15.7	11.5	10.2	8.3	10.4	19.0	21.1	21.7	18.4	16.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	1.0	1.3																						
YTR	11.7	0.8		T																				
ROC	4.8	0.3		0.5				T																
	T <sub>a</sub> 15.7(-2.9)								T <sub>a</sub> 15.0(-3.4)								T <sub>a</sub> 15.7(-2.5)							

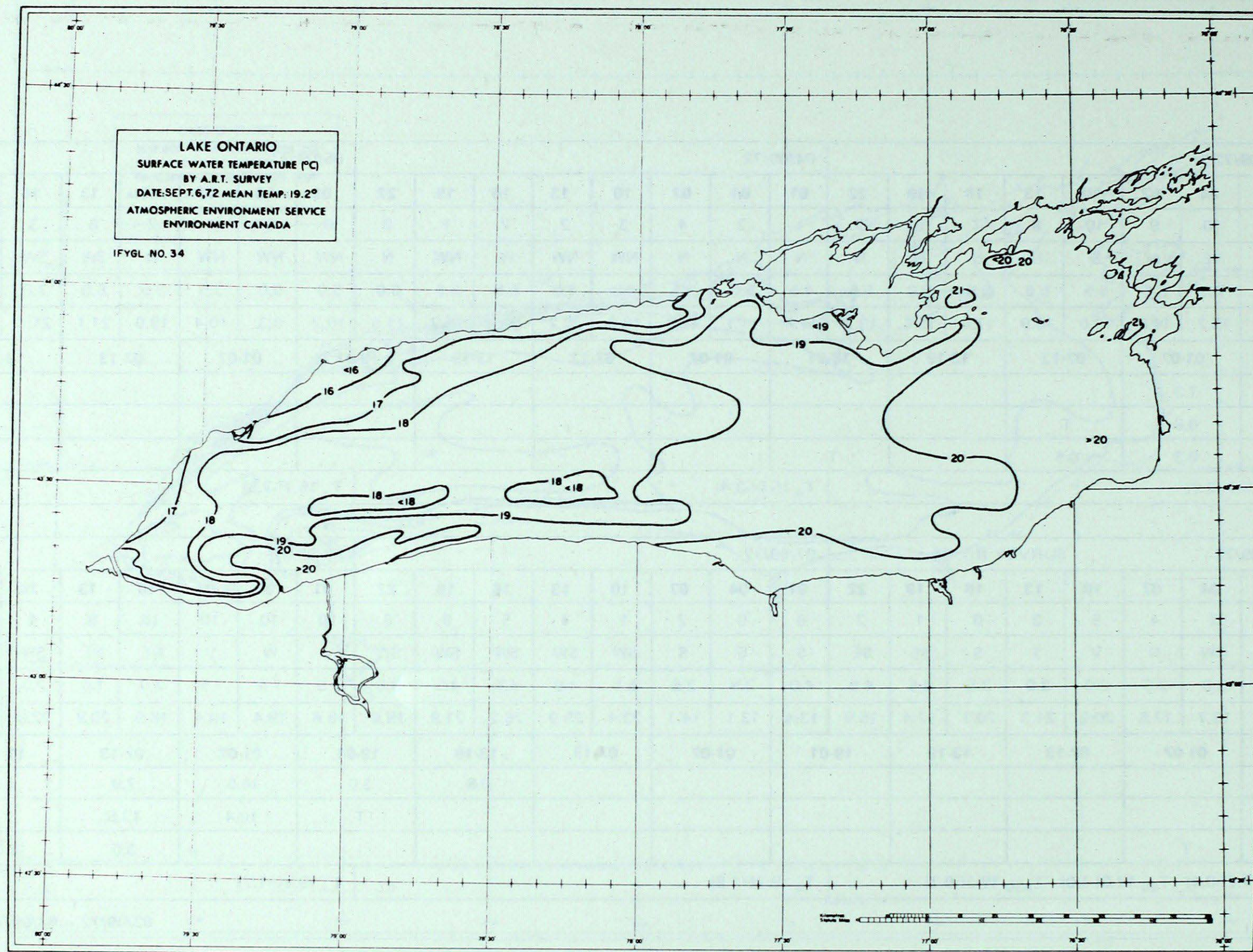
DAY	06/09/72								07/09/72								08/09/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	8	2	4	5	3	0	1	2	0	0	2	1	4	5	9	8	10	10	10	10	8	4	3	0
WDRN	W	NW	N	V	S	S	SE	SE	S	S	S	SW	SW	SW	SW	SW	V	W	V	NE	NE	SW	W	N
WSPD	5.5	3.0	2.5	2.0	3.0	3.5	4.5	4.5	4.0	2.5	3.5	5.5	4.0	4.5	4.5	3.0	1.5	1.5	1.5	2.0	1.0	2.0	3.5	7.0
T <sub>a</sub>	14.1	13.7	17.6	20.9	21.3	20.7	17.4	15.9	13.4	13.1	14.1	23.4	25.9	26.2	21.9	19.6	18.6	19.4	19.4	18.9	20.9	22.3	18.9	16.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T													0.8		3.0		18.5		7.9				
YTR	0.3															T		10.4		13.5				
ROC		T																		3.0		2.0		
	T <sub>a</sub> 17.7(-0.4) T <sub>a5</sub> 17.6(-1.0) T <sub>a30</sub> 19.3(-0.7)								T <sub>a</sub> 19.7(+1.8)								T <sub>a</sub> 19.4(+1.7)							

## WEATHER

03/09/72 – 08/09/72

Cold Front moves through the lower Great Lakes area early in the morning on 03/09, followed by a large High Pressure ridge; overcast with rain and strong N winds in the morning, clearing in the afternoon. High Pressure ridge remains over the Great Lakes on 04/09 and 05/09; moderate to strong NW winds, changing to SW in the evening of 05/09, with scattered cloud and below normal temp. A weak front passes through the area early on 06/09, causing scattered showers. A Low Pressure centre develops in the mid – western U.S. on 07/09 with a frontal structure extending into the upper Great Lakes region; light to moderate SW winds prevail over the lower Great Lakes, with increasing cloud and showers starting in the afternoon. Frontal system passes through the lower Great Lakes area on 08/09, followed by a High Pressure system; overcast with rain and light and variable winds in the morning, clearing in the afternoon and strong N winds in the evening.





SURVEY NO. 34

06/09/72

 $T_w$  19.2 (-0.5)

The survey is postponed one day because of poor visibility over the lake. On 06/09 conditions improve, although visibility remains poor in some areas.

Mean surface water temp. has decreased  $0.7^\circ$  since 30/08. The decrease has probably occurred during the preceding three days. The CCIW buoy network indicates that the water temp. remains in the  $20^\circ$  to  $21^\circ$  range until 03/09, then starts to fall with the onset of strong northerly winds and generally cool weather.

The surface water temperature pattern shows a typical late summer flat gradient structure. At this time the vertical temperature gradient in the thick epilimnion is also small. Consequently, the upwelling process along the north shore is not as apparent in the temperature gradient field, although strong northerly and westerly winds have dominated since 03/09.



DAY	09/09/72								10/09/72								11/09/72								SURVEY NO. 35				
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	1	3	3	2	3	2	2	0	0	0	0	1	1	1	1	3	9	6	4	2	3	5	7	7					
WDRN	N	N	N	N	N	N	N	N	N	NE	NE	V	SW	SW	SW	SW	SW	SW	SW	W	SW	SW	SW	W					
WSPD	6.5	6.0	7.0	7.5	6.0	5.5	6.0	6.5	6.0	5.5	3.5	1.5	3.0	4.0	3.0	3.0	4.0	4.0	4.0	3.5	4.0	4.0	5.0	5.5					
T <sub>a</sub>	16.1	14.8	14.3	18.8	19.8	19.8	14.5	11.8	10.4	8.0	9.3	17.9	20.0	19.8	15.0	12.0	12.2	12.4	14.3	21.1	24.3	23.5	20.5	18.3					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ																													
YTR																													
ROC																													
	T <sub>a</sub> 15.9(-1.7)								T <sub>a</sub> 14.1(-3.3)								T <sub>a</sub> 18.3(+1.1) T <sub>a5</sub> 17.4(-0.3) T <sub>a30</sub> 19.4(-0.1)												

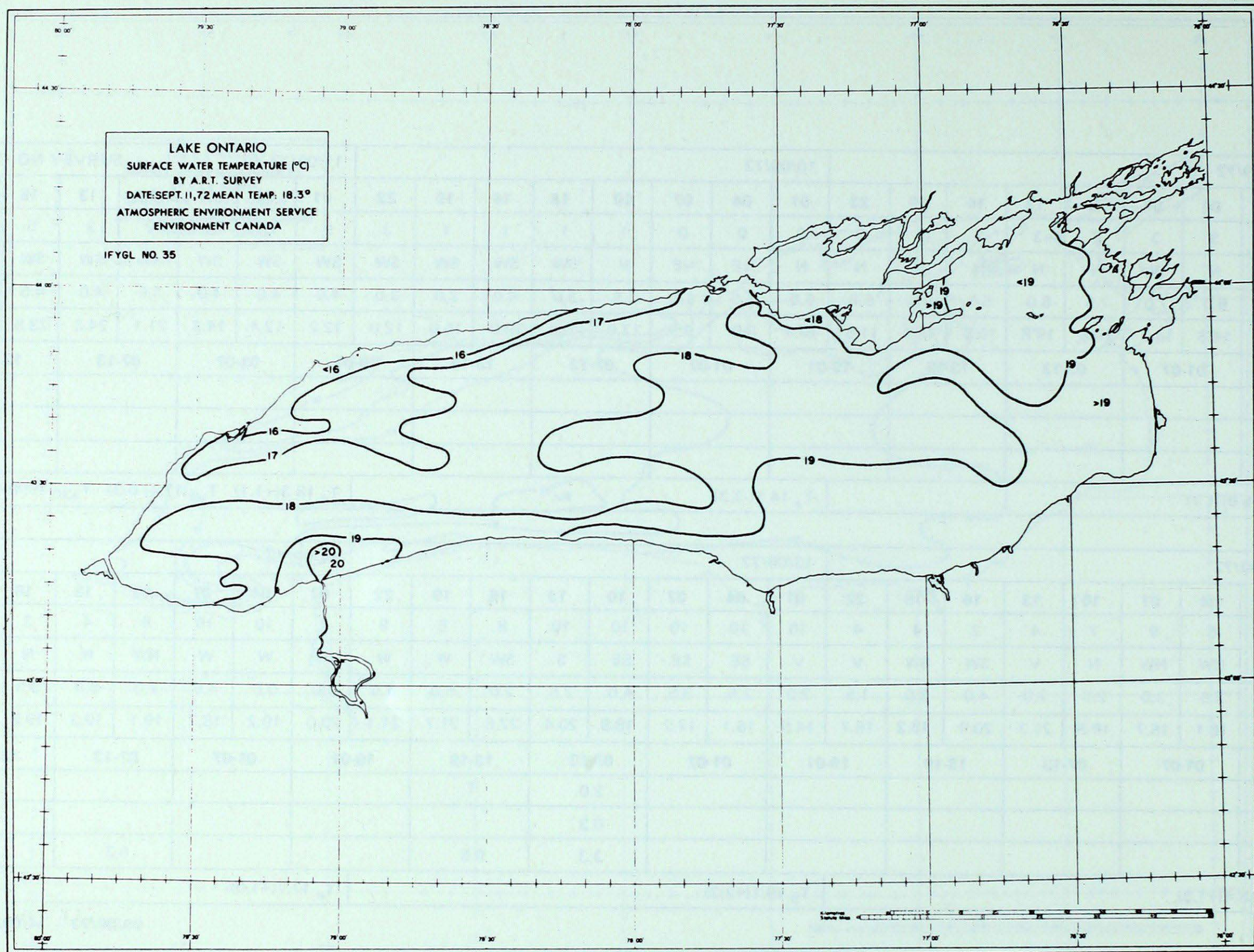
DAY	12/09/72								13/09/72								14/09/72												
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	8	6	9	7	4	2	4	4	10	10	10	10	10	8	6	9	7	10	10	8	4	3	1	0					
WDRN	W	NW	NW	N	V	SW	SW	V	V	SE	SE	SE	S	SW	W	W	W	W	W	NW	N	N	NW	N					
WSPD	4.5	3.5	3.0	2.5	2.0	4.0	3.0	1.5	2.0	2.5	3.5	4.0	2.5	2.0	5.0	4.5	4.0	3.0	4.5	7.0	6.0	3.5	5.0	5.5					
T <sub>a</sub>	17.2	16.1	16.7	19.8	21.3	20.9	18.2	16.7	14.5	16.1	17.2	18.9	20.4	22.6	21.7	21.1	20.0	19.2	18.7	19.1	19.3	19.8	14.4	10.7					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ												2.0		T															
YTR												0.3																	
ROC												3.3		0.5						0.3									
	T <sub>a</sub> 18.4(+1.3)								T <sub>a</sub> 19.1(+2.2)								T <sub>a</sub> 17.7(+1.0)												

## WEATHER

09/09/72 – 14/09/72

High Pressure system moves slowly east across the Great Lakes region on 09/09 and 10/09; cool, with mainly clear sky and strong N winds on 09/09, becoming moderate NE, then SW on 10/09. Frontal trough, extending south from a Low Pressure centre over Hudsons Bay, enters the upper Great Lakes area on 11/09; moderate SW winds and broken cloud over the lower Great Lakes. Frontal system advances south to the lower Great Lakes on 12/09 and stalls over the region on 13/09. Disturbances develop along the front and track east across the region, causing overcast sky and showers on 13/09. Variable light to moderate winds and above normal temp. prevail during this period. Frontal system shifts south of the Great Lakes on 14/09, in advance of a High Pressure ridge; strong NW winds in the afternoon with clearing sky and falling temp.





SURVEY NO. 35

11/09/72

 $T_w$  18.3 (-0.9)

Survey is completed as scheduled in good weather conditions.

Mean surface water temp. has decreased  $0.9^\circ$  since 06/09. The decrease, which is almost twice the normal seasonal, is due to the cold and windy weather of the preceding two days. The CCIW buoy network indicates that the water temp. increases slightly until 08/09 and then drops about  $0.5^\circ$  on 09/09 with the onset of strong N winds. Cooling of the lake surface is effected further by the clear sky and low ( $8^\circ$ ) air temp. in the morning hours of 10/09.

A typical early fall surface water temperature gradient has developed. The gradient is small and in the mid-lake region the isotherm configuration is in a SW — NE direction.



DAY	15/09/72								16/09/72								17/09/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	1	1	1	2	1	1	5	2	1	5	6	3	5	2	2	4	10	10	6	1	0	1	2
WDRN	N	NW	NW	W	SW	SW	SW	SW	W	W	W	W	W	S	SW	SW	SW	SW	SW	SW	W	W	NW	V
WSPD	4.5	4.0	4.0	5.0	7.0	8.0	9.0	8.5	8.5	8.0	4.5	3.5	2.5	2.5	5.0	6.0	9.0	11.0	10.5	8.0	4.5	3.5	2.5	2.0
T <sub>a</sub>	9.2	7.4	9.1	17.4	20.8	21.7	17.8	15.7	15.0	13.3	13.9	18.9	22.6	23.9	19.7	19.6	21.3	23.0	22.4	25.6	28.2	27.0	20.4	17.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																T								
YTR																								
ROC																								
	T <sub>a</sub> 14.9(-1.6)								T <sub>a</sub> 18.4(+2.0)								T <sub>a</sub> 23.1(+6.9)							

DAY	18/09/72								19/09/72								20/09/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	2	4	8	7	6	10	9	10	10	10	10	8	6	1	1	0	1	0	0	0	0	0	0	0
WDRN	E	E	E	E	E	E	NE	NE	N	N	NE	NE	NE	E	V	NE	E	E	NE	E	E	E	E	SE
WSPD	2.0	3.0	3.5	5.0	5.0	4.5	4.5	3.5	5.0	5.0	6.5	6.0	5.5	3.5	3.0	5.0	7.5	6.5	6.5	8.0	7.5	6.5	6.0	6.5
T <sub>a</sub>	15.2	13.4	15.7	19.8	21.7	22.1	19.4	18.0	17.0	15.9	15.4	15.7	17.0	17.4	13.1	12.0	10.2	8.0	7.9	14.8	17.8	18.7	14.1	10.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		T		T		T		T		T		T												
YTR				0.8		T				T														
ROC				T		10.2		T		0.5		T												
	T <sub>a</sub> 18.0(+2.0)								T <sub>a</sub> 15.4(-0.4)								T <sub>a</sub> 12.8(-2.8)							

## WEATHER

15/09/72 – 20/09/72

High Pressure ridge moves southeast across the lower Great Lakes on 15/09; cool, with scattered cloud and moderate NW winds in the morning, strong SW in the afternoon. A quasistationary frontal system overlies the Great Lakes region from 16/09 to 19/09 and the lower Great Lakes remain in the warm air sector during this period. Strong W winds on 16/09, very strong SW on 17/09, with variable cloud cover and rising temp. Weak disturbances track east along the front on 18/09, giving moderate E winds, broken to overcast cloud cover and showers. High Pressure ridge builds over northern Ontario on 19/09, pushing the frontal system south of the Great Lakes; strong NE winds with overcast sky and showers in the morning, clearing sky and falling temp. in the afternoon. High Pressure system remains over the Great Lakes on 20/09, giving strong E winds and clear and cool conditions.



DAY	21/09/72								22/09/72								23/09/72							
	SURVEY NO. 36																							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	1	1	8	2	1	5	8	3	1	2	5	2	1	0	0	0	1	1	1	3	8	8	9
WDRN	S	S	S	S	S	S	S	W	NW	NW	NW	N	NW	W	NW	N	N	NE	E	SE	E	E	SE	SE
WSPD	5.5	7.0	6.0	5.0	3.0	3.0	4.0	5.5	7.5	10.0	7.0	5.0	4.5	6.0	6.0	6.5	6.0	4.0	4.0	3.5	4.0	6.0	7.0	7.0
T <sub>a</sub>	9.3	11.3	13.0	19.1	22.8	23.7	19.3	15.9	15.3	9.8	6.4	12.4	14.1	15.6	10.0	6.3	5.4	3.5	4.6	14.1	16.3	15.7	13.7	13.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ								T																
YTR								T																
ROC																								
	T <sub>a</sub> 16.8(+1.4) T <sub>a5</sub> 17.7(+1.7) T <sub>a30</sub> 19.0(+1.0)								T <sub>a</sub> 11.2(-4.0)								T <sub>a</sub> 10.9(-4.1)							

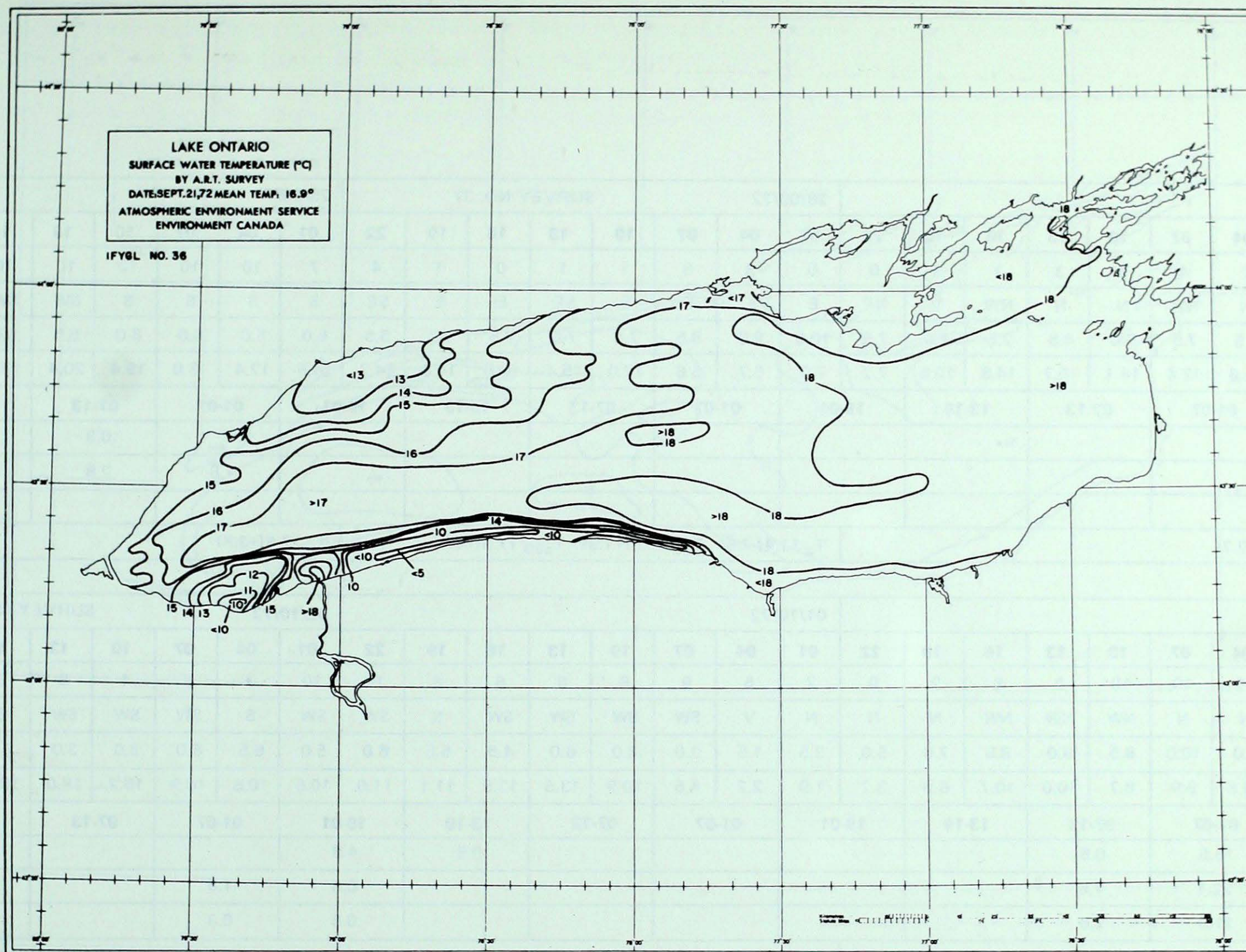
DAY	24/09/72								25/09/72								26/09/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	7	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	7	4
WDRN	S	S	S	S	S	V	SE	SE	V	V	V	S	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	W
WSPD	5.5	5.5	6.5	4.5	2.5	2.0	2.0	2.0	2.0	2.0	2.5	3.5	4.0	3.5	4.0	3.5	4.0	4.0	6.5	4.5	5.5	7.0	6.0	4.0
T <sub>a</sub>	13.9	13.0	13.1	13.6	18.5	19.8	18.5	16.9	16.7	17.1	17.0	20.2	23.5	22.6	21.9	20.8	20.9	20.2	19.1	20.9	22.8	22.9	21.3	19.1
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	3.6	0.5		T								T		T		10.7		2.5		2.5				
YTR	0.5	7.6				T						T		T		T		1.8		1.8		T		
ROC	T	33.0		2.3				11.9		1.5				T				1.3		0.5		0.8		
	T <sub>a</sub> 15.9(+1.1)								T <sub>a</sub> 20.0(+5.4)								T <sub>a</sub> 20.9(+6.5)							

## WEATHER

21/09/72 – 26/09/72

Cold Front, extending south from a large Low Pressure centre over Hudsons Bay, enters the western Great Lakes area on 21/09 and moves east through the Lake Ontario region on 22/09, followed by a large High Pressure ridge. Warm, with strong S winds and variable cloud cover on 21/09. Rapid fall in temp. with strong NW winds and scattered cloud on 22/09. High Pressure ridge moves to the Atlantic coast on 23/09; cold, with moderate E winds and scattered cloud during the day, strong SE winds and increasing cloud in the evening, as southerly flow of warm air is set up over the region. Very large High Pressure system persists over the Atlantic coast from 24/09 to 26/09, continuing to pump very warm air across the lower Great Lakes. A frontal trough moves into the upper Great Lakes area on 24/09 and remains quasistationary through the central Great Lakes until 26/09. Overcast sky, moderate to strong S and SW winds and above normal temp. continue during this period. Very heavy rain occurs early on 24/09, showers throughout 24/09, and 25/09, and continuous rain on 26/09, as a Low Pressure centre with associated frontal wave traverses the region.





SURVEY NO. 36

21/09/72

 $T_w$  16.9 (-0.9)

The survey is initially scheduled for 18/09. Bad weather causes postponement of the flight on 18/09 and 19/09, and equipment failure forces cancellation on 20/09. The survey is completed on 21/09 in reasonably good weather conditions.

Mean surface water temp. has decreased  $1.4^\circ$  since 11/09. This is a normal seasonal decrease. Although generally warm weather has prevailed [ $T_{a5}$  17.7 (+1.7),  $T_{a30}$  19.0 (+1.0)], upwelling along the south shore has lowered the lake-wide mean surface temp., which would otherwise be higher. The CCIW buoy network data demonstrate the effects of wind on the water temp. since 11/09. In the central deep water region the temp. decreases gradually by  $0.1^\circ$  to  $0.2^\circ$  per day, with a larger drop ( $0.4^\circ$ ) occurring on 17/09. In the northern region large drops in temp. ( $>1^\circ$ ) occur on 16/09 and 17/09, but on 20/09 and 21/09 the temp. increases by  $1^\circ$  and  $0.6^\circ$  respectively. The large decreases in water temp. coincide with very strong SW and W winds that cause upwelling and mixing in the surface layers, while the increases coincide with strong E and S winds that transport warm surface water northwestward.

Strong upwelling along the south shore is evident in the surface water temperature field. The upwelling is caused by strong NE and E winds on 20/09 and strong S winds on 21/09. The wind is moving warm surface water away from the shore, exposing the thermocline. The U.S. IFYGL Coastal Chain Program confirms that in the Olcott area the surface water temp. falls some  $9^\circ$  in 24 hours during 20/09 and 21/09, and that a strong westward current is set up along the shore.



DAY	27/09/72								28/09/72								29/09/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	9	2	4	4	3	1	1	0	0	3	5	1	1	0	1	4	7	10	10	10	10	10	10	9
WDRN	NW	N	NW	N	N	NW	V	NE	E	E	E	E	SE	E	E	SE	S	S	S	S	SW	SW	SW	SW
WSPD	4.0	7.5	7.5	6.0	4.5	2.5	4.0	7.5	10.0	9.0	8.5	7.0	7.5	7.5	7.5	5.5	5.0	5.0	6.0	8.0	5.5	5.0	5.0	6.0
T <sub>a</sub>	18.0	15.6	12.4	14.1	15.7	14.8	10.5	7.2	7.0	5.7	5.6	12.0	15.4	16.8	14.8	14.2	16.5	17.4	18.0	19.4	20.4	18.7	16.3	13.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																				0.8		11.2		
YTR																		1.8		2.8		13.5		
ROC																						1.3		
	T <sub>a</sub> 12.0(-2.2)								T <sub>a</sub> 11.4(-2.6) T <sub>a5</sub> 15.9(+1.3) T <sub>a30</sub> 17.3(+0.4)								T <sub>a</sub> 17.6(+3.8)							

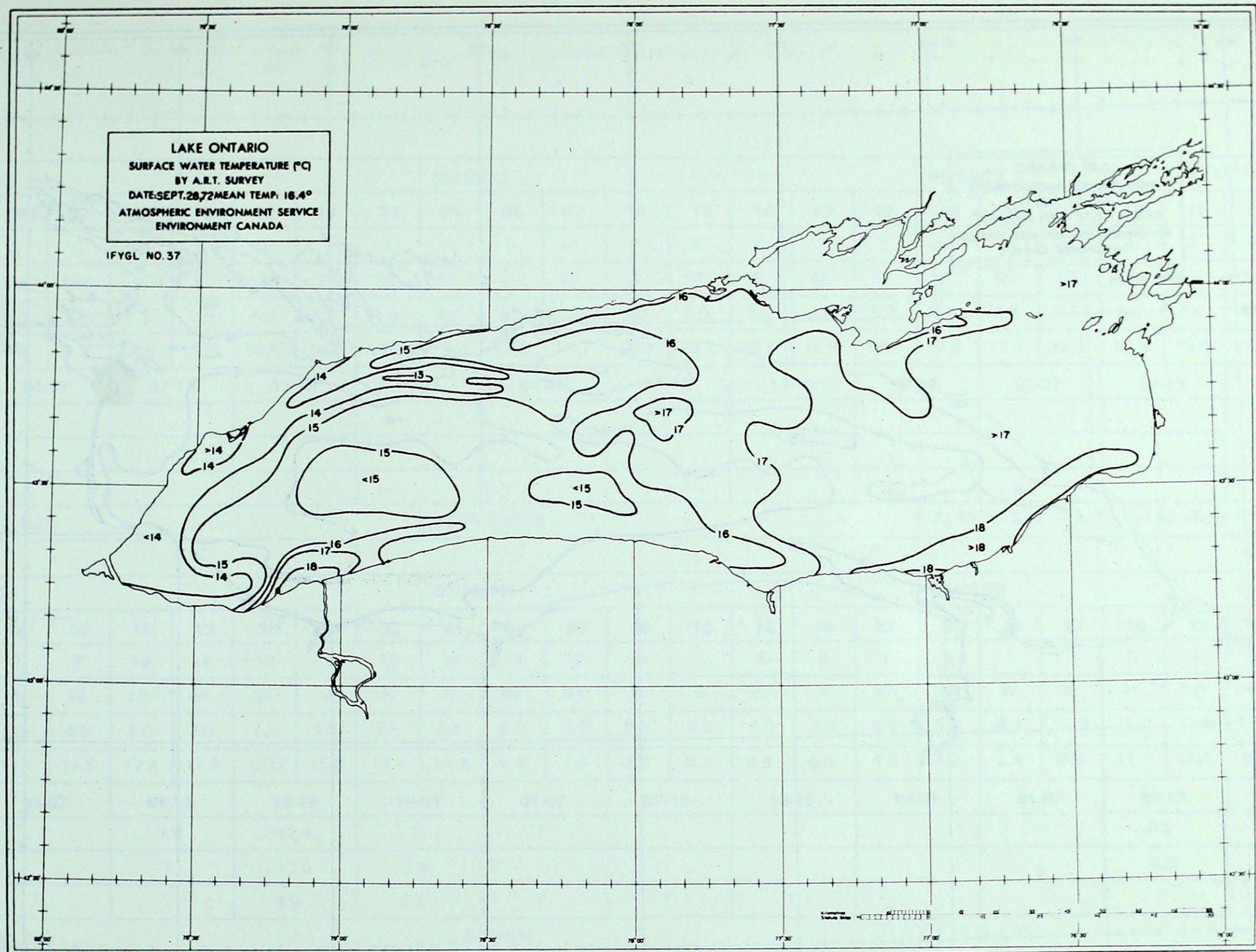
DAY	30/09/72								01/10/72								02/10/72								SURVEY NO. 38				
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	10	10	10	10	8	6	2	0	2	5	9	6	6	6	8	10	10	7	6	4	5	3	0	2					
WDRN	NW	N	N	NW	NW	NW	N	N	N	V	SW	SW	SW	SW	S	SW	SW	S	SW	SW	SW	S	S	S					
WSPD	5.5	6.0	10.0	8.5	9.0	8.5	7.0	5.0	3.5	1.5	3.0	6.0	6.0	4.5	5.5	6.0	5.0	6.5	6.0	5.0	3.0	2.5	4.0	3.5					
T <sub>a</sub>	11.7	10.8	8.9	8.7	10.0	10.7	6.9	3.2	1.9	2.2	4.5	10.9	13.5	13.9	11.1	11.0	10.6	10.6	10.9	15.2	18.0	18.7	14.4	10.6					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ	0.8	16.5		0.5										0.5		4.8													
YTR	1.3	22.1		7.6												0.5		1.8											
ROC	T	11.9		7.6												0.5		0.3											
	T <sub>a</sub> 8.9(-4.7)								T <sub>a</sub> 8.6(-4.7)								T <sub>a</sub> 13.6(+0.5) T <sub>a5</sub> 11.7(-2.1) T <sub>a30</sub> 16.1(-0.1)												

## WEATHER

27/09/72 – 02/10/72

Cold Front, followed by a High Pressure system, moves into the Great Lakes area on 27/09; strong NW winds, clearing sky and falling temp. High Pressure system moves east, as a frontal trough advances towards the region on 28/09; cool, with strong E winds and scattered cloud. Cold Front enters the upper Great Lakes area on 29/09, but southerly flow of warm air continues over the lower Great Lakes until the evening; strong S winds, change to SW, then NW; overcast with rain during the day. Cold Front, followed by a large arctic High Pressure system, advances through the lower Great Lakes area on 30/09; very strong NW winds and overcast with heavy rain in the morning, clearing with falling temp. during the day. High Pressure ridge moves across the region to the Atlantic coast on 01/10, bringing a return flow of warm southerly air to the Great Lakes by evening; light and variable winds in the morning, become strong SW during the day; increasing cloud with showers in the evening. High Pressure ridge remains over the Atlantic coast on 02/10 and warm air continues to circulate over the Great Lakes; strong SW winds in the morning, moderate S in the afternoon; broken cloud with showers in the morning, clearing in the afternoon.





