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EASTERN CANADA FACES WATER SHORTAGES

The following statement was made by Mr. John N. Turner, Member of Parliament, on June 30, at the inauguration of a seminar on water levels sponsored by the Montreal Port Council:

...Water remains Canada's most important natural resource. It is a resource which has always seemed plentiful and to which we Canadians have devoted altogether too little attention, except at times of crises – flood or drought. Water serves many needs. We Canadians have failed to think of water in its widest terms – water as water. We have traditionally thought of water as a great source of energy – a source of hydro-electric power. But, increasingly today, water is becoming important for its consumptive uses – important for industrial purposes, for irrigation, for pollution control, processed steam and so on. These other needs are becoming more valuable, and more competitive with water as a source of power or as a means of navigation.

Not only are the uses for water changing in character, but the needs for water are becoming paramount in ever-widening areas of the country. Water used to be a regional problem, isolated in small areas. The need is now reaching the proportions of river basins and entire lake systems... Water has become national in importance and will become – sooner than we think – our concern on a continental basis. River basins will no longer be considered as isolated one from the other; water diversions will be made from one system to another in order to relieve shortage. We may even look forward to a continental system of diversions linking water-surplus areas to those areas in short supply.

WATER-MANAGEMENT PRIORITY

It must now be clear to all of us that the development of a national water-management policy is a priority which must occupy us for the next generation. I want to say to you at the outset that Canada has had such a policy for many years but that, to my mind, it must be revised and sharpened... There are no immediate, dramatic solutions. We are dealing with natural phenomena that yield to man only slowly. No one can wave a magic wand or pull a lever and raise the water-level at Montreal by a flick of the wrist. This is no time to succumb to the temptation of political manoeuver or of harsh, impatient words.

PROBLEM OF TWOFOLD CO-ORDINATION

When any commodity enters into short supply, that is to say when it is insufficient to satisfy all the demands for it, then necessary comflicts develop. This is the situation with respect to water in the Great Lakes and St. Lawrence River system. There is already a conflict respecting the optimum use of the water as between Great Lakes ports and communities and the river communities of the St. Lawrence. We must recognize, therefore, that for Montreal to insist on a minimum water-level at the port may conflict with the legitimate needs of other ports farther up the river and on the Great Lakes. Conflicts are also developing outside the realm of navigation, as between the various uses of water – hydro-electric power, anti-pollution, irrigation, industrial consumption and so on. Water is a multi-use resource and navigation is only one use of that resource, albeit a crucial one for Montreal. In addition, we have

(Over)

jurisdictional conflicts. Control over water within the meaning of the British North America Act is divided in rather indefinite terms between the federal and provincial spheres, depending upon the use and purpose of the control. So, in parts of Eastern Canada, we have the problem of a commodity in short supply, destined for several conflicting uses, and subject to a divided control by federal, provincial and municipal governments. It should be the purpose of a national water-management policy to resolve these conflicts by way of a twofold co-ordination: co-ordination of the manifold uses of water and co-ordination among the three levels of government.

INTERNATIONAL JOINT COMMISSION

What do we have by way of water management in this country? We should be clear that a very considerable degree of management does prevail now and indeed has had a considerable history. There is today very active management of water on the Great Lakes and St. Lawrence River systems. Lake Superior and Lake Ontario are regulated within specific limits by the International Joint Commission, the body set up by Canada and the United States. The Ottawa River is regulated, and this regulation has a further bearing on Montreal harbour levels. The Prime Minister has recently announced that Canada believes that the possibility and benefit of increasing the level of regulation to the other lakes in the Great Lakes system should be investigated by the IJC. A draft reference has been sent to Ontario and Quebec for their comments with a view to sending it to the United States as a proposal for a joint reference to the IJC. It is our position that any steps taken to regulate and control water levels on the Great Lakes should be taken through the IJC. We do not intend to establish any new agency.

I think it is essential for the purposes of this seminar that we recognize some of the important factors with which the engineer must deal in considering the control of the Great Lakes and how these factors bear on the water levels of Montreal Harbour. The Great Lakes and St. Lawrence River system is unique and differs from other river systems because of the large surface area of the Great Lakes, about one-third of the total drainage area.