SURVEY NO. 37

28/09/72

 $T_w$  16.4 (-0.1)

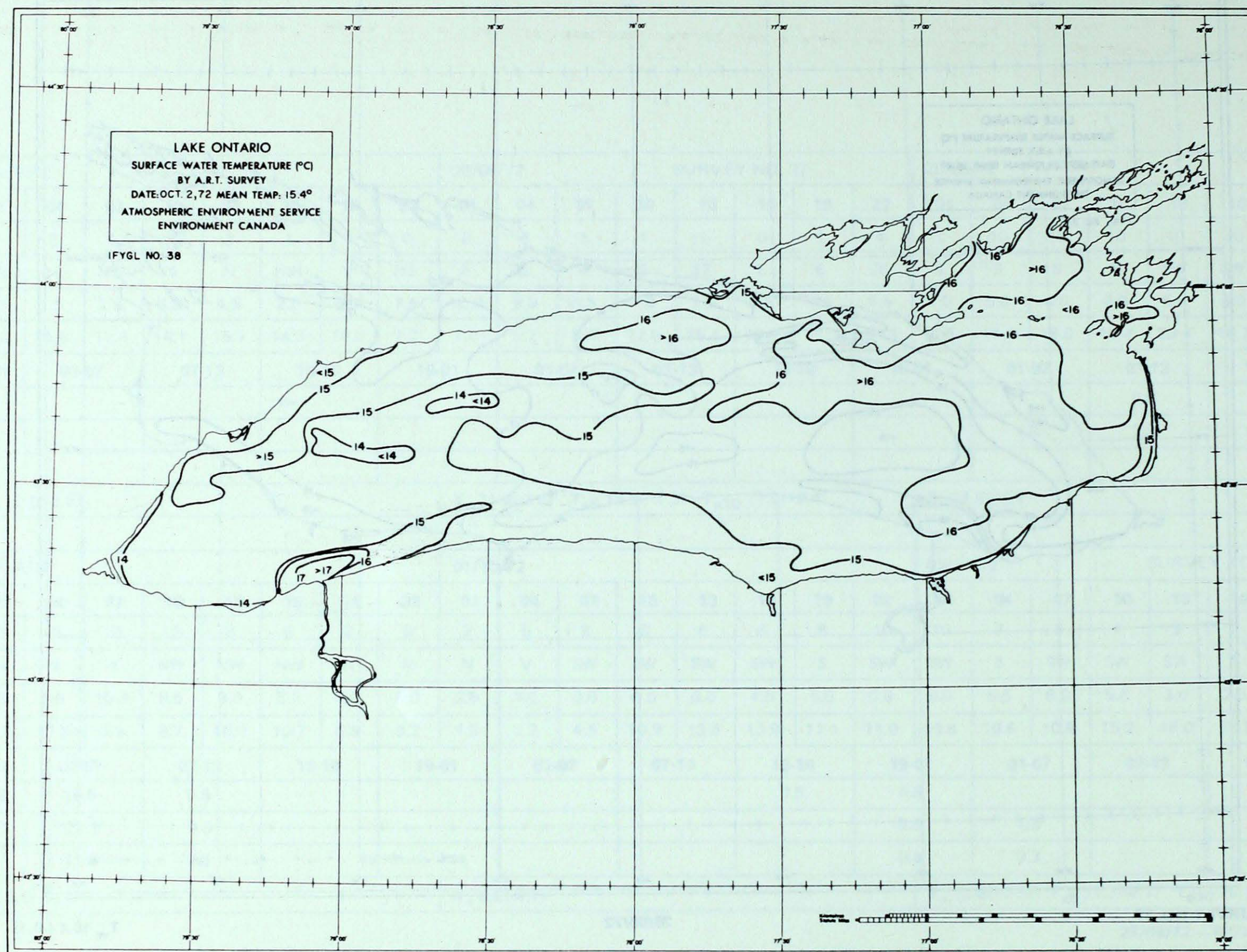
The survey is delayed by bad weather on 25/09 and 26/09 and by equipment failure on 27/09. On 28/09 the survey is completed in good weather conditions.

Mean surface water temp. has decreased  $0.5^\circ$  since 21/09. The decrease is much smaller than the seasonal normal of  $1.3^\circ$ . The small decrease can be attributed in part to the relatively warm weather [ $T_{a5}$  15.9 (+1.3),  $T_{a30}$  17.3 (+0.4)].

Additional reasons for the small decrease in the lake-wide temperature mean are provided by the surface temperature pattern, when compared to the pattern of the previous survey on 21/09. Upwelling along the south shore has ceased. The U.S. IFYGL Coastal Chain Program confirms the end of upwelling in the Olcott area on 23/09. Upwelling resumes again on 29/09, in response to the very strong E winds on 28/09 and 29/09.

A tongue of warm water extends westward along the north shore. Here the surface water temperature has increased since 21/09. The Coastal Jet Project data show that a change from an upwelled to a downwelled thermocline occurs in this region on 22/09, as a result of the strong S winds on 21/09. The downwelling persists until 30/09, in spite of northerly wind impulses on 22/09 and 27/09. The tongue of warm water, extending west along the north shore is a surface manifestation of a westward flowing current, set up by the strong E winds.





SURVEY NO. 38

02/10/72

 $T_w$  15.4 (-0.2)

The survey is completed as scheduled after the passage of a Warm Front. Conditions are good — scattered cloud, wind SW 5 — 3, air temp.  $13^\circ$  to  $18^\circ$ .

Mean surface water temp. has decreased  $1.0^\circ$  since 28/09; this is close to the normal seasonal decrease. The CCIW buoy network indicates that the greatest drop ( $0.5^\circ$ ) in water temp. occurs from 30/09 to 01/10, after the passage of a strong Cold Front that brings overnight air temp. down to  $2^\circ$ .

The surface water temperature gradient is relatively flat — a typical fall condition. The band of warm water ( $>15^\circ$ ) still persists in the northern region of the lake. Definite shallow water cooling shows up along the shores and in the northeast basin. The Niagara R. plume is well defined by its warmer water ( $>17^\circ$ ).



DAY	03/10/72								04/10/72								05/10/72								SURVEY NO. 39	
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22		
CLD	0	3	6	10	3	0	3	1	8	5	4	2	2	4	2	0	2	2	4	4	2	4	9	4		
WDRN	SW	SW	SW	V	E	E	E	SE	SE	S	SE	S	SE	E	SE	SE	E	SE	SE	S	SE	SE	E	SE		
WSPD	3.5	2.0	2.0	1.5	1.5	4.0	4.5	4.5	4.5	2.5	3.5	5.0	5.0	5.5	6.0	6.0	5.5	5.5	5.5	5.0	5.0	4.5	4.5	4.5		
T <sub>a</sub>	9.6	8.5	9.8	14.6	19.8	20.0	18.7	12.2	12.3	10.6	10.7	18.0	20.4	19.6	15.9	14.3	12.8	12.6	12.1	16.9	19.4	19.1	16.3	15.0		
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-		
YYZ																										
YTR																										
ROC																										
	T <sub>a</sub> 14.1(+1.2)								T <sub>a</sub> 15.2(+2.5)								T <sub>a</sub> 15.5(+3.0) T <sub>a5</sub> 12.1(-1.0) T <sub>a30</sub> 15.9(+0.3)									

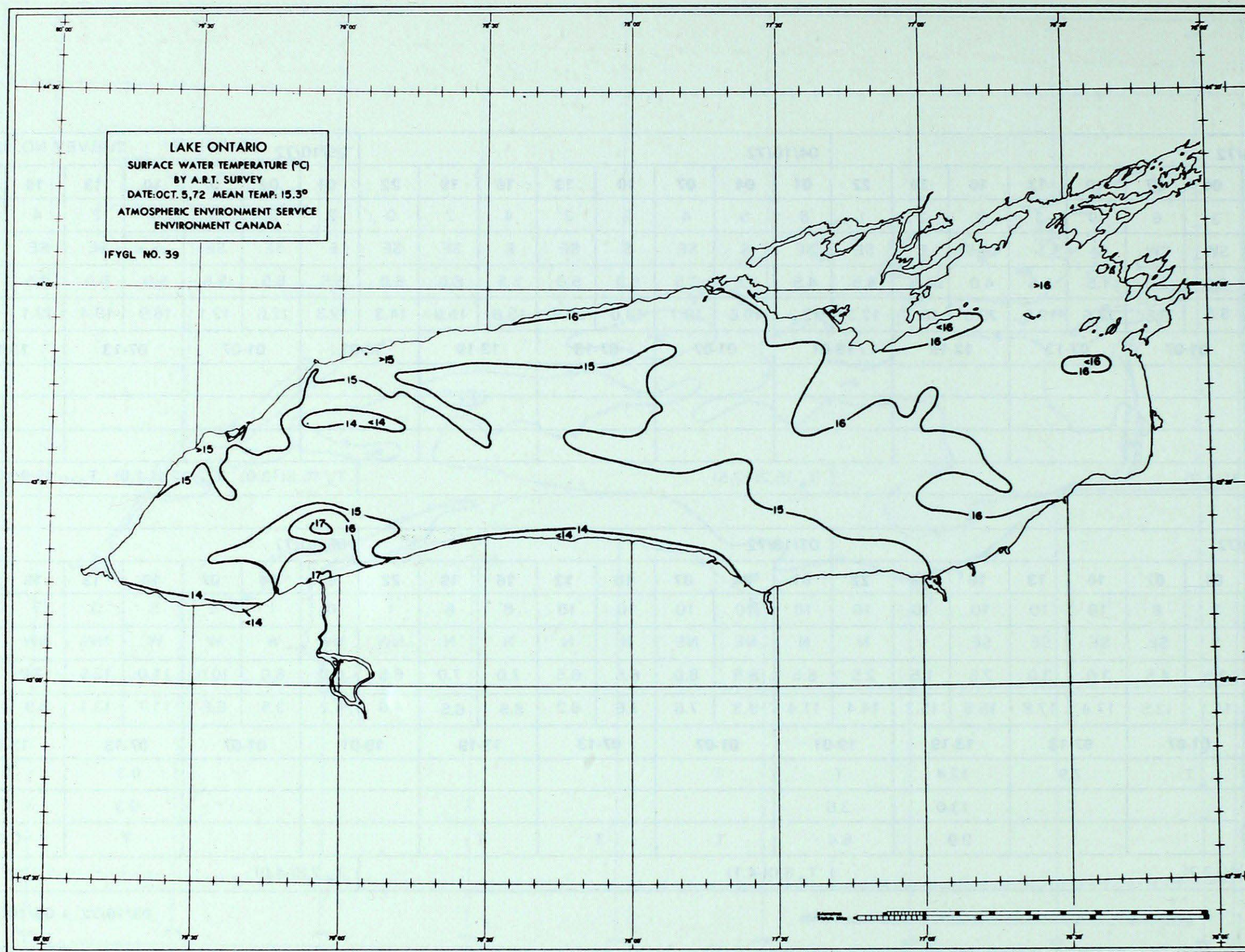
DAY	06/10/72								07/10/72								08/10/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	2	3	8	10	10	10	10	10	10	10	10	10	10	8	6	1	0	1	5	5	3	7	3	2
WDRN	S	S	SE	SE	SE	SE	V	N	N	NE	NE	N	N	N	N	NW	NW	W	W	W	NW	NW	W	W
WSPD	4.0	3.5	4.5	3.0	3.0	2.5	1.5	2.5	6.5	8.5	8.0	6.5	6.5	7.0	7.0	6.5	6.0	8.0	10.0	11.0	12.5	13.0	12.5	12.5
T <sub>a</sub>	12.4	14.1	13.5	17.4	17.8	15.5	15.2	14.4	11.4	9.3	7.6	7.6	8.2	8.5	6.5	4.8	4.2	3.5	6.9	11.7	13.1	8.9	8.2	6.1
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		T		7.9		12.4		T		T										0.3		T		
YTR				T		13.0		3.6												0.3		T		
ROC	T					9.9		6.4		T		T		T						T		0.5		
	T <sub>a</sub> 15.0(+2.7)								T <sub>a</sub> 8.0(-4.1)								T <sub>a</sub> 7.8(-4.0)							

## WEATHER

03/10/72 – 08/10/72

Very large High Pressure system persists over the Atlantic coast from 03/10 to 06/10, drawing warm southerly air over the Great Lakes; moderate to strong SE winds, scattered cloud and above normal temp. during this period. Cold Front enters the upper Great Lakes area on 06/10 and moves east of the lower Great Lakes early on 07/10. Warm, with moderate SE winds and increasing cloud on 06/10, becoming overcast with rain in the afternoon. Very strong N winds and overcast with scattered showers and rapidly falling temp. on 07/10. A second Cold Front, extending south from a Low Pressure centre in northern Ontario, sweeps through the Great Lakes region on 08/10; cold, with very strong NW winds, scattered cloud and a few showers.





SURVEY NO. 39

05/10/72

 $T_w$  15.3 (+0.3)

This is a special survey, flown during a designated IFYGL "alert period". The survey is completed as scheduled in very good weather.

Due to the warm fair weather, prevailing since 02/10, the mean surface water temp. has decreased only 0.1°.

The surface water temperature pattern suggests some transport of warm surface water away from the south shore and piling up against the north shore under the strong and SE winds that have prevailed since early on 04/10. The Niagara R. plume has also advanced further into the lake.



DAY	09/10/72								10/10/72								SURVEY NO. 40								11/10/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22								
CLD	0	1	5	5	7	6	3	0	0	0	0	0	0	1	2	2	4	2	3	2	6	9	10	10								
WDRN	NW	NW	NW	NW	NW	NW	NW	NW	N	NE	NE	E	SE	SE	SE	SE	SE	S	S	S	SE	SE	SW	SW								
WSPD	11.0	9.5	9.5	10.0	9.5	8.5	9.0	7.0	5.0	4.0	3.0	3.0	3.0	3.0	5.5	7.0	6.5	6.0	5.5	5.5	4.5	4.0	4.0	7.0								
T <sub>a</sub>	5.0	3.9	3.9	6.5	7.4	8.3	4.3	2.8	-0.5	-2.1	-2.8	5.7	7.8	7.6	4.8	5.2	4.1	4.8	4.6	12.8	16.8	17.2	15.6	15.0								
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-								
YYZ																						T										
YTR	0.5																					T										
ROC		0.5																														
	T <sub>a</sub> 5.3(-6.3)								T <sub>a</sub> 3.2(-8.2) T <sub>a5</sub> 10.3(-1.8) T <sub>a30</sub> 14.6(0.0)								T <sub>a</sub> 11.4(+0.2)															

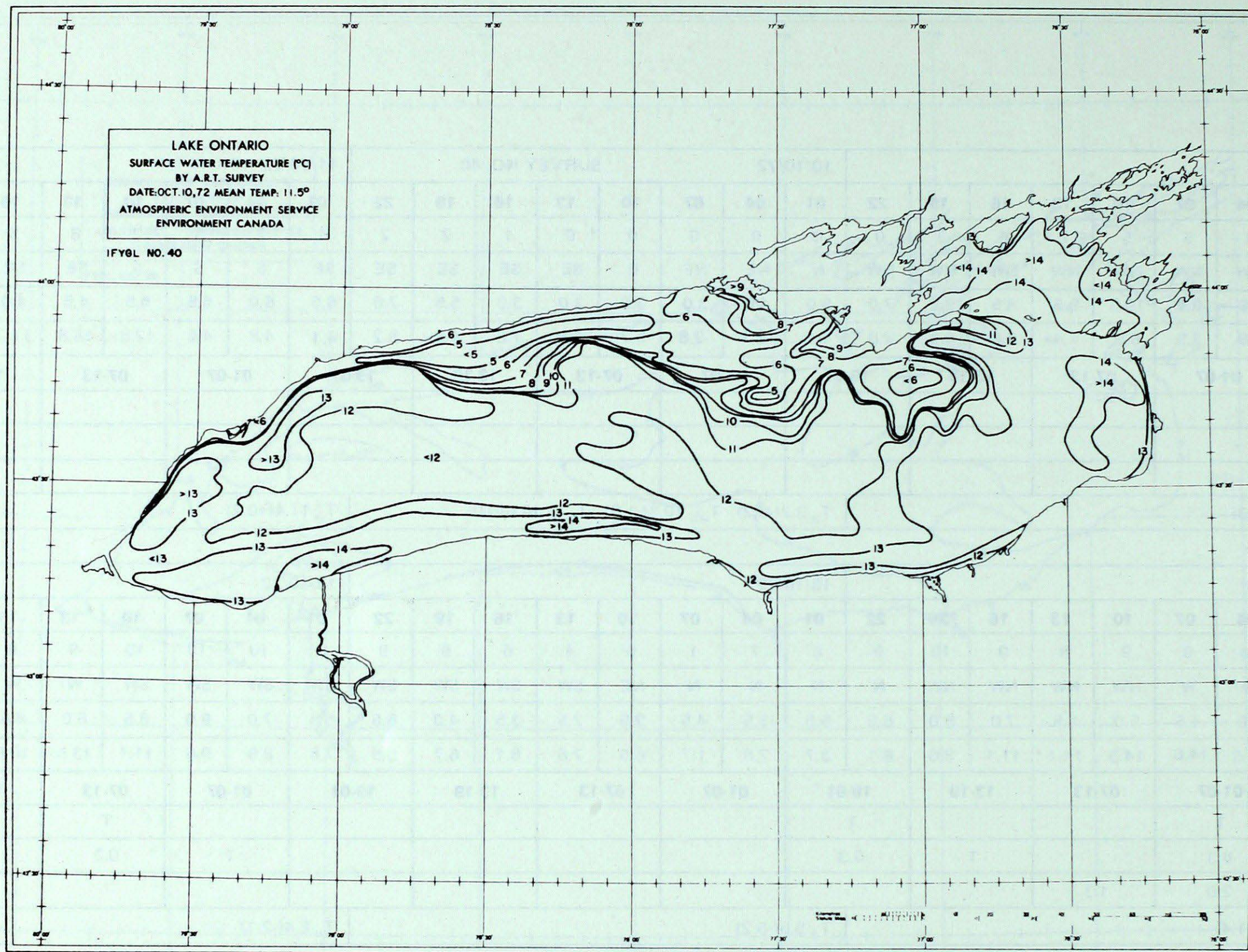
DAY	12/10/72								13/10/72								14/10/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	9	9	8	9	10	9	5	7	1	5	4	6	9	9	9	10	10	10	9	6	3	4
WDRN	SW	W	W	NW	NW	NW	NW	N	N	N	N	NE	SW	SW	SW	SW	SW	SW	SW	SW	W	W	NW	NW
WSPD	5.5	6.0	4.5	5.0	5.5	7.0	8.0	6.5	5.5	5.5	4.5	2.5	2.5	3.5	4.0	6.5	5.5	7.0	9.0	8.5	8.0	8.5	10.0	9.0
T <sub>a</sub>	14.8	15.6	14.6	14.3	14.1	11.1	8.0	6.1	3.7	2.8	1.7	6.5	7.6	8.1	6.7	6.5	7.8	8.9	9.6	11.1	13.5	10.6	2.4	3.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		T						T												T				
YTR	T	0.3				T		0.3										T		0.3		T		
ROC		2.0		1.3																		1.0		
	T <sub>a</sub> 12.3(+1.4)								T <sub>a</sub> 5.5(-5.2)								T <sub>a</sub> 8.4(-2.1)							

## WEATHER

09/10/72 – 14/10/72

A deep Low Pressure system over Labrador and a large High Pressure ridge approaching the Great Lakes from the west continue to pump cold air into the region on 09/10; very strong NW winds, scattered cloud and below normal temp. High Pressure ridge moves through the Great Lakes region on 10/10 and reaches the Atlantic coast on 11/10. Moderate to strong SE winds, clear sky and very cold on 10/10. Strong S and SW winds with increasing cloud and rising temp. on 11/10. Cold Front, followed by a High Pressure ridge enters the Great Lakes region on 12/10; strong SW winds overnight to 12/10, change to strong NW, then N in the evening, with overcast to broken cloud cover, scattered showers and falling temp. Large High Pressure ridge overlies the eastern portion of the continent on 13/10; cold, with variable cloud and strong N winds in the morning, moderate SW in the afternoon. A frontal trough passes through the area on 14/10. Strong SW winds in the morning, change to very strong NW in the evening. Broken to overcast cloud cover with showers during the day, clearing in the evening. Temp. rises, then falls again rapidly in the evening with the passage of a Cold Front.





SURVEY NO. 40

10/10/72

 $T_w$  11.5 (-2.6)

The survey is completed as scheduled in fair, but cold weather.

Mean surface water temp. has fallen drastically since 05/10. The large drop in water temp. has been caused by the passage of strong Cold Fronts on 07/10 and 08/10, continuing strong NW winds and low air temp. on 09/10, and the clear sky and freezing air temp. ( $-2^{\circ}$  to  $-3^{\circ}$ ) in the morning of 10/10.

The surface water temperature pattern is a startling example of how very strong NW winds and low air temp. can destroy the summer stratification in a lake and cause a rapid cooling of the surface waters by : (a) mixing of cold hypolimnion water into the warm epilimnion, and (b) direct loss of heat to the atmosphere.

The CCIW buoy network indicates that the water temp. in the northern region of the lake falls  $1^{\circ}$  with the passage of the first Cold Front on 07/10 and  $5^{\circ}$  from 08/10 to 09/10, after the passage of the second Cold Front. In mid - lake regions the water temp. falls  $0.5^{\circ}$  from 07/10 to 08/10, then  $3.5^{\circ}$  from 08/10 to 09/10, as the cold water spreads southward under the sustained very strong NW winds.



DAY	15/10/72								16/10/72								17/10/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	1	0	2	4	8	6	6	6	5	6	10	10	10	10	10	10	9	6	3	5	6	6	1	1
WDRN	NW	NW	NW	W	W	W	W	SW	W	W	W	SW	SW	SW	SW	SW	W	W	W	W	W	W	NW	NW
WSPD	8.0	7.0	7.5	5.5	6.0	7.0	7.0	8.0	9.5	10.0	9.5	10.5	9.5	11.5	11.0	12.0	11.0	11.0	11.0	10.0	8.5	8.5	7.5	7.5
T <sub>a</sub>	1.3	0.4	0.8	3.9	6.8	6.5	4.6	4.6	6.7	6.2	7.1	8.0	11.1	11.9	11.7	12.0	8.3	4.4	2.6	5.2	5.4	3.9	0.7	-1.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T															T				T		T		
YTR	T									0.5		2.8		0.8		1.5		T		T				
ROC	0.8			0.3								T								T		0.3		
	T <sub>a</sub> 3.6(-6.7)								T <sub>a</sub> 9.3(-0.8)								T <sub>a</sub> 3.6(-6.2)							

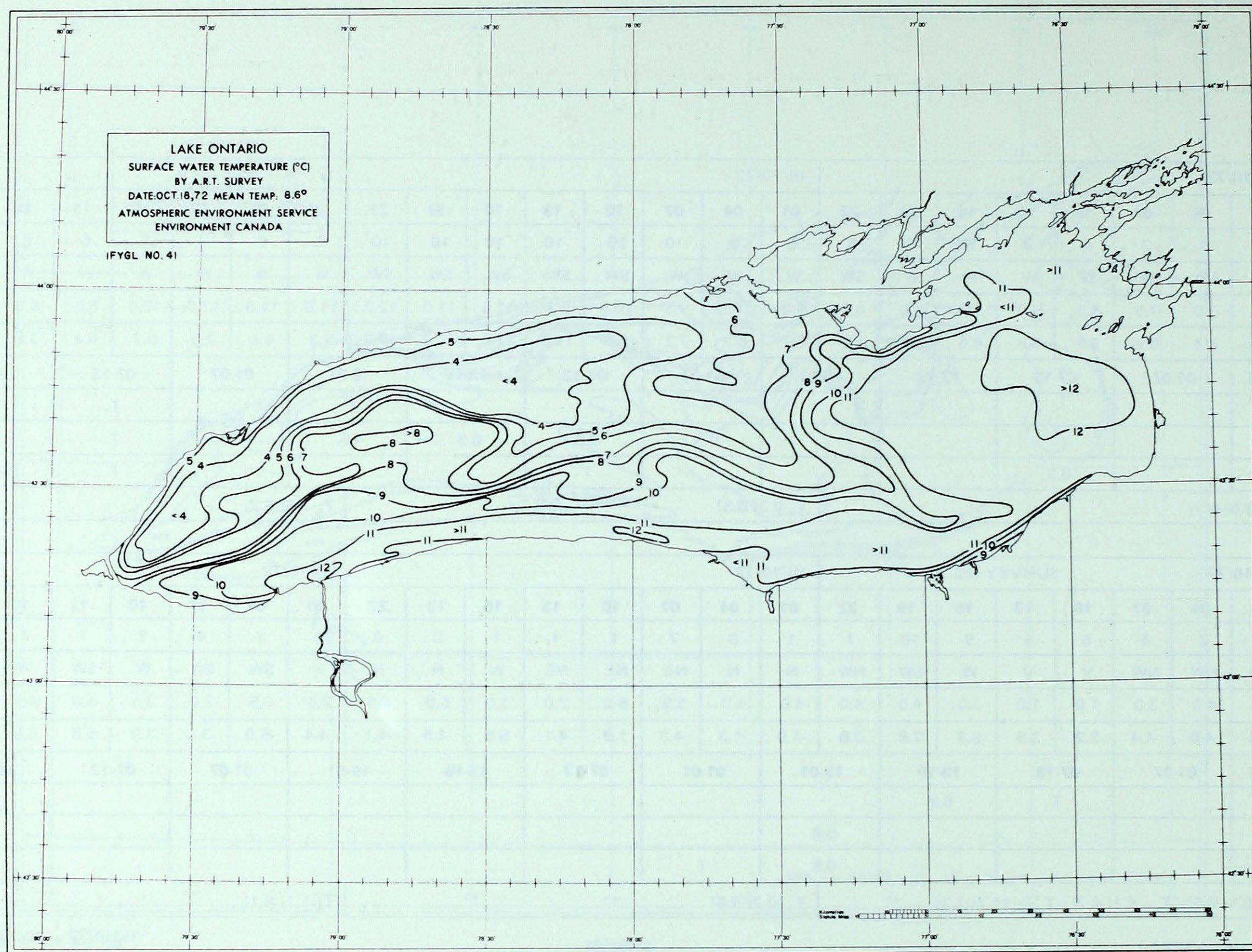
DAY	18/10/72								19/10/72								20/10/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	2	4	5	5	9	10	7	1	0	2	1	1	1	0	0	0	1	4	2	7	4	0	0
WDRN	NW	NW	NW	V	V	W	SW	NW	N	N	NE	NE	NE	W	N	N	V	SW	SW	W	SW	W	S	V
WSPD	5.0	4.0	3.0	1.0	1.0	3.0	4.0	4.0	4.0	5.0	5.5	6.0	2.0	3.0	5.0	4.5	2.0	0.5	2.0	3.5	4.0	4.5	2.0	1.5
T <sub>a</sub>	-3.5	-4.0	-4.4	2.2	3.9	3.3	2.8	0.6	-1.9	-1.3	-4.3	1.9	4.1	5.5	-1.5	-4.1	-4.4	-5.0	-3.1	3.9	6.8	6.9	3.1	0.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ				T		0.3																		
YTR								0.8																
ROC								0.8		T														
	T <sub>a</sub> 0.1(-9.5) T <sub>a5</sub> 6.1(-4.2) T <sub>a30</sub> 11.7(-1.3)								T <sub>a</sub> -0.2(-9.6)								T <sub>a</sub> 1.1(-8.1)							

## WEATHER

15/10/72 – 20/10/72

Large High Pressure system moves southeast across the Great Lakes region on 15/10; strong NW and W winds, broken cloud and very cold. High Pressure system reaches the Atlantic coast on 16/10 and a Warm Front advances north through the Great Lakes area; very strong SW winds and overcast with showers. Cold Front and a very large arctic High Pressure system enter the region early on 17/10. Very strong W winds in the morning, become moderate NW in the evening. Broken cloud with scattered showers, clearing in the evening with a rapid fall in temp. High Pressure system moves slowly east across the continent from 18/10 to 21/10. Very low temp., variable winds and scattered cloud during this period. A weak upper air trough passes across the Great Lakes area from 18/10 to 19/10, causing scattered showers overnight.