The *seasonal* variations in the water levels of the Great Lakes are due to phenomena that occur every year. The *long-term* variations in water levels are due to the large surface area and restricted outlet capacities of the Great Lakes, and these result in the accumulation over the years of the effects of persistent precipitation excesses or deficiencies. Such an accumulation means that the average levels can remain either above or below normal for many years and that the normal seasonal variations are superimposed on a higher or lower base. This type of variation is very different from the variations observed on ordinary river systems. It also explains why the Great Lakes can be low when neighbouring rivers and lakes are high or vice versa.

WATER STORAGE

Of the four Great Lakes, if we exclude Lake St. Clair and consider Lakes Michigan and Huron as one lake, two are completely controlled (Lakes Superior and Ontario) and two are not (Lakes Michigan-Huron and Erie). One of the basic principles used in the control of the lakes is to store water during periods of ample water supply for use during periods of deficient supply. There are several limitations on the amount of water which may be stored. Two of the more important of these are the amount of water available for storage and the storage space available. It is obvious on lakes the size of the Great Lakes that the storage available is greater than can be filled or emptied in a few months. For example, it has taken a series of three years of below normal precipitation to deplete the storage on the Great Lakes to the present levels. This has resulted in low levels and low outflows for the lakes which are not regulated. The lakes which are regulated have been held as high as possible under these drought conditions, and every opportunity to store additional water has been taken. However, since the regulated lakes have been subjected to low rainfall, and since their outflows have to be maintained to meet downstream requirements, their storages are also deficient. This is the situation with respect to Lake Ontario. There was opportunity this spring to store additional water on Lake Ontario, and the International St. Lawrence River Board of Control took advantage of this opportunity after consulting with the operating entities on the river. This storage will be used in the ensuing months since the depleted storage on Lakes Erie and Michigan-Huron will result in low water supplies for some months ahead.

TIME RELATIONS

Also of importance with respect to the storage, and consequently the levels, of the Great Lakes are the time relationships. It requires approximately three years for 50 per cent of a change in the outflow from Lake Superior to reach the St. Lawrence River. Why should this be so? Because a large volume of water is required to raise the water levels of Lakes Michigan-Huron and Erie in order to increase their outflows. For example, it would require almost one *million million* gallons of water to raise Lake Michigan-Huron sufficiently so that it could discharge an additional 2,000 cubic feet per second of water. This additional flow, if transferred to the St. Lawrence River, would raise Lake St. Louis and the Montreal harbour levels by about one inch. These are tremendous forces with which we are dealing, and changes in them persist in the system for many years.

The water levels in Montreal Harbour and on Lake St. Louis are not only subject to the storage problems and regulation effects of the Great Lakes, but are also affected by the regulation of the Ottawa River, winds, and local rainfall. In addition, Montreal harbour water levels are affected to some extent by tides. To give an idea of the importance of rainfall on the Great Lakes to Montreal harbour, we should note that it would require only one inch per year of additional rainfall running off from the entire basin, to provide sufficient flow to raise the harbour levels by an average of over one foot.

Now what can we suggest as possible lines of enquiries for prospective solutions to the water-level crisis? In pursuing these possibilities, I would like you to keep in mind the two points which I mentioned

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AVON THEATRE RESTORED

The playing of the Festival fanfare and a simple ceremony marked the opening of the newly-refurbished Avon Theatre at Stratford, Ontario, on July 3. On the stage, Mayor C.H. Meier of Stratford presented a baton to Conductor Louis Applebaum and the theatre was declared officially open. A glittering first-night audience viewed the first Stratford presentation of Gilbert and Sullivan's "The Yeomen of the Guard".

The Avon Theatre, purchased last year by the Stratford Festival, has been restored to its original turn-of-the-century atmosphere, with modern amenties. To many, the changes will be evident the moment they walk through the auditorium doors.

COMPLETE REJUVENATION

Planned by Robert Fairfield, the Toronto architect who was awarded the Governor-General's medal for the design of the Festival Theatre in 1957, the auditorium has been given a complete rejuvenation, with striking decor by Tanya Moiseiwitsch, designer of the Festival's renowned open stage. Gold-brocaded wallpaper and burnt orange carpeting have given the auditorium traditional elegance and charm. The seats have been re-upholstered and re-covered in deep olive green. An imposing seven-foot crystal chandelier commands the dome in the centre of the ceiling, complemented by seven matching ceiling and 16 wall fixtures.

Atop the proscenium arch is a 24-foot baroque cartouche, designed by Miss Moiseiwitsch and executed by Robert Ihrig of Stratford. The front stage curtain, hung so that it can be used either as a "traveller" or a "drop", consists of 210 square yards of gold velour and weighs an eighth of a ton.

Patrons will also find the new Avon comfortably cool, with an air-conditioning unit controlling the temperature at an even 73 degrees.

The National Festival Orchestra, under the direction of Louis Applebaum and John Cook, will be more easily accommodated in the enlarged orchestra pit, which will now seat 40 musicians.

OTHER BENEFITS

Behind the proscenium arch, the stage has been enlarged by a bow-front apron and its height has been increased by 16 feet with a new "grid" that makes for greater efficiency in the flying of scenery. An addition to the stage-house provides an extra 40 feet on stage right and houses the mechanical room, storage and workroom areas and dressing rooms. A new lighting system, in which a pre-set electronic lighting board controls the 140 stage lamps, has been installed.

Into the reconstruction have gone 200 tons of steel beams, replacing balcony and stage supports in the original building and the new wing; 6,000 board feet of Norway pine flooring has replaced the old stage boards; over 1,000 feet of metal duct-work have gone into the new air-conditioning system; more than a mile of cable, 3,000 feet of rope and seven tons of counterweighting have been rigged to handle the raising and lowering of scenery; 600 square yards of carpeting have been laid; the balcony floor has been completely replaced.

Months of work and hundreds of man hours have gone into the restoration. Now lighting technicians, painters, carpenters, stage-hands, interior decorators, bricklayers – well over 60 men – continue to work around the clock as the official opening draws nearer.

The "front of house" for this year is frankly and unapologetically makeshift, its shortcomings masked from public view on Downie Street by a facade of plywood and festive bunting. The next phase of reconstruction – which, it is hoped, can be undertaken soon – will be in this area, providing greater lobby space, exhibition facilities, box office, lounge and a reconstructed exterior.

When completed, the Avon Theatre will take its place with the Festival Theatre as one of the truly handsome playhouses of Canada.

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CANADIAN WIND TUNNEL FOR INDIA

An aeronautical-research wind-tunnel designed and manufactured in Canada has been sold to India, according to Mr. Mitchell Sharp, the Minister of Trade and Commerce.

The Export Credits Insurance Corporation will lend $4,200,000 to the Government of India to finance the purchase of Canadian equipment and services for the installation of a trisonic wind-tunnel four feet square in the National Aeronautical Laboratory at Belur, Bangalore State. The tunnel will provide all the primary aerodynamic performance requirements for model testing, and will be available to Indian Government and commercial research agencies.

The new Indian wind-tunnel will be of the intermittent-blowdown type rather than the continuous-flow type. It will have a subsonic, transonic and supersonic capacity from Mach 0.2 to Mach 4. Coupled with an electronic data-handling system, this type of tunnel can provide, in 10 to 40 seconds, data that would require much longer periods of testing if conventional methods were employed.

The ECIC loan agreement was negotiated under the special credits committed to India by Canada as is contribution to the World Bank Aid India Consortium. This is the sixth such agreement signed between Canada and India to provide long-term financing to assist India's economic development. With the new agreement, contracts signed under the Special Credits for India reached $60,500,000. Terms of the present loan call for repayment in 23 semi-annual instalments after a four-year grace period. The interest rate is 6 per cent.

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EXHIBITION OF VINTAGE AIRCRAFT

Tourists and residents in Ottawa this summer will have the opportunity to view 19 famous aircraft chosen from the historical-aviation holdings of the of the Canadian War Museum, the National Aviation Museum, and the Royal Canadian Air Force.

The old 'planes will be on display at RCAF Station Rockcliffe every day until September 7.

In addition to the full-scale aircraft, there will be a series of panels cut from "Halifax" bombers, depicting various methods of decorating individual 'planes. These panels are from the Canadian War Museum collection.

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previously. The first – the large volume of storage required to provide improvement, and the second – the time required for any improvement in the upper lakes to reach Montreal harbour.