SURVEY NO. 41

18/10/72

 $T_w$  8.6 (-3.8)

The survey is initially scheduled for 13/10, but problems with equipment cause postponement until 18/10. On 18/10 the survey is completed in fairly good weather conditions — broken cloud with isolated showers, light and variable winds, air temp.  $0^{\circ}$  to  $4^{\circ}$ .

Mean surface water temp. has decreased  $2.9^{\circ}$  since 10/10. The decrease is much greater than the seasonal normal of  $1.7^{\circ}$ . Cooling has been accelerated by the very cold and windy conditions prevailing during the previous five days. The CCIW buoy network indicates that the surface water temp., after recovering somewhat from the sharp drop during 08/10 — 10/10, decreases at a slower, more seasonal rate until 15/10. From 15/10 to 18/10 the water temp. again falls rapidly. This fall coincides with the period of very strong winds and low air temp.

The great effect of the long — sustained, very strong westerly winds on the surface water temperature field is illustrated by the temperature pattern. The epilimnion has been largely stripped away in the northwestern half of the lake. The tightly packed isotherms in the  $7^{\circ}$  to  $10^{\circ}$  range represent the advancing edge of the stripping process. The warmest water ( $>12^{\circ}$ ) is impounded in the east end of the lake.



DAY	21/10/72								22/10/72								23/10/72								
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	
CLD	0	0	2	4	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	7	10	
WDRN	SW	SW	SE	S	S	S	S	S	S	S	S	SW	S	S	SE	SE	SE	SE	SE	SE	SE	SW	SW	V	V
WSPD	1.0	0.5	2.0	4.5	4.5	4.0	4.5	5.5	4.5	4.0	2.5	3.0	2.5	1.5	3.0	2.5	2.5	2.5	2.5	2.5	3.5	4.0	4.0	5.0	
T <sub>a</sub>	-1.5	-1.8	-0.5	7.0	7.4	6.8	5.8	6.1	5.7	6.1	6.7	8.6	8.5	8.3	8.1	7.9	8.1	8.9	8.1	10.6	12.4	14.1	12.6	9.5	
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-	
YYZ				0.8		3.0		4.1		0.5		1.0		9.9		12.2		11.9		3.8		T			
YTR						0.5		0.3		1.0		1.3		3.3		11.9		8.9		7.1		2.8			
ROC						2.0		2.0		T				1.3		0.5		6.4		4.8		T			
	T <sub>a</sub> 3.5(-5.2)								T <sub>a</sub> 7.5(-1.2)								T <sub>a</sub> 10.6(+2.1)								

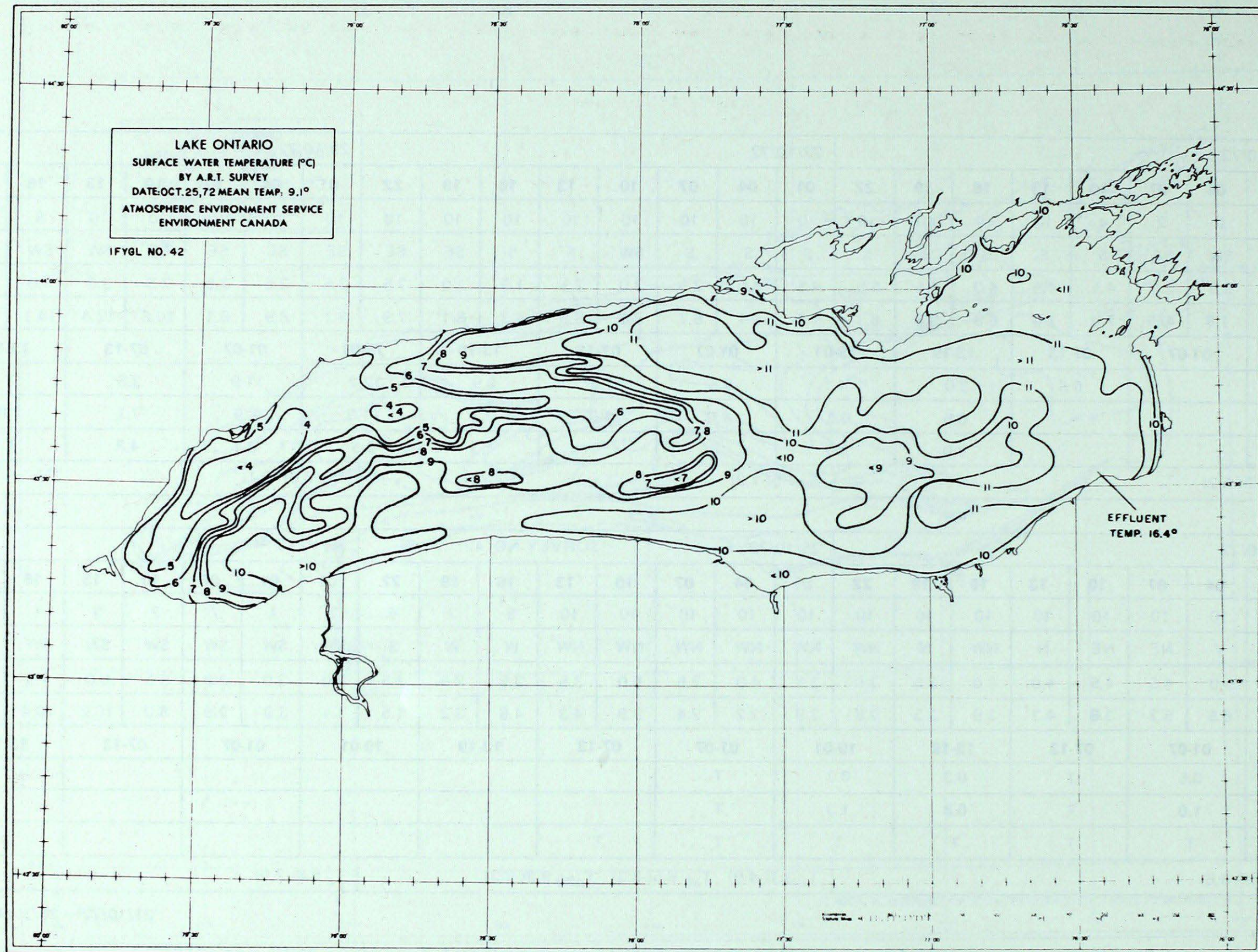
DAY	24/10/72								25/10/72								26/10/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	5	10	10	10	10	10	10	10	10	10	10	10	10	9	7	5	7	7	7	2	2	1	0	0
WDRN	V	V	NE	NE	N	NW	N	NW	NW	NW	NW	NW	NW	W	W	S	SW	SW	SW	SW	SW	SW	SW	SW
WSPD	6.0	5.0	4.5	4.5	4.0	3.0	2.5	3.0	3.5	4.0	2.5	5.0	3.5	3.5	2.0	1.5	2.0	2.0	3.0	6.5	5.0	4.5	2.0	1.0
T <sub>a</sub>	7.4	6.5	5.2	3.8	4.3	3.9	3.3	2.8	2.9	2.2	2.4	3.9	4.3	4.6	3.2	1.5	1.1	3.0	2.9	8.0	10.2	10.4	6.9	4.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	4.1	0.5		T		0.3		0.3		T														
YTR	4.8	1.0		T		0.8		1.3		T														
ROC	3.8	T		T		T		T		T		T												
	T <sub>a</sub> 4.7(-3.6)								T <sub>a</sub> 3.1(-4.9) T <sub>a5</sub> 5.5(-3.3) T <sub>a30</sub> 9.3(-2.2)								T <sub>a</sub> 5.8(-2.0)							

## WEATHER

21/10/72 – 26/10/72

A very large High Pressure ridge persists over the Atlantic coast, drawing warm southerly air into the Great Lakes region on 21/10; moderate S winds, very rapid rise in temp. and overcast with rain in the afternoon. Cold Front enters the upper Great Lakes area on 22/10 and stalls. Warm air continues to stream across the lower Great Lakes. A deep Low Pressure centre develops on the front and moves slowly northeast through the area on 23/10. Overcast with continuous rain, light to moderate southerly winds and rising temp. on both days. Cold Front, followed by a High Pressure ridge, moves southeast through the lower Great Lakes area on 24/10; variable winds in the morning, moderate NW in the afternoon, with overcast sky, light rain and falling temp. High Pressure ridge drifts southeast across the region on 25/10; moderate NW winds, become light S in the evening; overcast with light rain in the morning, broken cloud in the afternoon. High Pressure ridge, located southeast of the Great Lakes on 26/10, draws warm air into the region; moderate SW winds, clearing sky and rising temp.





## SURVEY NO.42

25/10/72

 $T_w$  9.2 (-2.0)

Scheduled for 23/10, the survey is delayed until 25/10 by bad weather.

Mean surface water temp. has increased  $0.5^\circ$  since 18/10. The increase is counter to the seasonal trend, but can be explained, in view of the events occurring prior to and after 18/10. Since the termination of the westerly wind regime on 18/10, mainly light to moderate southerly winds have prevailed. The warm surface water, piled up in the east end of the lake by the strong westerly winds, is now encroaching back into the northwestern half. The CCIW buoy network shows that the water temp. in the north — central region of the lake has increased steadily since 18/10, rising from about  $5^\circ$  to more than  $11^\circ$ .

The surface water temperature pattern shows the warm water returning to the north — central region of the lake, as a pronounced tongue. In the mid — lake regions, the rather confused pattern also suggests movement of warm water to the north. The northward spread of the Niagara R. plume is also evident.



DAY	27/10/72								28/10/72								29/10/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	1	0	0	1	1	0	5	10	10	10	10	10	10	10	10	10	10	10	10	9	9	0
WDRN	S	S	S	S	V	SE	E	V	S	S	S	SE	S	S	NW	N	NW	N	N	N	N	N	N	N
WSPD	0.5	1.0	1.5	3.5	2.5	2.5	3.0	3.0	2.0	3.0	1.5	2.5	1.5	0.5	2.0	3.0	2.0	3.0	3.0	4.0	4.0	6.0	5.0	4.5
T <sub>a</sub>	1.5	2.4	1.1	9.4	13.2	12.8	8.0	7.6	8.7	9.4	9.1	10.2	12.0	13.1	11.1	9.8	9.1	9.3	8.5	9.1	7.4	6.3	4.1	3.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ								T		0.8		1.5		1.5		3.8		9.7		2.8		0.3		
YTR										0.5		0.5		0.8		0.8		2.8		1.5				
ROC										1.8		0.3		T		T		4.3		5.1		0.5		
	T <sub>a</sub> 7.0(-0.6)								T <sub>a</sub> 10.4(+3.1)								T <sub>a</sub> 7.1(0.0)							

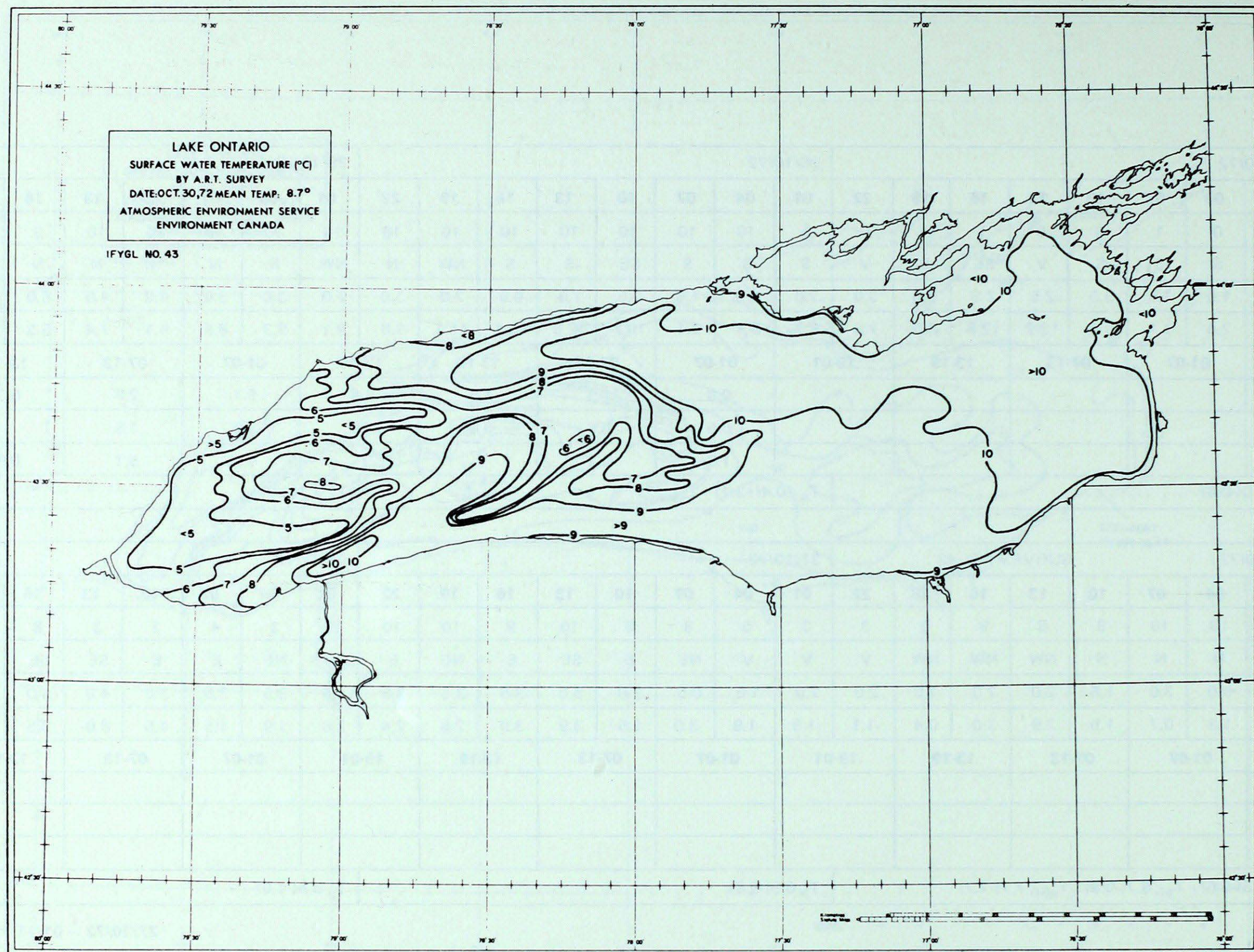
DAY	30/10/72								31/10/72								01/11/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	9	8	9	5	3	3	5	8	8	10	9	10	10	10	3	4	3	3	8	10	10
WDRN	NE	N	N	N	NW	NW	NW	V	V	V	NE	E	SE	E	NE	E	E	NE	E	E	SE	SE	SE	S
WSPD	4.0	3.0	3.0	1.5	2.0	2.0	1.0	2.0	2.0	1.5	0.5	3.0	5.0	3.5	3.5	3.5	4.0	3.5	3.5	3.0	4.0	3.0	3.5	4.0
T <sub>a</sub>	1.7	1.3	0.7	1.5	2.9	3.0	0.4	-1.1	-1.9	-1.9	-3.0	1.5	3.9	3.9	2.6	2.4	2.6	1.9	1.5	4.5	8.0	9.5	8.2	7.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC	T																							
	T <sub>a</sub> 1.3(-5.6) T <sub>a5</sub> 6.7(-0.9) T <sub>a30</sub> 7.7(-2.7)								T <sub>a</sub> 0.9(-5.8)								T <sub>a</sub> 5.5(-1.0)							

## WEATHER

27/10/72 – 01/11/72

High Pressure system, centered over the Atlantic coast, continues fair seasonal weather over the Great Lakes on 27/10; light S and SE winds and clear sky. A large Low Pressure system with an associated frontal wave tracks north, west of the Great Lakes on 28/10, and a Cold Front swings southeast into the upper Great Lakes area; light S winds and overcast sky with rain over the lower Great Lakes. Cold Front moves through the lower Great Lakes area on 29/10; moderate N winds, falling temp. and overcast with rain. High Pressure system, centered in northern Ontario on 30/10, drifts east into Quebec on 31/10. Light northerly winds on 30/10, change to moderate E. on 31/10, with broken cloud and below normal temp. on both days. High Pressure ridge remains over the Great Lakes on 01/11; moderate E and SE winds, variable cloud cover and seasonal temp.





SURVEY NO. 43

30/10/72

 $T_w$  8.7 (-1.4)

The survey is completed as scheduled in good weather conditions.

Mean surface water temp. has decreased  $0.4^\circ$  since 25/10. The decrease is less than the seasonal normal of  $1.0^\circ$ , even though the weather has been relatively cool [ $T_{a5}$  6.7 (-0.9),  $T_{a30}$  7.7 (-2.7)]. The small decrease in the lake-wide surface temp. is probably due to the fact that warm surface water, piled up in the east end prior to 19/10, is continuing to flood back into the northwestern regions of the lake. In addition, some daytime heating has occurred during the warm and sunny intervals on 26/10 and 27/10. The CCIW buoy network indicates that the water temp. in the northwestern regions has been increasing slightly since 25/10.

The rather disorganized pattern of the surface water temperature field in the west half of the lake suggests on-going mixing of the warm surface waters with the previously exposed cold hypolimnion. The area of cold water has decreased since 25/10. The lenses of  $<4^\circ$  water have disappeared from the surface and the tongue of warm water, protruding along the north shore, has enlarged. In the east half of the lake there is evidence of the normal fall cooling of shallow waters.



DAY	02/11/72								03/11/72								04/11/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	10	9	7	6	10	9	9	10	10	10	10	10	10	10	10	10	10	10
WDRN	S	E	SE	E	E	SE	V	SW	SW	W	W	W	NW	N	N	NE	E	E	E	E	E	NE	V	NW
WSPD	3.0	2.5	2.5	3.0	1.5	2.5	2.0	2.5	4.0	5.5	8.0	6.5	6.5	5.5	3.5	3.5	4.5	3.5	3.5	3.0	3.5	2.0	3.0	3.5
T <sub>a</sub>	8.1	8.1	8.0	8.1	9.4	10.7	12.2	11.7	11.7	9.1	9.3	8.1	8.7	7.9	4.6	4.2	3.9	3.9	3.7	3.5	4.1	3.9	3.9	3.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T	5.1		8.6		0.8						0.3				0.3		T		1.3		2.5		
YTR		1.5		7.9		2.3						T		T				T		T		2.3		
ROC	T	5.6		5.6				2.8										T		0.3		0.8		
	T <sub>a</sub> 9.5(+3.2)								T <sub>a</sub> 8.0(+1.9)								T <sub>a</sub> 3.8(-2.1)							

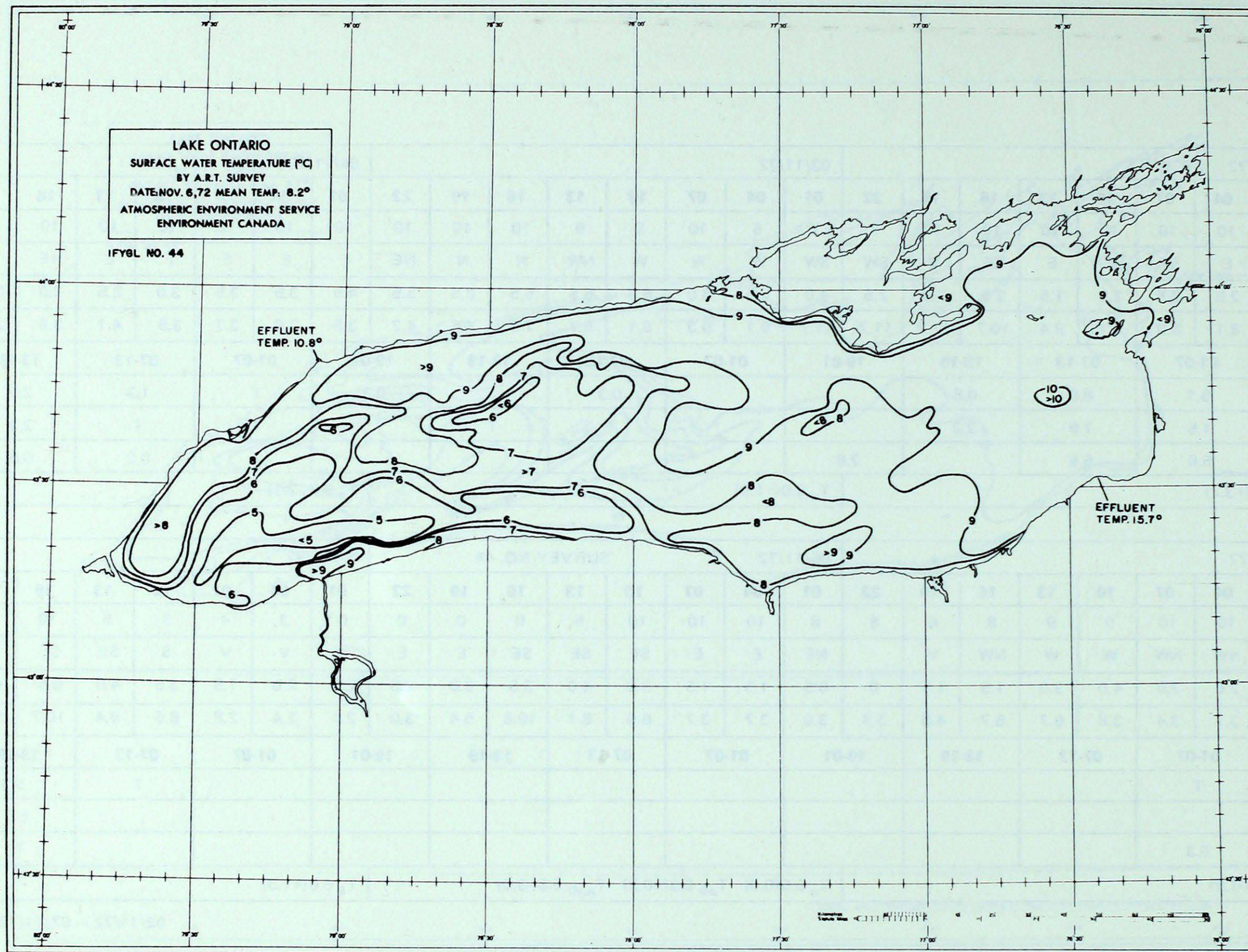
DAY	05/11/72								06/11/72								07/11/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	9	9	8	8	8	8	10	10	10	5	0	0	0	0	3	4	3	5	10	10	10
WDRN	NW	NW	NW	W	W	NW	V		NE	E	E	SE	SE	SE	E	E	V	V	V	S	SE	SE	E	E
WSPD	1.5	2.0	2.0	4.0	3.0	1.5	1.5	0	0.5	1.5	1.5	3.0	4.0	3.5	3.0	2.5	2.0	2.0	1.5	3.5	4.0	5.5	4.0	4.0
T <sub>a</sub>	3.2	3.7	3.4	3.8	6.7	6.7	4.8	3.3	3.0	3.7	3.7	6.5	8.1	10.8	5.4	3.0	2.4	2.4	2.8	6.6	9.4	10.7	10.0	8.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T	T																		T		5.3		
YTR	1.0																					1.5		
ROC	T	0.3																				T		
	T <sub>a</sub> 4.5(-1.2)								T <sub>a</sub> 5.5(0.0) T <sub>a5</sub> 6.3(+0.2) T <sub>a30</sub> 5.8(-3.0)								T <sub>a</sub> 6.6(+1.3)							

## WEATHER

02/11/72 – 07/11/72

A large Low Pressure system with associated frontal wave enters the lower Great Lakes area from the southwest on 02/11 and tracks slowly east on 03/11. Warm, with light SE winds, overcast sky and rain on 02/11. Strong W winds on 03/11, changing to strong N in the afternoon, with broken to overcast cloud cover, scattered showers and falling temp., as cold air surges in behind the departing Low Pressure centre. A trough of low pressure overlies the lower Great Lakes on 04/11; moderate E winds with overcast sky and light rain. High Pressure cell pushes into the Great Lakes area from the southwest on 05/11 and combines with a large High Pressure ridge building over the Atlantic coast on 06/11. Overcast to broken cloud cover with light to moderate NW winds on 05/11. Light E winds on 06/11 with clearing sky and seasonal temp. Low Pressure system with a complex frontal wave enters the Great Lakes area from the southwest on 07/11; light and variable winds in the morning, moderate E in the afternoon, with increasing cloud and rain.





SURVEY NO. 44

06/11/72

 $T_w$  8.2 (-0.6)

The survey is completed as scheduled in fair weather conditions — clearing sky, wind SE 3 — 4, temp. 5° to 11°.

Mean surface water temp. has decreased only 0.5° since 30/10. In comparison, the normal seasonal decrease is 1.3°. Generally overcast sky has prevailed since 31/10, with a mild and rainy period from 02/11 to 05/11. This has retarded surface cooling. The predominantly easterly winds from 31/10 to 03/11, on 04/11, and on the day of the survey, have reinforced the transport of warm water westward along the north shore, causing a considerable rise in water temp. in the northwest corner of the lake.

The surface water temperature pattern shows the tongue of warm water ( $>8^\circ$ ) reaching down into the southwestern end of the lake.  $<5^\circ$  water is found only in a small lens, nudging against the Niagara R. plume. In the eastern half of the lake the temperature field has a typical fall cooling pattern. Here the surface water temp. has decreased about 1° since 30/10.



DAY	08/11/72								09/11/72								10/11/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	4	4
WDRN	SE	E	E	NE	N	N	N	N	N	N	N	N	N	NW	N	N	N	NE	NE	SE	E	E	SE	E
WSPD	4.0	3.5	3.0	6.5	6.5	8.0	8.0	9.0	8.0	7.5	6.5	5.0	5.5	4.5	2.5	2.0	2.0	2.5	2.5	4.5	5.5	5.5	3.5	4.5
T <sub>a</sub>	7.7	7.9	9.1	8.2	7.8	8.0	6.3	5.4	4.6	4.4	3.9	4.3	4.5	4.1	3.3	2.2	3.0	2.9	3.0	3.9	5.0	5.4	5.7	4.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	4.1	7.1		3.8		1.8		T																
YTR	3.0	12.4		10.7		9.1		1.8		0.8														
ROC	9.1	11.9		6.6		5.6		9.9		5.8		T												
	T <sub>a</sub> 7.6(+2.5)								T <sub>a</sub> 4.0(-0.9)								T <sub>a</sub> 4.2(-0.5)							

DAY	11/11/72								12/11/72								13/11/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	7	10	10	10	10	10	10	9	10	8	10	10	10	10	10	10	5	10	10	10	10	10	10	10
WDRN	E	E	NE	V	V	NW	NW	W	W	W	SW	SW	SW	S	S	SW	SW	SW	NW	NW	N	N	NE	NE
WSPD	4.5	2.5	1.5	2.5	2.5	3.0	3.5	2.5	3.0	2.0	1.0	1.5	1.5	2.0	2.0	1.0	0.5	1.5	2.0	3.5	2.5	3.5	3.0	4.0
T <sub>a</sub>	3.9	4.0	4.8	5.0	5.9	6.6	5.7	4.4	4.4	3.5	3.1	4.5	7.0	7.8	6.7	6.0	5.0	4.4	4.2	4.3	4.8	5.6	4.6	3.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		4.1		2.5																				
YTR				1.3		0.3																1.0		
ROC		T		1.3		T		T		T														
	T <sub>a</sub> 5.0(+0.5)								T <sub>a</sub> 5.4(+1.1)								T <sub>a</sub> 4.5(+0.4)							

## WEATHER

08/11/72 – 13/11/72

A large Low Pressure system moves slowly east through the Great Lakes area on 08/11, followed by a large High Pressure ridge; warm and overcast with continuous rain and moderate E winds, changing to strong N in the afternoon. High Pressure ridge moves east across the eastern part of the continent on 09/11 and 10/11. Strong N winds in the morning of 09/11, decrease in the afternoon and change to moderate E on 10/11. Overcast with seasonal temp. on both days. Low Pressure system passes east across the lower Great Lakes on 11/11; light E winds, changing to NW in the afternoon and overcast with showers. High Pressure system builds over the Great Lakes on 12/11 and 13/11. Very light SW winds on 12/11, light N on 13/11, with overcast sky and seasonal temp. on both days.



DAY	14/11/72								15/11/72								16/11/72								SURVEY NO. 45(P)				
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	10	10	10	10	10	10	10	10	9	7	9	10	10	8	7	7	6	7	7	8	6	6	0	3					
WDRN	NE	NE	NE	NE	NE	NE	NE	NE	N	N	N	NW	NW	NW	W	W	NW	W	W	W	SW	S	E	E					
WSPD	7.0	7.5	7.0	7.5	8.0	8.5	8.0	7.5	7.0	5.0	5.0	4.5	4.5	5.0	4.0	4.0	3.0	1.5	2.5	1.5	2.0	3.0	0.5	2.0					
T <sub>a</sub>	2.0	-0.2	-1.7	-1.7	-2.0	-1.8	-1.8	-1.9	-2.6	-3.1	-3.1	-2.4	-1.5	-1.3	-3.0	-4.3	-5.2	-4.4	-5.7	-3.1	-0.2	-0.6	-3.2	-3.7					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ	T*	3.6*		0.8*		3.0*		2.5*																					
YTR		T*		T*		0.5*		T*																					
ROC	1.3	6.4*		4.8*		5.3*		12.7*		2.5*																			
	T <sub>a</sub> -1.1(-5.0)								T <sub>a</sub> -2.7(-6.4)								T <sub>a</sub> -3.3(-6.8) T <sub>a5</sub> 2.2(-1.9) T <sub>a30</sub> 4.6(-2.1)												

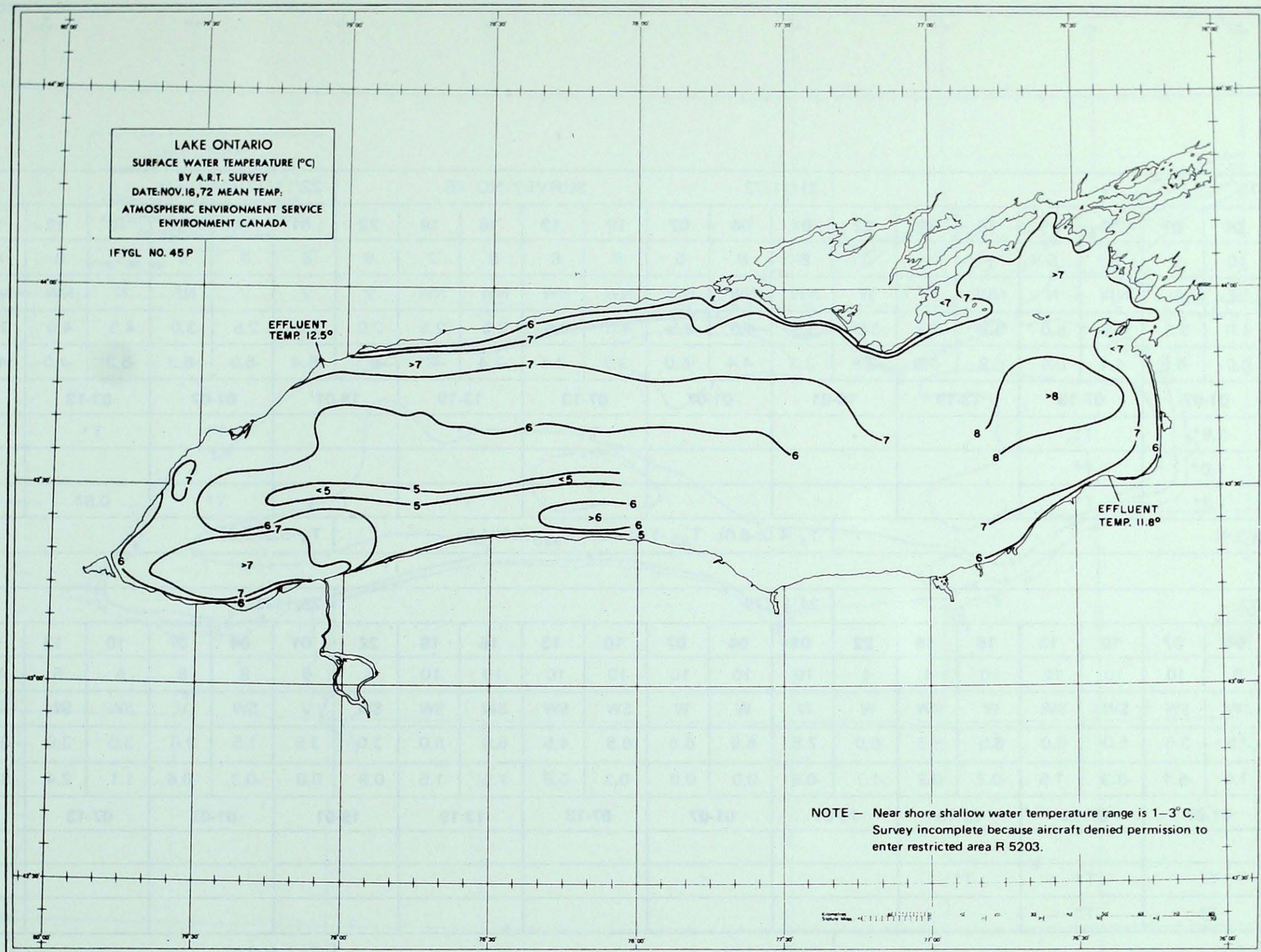
DAY	17/11/72								18/11/72								19/11/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	4	5	5	4	4	3	3	3	10	9	10	9	9	7	4	3	4	3	3	5	10	10	10	10
WDRN	V	V	NE	NE	V	NE	V	W	W	W	SW	SW	W	W	SW	W	N	N	NE	V	NE	NE	E	NE
WSPD	2.0	1.5	2.0	1.5	2.0	1.0	1.0	1.0	1.5	2.0	1.5	2.0	2.5	2.0	1.0	1.5	1.5	1.0	1.5	2.0	3.5	4.0	3.5	4.5
T <sub>a</sub>	-4.1	-3.7	-3.9	-3.0	0.0	0.4	-0.5	-2.2	-2.6	-2.6	-2.4	-0.2	1.4	2.6	0.9	-0.9	-1.5	-2.6	-2.8	-1.3	0.6	2.4	1.7	0.8
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																				T		0.3		
YTR																				T*r		0.5		
ROC																						T*		
	T <sub>a</sub> -2.1(-5.4)								T <sub>a</sub> -0.5(-3.6)								T <sub>a</sub> -0.3(-3.3)							

## WEATHER

14/11/72 – 19/11/72

A very large arctic High Pressure system invades the central part of the continent on 14/11, as a Low Pressure system moves east, just south of the Great Lakes; cold, with strong NE winds, overcast sky and snow. Arctic High Pressure system moves east slowly, persisting over the eastern part of the continent until 19/11. Light winds, broken to scattered cloud and below normal temp. prevail during this period. A Low Pressure system with a frontal wave approaches the Great Lakes from the south on 19/11; very light N winds in the morning, moderate NE in the afternoon, with overcast sky, mixed rain and snow showers and rising temp.



**SURVEY NO. 45 (P)****16/11/12**

Initially scheduled for 14/11, the survey is delayed by bad weather on 14/11 and equipment failure on 15/11. On 16/11 weather conditions are good, but a portion of the lake is not surveyed, because the aircraft is not allowed to fly through a military restricted area.

From the incomplete survey it appears that the surface water temp. has decreased about 2° since 06/11. This decrease is close to the normal seasonal.

In comparison with the survey on 06/11, the surface water temperature pattern is simpler and more orderly in the west half of the lake. The flat temperature gradient is more characteristic of the normal late fall conditions. Through gradual cooling and mixing in the surface layers the epilimnion has been thinned and the contrast between specific water masses has been largely eliminated.

The CCIW buoy network data indicate that two periods of rapid surface cooling have occurred: from 08/11 to 09/11, and from 13/11 to 15/11. The first period is associated with strong N winds and a heavy rainfall, the second period coincides with the first outbreak of arctic air over the region, with associate strong NE winds, sub-zero air temp. and a heavy snowfall.



DAY	20/11/72								21/11/72								22/11/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	9	8	5	1	1	3	6	8	5	8	8	8	7	8	8	8	9	5	8	6	9	8
WDRN	NE	NE	N	NW	N	NW	W	W	NW	NW	NW	NW	NW	NW	NW	V	V	V	NE	N	NW	NW	NW	W
WSPD	5.5	4.0	5.0	4.5	5.0	5.0	3.5	3.5	3.5	4.0	3.5	4.0	3.5	2.5	2.5	2.0	2.0	2.5	3.0	4.5	4.0	3.5	2.0	1.5
T <sub>a</sub>	0.2	0.0	-0.6	-1.1	0.6	0.9	-1.8	-2.8	-3.3	-4.4	-5.0	-3.9	-2.4	-2.4	-4.1	-6.1	-5.4	-5.0	-6.3	-5.2	-4.0	-4.4	-6.8	-7.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	5.1*	3.8*		T*								T*		T*				T*		T*				
YTR	4.1*	1.0*		T*																		T*		
ROC	3.8*	1.3*		T*										T*		T*		T*		0.8*		0.3*		
	T <sub>a</sub> -0.6(-3.4)								T <sub>a</sub> -4.0(-6.6) T <sub>a5</sub> -1.4(-4.6) T <sub>a30</sub> 4.1(-1.5)								T <sub>a</sub> -5.6(-8.0)							

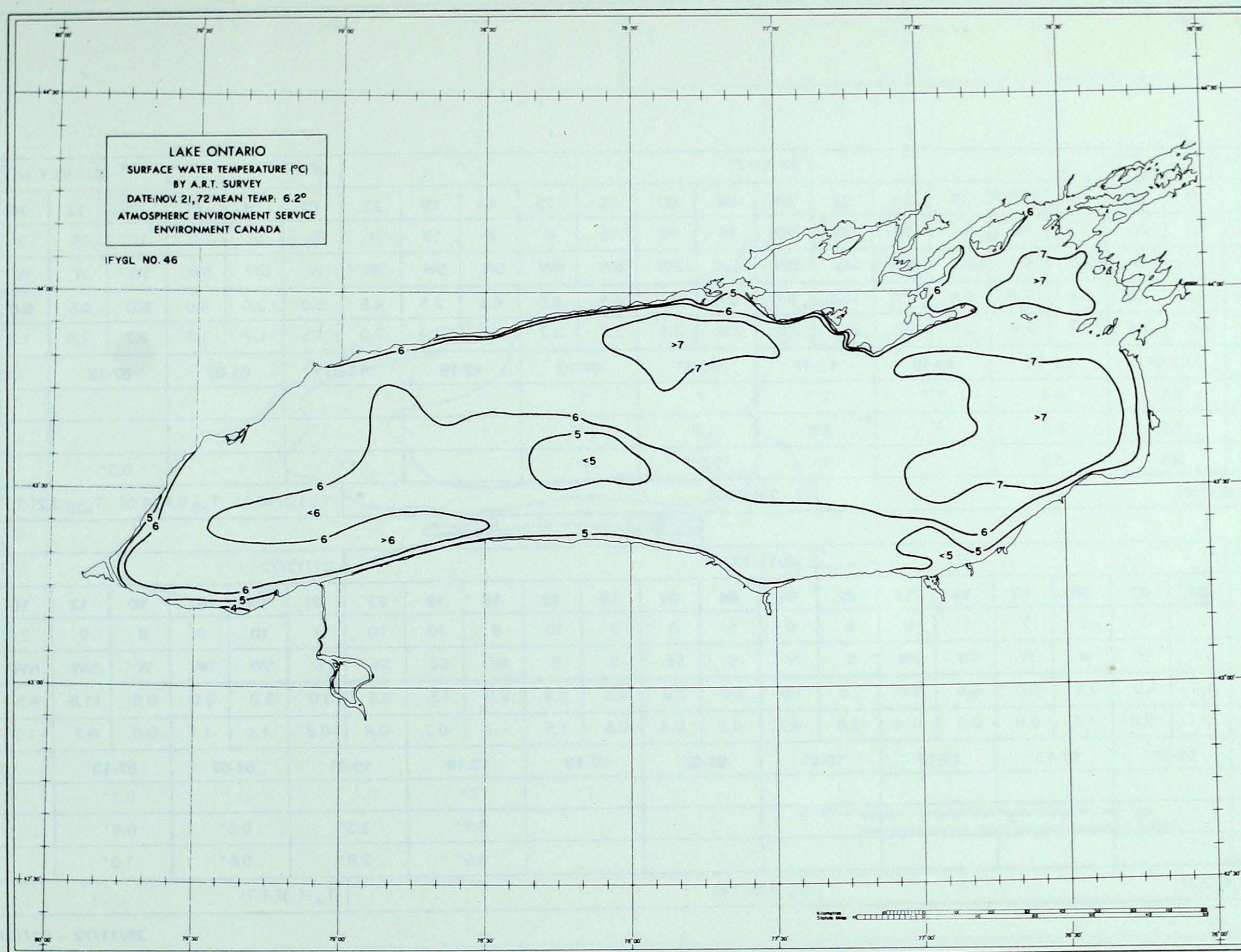
DAY	23/11/72								24/11/72								25/11/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	9	8	10	10	10	10	4	4	10	10	10	10	10	10	10	8	8	8	8	5	5	10	10	10
WDRN	W	SW	SW	SW	SW	W	SW	W	W	W	W	SW	SW	SW	SW	SW	V	SW	V	SW	SW	SE	SE	SE
WSPD	2.0	2.5	3.0	5.0	6.0	6.5	5.5	6.0	7.5	6.5	6.0	6.5	4.5	6.0	5.0	3.0	3.5	1.5	3.0	3.0	3.0	3.0	3.0	4.0
T <sub>a</sub>	-5.7	-7.0	-5.4	-3.3	-1.5	-0.2	0.2	-1.7	-0.9	0.0	0.0	0.3	0.9	1.5	1.5	0.9	0.0	-0.3	-0.6	1.1	2.4	3.1	2.9	2.8
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR	T*	T*		T*		T*																		
ROC	0.3*	T*		T*																				
	T <sub>a</sub> -3.1(-5.3)								T <sub>a</sub> 0.6(-1.4)								T <sub>a</sub> 1.4(-0.4)							

## WEATHER

20/11/72 – 25/11/72

A very large arctic High Pressure system invades most of the continent on 20/11, while a Low Pressure centre departs the Great Lakes region; moderate NE winds with overcast sky and snow in the morning, moderate NW winds and clearing sky in the afternoon. Arctic High Pressure system dominates over the continent on 21/11 and 22/11; moderate NW winds, broken cloud and very cold. Thermal Low Pressure centre develops over the Great Lakes on 21/11, causing scattered snow showers. High Pressure system remains centered over southeastern U.S.A. on 23/11 and 24/11, moving out over the Atlantic on 25/11. Strong SW winds on 23/11 and 24/11, with overcast sky and gradually rising temp.; scattered snow showers on 23/11. Low Pressure system with associated frontal wave approaches the Great Lakes from the west on 25/11; light SW and SE winds, broken cloud and seasonal temp.





## SURVEY NO. 46

21/11/72

 $T_w$  6.2 (-0.1)

The survey is postponed from 20/11 because of bad weather. On 21/11 conditions are marginal — broken cloud with scattered snow showers, wind NW 3 — 4, temp.  $-4^\circ$  to  $-2^\circ$ .

Mean surface water temp. has decreased  $2.0^\circ$  since 06/11. The decrease is less than the normal seasonal of  $2.5^\circ$ , even though the weather has been quite cold [ $T_{a5} -1.4(-4.6)$   $T_{a30} 4.1(-1.5)$ ]. A possible reason for the slow decrease in surface water temp. may be that large amounts of heat have been transported into the deeper layers of the lake during the periods of extreme mixing in October and early November. If so, a longer period of cold weather would be required to dissipate the stored heat back to the atmosphere.

The surface water temperature field is flat and featureless, typical of late fall.



DAY	26/11/72								27/11/72								28/11/72								SURVEY NO. 47(P)			
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22				
CLD	10	10	10	10	10	10	10	10	10	10	10	10	8	8	10	9	8	9	10	10	10	9	8	4				
WDRN	SE	E	E	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	W	SW	SW	SW	W	W	W	SW				
WSPD	5.0	4.5	3.5	3.0	8.0	8.0	7.0	10.5	9.0	9.5	9.5	8.5	8.0	6.5	2.5	4.5	5.0	3.0	4.0	5.0	4.5	6.0	5.5	6.0				
T <sub>a</sub>	1.5	2.4	2.4	1.8	2.8	3.7	3.2	2.6	2.6	2.6	2.4	2.2	3.2	3.5	2.0	2.0	1.5	1.7	1.8	2.2	2.8	1.3	0.7	-0.6				
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-				
YYZ	T	0.5		4.8		T <sup>r*</sup>		T <sup>*r</sup>		T		T										T*						
YTR	3.8	6.4		5.1		T		3.8		1.8		T <sup>*r</sup>																
ROC	4.8 <sup>*r</sup>	2.8		3.3				T*		2.0 <sup>*r</sup>		T*				T*				0.3*		1.0*						
	T <sub>a</sub> 2.6(+1.0)								T <sub>a</sub> 2.6(+1.2)								T <sub>a</sub> 1.4(+0.3) T <sub>a5</sub> 0.8(-1.0) T <sub>a30</sub> 2.2(-2.0)											

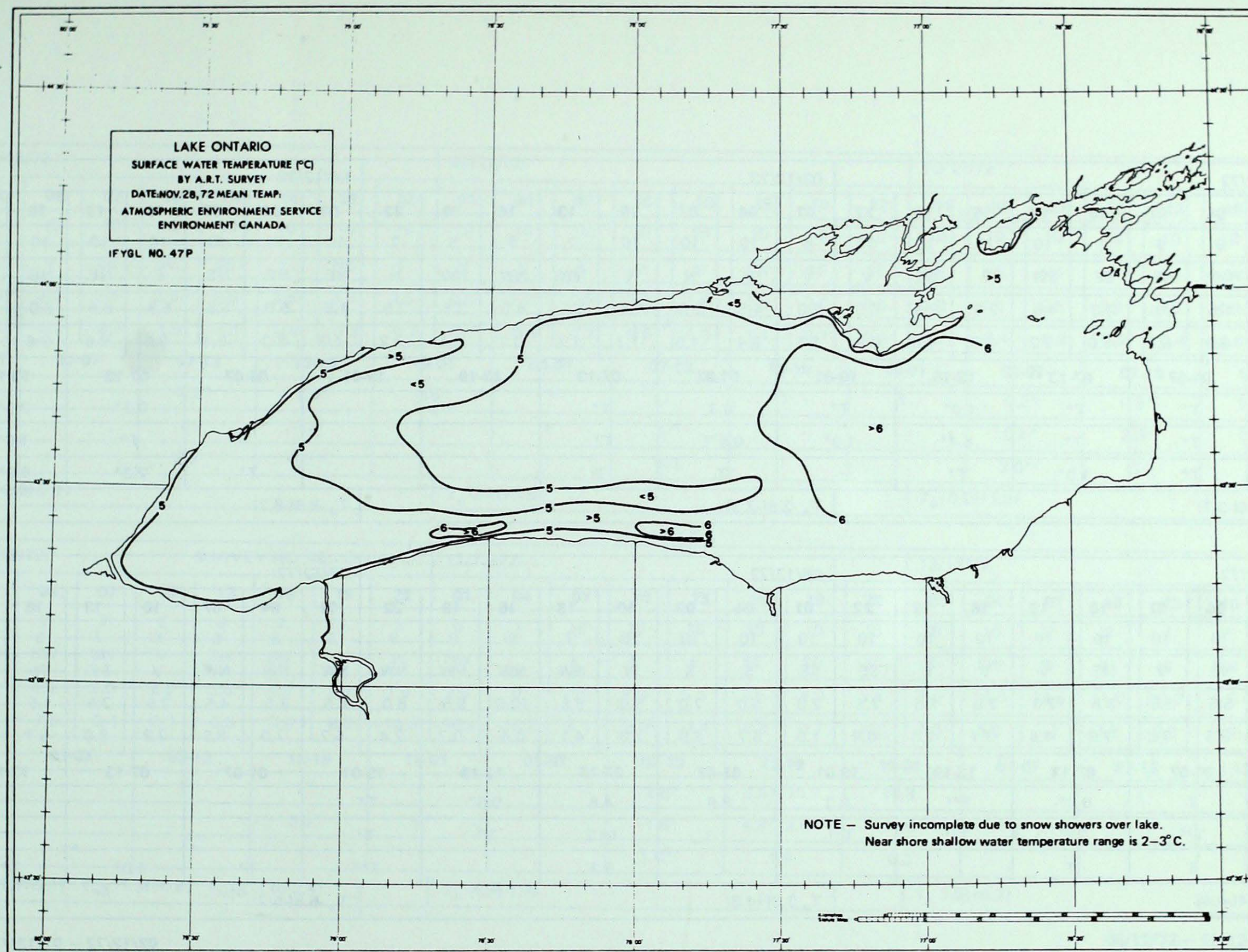
DAY	29/11/72								30/11/72								01/12/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	1	2	2	2	2	1	0	0	0	5	8	9	10	9	10	10	8	10	9	8	9	2	10	8
WDRN	W	W	W	W	W	SW	SW	S	V	V	SE	S	S	SE	SE	SE	S	SW	SW	W	NW	NW	NW	NW
WSPD	7.0	5.0	5.5	6.5	6.0	5.0	2.0	1.5	1.5	2.0	2.0	4.5	5.5	5.5	4.5	3.5	3.0	3.0	3.0	6.0	11.5	6.5	6.5	4.0
T <sub>a</sub>	-0.8	-1.7	-2.8	-1.5	0.0	0.2	-1.4	-2.8	-4.1	-4.3	-2.4	0.6	1.5	1.7	-0.2	-0.4	-0.6	-1.1	-1.7	0.0	0.7	-1.3	-2.2	-4.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ												T*		T*						0.3*		T*		
YTR				T*										4.8*		3.3*		0.8*		0.5*				
ROC														0.5*		2.8*		0.8*		1.0*		T*		
	T <sub>a</sub> -1.4(-2.3)								T <sub>a</sub> -1.0(-1.6)								T <sub>a</sub> -1.3(-1.7)							

## WEATHER

26/11/72 - 01/12/72

A very large Low Pressure system develops over the Great Lakes on 26/11, as two Low Pressure centres travelling north merge with a Low Pressure centre approaching from the west; moderate E winds in the morning, very strong SW in the afternoon, with overcast sky and rain and snow mixed. Large Low Pressure system moves north on 27/11, but a low pressure trough remains over the area until 29/11. Very strong SW winds on 27/11, decreasing in the evening, with overcast sky and mixed rain and snow showers. Moderate to strong SW winds, overcast to broken cloud cover and a few snow showers on 28/11. High Pressure system builds over the central continent on 29/11 and moves to south of the Great Lakes; strong W winds and scattered cloud. Cold Front with associated Low Pressure trough enters the upper Great Lakes area on 30/11 and passes through the lower Great Lakes area on 01/12, while a deep Low Pressure centre travels north along the Atlantic coast. Light and variable winds in the morning of 30/11, become moderate SE in the afternoon, with increasing cloud and snow showers. Moderate SW winds in the morning of 01/12, strong NW during the day, with broken cloud, snow showers and falling temp. during the day.



**SURVEY NO. 47 (P)****28/11/72**

The survey is postponed from 27/11, due to bad weather. On 28/11 weather conditions remain marginal — overcast with snow showers, wind SW 5, air temp. 2° to 3°. Survey can not be completed because of snow showers over the eastern part of the lake.

Mean surface water temp. appears to have decreased about 1°. This decrease is close to the normal seasonal decrease.

The surface water temperature gradient is flat — a typical late fall pattern.



DAY	02/12/72								03/12/72								04/12/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	7	9	9	7	10	10	10	10	8	10	10	10	7	8	5	7	10	10	10	10	10	10	10	10
WDRN	NW	NW	SE	SE	SW	E	SE	V	V	V	N	N	NW	NW	NW	N	NE	NE	NE	E	NE	NE	NE	NE
WSPD	3.0	1.5	2.0	3.0	4.5	2.5	2.5	6.0	6.0	4.5	5.0	4.5	5.5	4.5	3.5	2.5	4.5	5.0	5.5	5.5	6.5	6.0	7.5	5.0
T <sub>a</sub>	-5.5	-6.9	-6.2	-5.0	-2.2	-1.8	-1.8	0.9	1.1	0.4	-1.5	-1.7	-1.7	-3.7	-6.1	-7.2	-7.0	-8.3	-9.1	-9.6	-9.6	-9.6	-9.3	-8.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	0.5*	T*		T*		1.0*		T*		0.3		T*								0.3*		3.3*		
YTR		T*		T*		5.1*		1.0*		0.5* <sup>r</sup>		T*								T*		1.0*		
ROC	1.3*	T*		1.0*		T*				T		T						T*		2.3*		5.6*		
	T <sub>a</sub> -3.6(-3.7)								T <sub>a</sub> -2.6(-2.3)								T <sub>a</sub> -8.9(-8.3)							

DAY	05/12/72								06/12/72								07/12/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	10	10	10	10	10	10	9	9	9	9	7	6	6	5	7	5	2	3
WDRN	NE	NE	V	NE	V	V	E	SE	SE	S	S	W	NW	NW	NW	NW	NW	NW	NW	V	SE	N	SE	V
WSPD	6.0	5.5	3.0	3.5	2.0	2.0	1.5	2.5	2.0	5.0	7.0	5.0	9.5	10.5	9.5	8.0	8.5	6.5	4.5	2.5	2.5	1.5	2.0	2.5
T <sub>a</sub>	-8.5	-8.5	-7.8	-7.0	-4.6	-3.7	-2.8	-0.4	1.5	6.7	8.9	7.0	4.1	0.4	-0.7	-2.4	-5.2	-7.0	-8.5	-7.2	-6.0	-6.1	-7.2	-7.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	0.8*	T		0.3*		T*r		0.3		8.6		4.6		0.3*		T*								
YTR	0.8*	T*r		T*r		T*r		T*r		1.3		10.2		T*		T*								
ROC	0.3*r	T		T								5.3				T*r		T*		1.0*		T*		
	T <sub>a</sub> -5.4(-4.4)								T <sub>a</sub> 3.3(+4.6)								T <sub>a</sub> -6.8(-5.2)							

## WEATHER

02/12/72 - 07/12/72

A quasistationary front remains in the vicinity of the lower Great Lakes from 02/12 to 06/12. Generally overcast with mixed rain, freezing rain and snow showers, NE winds and below normal temp. during this period. Low Pressure centre forms on frontal wave over the Great Lakes on 06/12 and moves northeast, as a large High Pressure ridge builds west of the Great Lakes; strong S winds, rapid rise in temp. and overcast with heavy rain in the morning; very strong NW winds, broken cloud with snow showers and rapid fall in temp. in the afternoon. High Pressure ridge moves into the Great Lakes region on 07/12; cold, with broken to scattered cloud and snow showers along the south shore of Lake Ontario.



DAY	08/12/72								09/12/72								10/12/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	8
WDRN	E	V	SE	SE	SE	E	NE	E	N	V	N	V	V	SW	SE	SE	SE	NE	NE	V	W	NW	NW	NW
WSPD	4.0	2.5	3.5	3.5	3.0	3.5	3.0	2.5	0.5	2.0	1.0	2.5	1.5	1.0	2.0	0.5	1.0	1.5	0.5	3.0	4.5	4.0	6.0	6.5
T <sub>a</sub>	-6.1	-5.2	-3.7	-1.9	-1.1	-0.9	-1.3	-0.7	-0.7	-0.4	-0.2	0.5	1.3	1.1	0.7	0.4	0.2	-0.4	-0.2	-0.9	-0.4	-0.6	-1.1	-2.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ				2.3*		2.5*		0.8		T*r		T		T		T		0.3*		0.8*		1.3*		
YTR	T*			1.5*		4.8*		T*r		T		T*r						0.5*		2.8*		0.5*		
ROC				2.0*r		0.5*r				T		0.3		T				2.0*r		T		T		
	T <sub>a</sub> -2.6(-0.7)								T <sub>a</sub> 0.4(+2.6)								T <sub>a</sub> -0.9(+1.5)							

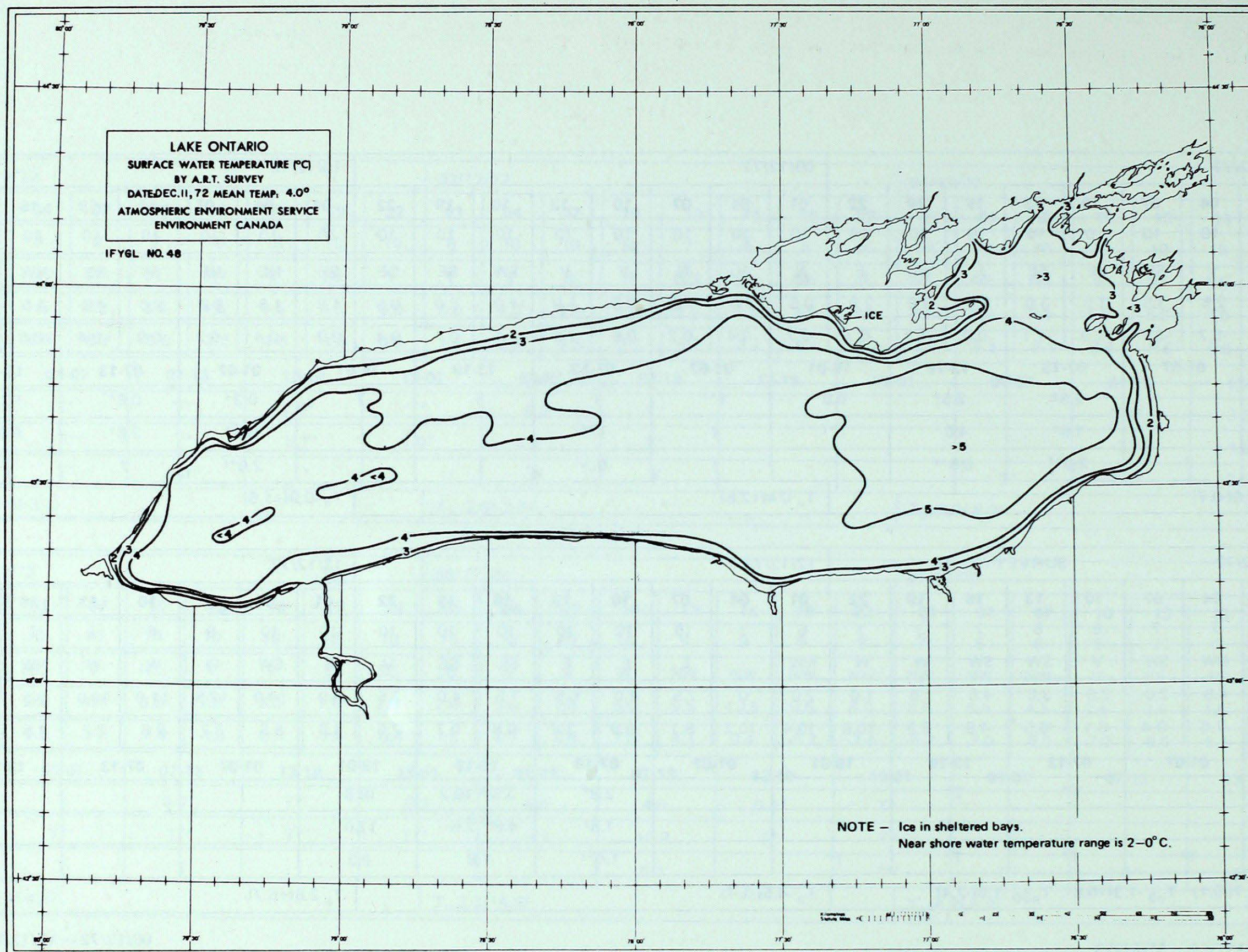
DAY	11/12/72								12/12/72								13/12/72							
	SURVEY NO. 48																							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	6	7	7	6	8	7	3	3	6	7	10	10	10	10	10	10	10	10	9	8	7	7	8	10
WDRN	NW	NW	SW	V	SW	SW	W	W	NW		E	E	E	SE	SE	V	S	SW	W	W	W	NW	W	W
WSPD	6.0	4.5	2.0	2.5	3.0	4.5	1.5	1.0	2.0	0	2.5	4.0	5.5	7.5	4.0	3.5	5.0	14.0	12.5	11.0	10.0	5.5	3.5	4.5
T <sub>a</sub>	-5.7	-7.6	-9.4	-8.1	-6.5	-4.8	-8.9	-10.6	-10.4	-10.2	-8.1	-5.9	-3.4	-0.8	0.7	2.0	4.6	5.6	3.7	2.8	2.2	1.5	0.2	0.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T*			T*		T*						2.8*		3.3* 10.2		18.8								
YTR	T*					0.3*		T*				1.8*		4.8* 2.5		17.0								
ROC	T*		T*		T*		T*					1.0*r		1.8		0.3								
	T <sub>a</sub> -7.7(-5.1) T <sub>a5</sub> -1.3(+0.6) T <sub>a30</sub> -1.0(-2.4)								T <sub>a</sub> -4.5(-1.7)								T <sub>a</sub> 2.8(+5.7)							

## WEATHER

08/12/72 – 13/12/72

High Pressure system moves east to the Atlantic coast and a large Low Pressure system enters the Great Lakes area on 08/12; moderate SE winds and overcast with rain and snow mixed. Disturbances form and track east across the Great Lakes along a quasistationary front on 09/12 and 10/12. Mild and overcast, with mixed rain and snow showers and light and variable winds during this period. High Pressure cell, centered west of the Great Lakes, enters the region late on 10/12 and moves east on 11/12. Strong NW winds overnight to 11/12, light to moderate SW on 11/12. Cold, with broken cloud and scattered snow showers on 11/12. Low Pressure centre with a frontal wave moves quickly northeast through the area on 12/12; rapidly rising temp., moderate E winds and overcast, with a heavy fall of rain and snow mixed. A High Pressure cell follows the departing Low Pressure centre on 13/12; very strong SW winds in the morning, very strong W during the day, decreasing in the evening; broken cloud and falling temp.