DIVERSION FROM NORTHERN SOURCES

Obviously, the present problem is lack of water and the solution is to obtain additional water that is not at present being used. This suggests diversion into the lakes. One of the sources that has been suggested is water that now flows into James Bay. Since this resource is in either Ontario or Quebec, it falls under the jurisdiction of these provinces. Such diversion might be made into the Ottawa River or into one of the Great Lakes. If the water were diverted, certain problems would be encountered. Certainly, it would improve low water levels, but it could increase the risk of flooding unless the diversion could be shut off when high water was anticipated. This would require, in the case of a diversion into Lake Michigan-Huron, a forecast two to three years ahead because of the time relationships I spoke of earlier.

Speaking personally, I am one of those who look optimistically upon the imaginative possibility of diversions from the rivers flowing north back into into the Great Lakes and Ottawa River systems. I have been told that such diversions are now possible in terms of engineering. The cost would be phenomenal, but anything becomes economically feasible if there are those willing and able to pay for it. The consumptive demands of the Canadian provinces and American states around the Great Lakes may soon reach such intensity that the financing of such a diversion would be practicable. Two strong words of caution should, however, be said – namely, the difficulty of predicting precipitation on the Great Lakes, and the time-lag of two to three years in run-off throughout the system. A danger might exist of diverting water into the Great Lakes followed in a subsequent year by heavy precipitation, both of which together might cause flood conditions that it would then be too late to control. We have not discounted the possibility or indeed the necessity for using computer controls in the regulation of the Great Lakes. However, even with such controls there would have to be considerable foreknowledge of the hydrometeorological conditions which could be expected many months in advance, so that diversions could be made without subsequent damage to the balance of the Great Lakes system. I wonder whether our weather forecasts are yet accurate enough to be fed into such a computer-control system.

OTHER POSSIBLE SOLUTIONS

A second possible solution to low water levels might be the release of storage on Lake Superior. Lake Superior levels are near normal, and satisfactory rainfall in recent weeks has further improved conditions. It would be logical to release any additional water available to downstream users. This certainly has merit as a long-term assist but, again, the time relationships in the storages of the Great Lakes prevent a large portion of this benefit from reaching the lower lakes and Montreal harbour for well over one year. Some additional water has already been released this year and this possibility is being further explored by the International Joint Commission and its Lake Superior Control Board.

A third possible solution is regulation of *all* the lakes. As I said before, only two of the four Great Lakes are now being regulated and it seems to me that before we consider adding water *to* the system we should study what can be done with the *natural* supplies through co-ordinated regulation of the four lakes. This is what the Federal Government is proposing. This would enable larger amounts of storage to be set aside at the beginning of dry periods to maintain flows through these periods. Many technical problems are raised which will require intensive study. One of the most difficult would be the development of improved, long-term weather forecasts. Economics would have to be considered because of the very high costs of the works required.

SUMMATION

To sum up my remarks, the problems of low water on the Great Lakes are intensely complicated. Two of the more complicated relationships affecting these are the volume of storage and the time required to make significant changes in this storage. Three possible solutions suggest themselves from my remarks. These are diversion, release of storage from Lake Superior, and more complete regulation of all the lakes. Diversion to the Great Lakes could make conditions of high water worse. Release of storage in Lake Superior is not a solution which will provide immediate relief to Montreal harbour or Lake St. Louis, but would assist lake levels in Michigan-Huron. Regulations of all the lakes is perhaps the best initial approach, and we should direct our efforts so as to determine how the water which is now available to the Great Lakes basin can be used more effectively by regulation of the remaining lakes, bringing the whole system under integrated control...

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STRATFORD CHAMBER WORKSHOP

On June 29, musicians from Vancouver to Halifax met in Stratford, Ontario, to form the National Festival Orchestra and to begin their activities in the Chamber Music Workshop.

This season, six guest instructors and three Canadian pianists have been engaged for the Workshop sessions, which opened on July 1 and will end on August 15 at the Stratford Festival. An important feature of the Workshop season is the participation of three outstanding pianists, together with one of the resident quartets, in the study of one of the major piano quintets. There will be six Saturday morning concerts, with the pianists Sheila Henig, Patricia Parr and Paul Helmer as guest artists and Leon Fleisher, David Mankowitz, Charles Rosen, Robert Koff, Sol Schoenbach and Rudolf Firkusny as visiting instructors.

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