SURVEY NO. 48

11/12/72

 $T_w$  4.0 (0.0)

Initially scheduled for 04/12, the survey is delayed by continuing bad weather. On 11/12 conditions remain marginal — broken cloud with lake — effect snow showers, wind SW 3, temp.  $-8^{\circ}$  to  $-5^{\circ}$ .

The weather has been generally cold since 21/11 [ $T_{a30} -1.0$  ( $-2.4$ )] and overcast, with lengthy periods of snow and rain, as well as strong winds. While low air temp., wind and frozen precipitation have contributed to cooling of the lake surface, the predominantly overcast sky has reduced radiational cooling. Mean surface water temp. has decreased  $2.2^{\circ}$  since 21/11, which is equivalent to the normal seasonal decrease.

The surface water temperature distribution is the common early winter, depth — reflecting type. Warmest water ( $>5^{\circ}$ ) is found over the deepest part of the lake. Shallow water temp. ranges from  $0^{\circ}$  to  $2^{\circ}$ , with some ice in sheltered bays.



DAY	14/12/72								15/12/72								16/12/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	8	8	9	7	8	9	10	10	10	10	10	10	10	8	9	8	9	9	8	8
WDRN	W	W	W	W	N	N	NE	NE	NE	E	E	E	E	E	NE	NE	W	W	NW	NW	NW	NW	NW	NW
WSPD	4.0	3.0	2.5	3.0	2.5	2.0	2.0	2.5	4.5	7.0	6.0	7.0	6.5	6.0	5.5	6.5	7.0	6.5	9.0	9.5	7.5	9.5	12.5	10.0
T <sub>a</sub>	0.2	-0.2	-0.9	-0.2	1.0	0.4	-0.7	-2.2	-2.6	-4.1	-4.8	-4.6	-3.5	-3.7	-5.6	-6.3	-4.8	-6.1	-5.9	-6.5	-7.0	-7.9	-9.3	-9.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ										T*		T*r		9.1*		3.0*		0.5*		T*		0.8*		
YTR												T*		7.1*		7.9*		1.5*		T*		T*		
ROC				T*								0.3*		8.1*		3.8*		T*		3.8*		1.3*		
	T <sub>a</sub> -0.8(+2.3)								T <sub>a</sub> -4.4(-1.3)								T <sub>a</sub> -7.8(-3.8)							

DAY	17/12/72								18/12/72								19/12/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	7	6	4	0	0	1	2	0	10	10	10	10	10	10	10	10	8	10	10	10	10	10	10	10
WDRN	NW	NW	NW	NW	NW	W	SW	SW	SW	SW	SW	SW	W	W	W	SW	SW	SW	SW	SW	SW	W	W	SW
WSPD	9.5	9.0	7.5	8.0	8.0	5.0	2.5	5.0	9.0	11.0	10.5	9.0	7.0	5.5	4.5	3.5	3.0	3.5	4.0	4.5	9.5	8.0	5.0	2.5
T <sub>a</sub>	-10.4	-12.4	-14.5	-13.5	-10.9	-10.3	-10.2	-9.4	-4.8	-4.1	-3.9	-3.5	-2.2	-1.3	-1.1	-1.0	-1.5	-1.7	-1.1	0.9	2.6	2.8	2.4	1.8
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	0.5*	T*		T*								T*		T*		T*		T*		0.5*				
YTR								T*		T*						T*		T*		2.0* 0.5		T		
ROC	0.3*	0.5*		T*								T*		T*		T*				T*		T		
	T <sub>a</sub> -11.5(-8.1)								T <sub>a</sub> -2.7(+0.8)								T <sub>a</sub> 0.8(+4.4)							

## WEATHER

14/12/72 – 19/12/72

High Pressure system remains centered over the Great Lakes on 14/12; light W and N winds, overcast to broken cloud cover and mild. A broad Low Pressure trough develops from Hudsons Bay to the Great Lakes on 15/12 and deepens, as Low Pressure centres move north from southern U.S.A. along the Atlantic coast; strong E winds and overcast with snow. Large High Pressure ridge, covering most of the continent, moves southeast behind the departing Low Pressure system on 16/12 and 17/12. Very strong NW winds, falling temp. and broken cloud with continuing snow on 16/12. Strong NW winds, very cold and clearing sky on 17/12. High Pressure system, centered over southeastern U.S.A. on 18/12, brings a gradual rise in temp. to the Great Lakes area, under very strong SW winds and overcast sky with snow showers. A quasistationary frontal trough pushes south over the Great Lakes on 19/12; very mild, with moderate to strong SW winds, overcast sky and rain and snow mixed.



DAY	20/12/72								21/12/72								22/12/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
WDRN	V	V	NE	E	NE	NE	NE	NE	E	NE	E	NE	NE	NE	E	NE	NE	NE	NE	NE	NE	NE	NE	NE
WSPD	1.5	3.0	5.0	6.0	5.5	5.0	5.5	6.0	4.5	5.0	4.0	4.0	3.0	2.5	2.5	3.0	3.5	3.0	2.5	3.5	3.0	2.0	1.5	0.5
T <sub>a</sub>	1.7	0.7	-1.1	-2.4	-2.8	-3.7	-4.3	-5.0	-5.4	-6.3	-6.3	-5.4	-4.1	-2.8	-2.0	-2.1	-1.7	-0.7	-0.7	-0.7	0.4	0.9	0.7	0.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T	T*r		0.3*		T*		T*		T*r		0.3* 0.5		T*r		T		T		T				
YTR	T	T*r*		T*						T*		0.5		T		0.5		3.3		0.3				
ROC	T	2.0r*		T*		T*		T*		0.5*r		T		T		2.0		4.1		0.8		T		
	T <sub>a</sub> -2.1(+1.6)								T <sub>a</sub> -4.3(-0.6)								T <sub>a</sub> -0.2(+3.6)							

DAY	23/12/72								24/12/72								25/12/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
WDRN	NE	V	SE	NE	NE	SE	NE	E	SW	SW	SW	NW	NW	V	V	NE	NE	NE	NE	V	NE	SE	SW	SW
WSPD	0.5	1.5	2.0	1.0	1.0	1.0	0.5	1.0	1.5	1.5	1.5	2.0	2.0	1.0	2.0	1.5	2.0	2.5	2.5	2.5	2.0	1.0	2.0	4.0
T <sub>a</sub>	0.4	0.2	0.4	0.9	1.8	1.9	1.9	1.3	1.7	1.9	1.9	2.2	3.3	2.6	2.2	1.7	2.0	1.5	1.1	0.9	0.9	1.3	0.9	0.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T	T										T						T		T		T		
YTR		T		T		T														T*		T*		
ROC																								
	T <sub>a</sub> 1.1(+5.0)								T <sub>a</sub> 2.2(+6.2)								T <sub>a</sub> 1.2(+5.3)							

## WEATHER

20/12/72 – 25/12/72

Quasistationary front remains over the lower Great Lakes from 20/12 to 23/12; moderate to strong NE winds and overcast with rain and snow mixed during this period. A weak ridge of higher pressure overlies the area on 23/12 and 24/12. Very light E winds and overcast with a few rain showers on 23/12. Variable and light winds and overcast on 24/12. Very mild temp. prevails on both days. A Cold Front drifts slowly south on 25/12 and remains quasistationary in the lower Great Lakes area; continuing very mild with light NE winds in the morning, light SW in the afternoon and overcast sky, with light rain and snow showers.



DAY	26/12/72								27/12/72								SURVEY NO. 49(P)								28/12/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22								
CLD	10	10	10	10	10	10	10	10	10	9	10	10	10	10	10	10	10	10	10	9	7	7	8	2								
WDRN	SE	V	V	S	SW	W	W	NW	NW	NW	NW	W	SW	SW	SW	W	W	NW	NW	NW	NW	NW	NW	N								
WSPD	2.0	2.5	2.0	2.5	5.0	5.0	5.5	7.0	8.0	6.5	4.5	3.0	3.5	5.0	4.0	5.5	8.5	8.5	5.5	6.0	9.0	6.5	7.5	4.5								
T <sub>a</sub>	0.4	0.7	0.6	1.7	2.1	1.8	1.3	0.4	-0.9	-2.2	-2.8	-2.2	-1.7	-1.1	-0.4	-0.2	0.6	0.0	-0.4	-1.8	-2.8	-4.1	-6.1	-8.5								
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-								
YYZ		0.5		1.0*						T		0.3*		T <sup>r</sup> *		T <sup>r</sup> *				0.3*												
YTR	T <sup>r</sup> *	T <sup>r</sup> *		2.5 1.0*		1.0		T <sup>r</sup> *				0.3*		5.3*		4.6*		0.5*		T*												
ROC				1.8 <sup>r</sup> *		T*						0.3*		T*		0.5*		0.8*		T*		T*										
	T <sub>a</sub> 1.1(+5.2)								T <sub>a</sub> -1.4(+2.8) T <sub>a5</sub> 1.1(+3.1) T <sub>a30</sub> -2.1(0.0)								T <sub>a</sub> -2.9(+1.4)															

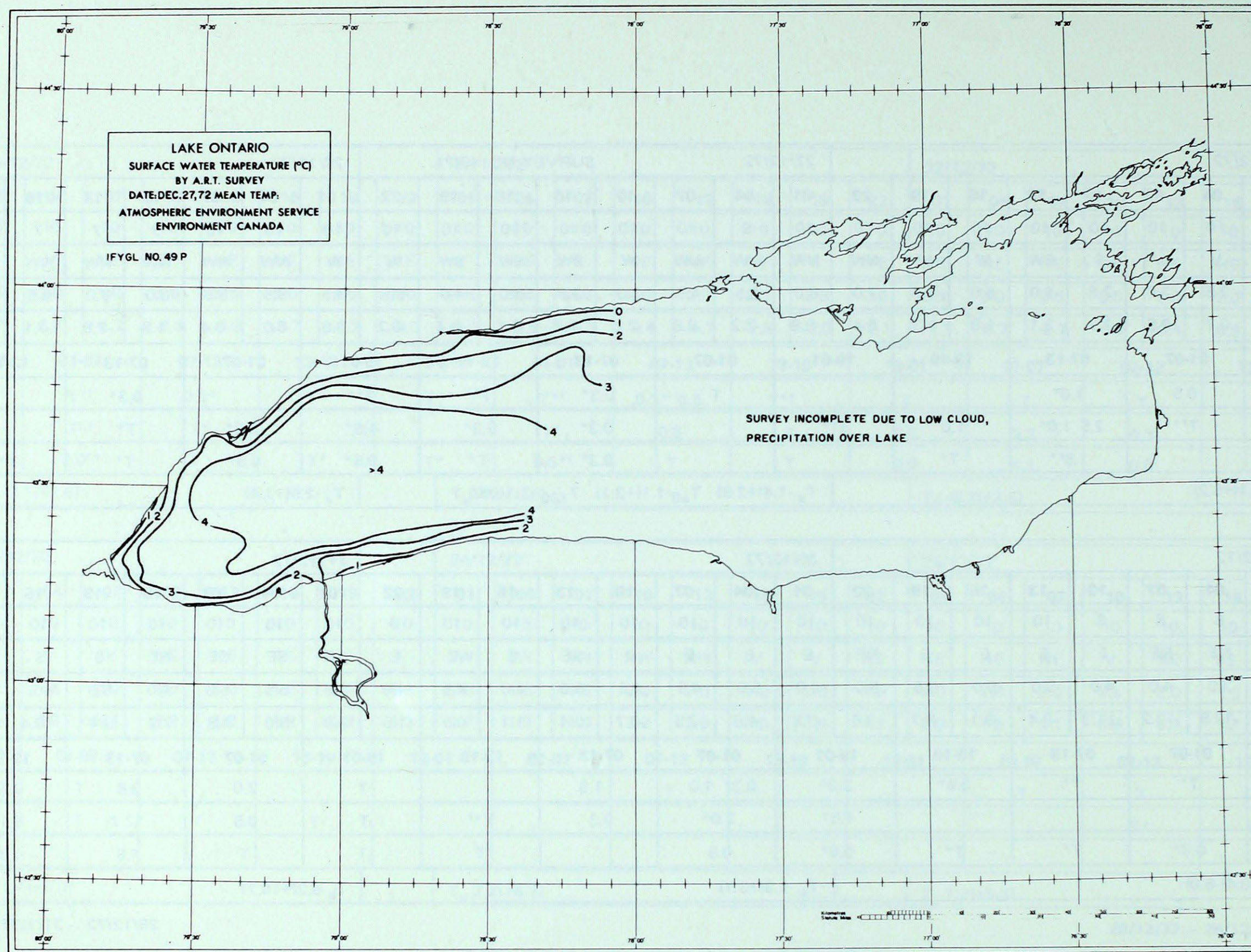
DAY	29/12/72								30/12/72								31/12/72							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	2	6	8	8	10	10	10	10	10	10	10	10	10	10	10	9	10	10	10	10	10	10	9	10
WDRN	N	NE	NE	E	E	E	E	NE	E	E	E	E	SE	E	E	E	SE	SE	SE	SE	S	S	SW	SW
WSPD	3.5	3.0	4.0	4.0	5.0	6.0	6.5	6.0	4.0	5.0	4.5	4.5	5.0	4.0	4.5	4.0	3.5	5.5	5.0	4.0	5.5	4.5	2.5	4.0
T <sub>a</sub>	-10.9	-12.8	-13.2	-11.3	-9.4	-9.1	-8.7	-7.6	-5.8	-4.6	-2.9	-0.7	0.4	1.1	0.5	1.5	2.0	3.0	4.8	7.2	9.4	10.4	6.9	5.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T*	T*		T*		0.5*		3.3*		0.3* 1.0		1.3				T		2.0		3.6		0.5		
YTR								1.5*		2.0*		0.3		T*r		T		0.5		12.7		6.1		
ROC		0.3*		T*		T*		0.5*		0.8				T		T		T		1.8		0.3		
	T <sub>a</sub> -10.4(-6.0)								T <sub>a</sub> -1.3(+3.1)								T <sub>a</sub> 6.2(+10.7)							

## WEATHER

26/12/72 – 31/12/72

Low Pressure centre with a frontal wave moves through the Great Lakes area on 26/12; very mild with light S winds in the morning, strong W, then NW in the afternoon and overcast with rain and snow mixed. A weak trough of low pressure overlies the Great Lakes on 27/12 and a quasistationary front develops during the day, as a Low Pressure centre enters the upper Great Lakes area; mild, with strong NW winds in the morning, moderate SW in the afternoon and continuing overcast with wet snow. Low Pressure centre tracks southeastward across the Great Lakes on 28/12, followed by a High Pressure ridge that moves to northern Ontario on 29/12. Strong NW winds with falling temp. overcast to broken cloud cover and snow on 28/12. Cold, with moderate E winds, broken to overcast cloud cover and lake — effect snow showers on 29/12. A Warm Front enters the lower Great Lakes area on 30/12 and stalls. A deep Low Pressure centre moves northeast across Lake Superior on 31/12, dragging more warm air over the lower Great Lakes. Moderate E winds on 30/12, SE changing to SW on 31/12. Gradually rising temp. on 30/12, very warm on 31/12. Overcast on both days with mixed rain and snow showers on 30/12, continuous rain on 31/12.





## SURVEY NO. 49 (P)

27/12/72

Continuing bad weather delays this survey from the scheduled date on 18/12. On 27/12 weather conditions are very marginal — low cloud with light snow and restricted visibility. The survey is aborted less than half way into the flight.

In the west end of the lake the surface water temperature pattern is relatively unchanged from that on 11/12. The  $>4^{\circ}$  area has decreased slightly and in the northern region the  $3^{\circ}$  isotherm has advanced a little further into the lake. The cooling process has probably been slowed down by the continuing cloudy and relatively mild weather [ $T_{a5}$  1.1 (+3.1),  $T_{a30}$  -2.0 (0.0)].



DAY	01/01/73								02/01/73								SURVEY NO. 50(P)								03/01/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22								
CLD	9	10	9	10	10	10	10	10	10	8	9	9	2	6	6	10	10	8	8	6	4	1	10	10								
WDRN	W	W	SW	SW	SW	W	W	W	W	W	SW	W	W	W	W	SW	W	W	SW	SE	SE	E	E	SE								
WSPD	9.0	7.0	8.0	9.5	9.5	8.5	9.0	10.0	8.5	8.0	6.0	6.5	7.0	7.0	6.5	5.5	3.5	3.0	2.5	2.5	4.0	4.5	6.5	8.0								
T <sub>a</sub>	3.7	2.6	2.1	1.9	1.1	-0.2	-1.1	-2.0	-3.7	-5.4	-5.2	-3.9	-2.0	-2.6	-5.0	-4.4	-4.4	-4.5	-4.6	-2.6	-0.2	0.0	-0.6	0.6								
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-								
YYZ				T*		T*		T*		T*		T*		T*																		
YTR								T*		T*																						
ROC						T						T																				
	T <sub>a</sub> 1.0(+5.5)								T <sub>a</sub> -4.0(+0.6) T <sub>a5</sub> 1.5(+3.0) T <sub>a30</sub> -2.3(+0.8)								T <sub>a</sub> -2.2(+2.4)															

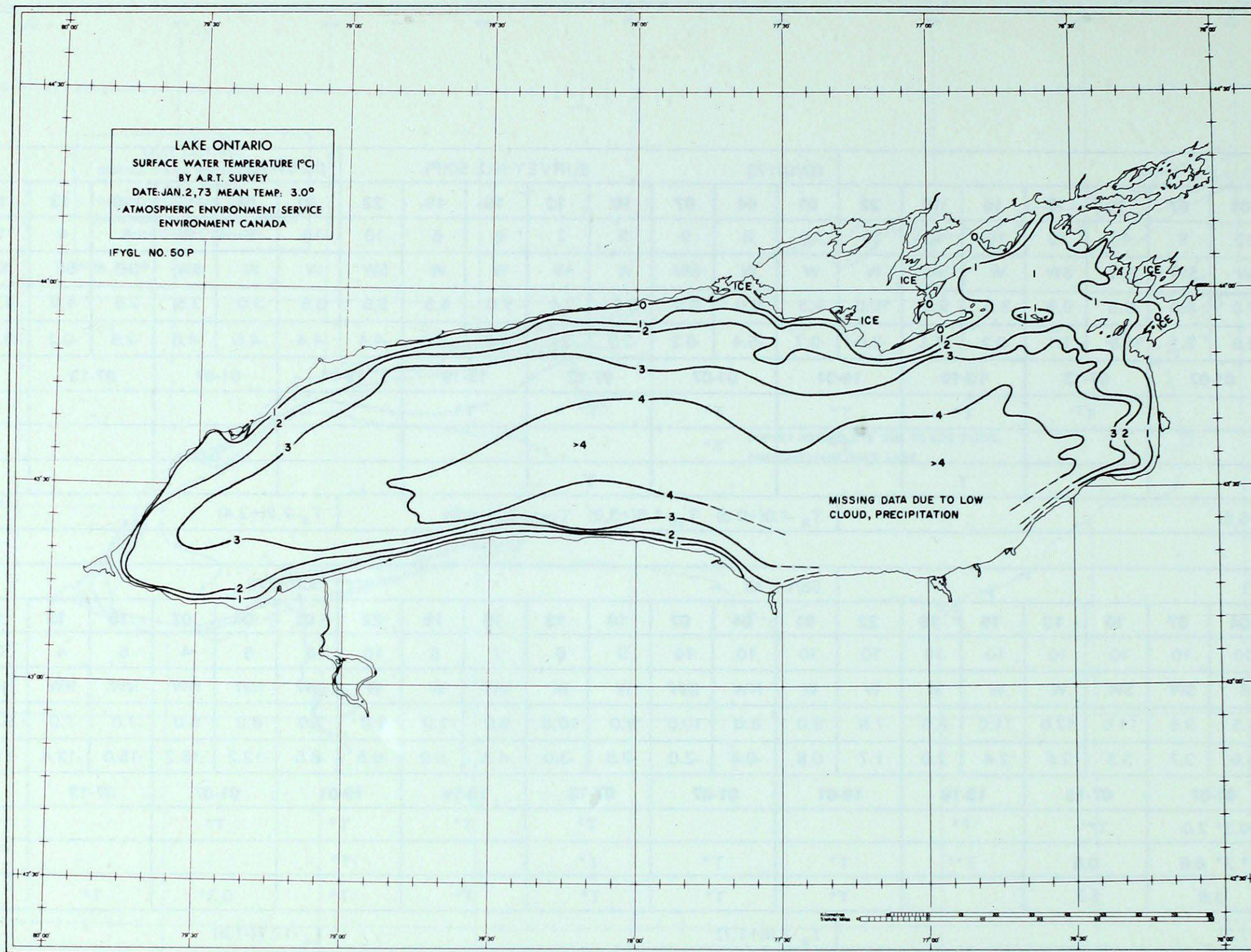
DAY	04/01/73								05/01/73								06/01/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	10	10	10	10	10	9	6	7	8	10	8	5	4	5	4	0	0	6
WDRN	SE	S	SW	SW	W	W	W	W	W	NW	NW	W	W	NW	W	W	NW	NW	NW	NW	NW	NW	NW	NW
WSPD	6.0	6.5	9.5	11.0	12.0	11.0	8.5	7.5	9.0	8.0	10.0	9.0	10.0	9.0	7.0	7.0	7.0	8.0	6.0	7.0	7.0	8.0	5.5	7.0
T <sub>a</sub>	1.3	3.0	3.7	3.3	2.6	2.4	2.0	1.7	0.8	-0.4	-2.0	-2.8	-3.0	-4.3	-5.9	-6.5	-8.5	-12.2	-15.2	-15.0	-12.4	-11.7	-13.2	-13.3
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	2.0*4.8	0.3* 2.0		T*r		T*						T*		T*		T*		T*						
YTR	1.5*1.8	1.3* 6.6		0.5		T*r		T*		T*		T*				T*								
ROC	11.4	3.6		1.3				T*		T*		T*		T*		T*		0.3*		T*				
	T <sub>a</sub> 2.5(+7.2)								T <sub>a</sub> -3.0(+1.7)								T <sub>a</sub> -12.7(-7.9)							

## WEATHER

01/01/73 – 06/01/73

A large High Pressure system builds over central U.S.A. on 01/01; very strong W winds with gradually rising temp., overcast sky and a few snow showers. High Pressure system moves eastward on 02/01 and reaches the Atlantic coast on 03/01. Strong W winds, seasonal temp. and variable cloud cover with scattered snow showers on 02/01. Moderate W winds, changing to SE on 03/01, with variable cloud cover and rising temp. A complex frontal system with associated Low Pressure centres moves northeast through the Great Lakes region on 04/01; very warm, with very strong SW and W winds, overcast sky and rain and snow mixed. Large arctic High Pressure system pushes south on 05/01 and overlies most of the continent on 06/01. Very strong NW winds, with falling temp., clearing sky and scattered snow showers on both days.





SURVEY NO. 50 (P)

02/01/73

 $T_w$  3.0 (-0.4)

This survey has been delayed by bad weather since 28/12/72, with one aborted attempt on 29/12/72. On 02/01/73 weather conditions remain marginal — broken low cloud with snow showers, wind W 7, temp.  $-4^{\circ}$  to  $-2^{\circ}$ . A small southeast portion of the lake remains unsurveyed.

Although the weather has remained quite mild [ $T_{a5}$  1.5 (+3.0),  $T_{a30}$  -2.3 (+0.8)], the mean surface water temp. has decreased  $1.0^{\circ}$  since 11/12/72. The normal seasonal decrease for this period is  $0.6^{\circ}$ . In the west end of the lake the water temp. had changed very little between 11/12/72 and 27/12/72, but appears to have decreased by about  $1^{\circ}$  since 27/12/72. This suggests that the lake — wide surface temp. has also experienced most of the decrease since 27/12/72. At this point on the seasonal cooling cycle, when the surface water is near the temperature of maximum density ( $4^{\circ}$ ), the surface cools at a slower rate. The cooling rate speeds up again, after the surface temperature falls below the  $4^{\circ}$  mark. The unequal cooling rates are associated with the process known as the "fall overturn". At this stage correlation of water temperature trends with meteorological factors is difficult.

The surface water temperature pattern is a well organized, depth — reflecting type. Some ice is found in the shallow bays along the north shore and in the northeast basin.



DAY	07/01/73								08/01/73								09/01/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	5	5	5	5	4	0	0	6	5	5	5	4	4	0	1	2	1	6	9	6	1	7	0	1
WDRN	NW	NW	NW	NW	NW	NW	NW	NW	NW	NE	N	V	NW	NW	NW	SW	SW	W	V	SW	W	W	W	W
WSPD	5.5	4.5	5.5	7.0	7.5	6.0	3.5	4.5	3.5	4.0	3.5	3.5	3.0	1.5	1.5	0.5	1.0	2.5	3.0	3.0	7.5	8.5	8.0	7.0
T <sub>a</sub>	-14.5	-15.6	-16.9	-15.9	-13.1	-12.2	-14.1	-15.0	-16.1	-16.9	-18.2	-17.4	-14.4	-13.7	-15.4	-15.7	-15.4	-15.5	-14.6	-11.5	-5.6	-6.3	-8.5	-9.3
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																T*				T*		T*		
YTR																						T*		
ROC	T*	T*		T*				T*		T*		T*		T*						T*		T*		
	T <sub>a</sub> -14.7(-9.8)								T <sub>a</sub> -16.0(-11.1)								T <sub>a</sub> -10.8(-5.8)							

DAY	10/01/73								11/01/73								12/01/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	1	3	1	7	6	2	2	3	3	8	10	2	9	5	1	5	5	5	3	9	6	8	7	6
WDRN	W	W	W	SW	W	SW	SW	SW	SW	SW	SW	SW	NW	W	W	W	W	W	SW	SW	W	W	W	W
WSPD	7.0	6.0	5.0	7.0	7.5	6.5	6.5	6.5	7.5	8.0	7.0	7.5	7.0	6.5	6.0	6.0	6.0	4.0	5.0	8.0	9.0	8.0	5.0	3.5
T <sub>a</sub>	-9.2	-10.0	-10.7	-8.1	-6.3	-6.5	-7.4	-8.1	-8.0	-7.8	-8.0	-7.0	-6.1	-6.9	-9.8	-10.7	-10.7	-11.3	-12.2	-8.1	-4.1	-4.2	-6.1	-8.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T*	T*		T*		T*		T*		T*		T*		T*		T*		T*		T*		5.6*		
YTR						T*		T*		T*		T*				T*		T*		T*		T*		
ROC				T*		T*		T*		T*		T*		T*		0.3*		0.3*		T*		T*		
	T <sub>a</sub> -8.3(-3.3)								T <sub>a</sub> -8.0(-3.0)								T <sub>a</sub> -8.1(-3.0)							

## WEATHER

07/01/73 – 12/01/73

A very large arctic High Pressure system dominates over most of the continent from 07/01 to 13/01. Generally strong NW and W winds and below normal temp. prevail during this period, with variable cloud cover, scattered flurries and lake – effect snow showers along the south shore of Lake Ontario. Additional precipitation is caused by thermal troughing over the Great Lakes on 08/01 and 12/01, and by a trough traversing northern Ontario on 11/01.



DAY	13/01/73								14/01/73								15/01/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	7	8	4	3	3	4	3	9	8	5	9	10	10	10	10	10	10	10	10	10	9	10	10	10
W <sub>DRN</sub>	V	V	V	V	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	W	SW	W	SW	SW	W	W	NW	W	W
W <sub>SPD</sub>	2.5	3.0	3.0	4.0	7.5	5.0	5.0	7.0	7.5	7.0	5.0	6.0	5.5	4.0	3.5	3.5	2.0	2.0	3.0	4.5	5.0	6.0	6.5	5.0
T <sub>a</sub>	-7.4	-7.6	-7.8	-4.1	-0.4	0.4	-0.2	0.2	0.6	0.2	0.0	0.0	0.2	-0.4	-0.9	-0.9	-1.1	-1.7	-1.1	0.4	2.0	2.0	1.1	1.3
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T*											0.5*		0.5*		T*								
YTR		T*		T*						T*		0.3*		1.5*		T*		T*		T*				
ROC	T*													T*		T*		T*		T*		T*		
	T <sub>a</sub> -3.4(+1.7)								T <sub>a</sub> -0.2(+5.0)								T <sub>a</sub> 0.4(+5.6)							

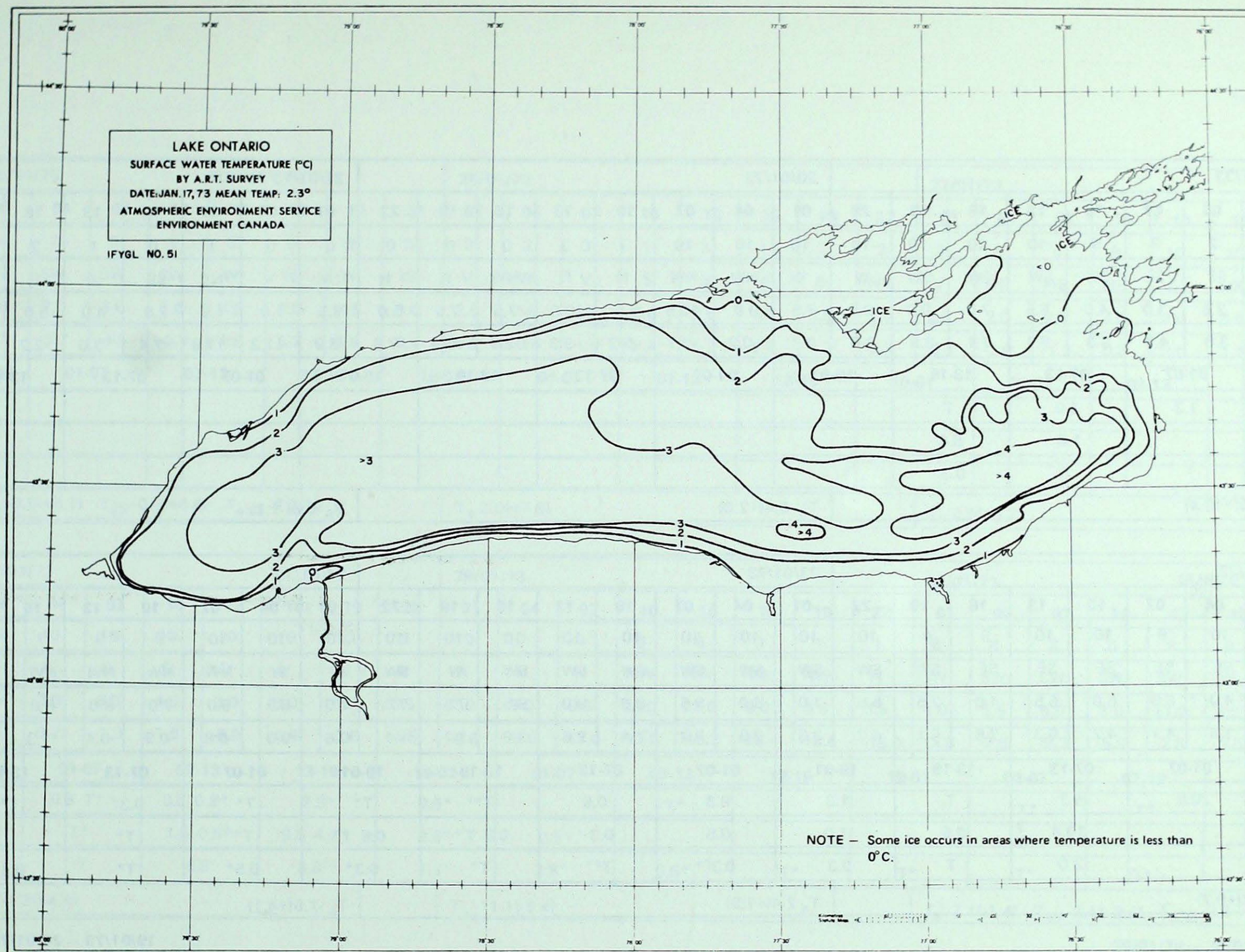
DAY	16/01/73								17/01/73								18/01/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	5	8	5	3	2	1	0	2	0	2	10	10	10	10	10	10	10	9	3	4	2	2
WDRN	W	SW	SW	SW	W	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	S
WSPD	6.0	8.0	6.5	10.0	10.5	8.0	8.0	6.5	7.0	7.5	9.0	8.5	8.5	4.5	4.0	4.0	3.5	5.0	4.5	5.0	5.5	3.5	1.5	2.5
T <sub>a</sub>	0.7	0.0	-0.4	1.3	3.0	3.5	3.2	3.3	3.3	4.8	5.0	6.3	7.3	6.7	5.7	6.5	6.1	6.6	6.3	7.2	10.0	10.2	6.3	5.8
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																				T				
YTR	T*														T*		T*							
ROC																								
	T <sub>a</sub> 1.8(+7.1)								T <sub>a</sub> 5.7(+11.0) T <sub>a5</sub> -1.9(+3.3) T <sub>a30</sub> -3.3(+1.2)								T <sub>a</sub> 7.3(+12.7)							

## WEATHER

13/01/73 – 18/01/73

Large High Pressure system moves south and remains centered over the southeastern U.S.A., continuing as the dominant weather feature from 13/01 to 19/01. Strong circulation of warm air is maintained over the Great Lakes region. Moderate to strong SW winds and much above normal temp. persist during this period. A weak Low Pressure system moves through the lower Great Lakes area on 14/01 and 15/01, causing overcast sky and snow showers. A complex frontal system with associated Low Pressure centres moves into the western Great Lakes area from the southwest on 18/01, but reasonably good weather continues over Lake Ontario.



**SURVEY NO. 51****17/01/73** **$T_w$  2.3 (-0.1)**

Initially scheduled for 08/01, the survey is delayed by bad weather until 17/01. Four attempted flights are aborted in the intervening period.

Mean surface water temp. has decreased  $0.7^\circ$  since 02/01. This is slightly less than the normal seasonal decrease of  $1.0^\circ$ . Relatively mild weather has also prevailed [ $T_{a5} -1.9$  (+3.3),  $T_{a30} -3.3$  (+1.2)].

The surface water temperature pattern shows the depth — related progression of cooling. The  $>3^\circ$  zone appears to be due for imminent separation into two portions in the area where cold surface waters characteristically encroach into mid — lake during the winter season. Relatively little fast ice is found in the northeast basin, but bits of broken ice occur in areas where the surface temperature is indicated to be less than  $0^\circ$ . The mild weather and strong SW winds, prevailing since 13/01, are responsible for the limited amounts of solid ice.



DAY	19/01/73								20/01/73								21/01/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	2	2	9	9	10	10	10	10	10	10	10	7	3	0	0	0	0	0	1	0	1	2	1	2
WDRN	E	SE	SE	SW	SW	SW	SW	W	W	NW	NW	N	N	NW	N	N	N	V	NE	SE	E	E	E	E
WSPD	2.0	2.5	3.0	4.0	5.5	7.0	9.0	9.0	7.5	9.0	10.5	9.5	10.0	7.5	7.5	5.0	3.5	1.0	1.5	2.0	4.0	5.0	4.5	3.5
T <sub>a</sub>	2.9	3.0	4.0	8.3	8.1	7.1	3.9	3.0	1.1	-0.2	-3.7	-5.2	-3.3	-2.9	-5.4	-7.6	-8.9	-11.3	-11.9	-7.4	-3.0	-2.2	-3.9	-3.9
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		1.3		3.0		T																		
YTR				1.8		5.6																		
ROC				T		0.3																		
	T <sub>a</sub> 5.0(+10.4)								T <sub>a</sub> -3.4(+2.0)								T <sub>a</sub> -6.6(-1.1)							

DAY	22/01/73								23/01/73								24/01/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	4	10	9	10	10	9	4	10	10	10	10	10	10	10	10	10	10	10	10	9	9	7	0	0
WDRN	SE	SE	SE	SE	SE	SE	SW	SW	SW	SW	SW	SW	SW	SW	W	SW	W	W	NW	NW	NW	NW	NW	W
WSPD	4.5	4.0	6.5	6.0	6.5	4.0	2.5	5.5	7.0	8.0	9.5	8.0	9.0	8.5	7.5	7.0	7.0	6.5	6.0	7.0	8.0	8.0	4.5	3.5
T <sub>a</sub>	-0.4	1.8	4.1	4.2	6.3	7.6	6.1	4.2	3.3	2.9	2.2	2.4	2.6	2.6	1.7	1.1	0.6	0.0	-0.8	-0.9	-0.4	-1.3	-3.5	-5.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		0.8		4.3		T		1.3		0.3		0.5		T*r		T*		T*		0.3*		T*		
YTR				10.4		0.5		1.0		0.5		0.3		0.8 T*		0.8 T*		T*		T*				
ROC				3.0		T		0.3		0.3 <sup>r*</sup>		T <sup>r*</sup>		T*		0.3*		0.5*		T*		0.3*		
	T <sub>a</sub> 4.2(+9.7)								T <sub>a</sub> 2.4(+7.9)								T <sub>a</sub> -1.5(+4.1)							

## WEATHER

19/01/73 – 24/01/73

Complex frontal system with associated Low Pressure centre moves northeast through the Great Lakes area on 19/01; very warm and overcast with rain, light SE winds in the morning, strong SW in the afternoon. A large High Pressure system enters the region on 20/01 and moves southeast across the Great Lakes on 21/01. Very strong N winds on 20/01, light and variable in the morning of 21/01, becoming moderate E in the afternoon. Clearing sky and falling temp. on 20/01, clear and cold on 21/01. A large Low Pressure system with associated frontal structure enters the Great Lakes region on 22/01 and moves northeast on 23/01. Strong SE winds and very warm on 22/01, with broken cloud and rain showers. Continuing warm on 23/01, with strong SW winds, overcast sky and rain and snow mixed. A trailing Cold Front moves through the area early on 24/01; falling temp. during the day, with strong W and NW winds and overcast sky with snow showers, clearing in the evening.



DAY	25/01/73 SURVEY NO. 52								26/01/73								27/01/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	5	2	3	9	3	0	0	2	2	2	3	1	3	1	2	3	3	4	4	9	10	10	8	10
WDRN	SW	SW	SW	SW	W	W	W	W	V	W	V	S	S	S	E	NE	V	NE	NE	NE	E	NE	NE	NE
WSPD	4.0	2.0	3.0	8.0	8.5	8.0	4.5	3.0	2.5	1.5	1.5	2.0	2.5	1.0	2.5	1.5	2.5	2.0	2.5	4.0	6.0	5.5	5.0	4.0
T <sub>a</sub>	-5.2	-5.7	-4.5	-0.4	4.6	5.2	1.8	0.4	0.3	-0.4	-1.9	2.4	5.7	6.7	1.7	1.3	-0.4	-2.0	-1.3	0.8	2.0	1.7	1.7	1.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC																								
	T <sub>a</sub> -0.5(+5.1) T <sub>a5</sub> -0.9(+4.6) T <sub>a30</sub> -2.7(+2.3)								T <sub>a</sub> 2.0(+7.6)								T <sub>a</sub> 0.5(+6.2)							

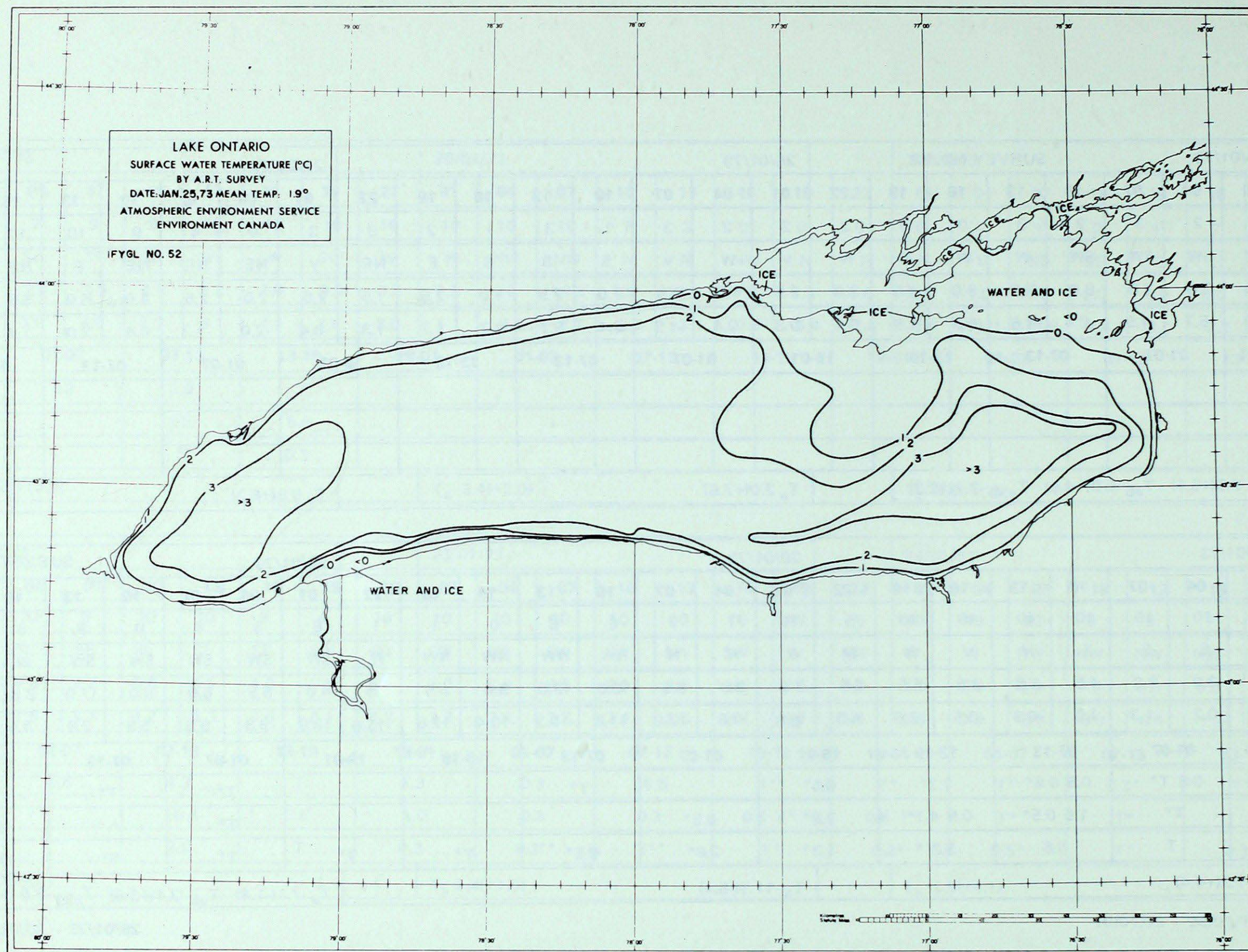
DAY	28/01/73								29/01/73								30/01/73								SURVEY NO. 53 (P)					
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22						
CLD	10	10	10	10	10	10	10	5	10	7	7	6	6	0	1	1	6	8	8	0	8	8	6	8						
WDRN	NE	E	E	E	V	V	N	N	N	N	N	NW	NW	NW	NW	W	SW	SW	SW	SW	SW	W	W	NW						
WSPD	5.5	3.0	3.0	4.5	3.0	3.0	6.5	5.5	7.0	9.0	9.5	10.0	12.0	9.0	6.5	3.5	4.0	5.5	6.0	8.0	11.0	8.5	6.0	8.0						
T <sub>a</sub>	0.6	0.2	-1.3	1.5	-0.9	-0.6	-2.6	-4.5	-6.8	-9.6	-12.0	-11.8	-10.2	-10.4	-12.6	-15.0	-13.0	-9.8	-9.3	-5.9	-2.8	-3.5	-5.8	-7.0						
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-						
YYZ		0.8 T*		0.5 0.8*		2.3*		0.5*				T*						T*		T*		T*								
YTR		T*		1.5 0.5*		0.5 4.1*		2.8*		0.5*								T*				0.3*								
ROC	T	T		0.8		3.8r*		1.3*		2.8*		0.5*		T*		T*		T*		T*		0.3*								
	T <sub>a</sub> -1.3(+4.4)								T <sub>a</sub> -11.1(-5.4)								T <sub>a</sub> -7.1(-1.4) T <sub>a5</sub> -2.1(+3.6) T <sub>a30</sub> -2.6 (+2.6)													

## WEATHER

25/01/73 – 30/01/73

A large High Pressure system builds over the southern part of the continent on 25/01 and persists on 26/01, maintaining warm southerly circulation over the Great Lakes. Warm and fair on both days, with strong SW winds on 25/01, light S on 26/01. Pressure drops over the Great Lakes on 27/01, as a Cold Front nears the area from the north and Low Pressure centres approach from the south; warm, with moderate NE winds and increasing cloud. Cold Front with associated Low Pressure centres moves slowly into the lower Great Lakes area on 28/01; overcast with rain and snow mixed, falling temp., moderate E winds in the morning, strong N in the evening. High Pressure ridge moves into the region on 29/01; cold, with very strong NW winds, broken cloud and snow showers in the morning, clearing sky with lake – effect snow showers during the day. High Pressure ridge remains over the Great Lakes on 30/01, but an upper air trough crosses the region, causing broken cloud and snow showers.





## SURVEY NO. 52

25/01/73

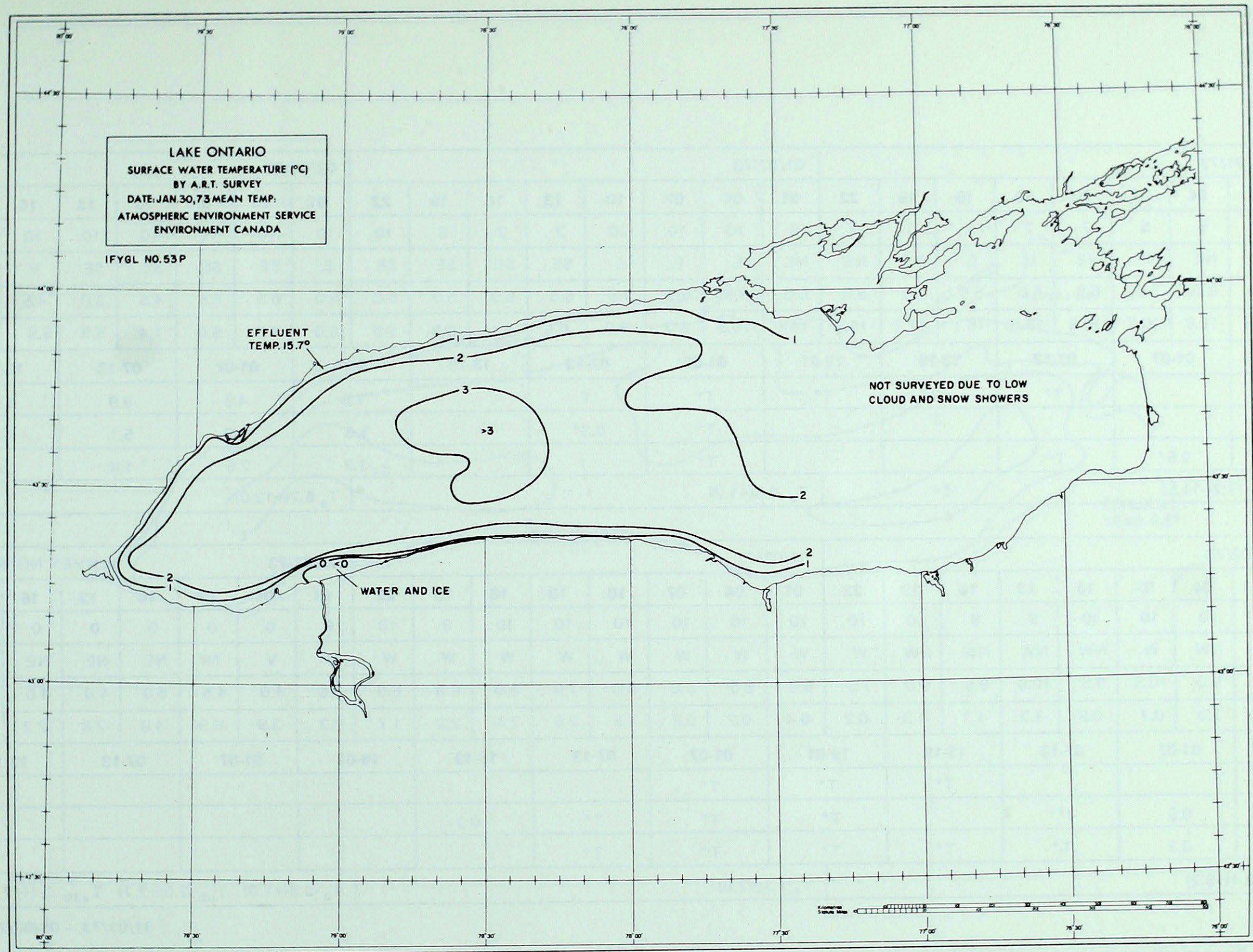
 $T_w$  1.9 (-0.2)

The survey is postponed from 22/01 due to bad weather. On 25/01 weather conditions are good, except for strong SW winds.

Since 17/01, the mean surface water temp. has decreased by the normal seasonal amount of  $0.4^\circ$ .

The surface water temperature pattern shows the normal progress of the cooling of the lake surface. The  $>3^\circ$  central zone has contracted down to two lenses and the bulge in the  $2^\circ$  and  $1^\circ$  isotherms is advancing toward mid — lake from the Prince Edward County shore in the usual manner. Ice formation in the northeast basin is slow, due to the persisting mild weather and strong winds.



**SURVEY NO. 53 (P)****30/01/73**

Postponed from 29/01 because of bad weather, the survey is attempted in marginal conditions on 30/01. The eastern third of the lake can not be surveyed, due to low cloud and snow showers generated over water by the cold air.

The outbreak of cold air over the region on 29/01 is probably responsible for a small, but interesting change in the surface water temperature pattern since the previous survey on 25/01; that is, the apparent "shift" of the lens of  $>3^{\circ}$  water from the west end to the central region of the lake. One possible explanation for this shift is that the very strong NW winds have covered up the  $>3^{\circ}$  water in the west end by moving cold near-shore waters eastward, and at the same time, and by the same process, have uncovered an area of warmer sub-surface water in the mid-lake region.



DAY	31/01/73								01/02/73								02/02/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	5	5	5	7	2	3	3	7	8	10	10	10	2	2	5	10	10	10	10	10	10	10	10	10
WDRN	NE	NE	NE	NE	E	E	NE	NE	NE	E	E	E	SE	SE	SE	SE	E	SE	SE	SE	SE	V	W	SW
WSPD	7.5	6.0	5.5	6.5	6.0	5.5	6.5	6.5	6.0	6.0	5.5	4.5	6.0	5.0	5.5	5.0	5.0	6.5	5.5	4.5	3.0	4.5	4.0	7.0
T <sub>a</sub>	-12.8	-16.8	-20.2	-19.8	-18.0	-16.1	-17.2	-16.3	-14.8	-10.8	-8.2	-5.0	-0.5	1.1	0.9	1.5	3.0	4.3	5.0	7.4	8.9	8.9	5.5	6.3
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T*			T*		2.0*		T*		T*		T				1.8		4.8		9.9		1.0		
YTR	T*									T*		0.3*				1.5		9.9		5.1		8.6		
ROC	1.5*	0.5*		T*						T*						1.8		2.5		1.8		3.0		
	T <sub>a</sub> -17.2(-11.5)								T <sub>a</sub> -4.5(+1.2)								T <sub>a</sub> 6.2(+12.0)							

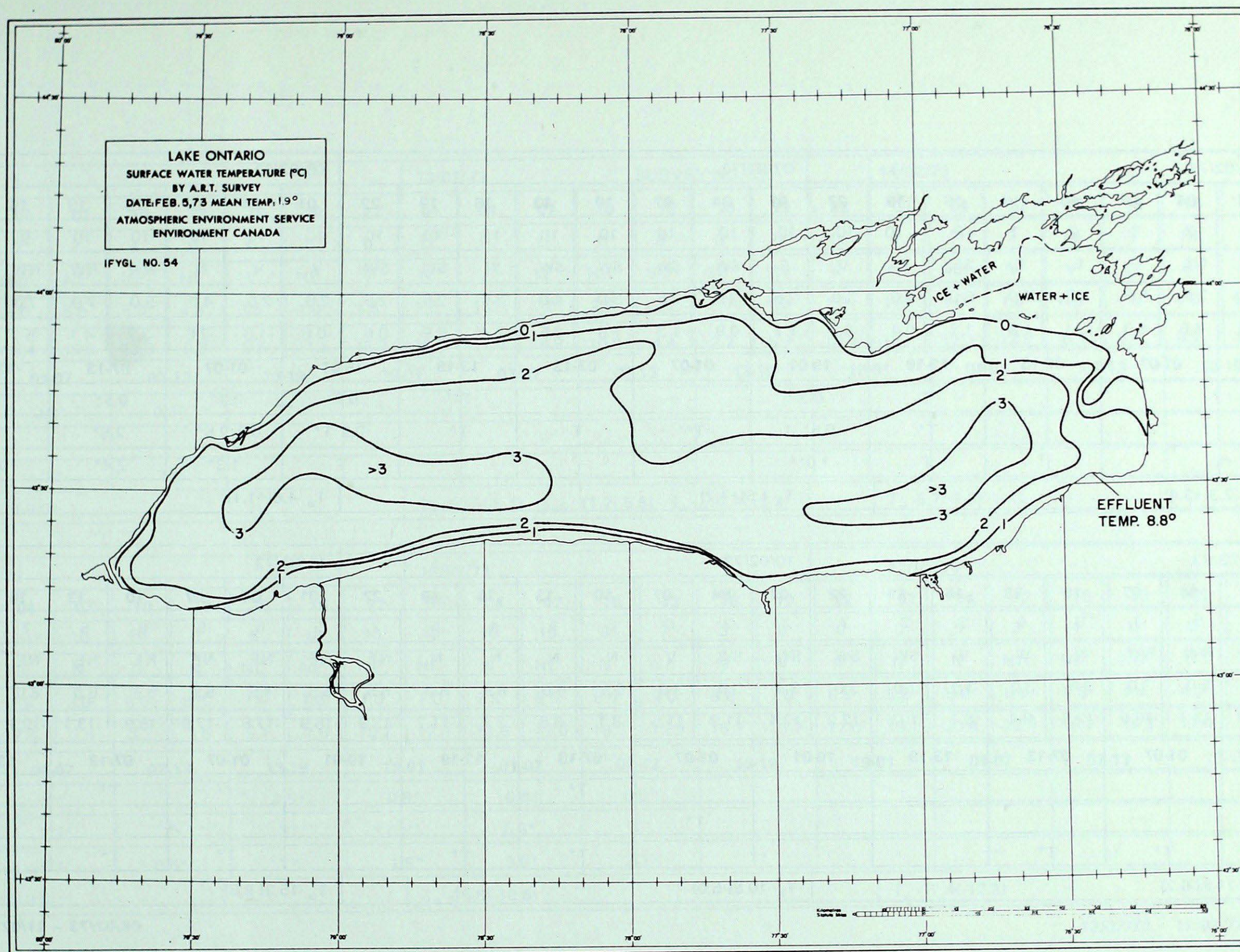
DAY	03/02/73								04/02/73								05/02/73			SURVEY NO. 54					
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	
CLD	10	10	10	10	9	9	10	10	10	10	10	10	10	10	9	10	6	0	0	0	0	0	0	0	
WDRN	W	NW	W	NW	NW	NW	NW	W	W	W	W	W	W	W	W	W	W	V	N	NE	NE	NE	E	SE	
WSPD	8.0	9.0	10.5	9.5	10.0	9.5	9.0	7.5	6.5	6.0	6.0	6.0	7.0	8.0	6.0	6.0	5.5	4.0	4.5	5.0	4.0	4.0	3.5	3.5	
T <sub>a</sub>	4.3	3.3	0.7	-0.9	-1.3	-1.1	-1.3	-0.2	-0.4	-0.2	0.8	1.5	2.6	2.4	2.2	1.7	0.2	-3.9	-5.9	-4.8	-2.8	-2.2	-5.0	-5.7	
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-	
YYZ	1.5					T*		T*		T*															
YTR	3.3	0.5		T <sup>r</sup> *				T*		T*		T*		0.3											
ROC	T	0.3		T*		T*		T*		T*		T*													
	T <sub>a</sub> 0.4(+6.2)								T <sub>a</sub> 1.3(+7.0)								T <sub>a</sub> -3.8(+1.9) T <sub>a5</sub> -2.0(+3.7) T <sub>a30</sub> -3.1(+2.3)								

## WEATHER

31/01/73 – 05/02/73

High Pressure cell moves southeast from northern Ontario on 31/01; very cold, with strong NE winds, scattered cloud and snow showers. High Pressure cell reaches the Atlantic coast on 01/02, as a Warm Front approaches the Great Lakes from the south; strong E winds in the morning, SE in the afternoon, with variable cloud cover, scattered snow showers and rising temp. Complex frontal system with a large Low Pressure centre enters the region on 02/02; very warm, with strong SE winds, overcast sky and heavy rain. Cold Front moves through the Great Lakes region behind departing Low Pressure centre on 03/02; falling temp., with very strong NW winds, overcast sky and rain changing to snow showers. A second Cold Front, followed by a High Pressure system, enters the lower Great Lakes area in the evening of 04/02; temp. remains well above normal during the day, with strong W winds, overcast sky and snow showers ending in the evening. High Pressure system, centered north of the Great Lakes, moves southeast through the region on 05/02; colder, with clear sky, moderate N winds in the morning, NE during the day.





SURVEY NO. 54

05/02/73

 $T_w$  1.9 (+0.2)

Survey is completed as scheduled in good weather conditions.

Mean surface water temp. remains unchanged from 25/01. The normal seasonal decrease in temp. for this period is  $0.4^\circ$ . The water temp. has remained unchanged, due to the prevailing warm and windy weather [ $T_{a5}$  -2.0 (+3.7),  $T_{a30}$  -3.1 (+2.3)].

The surface water temperature pattern suggests that mixing of warmer water into the surface layer has occurred under the very strong winds on 03/02 and 04/02. At the same time surface cooling has been minimal, due to the high air temp. In comparison with the isotherm pattern on 25/01, the  $>3^\circ$  lens in the east end is nearly as large, and the lens in the west end is larger, having extended further into mid-lake. The  $1^\circ$  isotherm south of Prince Edward County has retreated towards the shore. In the northeast basin there is no solid ice cover; the ice appears to be broken up thoroughly.



DAY	06/02/73								07/02/73								08/02/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	1	2	6	2	1	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	8	6
WDRN	E	NE	E	E	E	SE	E	V	S	SW	SW	SW	SW	W	SW	SW	V	V	N	NW	NW	NW	NW	NW
WSPD	6.0	3.5	5.5	5.0	6.0	6.0	4.0	3.0	2.5	2.0	2.5	3.0	4.0	3.5	2.5	2.5	2.5	2.5	4.0	5.0	7.0	7.0	6.5	6.5
T <sub>a</sub>	-6.1	-7.0	-6.1	-3.1	1.8	1.7	0.4	-0.2	1.1	0.9	1.3	1.6	3.5	2.4	0.9	0.6	-0.6	-1.3	-2.6	-3.7	-4.1	-5.7	-8.0	-10.4
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ						T		0.3						T*r		0.8*		2.3*		0.5*		T*		
YTR						T*		0.5* T		T*r		T		T*		0.5 T*		0.3 2.5*		2.5*		T*		
ROC						T		1.0*r								T		1.3*		7.4*		0.3*		
	T <sub>a</sub> -2.3(+3.4)								T <sub>a</sub> 1.5(+7.2)								T <sub>a</sub> -4.6(+1.1)							

DAY	09/02/73								10/02/73								11/02/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	7	5	3	0	6	3	2	7	3	2	0	6	5	4	5	2	5	5	5	6	5	7	5	5
WDRN	NW	NW	NW	N	W	V	SW	SW	SW	SW	V	N	N	N	N	NE	NE	NE	NE	NE	NE	NE	NE	NE
WSPD	6.0	5.0	3.0	3.0	3.0	3.0	1.0	3.0	3.0	3.0	3.0	5.5	6.0	6.5	5.0	5.5	5.5	4.5	6.5	5.5	6.0	6.0	5.0	4.5
T <sub>a</sub>	-11.3	-13.7	-16.6	-12.6	-9.1	-8.1	-10.9	-12.2	-12.4	-11.9	-11.5	-8.1	-6.8	-8.7	-11.7	-13.9	-16.9	-17.8	-17.9	-15.9	-13.1	-12.1	-13.5	-15.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ													T*								T*		T*	
YTR											T*													
ROC	T*		T*		T*								T*		T*				T*		T*		T*	
	T <sub>a</sub> -11.8(-6.2)								T <sub>a</sub> -10.6(-5.0)								T <sub>a</sub> -15.3(-9.8)							

## WEATHER

06/02/73 - 11/02/73

High Pressure system moves east to Quebec on 06/02 and a trough of low pressure with a complex frontal system passes slowly through the Great Lakes area on 07/02 and 08/02. Moderate to strong E winds, variable cloud cover and rising temp. on 06/02, with overcast sky and rain and snow mixed in the evening. Mild, with light to moderate SW winds, overcast sky and scattered rain and snow showers on 07/02. Winds become strong NW on 08/02, with continuing overcast sky, snow and rapidly falling temp., as large arctic High Pressure ridge moves southward. Arctic High Pressure ridge invades the continent on 09/02 and moves east, reaching the Atlantic coast on 11/02. Very cold, with scattered cloud and snow showers along the south shore of Lake Ontario under the moderate to strong northerly winds during this period.



DAY	12/02/73								13/02/73								14/02/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	6	7	7	4	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	10	10	10	10	10
WDRN	NE	NE	NE	NE	NE	V	NE	V	N	V	W	NW	SW	SW	SW	V	N	NE	N	V	E	E	E	E
WSPD	5.5	6.0	6.5	5.0	4.5	3.5	1.0	1.5	1.0	1.0	2.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	0.5	4.5	4.0	5.0	5.0
T <sub>a</sub>	-15.6	-15.4	-15.9	-13.3	-9.8	-8.5	-11.5	-15.9	-16.8	-17.0	-16.8	-10.9	-4.4	-2.2	-5.7	-10.4	-13.5	-12.0	-12.8	-6.1	0.0	0.9	-0.4	-1.3
PPTN	01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		0.3*		0.3*		T*																T*		
YTR																								
ROC	T*	T*		T*																		T*		
	T <sub>a</sub> -14.5(-9.0)								T <sub>a</sub> -10.5(-5.1) T <sub>a5</sub> -11.2(-5.6) T <sub>a30</sub> -2.4(+3.2)								T <sub>a</sub> -5.7(-0.3)							

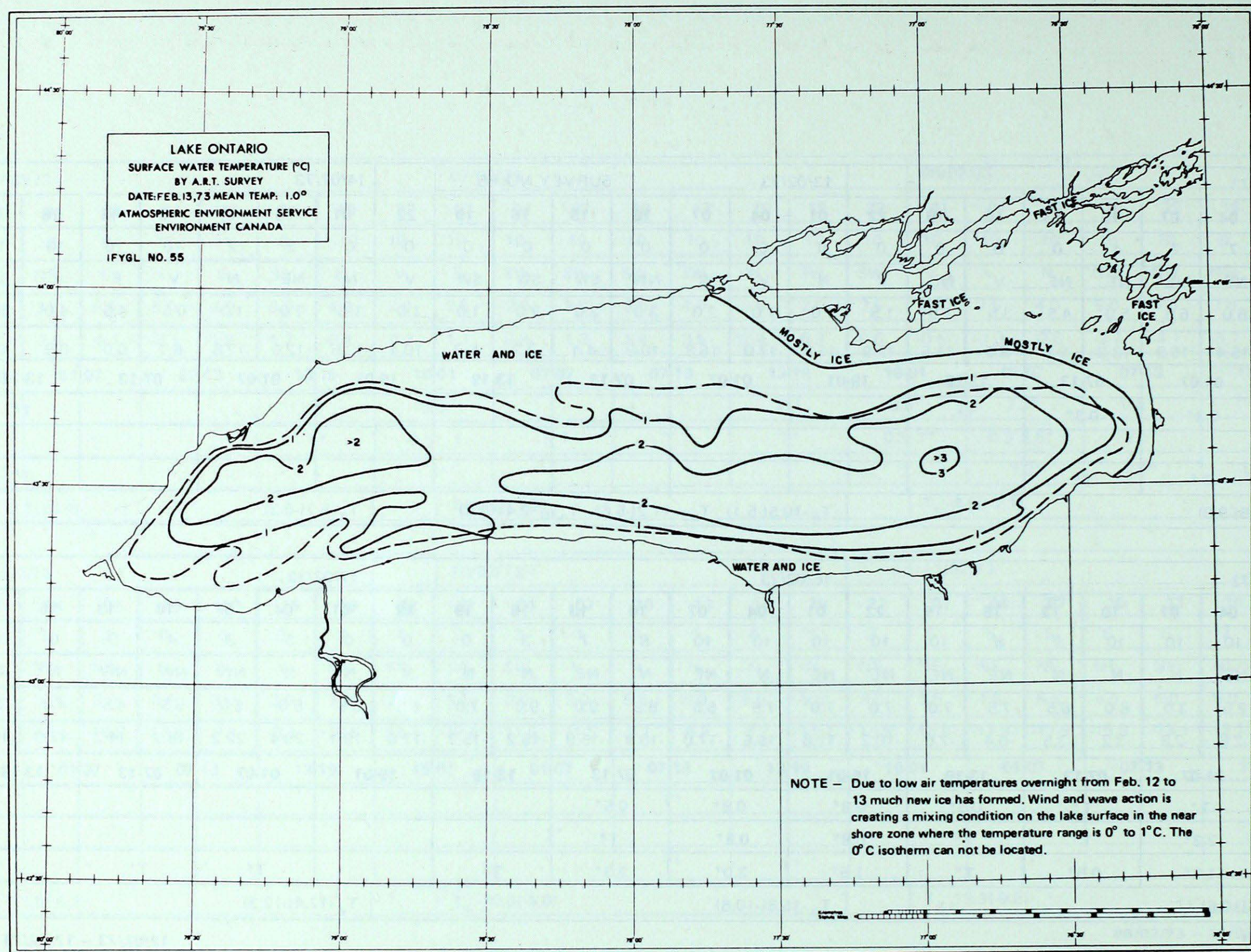
DAY	15/02/73								16/02/73								17/02/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	9	8	10	10	10	10	10	8	7	3	0	0	0	5	3	4	0	0	0	0
WDRN	NE	NE	N	N	N	NE	NE	NE	NE	N	NE	N	NE	N	N	N	N	N	NW	NW	NW	W	SW	SW
WSPD	5.5	2.5	3.0	6.0	6.5	7.5	7.0	7.0	7.0	7.5	6.5	8.5	9.0	9.0	7.0	6.5	5.5	5.0	5.0	5.5	4.5	4.0	3.0	3.5
T <sub>a</sub>	-1.9	-2.8	-2.8	-3.2	-3.5	-5.4	-7.0	-10.2	-12.8	-15.6	-17.0	-16.9	-15.9	-15.2	-15.7	-17.0	-19.1	-20.4	-22.2	-18.2	-14.3	-12.0	-15.9	-16.9
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	0.8*	T*		T*		0.5*		0.8*		0.8*		0.5*												
YTR	4.3*	2.3*		T*		T*		0.8*		0.8*		T*												
ROC	7.4*	1.3*		0.5*		T*		1.5*		3.0*		2.3*		T*				T*		T*				
	T <sub>a</sub> -4.6(+0.6)								T <sub>a</sub> -15.8(-10.6)								T <sub>a</sub> -17.4(-12.3)							

## WEATHER

12/02/73 – 17/02/73

High Pressure ridge persists over the northeastern part of the continent on 12/02 and 13/02. Strong NE winds, broken cloud and scattered snow showers in the morning of 12/02, light and variable winds and clear sky in the afternoon. Continuing very cold with light and variable winds and clear sky on 13/02. Cold Front, followed by a large arctic High Pressure system enters the upper Great Lakes area on 14/02, as a Low Pressure centre moves northeast along the Atlantic coast; moderating temp. during the day in the lower Great Lakes region, with overcast sky, very light N winds in the morning, moderate E in the afternoon. Cold Front moves through the lower Great Lakes area on 15/02, as Low Pressure centre on the Atlantic coast continues on a northeasterly track towards the Maritimes; strong NE winds and overcast with snow. Large arctic High Pressure ridge, over the central continent, moves into the Great Lakes region on 16/02; very cold, with strong N winds, overcast sky and snow in the morning, clearing in the afternoon. High Pressure ridge overlies the eastern half of the continent on 17/02; clear and very cold, with moderate NW winds changing to SW in the evening.





## SURVEY NO. 55

13/02/73

 $T_w$  1.0 (-0.4)

The survey is postponed from 12/02, due to bad weather. On 13/02 conditions are reasonable — cold, but sunny with light winds.

Mean surface water temp. is below normal, due mainly to the strong cooling of the lake surface and the formation of an extensive new ice cover under ideal conditions during the previous night — clear sky, very light winds, air temp.  $-17^\circ$ .

The surface water temperature field illustrates a very temporary condition, created under a specific set of meteorological factors. A skin of new ice and extensive frazil ice have formed overnight, under the very light winds. As the wind increases, the thin new ice breaks up and broken ice, as well as frazil ice, begins to move into deeper, warmer water. An anomalous temperature structure is created where ice is over-riding areas of warm surface water.



DAY	18/02/73								19/02/73								20/02/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	1	1	1	1	2	2	10	10	10	10	10	10	10	10	10	10	8	10	10	9	7	2
WDRN	SW	SW	SW	W	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	V	NW
WSPD	3.0	2.5	3.0	5.5	5.5	7.5	4.0	4.0	5.0	4.5	6.5	8.0	6.5	6.5	7.0	6.0	3.5	4.0	4.0	5.5	3.0	4.5	3.5	5.5
T <sub>a</sub>	-18.3	-17.8	-15.2	-10.4	-5.7	-4.4	-6.7	-7.0	-3.9	-3.3	-1.8	-0.6	0.8	1.1	0.9	1.1	1.3	1.9	0.7	1.5	2.6	0.7	-0.5	-1.3
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ												T*r		T*r		T*		T*		1.8*		0.5*		
YTR										T*		T*		T*r		T*		T*		T*r		0.3	1.0*	
ROC												T*		T*		T*						T*		
	T <sub>a</sub> -10.7 (-5.7)								T <sub>a</sub> -0.7(+4.2)								T <sub>a</sub> 0.9(+5.7)							

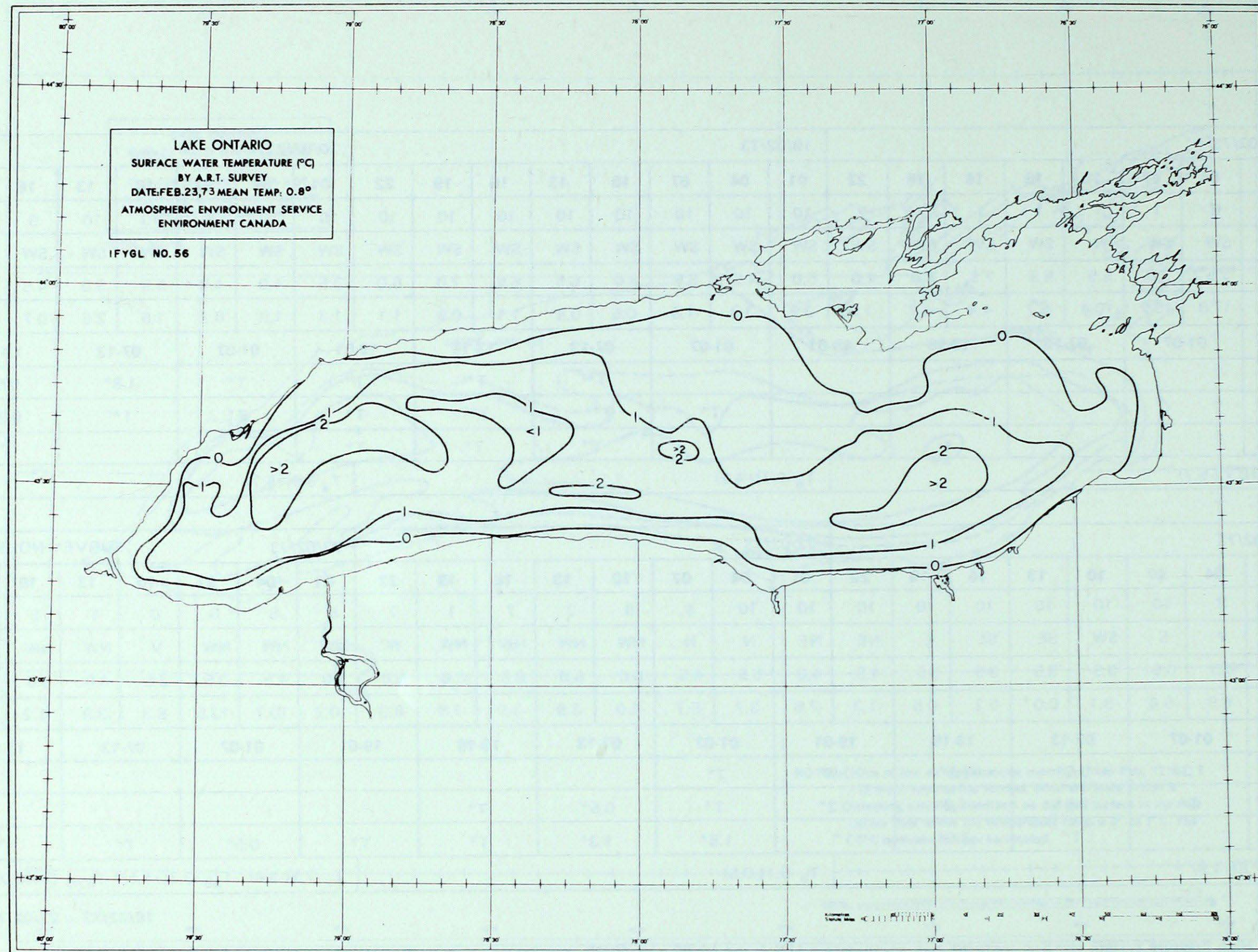
DAY	21/02/73								22/02/73								23/02/73			SURVEY NO. 56						
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22		
CLD	1	3	10	10	10	10	10	10	10	10	9	8	7	7	1	7	8	8	0	0	4	1	3	7		
WDRN	V	V	S	SW	SE	SE	E	NE	NE	N	N	NW	NW	NW	NW	W	NW	NW	NW	V	NW	NW	W	W		
WSPD	3.5	0.5	0.5	0.5	3.5	3.5	3.5	4.5	4.0	5.5	4.5	6.0	6.0	6.5	5.0	5.0	5.0	4.5	3.5	3.5	4.0	5.5	4.0	4.5		
T <sub>a</sub>	-4.8	-6.9	-5.6	-3.1	0.0	0.2	-0.5	-1.3	-2.6	-3.7	-5.7	-5.0	-3.9	-3.9	-7.8	-8.3	-10.2	-10.7	-13.5	-8.3	-3.9	-3.2	-6.3	-6.7		
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-		
YYZ		1.3*		0.5*		1.3*		0.8*		T*																
YTR		T*		0.5*		1.0*		0.3*		T*		0.5*		T*												
ROC	T*			T*		3.0*		T*		1.8*		1.3*		T*		T*		0.5*		T*		T*				
	T <sub>a</sub> -2.8(+1.9)								T <sub>a</sub> -5.1(-0.5)								T <sub>a</sub> -7.9(-3.4) T <sub>a5</sub> -3.7(+1.1) T <sub>a30</sub> -5.4(0.0)									

## WEATHER

18/02/73 – 23/02/73

Large High Pressure system remains centered over southeastern U.S.A. on 18/02 and 19/02, circulating warm air over the Great Lakes; moderate to strong SW winds and gradually rising temp. during this period, with scattered cloud on 18/02, overcast sky and snow and rain mixed on 19/02. Low Pressure centre with associated Cold Front enters the Great Lakes region on 19/02 and passes through the lower Great Lakes area in the evening of 20/02, followed by a second Low Pressure system on 21/02. Warm, with moderate SW winds, overcast sky and snow and rain mixed on 20/02. Temporary clearing overnight is followed by overcast sky and snow on 21/02. A weak High Pressure ridge overlies the lower Great Lakes on 22/02, while a Low Pressure system enters the upper Great Lakes area from the northwest; strong NW winds and broken cloud with snow showers. Low Pressure system moves through the lower Great Lakes area early on 23/02, followed by a High Pressure ridge, pushing south from northern Ontario; moderate NW winds with variable cloud cover and lake – effect snow showers.





SURVEY NO. 56

23/02/73

 $T_w$  0.8 (-0.3)

Initially scheduled for 19/02, the survey is delayed by bad weather until 23/02. On 23/02 weather conditions are fair — wind NW 4, temp.  $-10^{\circ}$  to  $-3^{\circ}$ , scattered cloud, with a few lake — effect snow showers along the south shore of the lake.

Mean surface water temp. is slightly below normal, probably due to the cold weather on 22/02 and on the day of the survey.

The surface water temperature pattern appears disorganized in the deep water region. This is probably due to ice movement and mixing in the surface layers under the strong NW winds on 22/02. Broken ice occurs in a large area along the north shore and in the northeast basin where water temperature is indicated to be less than  $0^{\circ}$ . This is, likewise, an indicator of recent break up and transport of ice.



DAY	24/02/73								25/02/73								26/02/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	8	8	9	1	6	6	6	5	4	5	5	2	8	10	10	10	8	5	5	3	0	0	0	0
WDRN	W	W	NW	NW	NW	NW	NW	NW	NW	NW	N	E	SE	V	NE	E	NE	NE	NE	V	N	N	NE	NE
WSPD	5.0	4.5	4.0	4.0	4.0	5.5	6.0	6.0	4.0	3.0	1.0	3.5	3.5	4.0	4.0	2.5	3.5	2.0	3.5	3.5	4.5	4.5	5.5	5.0
T <sub>a</sub>	-6.3	-6.9	-8.0	-4.5	-2.0	-1.8	-4.6	-7.4	-10.0	-12.4	-12.2	-8.7	-6.8	-6.1	-7.4	-8.5	-8.9	-13.4	-12.1	-8.4	-6.3	-6.7	-10.7	-12.6
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T*	T*		T*		T*						T*		1.3*		2.0*		T*		T*				
YTR														T*		1.3*		T*						
ROC	T*	0.3*		T*		T*		T*		T*		T*		T*		T*		1.0*		T*				
	T <sub>a</sub> -5.2(-0.8)								T <sub>a</sub> -9.0(-4.7)								T <sub>a</sub> -9.9(-5.7)							

DAY	27/02/73								28/02/73								01/03/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	2	1	2	1	1	1	1	3	5	9	10	10	9	1	5	10	4	4	10	5	10	10
WDRN	NE	NE	NE	NE	E	E	NE	V	N	V	W	SW	S	S	SE	SE	SE	S	SW	SW	SW	SW	W	V
WSPD	4.5	4.0	4.0	6.0	4.5	4.0	3.0	2.5	1.5	2.5	1.0	3.0	3.0	1.5	2.5	2.0	2.5	3.0	6.5	6.5	7.0	5.5	2.0	1.5
T <sub>a</sub>	-13.3	-15.0	-15.5	-13.2	-9.1	-8.5	-10.3	-12.8	-15.0	-15.8	-14.4	-9.3	-5.0	-2.6	-3.1	-5.0	-7.2	-1.1	1.5	3.5	5.5	6.1	4.5	2.2
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		T*		T*		T*														T		T		
YTR																								
ROC																								
	T <sub>a</sub> -12.2(-8.2)								T <sub>a</sub> -8.8(-4.9)								T <sub>a</sub> 2.0(+5.8)							

## WEATHER

24/02/73 – 01/03/73

High Pressure ridging persists over the Great Lakes from 24/02 to 01/03. Temp. remains below normal and winds are generally moderate northerly, becoming southerly on 28/02. Thermal troughing develops over the Great Lakes on 24/02, causing broken cloud and scattered snow showers. A weak disturbance tracks by south of the lower Great Lakes on 25/02 and 26/02, producing overcast to broken cloud cover and light snow. High Pressure ridge shifts to the Atlantic coast on 01/03, bringing a flow of warm southerly air into the Great Lakes region; rapid rise in temp., with strong SW winds and variable cloud cover.



DAY	02/03/73								03/03/73								04/03/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	10	10	4	8	8	8	10	10	10	10	10	10	10	10	9	6	3	3
WDRN	SW	N		E	E	NE	NE	NE	NE	E	E	E	E	E	SE	V	SW	SW	W	W	NW	NW	NW	N
WSPD	0.5	0.5	0	1.5	1.5	3.5	3.5	4.0	3.5	3.0	2.5	2.0	1.5	3.5	4.0	2.5	4.0	1.5	2.5	3.5	4.0	5.5	5.0	2.0
T <sub>a</sub>	1.8	1.7	1.3	3.1	5.7	4.3	1.8	0.9	0.4	-0.4	-0.5	2.0	4.4	5.2	5.6	5.0	5.2	4.8	4.6	6.1	8.7	8.5	3.9	1.7
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	T	T		T								0.3		0.5		1.8		0.3						
YTR		0.3		0.3		T						T		2.3		2.5		1.5		0.3				
ROC												0.8		1.8		1.5		T						
	T <sub>a</sub> 2.6(+6.3)								T <sub>a</sub> 2.7(+6.2)								T <sub>a</sub> 5.4(+8.7)							

DAY	05/03/73								06/03/73								07/03/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	3	2	8	8	9	10	10	10	9	10	5	3	2	0	0	0	8	8	3	4	4	5	10	9
WDRN	N	NE	NE	E	E	E	E	E	E	E	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	S	SW
WSPD	3.0	5.0	6.0	7.0	6.0	9.0	8.5	7.0	6.5	6.0	2.5	5.5	6.0	6.5	5.5	6.0	6.0	5.5	6.0	8.0	8.0	6.5	7.5	5.5
T <sub>a</sub>	1.1	1.7	0.4	2.2	4.3	3.5	2.4	3.4	3.7	4.1	4.3	7.6	11.1	11.7	8.0	6.1	7.0	6.5	6.7	10.6	12.6	11.7	10.7	10.5
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ						3.0		4.1		0.8										1.0		2.8		
YTR						T		3.6		1.5		0.5										7.9		
ROC						0.3		T		0.5												T		
	T <sub>a</sub> 2.4(+5.5)								T <sub>a</sub> 7.1(+10.0)								T <sub>a</sub> 9.5(+12.4)							

## WEATHER

02/03/73 – 07/03/73

A quasistationary front overlies the lower Great Lakes on 02/03 and 03/03; very mild and overcast with scattered rain showers and very light to moderate E and NE winds. A large Low Pressure system, with a frontal trough extending south, moves into northern Ontario on 03/03 and frontal trough moves through the lower Great Lakes in the afternoon of 04/03; light to moderate SW and W winds and overcast with rain in the morning, moderate NW winds, clearing sky and cooler in the afternoon. A large High Pressure system moves east through northern Ontario on 05/03; continuing mild, with broken cloud and strong NE and E winds. A weak disturbance moves towards the lower Great Lakes from the southwest on 05/03, giving overcast sky with rain in the afternoon. High Pressure system in northern Ontario moves to the Atlantic coast on 06/03, maintaining a strong southerly flow of warm moist air over the Great Lakes on 06/03 and 07/03. Very warm, with strong SE winds, variable cloud cover and periods of rain on both days.



DAY	08/03/73								09/03/73								10/03/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	8	6	1	0	1	1	1	0	2	0	8	9	3	5	5	10	10	10	10	10	10	10	10	3
WDRN	SW	SW	SW	SW	W	W	NW	NW	N	NW	N	NE	E	E	NE	NE	E	E	E	V	V	SE	SE	E
WSPD	4.5	4.0	3.0	5.0	8.0	8.5	6.5	3.0	1.5	1.5	3.0	6.5	5.5	6.5	5.0	5.0	6.0	5.0	3.5	5.0	4.0	3.5	2.0	4.0
T <sub>a</sub>	8.4	7.8	4.3	9.8	12.4	12.2	6.7	3.0	0.7	0.9	-0.6	3.0	4.8	3.9	2.0	1.9	1.7	1.9	3.0	6.7	8.0	9.6	9.1	8.1
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	0.3															1.5		0.3		3.6				
YTR	0.5	T																1.0		T		T		
ROC	T															0.5		2.5		0.3		T		
	T <sub>a</sub> 8.1(+10.5) T <sub>a5</sub> 5.4(+8.5) T <sub>a30</sub> -5.0(-0.4)								T <sub>a</sub> 2.2(+4.4) T <sub>a5</sub> 6.5(+9.4) T <sub>a30</sub> -4.7(-0.2)								T <sub>a</sub> 6.0(+8.0)							

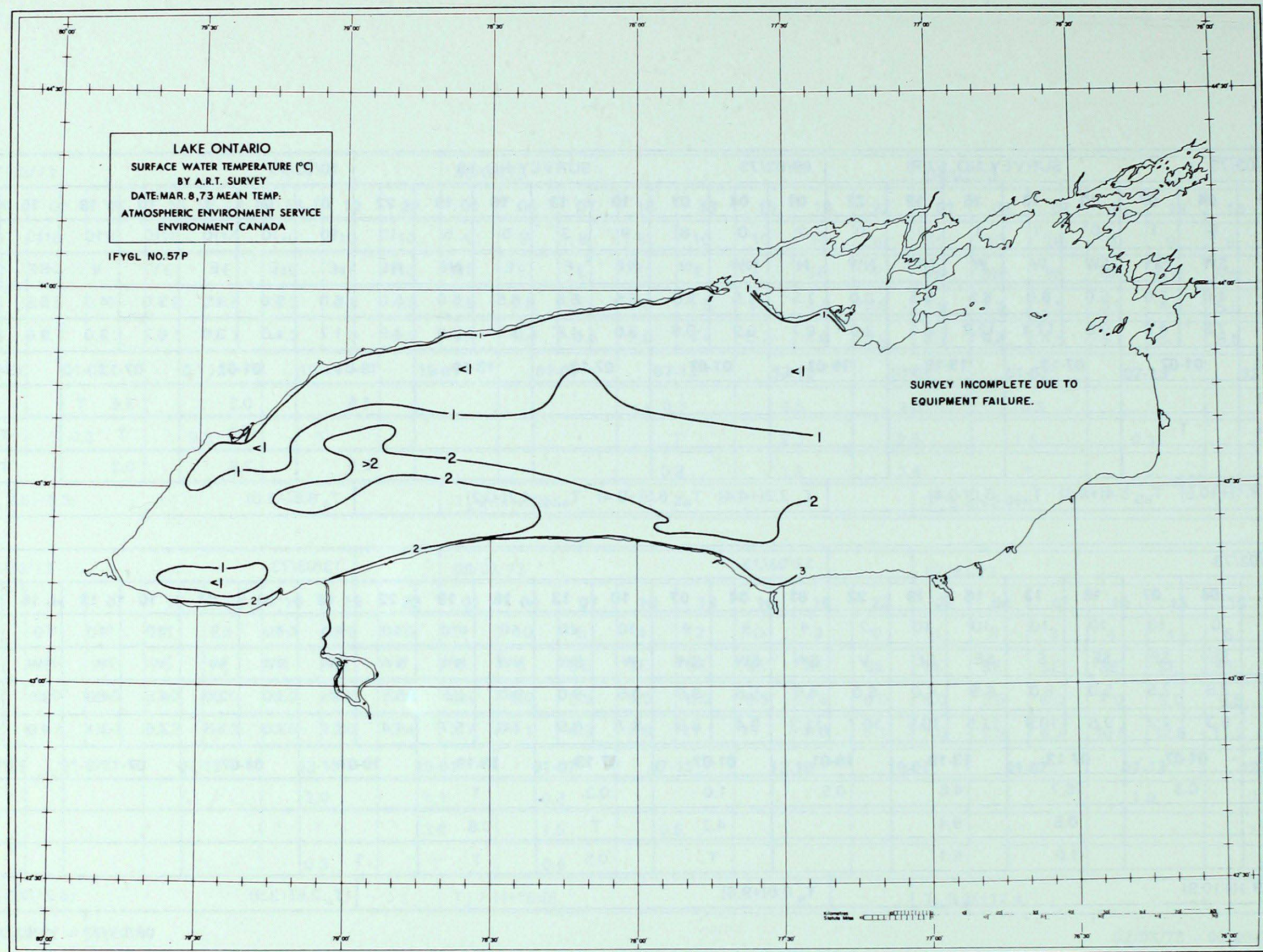
DAY	11/03/73								12/03/73								13/03/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	2	0	10	10	10	10	10	2	4	9	9	10	10	10	10	10	10	10	9	10	10	9	6	6
WDRN	E	SE	SE	SE	S	SE	SE	V	SW	SW	SW	W	SW	NW	NW	NW	NW	NW	W	W	W	SW	V	V
WSPD	2.0	3.5	3.5	5.0	6.0	6.5	4.0	6.0	4.5	5.5	9.5	9.5	9.0	9.0	8.5	5.5	4.5	3.0	2.0	4.5	4.0	3.5	2.5	2.0
T <sub>a</sub>	6.1	6.3	7.2	9.6	10.9	11.5	10.5	10.7	11.3	9.4	8.5	8.7	8.5	7.6	5.7	4.4	3.1	2.0	1.8	2.6	3.1	4.0	2.4	1.8
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ		0.3		15.7		4.8		0.5		1.0		0.3		T										
YTR				0.5		9.4				4.3		T		0.8										
ROC				1.0		6.1				T		0.5		T		T								
	T <sub>a</sub> 9.1(+10.9)								T <sub>a</sub> 8.0(+9.6)								T <sub>a</sub> 2.6(+3.9)							

## WEATHER

08/03/73 – 13/03/73

A weak frontal trough moves through the lower Great Lakes area on 08/03, followed by a High Pressure ridge building over the region; continuing very warm, with scattered cloud and moderate SW winds, becoming strong W in the afternoon, light NW in the evening. High Pressure system traverses northern Ontario, arriving over Quebec on 09/03; light NW winds in the morning, strong SE in the afternoon and cooler, with variable cloud cover. Warm Front moves northward through the region on 10/03; warm and overcast with showers and strong E winds, becoming moderate SE in the afternoon. Large complex Low Pressure system with associated frontal wave moves northeast through the Great Lakes region on 11/03 and 12/03. Moderate SE winds increase to strong SE in the afternoon of 11/03. Very strong SW winds in the morning of 12/03, change to NW in the afternoon, as Low Pressure system departs the area. Mainly overcast with rain on both days and very warm, becoming cooler in the afternoon of 12/03.





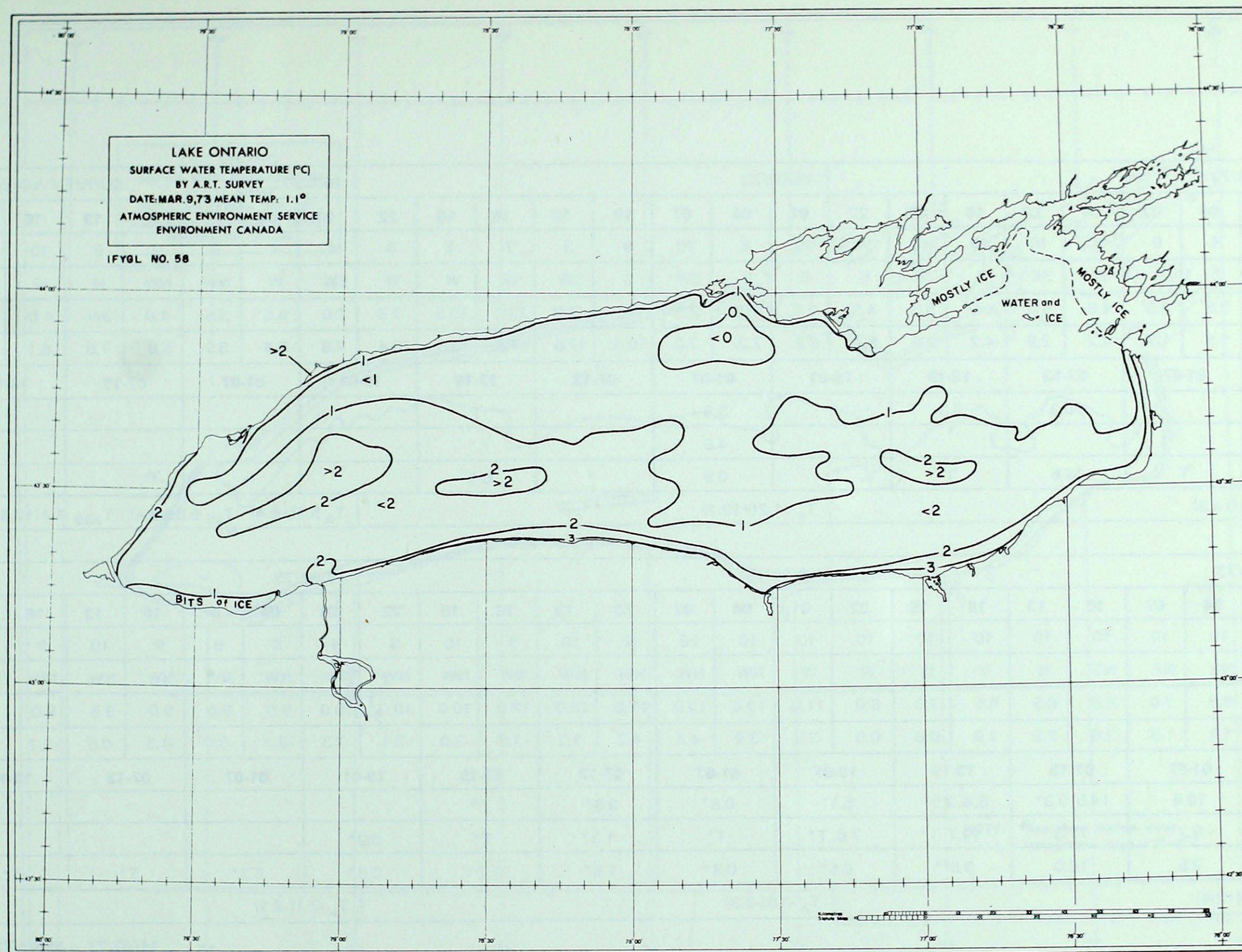
## SURVEY NO. 57 (P)

08/03/73

The survey is initially scheduled for 27/02. On 27/02 and 28/02 the survey is cancelled because of snow showers generated over the lake. From 01/03 to 07/03 the survey is postponed because of unfavourable weather conditions. On 08/03 weather conditions are good, but the flight is terminated due to equipment failure.

Abnormally warm weather has persisted over the region since 01/03. The surface water temperature field shows the effects of the warm weather. There is evidence of shallow water warming along the south shore. A large area of  $<1^{\circ}$  water lies in the northern third of the lake. Probably melting ice has been transported westward through these waters by the strong E and SE winds prevailing from 05/03 to 08/03.





SURVEY NO. 58

09/03/73

 $T_w$  1.1 (0.0)

After the incomplete survey on 08/03, this survey is flown to obtain coverage of the entire lake. Very good weather continues on 09/03.

Mean surface water temp. has increased  $0.3^\circ$  since 01/03, due to the very warm weather [ $T_{a5}$  6.5 (+9.4),  $T_a$  2.2 (+4.4)]. Several rainy periods have also occurred during the days with high air temp., producing favourable conditions for melting of ice. However, as the broken ice is driven out into deeper water by wind, the melting process lowers the surface temp. in the mid-lake regions.

The surface water temperature pattern, in comparison to that on 08/03, suggests that ice transport southward has occurred under the northerly winds during the last 24 hours. In the mid-lake region, the  $1^\circ$  isotherm bulges southward, almost reaching the opposite shore. The contorted shape of the  $1^\circ$  isotherm in the eastern third of the lake and the lens of  $<0^\circ$  water off Prince Edward County are additional indicators of ice movement. Bits of ice occur along the shore, west of the Welland canal, where on 08/03 the water temp. had been  $>2^\circ$ . At the same time, there are definite signs of shallow water warming elsewhere along the shore.



DAY	14/03/73								15/03/73								16/03/73								SURVEY NO. 59				
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22					
CLD	8	8	9	10	10	10	10	10	10	8	10	9	3	7	1	0	4	4	8	9	9	10	10	10					
WDRN	E	E	E	SE	SE	E	E	E	E	E	SW	S	SW	W	W	W	SW	W	NW	NW	N	N	NE	NE					
WSPD	1.5	2.5	3.5	4.5	5.0	5.5	5.5	4.5	2.5	2.0	2.0	3.0	7.0	12.0	10.5	7.5	7.0	6.5	3.5	4.0	3.5	4.0	4.5	5.5					
T <sub>a</sub>	0.9	1.5	1.7	2.2	3.9	4.2	4.6	5.4	5.2	7.2	7.2	10.4	17.6	17.8	13.5	10.4	7.8	5.6	3.9	5.8	7.0	6.1	5.0	4.3					
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-					
YYZ				20.3		0.3		T		3.8				T															
YTR										4.6												T							
ROC		T		16.8		T				0.5				0.3															
	T <sub>a</sub> 3.1(+4.3)								T <sub>a</sub> 11.2(+12.1)								T <sub>a</sub> 5.7(+6.4) T <sub>a5</sub> 6.8(+8.4) T <sub>a30</sub> -1.1(+2.5)												

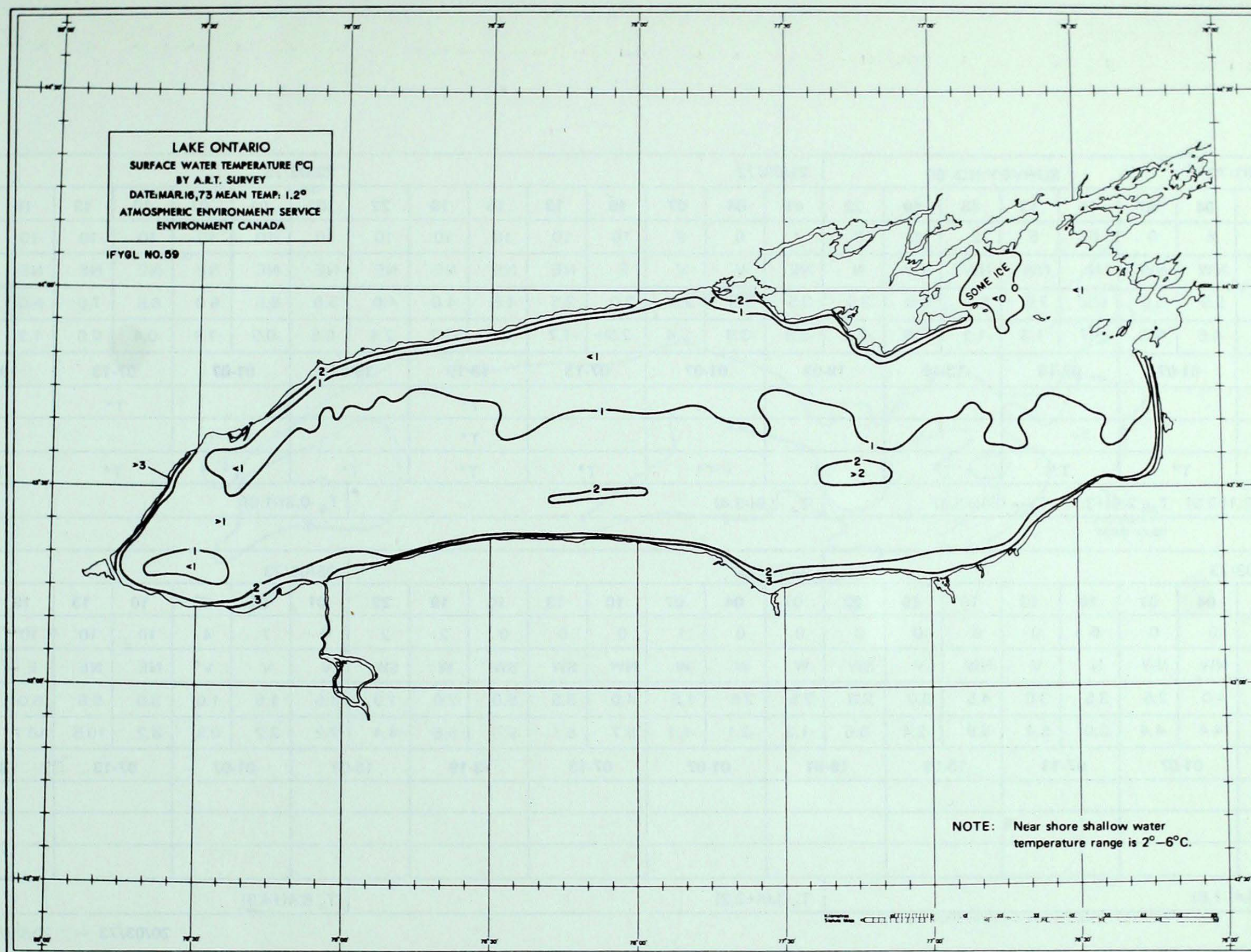
DAY	17/03/73								18/03/73								19/03/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	10	10	10	10	10	10	10	10	10	10	10	9	10	9	9	8	9	9	10	9	9	8
WDRN	NE	NE	NE	NE	N	V	W	W	W	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW
WSPD	6.0	9.0	7.0	8.0	6.5	6.5	7.0	8.0	11.0	10.0	12.0	11.0	12.0	12.0	10.0	10.0	10.0	9.0	9.0	9.0	9.5	9.0	8.0	6.0
T <sub>a</sub>	3.0	1.8	1.9	2.6	2.8	1.9	0.0	0.9	-2.8	-3.9	-4.8	-4.2	-3.3	-3.0	-3.0	-3.1	-3.3	-3.3	-3.0	-1.5	-0.5	-1.1	-1.9	-2.1
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	2.8	10.9		14.5 0.3*		6.4 2.5*		5.1*		0.8*		0.3*		T*										
YTR	2.8	9.7		17.3		14.7 T*		7.6 T*		T*		1.3*		T*		0.3*								
ROC	1.8	2.5		16.0		9.9 <sup>r</sup> *		0.5*		0.8*		1.5*		1.3*		0.3*		0.3*		T*		T*		
	T <sub>a</sub> 1.9(+2.4)								T <sub>a</sub> -3.5(-3.3)								T <sub>a</sub> -2.1(-2.1)							

## WEATHER

14/03/73 – 19/03/73

A large Low Pressure system enters the lower Great Lakes area from the south on 14/03 and tracks northward on 15/03. Mild, with light to moderate E winds, overcast sky and heavy showers on 14/03. Very warm, with light and variable winds, broken cloud and showers in the morning on 15/03, very strong W winds and clearing sky in the afternoon. A quasistationary front remains south of the Great Lakes on 16/03; moderate to strong NW winds in the morning, changing to NE in the afternoon and continuing mild with broken to overcast cloud cover. A large complex Low Pressure system moves north through the Great Lakes region on 17/03 and 18/03, as a large arctic High Pressure ridge builds in the west. Very strong NE winds in the morning of 17/03, change to strong W in the afternoon and become very strong NW on 18/03. Overcast on both days, with heavy rain on 17/03, changing to snow on 18/03, as temp. falls rapidly. High Pressure ridge overlies the Great Lakes on 19/03; cold, with very strong NW winds, broken cloud and snow showers along the south shore of Lake Ontario.





SURVEY NO. 59

16/03/73

 $T_w$  1.2 (0.0)

Initially scheduled for 13/03, the survey is delayed by equipment failure. After postponements due to bad weather on 14/03 and 15/03, the survey is completed on 16/03 in marginal conditions – broken to overcast cloud cover, wind NW 4, temp. 4° to 7°.

Mean surface water temp. has increased only 0.1° since 09/03, despite the very warm weather. Although air temp. has been much above normal [ $T_{a5}$  6.8 (+8.4)], solar radiation has been minimal, due to the prevailing overcast conditions. Furthermore, large amounts of heat have been required to melt the ice.

The surface water temperature pattern shows a large area of <1° water in the northern third of the lake. The low temp. in this area is due to melting of westward moving broken ice. Almost all ice has disappeared from the northeast basin. Shallow water warming is advanced, particularly along the south shore; temp. in some areas is up to 6°.



DAY	20/03/73 SURVEY NO. 60								21/03/73								22/03/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	8	8	0	6	5	2	1	8	7	8	9	10	10	10	10	10	10	10	10	10	10	10	7	0
WDRN	NW	NW	NW	N	NW	NW	NW	N	NE	V	V	E	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NW	N
WSPD	5.0	5.5	5.0	6.5	7.5	6.0	5.0	3.0	3.5	2.5	2.0	3.0	3.5	4.5	4.0	4.0	5.0	5.5	6.0	6.5	7.5	6.0	4.5	2.0
T <sub>a</sub>	-2.8	-4.6	-5.6	-3.7	-1.3	-1.1	-2.6	-2.8	-3.9	-3.9	-5.4	-2.8	-1.7	-0.9	-2.2	-2.4	-0.6	-0.9	-1.1	-0.4	0.6	1.3	0.4	-1.9
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ														T*						T*				
YTR	T*													T*										
ROC	T*	T*		T*		T*		T*		T*		T*		T*		T*		T*		T*		T*		
	T <sub>a</sub> -3.1(-2.9) T <sub>a5</sub> 2.6(+3.1) T <sub>a30</sub> 0.4(+3.3)								T <sub>a</sub> -2.9(-3.4)								T <sub>a</sub> -0.3(-1.0)							

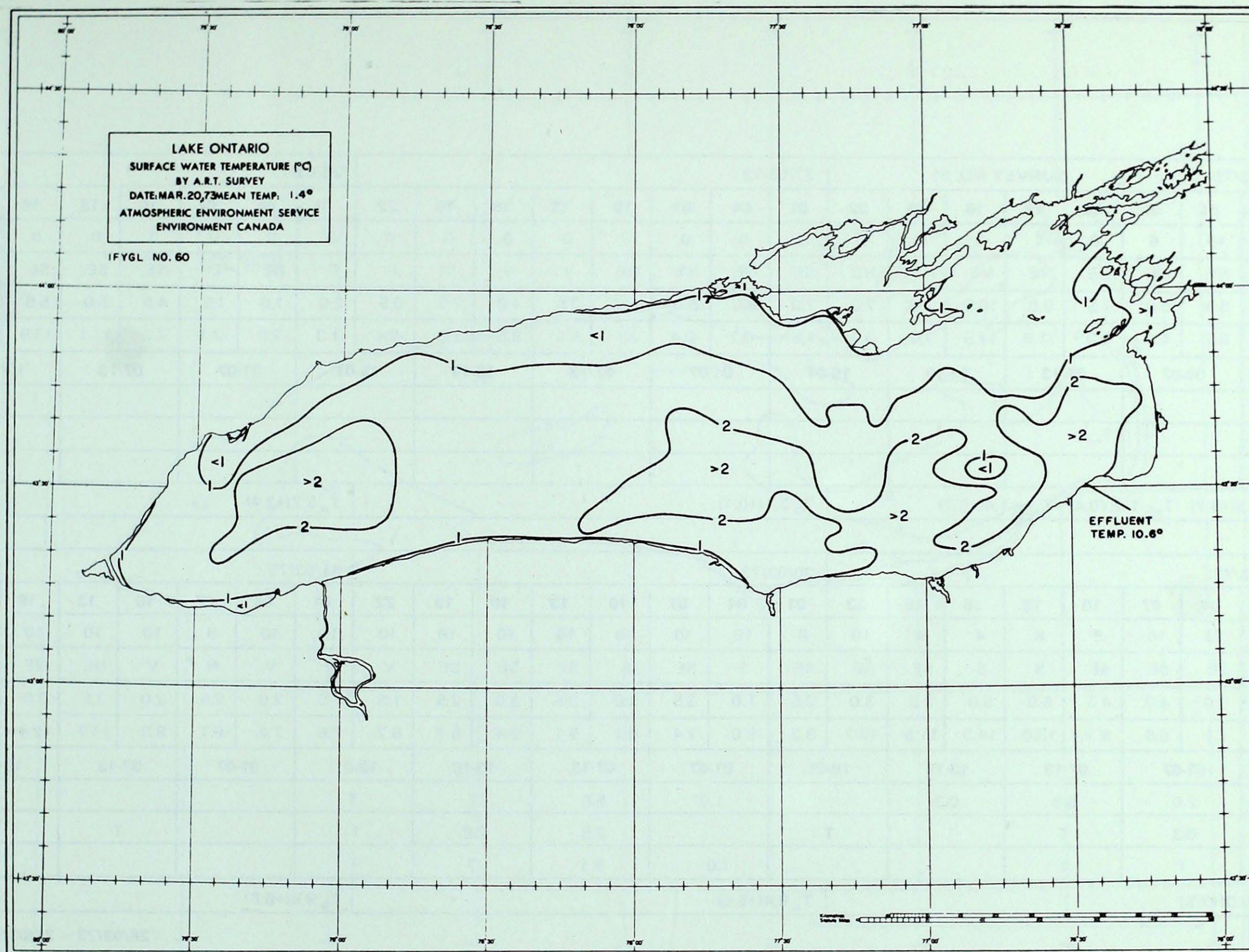
DAY	23/03/73								24/03/73								25/03/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	2	7	7	4	10	10	10	10	10
WDRN	NW	NW	NW	N	V	NW	V	SW	W	W	W	NW	SW	SW	W	SW	V	V	V	NE	NE	E	NE	V
WSPD	3.5	4.0	2.5	3.5	3.0	4.5	3.0	2.0	2.5	2.5	1.5	4.0	3.5	5.0	2.0	1.0	1.5	1.5	1.0	3.0	5.5	6.0	3.5	4.0
T <sub>a</sub>	-3.9	-4.4	-4.4	3.0	5.4	5.9	2.4	-0.6	-1.3	-2.1	-1.1	5.7	8.1	9.3	5.6	4.4	2.2	2.2	0.9	8.2	10.5	10.7	9.1	7.0
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC																								
	T <sub>a</sub> 0.4(-1.6)								T <sub>a</sub> 3.6(+2.3)								T <sub>a</sub> 6.4(+4.9)							

## WEATHER

20/03/73 – 25/03/73

A large High Pressure system, centered over Hudsons Bay and northern Quebec, is the controlling weather feature over the Great Lakes from 20/03 to 23/03. Below normal temp., moderate to strong northerly winds and broken to overcast cloud cover persist during this period, with lake — effect snow showers along the south shore of Lake Ontario. A High Pressure cell develops over the Great Lakes on 23/03, remains quasistationary over the region on 24/03 and drifts slowly southeast to the Atlantic on 25/03. Light to moderate variable winds, clear sky and gradually rising temp. on 23/03 and 24/03. Warm, with increasing cloud, light and variable winds in the morning, moderate NE in the afternoon on 25/03.





SURVEY NO. 60

20/03/73

 $T_w$  1.4 (+0.1)

The survey is completed as scheduled in marginal weather conditions — wind NW 6 — 7, temp.  $-4^{\circ}$  to  $-1^{\circ}$ , scattered cloud with snow showers along the south shore.

Mean surface water temp. has increased  $0.2^{\circ}$  since 16/03, although cold weather has prevailed during the intervening period, with overcast sky, snow and rain mixed and very strong NW winds. The rise in temp. has occurred in the deep water regions, as a result of very strong mixing by wind in the upper layer of water. Furthermore, with the disappearance of the last ice, surface cooling due to ice melt is no longer a factor.

The surface water temperature pattern shows the effects of the cold and very windy weather. Temperature of the shallow water has decreased considerably, particularly along the south shore, where temp. has been as high as  $6^{\circ}$  on 16/03. At the same time, wind mixing action is noticeable in the deeper water regions. The zone of  $<1^{\circ}$  water in the northern region is reduced, and the  $>2^{\circ}$  areas in the central region have enlarged. The contorted tongue of  $<2^{\circ}$  water, extending south toward Sodus Bay, has likely resulted from a surge of remnant ice from the northeast basin, under the sustained blow of very strong NW winds.



DAY	26/03/73 SURVEY NO. 61								27/03/73								28/03/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	10	10	6	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2
WDRN	V	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	V	V	V	E	E	NE	E	SE	SE	SE	E	S
WSPD	3.5	5.5	5.0	7.5	9.0	10.5	7.0	7.0	7.0	6.0	5.0	6.5	3.5	4.0	2.5	0.5	2.0	1.0	1.5	4.5	5.0	5.5	4.0	4.5
T <sub>a</sub>	6.1	5.2	5.4	9.3	11.9	11.5	7.0	3.7	1.5	-0.2	-0.4	3.1	5.6	5.5	1.9	-0.4	-1.3	-2.8	-2.1	7.2	11.1	13.9	10.4	8.9
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ																								
YTR																								
ROC	T																							
	T <sub>a</sub> 7.5(+5.7) T <sub>a5</sub> 1.4(+0.4) T <sub>a30</sub> 1.4(+3.2)								T <sub>a</sub> 2.1(+0.1)								T <sub>a</sub> 5.7(+3.4)							

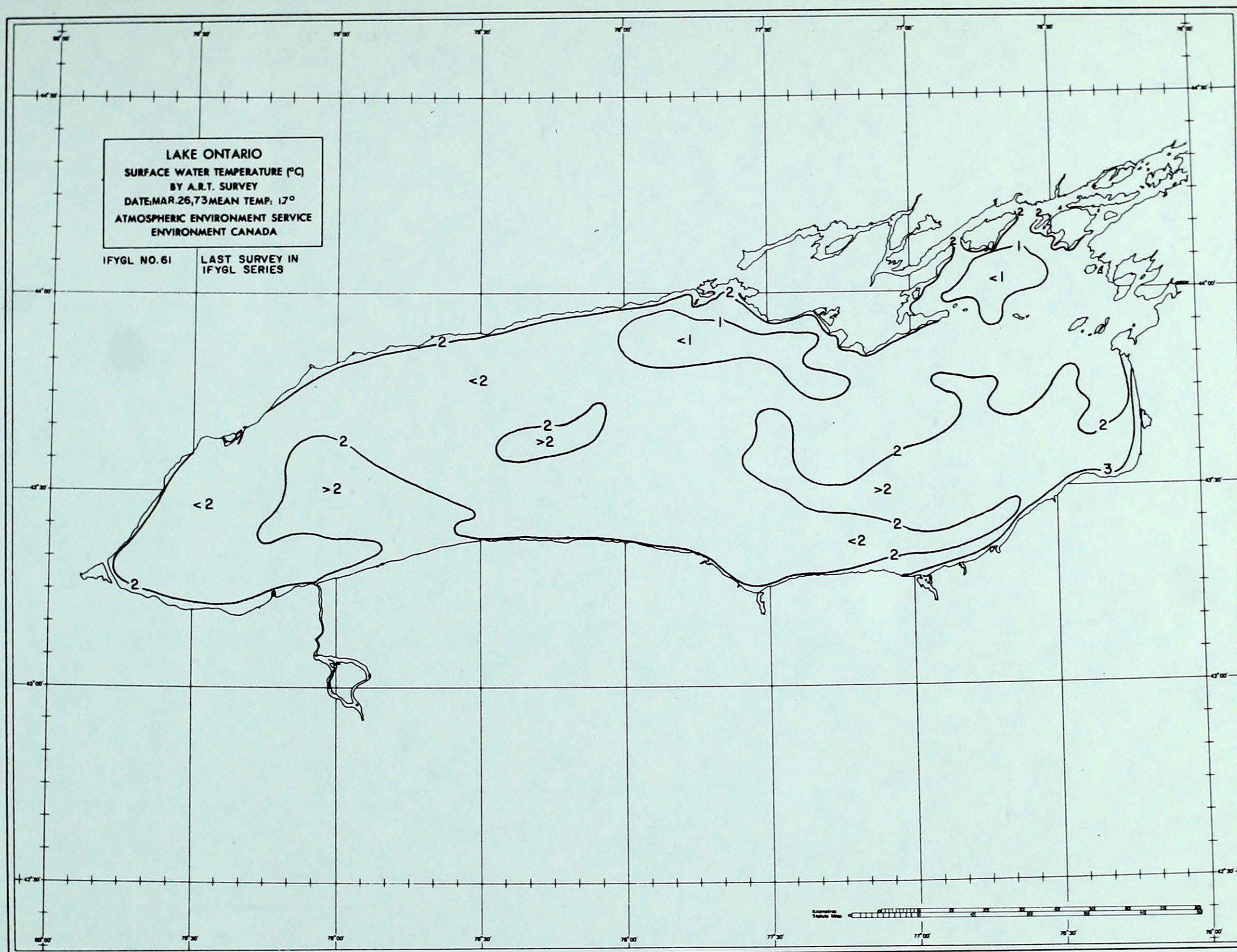
DAY	29/03/73								30/03/73								31/03/73							
HR	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22	01	04	07	10	13	16	19	22
CLD	9	10	10	8	8	4	9	10	8	10	10	10	10	10	10	10	10	10	9	10	10	10	10	10
WDRN	S	SE	SE	SE	S	S	SE	SE	SE	S	SE	S	SE	SE	SE	V	V	V	N	V	NE	NE	E	E
WSPD	5.0	3.0	4.0	4.5	5.0	5.0	2.5	3.0	2.5	1.0	3.5	3.0	3.5	3.0	2.5	1.5	1.0	2.5	2.5	2.0	3.5	3.0	2.5	5.5
T <sub>a</sub>	8.0	7.1	6.8	9.1	13.0	14.3	11.6	10.2	8.3	8.0	7.4	8.1	9.1	9.4	8.7	8.2	7.6	7.4	6.7	8.9	11.7	12.4	11.9	11.9
PPTN	-01	01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-01		01-07		07-13		13-19		19-
YYZ	0.8	2.0		0.8		0.3				1.0		5.6		T		T								
YTR		0.3		T				T				2.5		2.8		T				T				
ROC		T		T						1.0		5.1		T		T								
	T <sub>a</sub> 10.0(+7.5)								T <sub>a</sub> 8.4(+5.6)								T <sub>a</sub> 9.8(+6.8)							

## WEATHER

26/03/73 – 31/03/73

Cold Front enters the upper Great Lakes region on 26/03, but the lower Great lakes remain in warm air; strong NE winds, broken cloud in the morning, clear in the afternoon. High Pressure ridge, centered over northern Quebec on 27/03, moves southeast to the Atlantic coast on 28/03. Strong NE winds in the morning of 27/03, become moderate to light variable in the afternoon. Very light E winds in the morning of 28/03, increase to moderate SE in the afternoon. Sky remains clear on both days. A frontal trough enters the lower Great Lakes area on 29/03 and a filling quasistationary Low Pressure centre remains over the area until 31/03. Warm, with light to moderate SE winds, broken to overcast cloud cover and showers on 29/03 and 30/03. Continuing warm and overcast on 31/03, with very light and variable winds in the morning, light NE in the afternoon.





SURVEY NO. 61

26/03/73

 $T_w$  1.7 (+0.3)

The last survey in the IFYGL series is completed as scheduled in good weather conditions.

Mean surface water temp. has increased  $0.3^\circ$  since 20/03 and is slightly above normal.

The surface water temperature pattern shows an over-all small rise in temp., which has resulted from heating by solar radiation on 23/03 and 24/03, and from surface mixing by wind. Only small lenses of  $<1^\circ$  water remain in the northeast basin and off the Prince Edward County shore. The temperature of most of the lake surface is very uniform at slightly above, or below  $2^\circ$ . Shallow water warming has resumed and is particularly noticeable along the north shore.