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InterOffice Communication-COUPL02R

To: Planning Advisory Committee
Attn.: Gail Foisey Esqrs., Secretary
Halifax County Municipality

From: S. M. Mandaville, Co-Ordinator

Date: 06 March 1995

Subject: SUBMISSION # 9501R to the plan review process for Districts 15, 18 & 19--LAKE CARRYING CAPACITIES **with special reference to allowable change in `productivity'** of all lakes in the said districts

For purposes of brevity, this submission will be in a point format. I will be pleased to expand/elucidate on any point(s) to the `PAC'.

[I] Issues relating to land development (and other auxiliary aspects, i.e. alterations to the terrestrial ecosystems) are generally considered to be a municipal priority and not provincial, and there have been several authenticated `proven precedents' from elsewhere and among the ones we are cognizant of and which stand out are the Regional District Municipality of Muskoka (approx. 500-600 lakes) as well as other adjacent jurisdictions, and in slightly different aspects, the bi-State authority (at the municipal level) dealing with certain development issues relating to Lake Tahoe on the California-Nevada border. Kings County is actively considering such *modus operandi* w.r.t. lakes Aylesford, George and Loon. `Shifting the responsibility' to the N.S. Dept. of Env. bespeaks of the lack of leadership/interest on the part of Municipal Councils/Committees. N.S. Dept. of Env. has already notified us in writing (once by the Minister and a second time by a senior staff member) that the Province will co-operate with Municipalities willing to be stewards of the water resources located in their jurisdictions. Indeed the Province is aggressively co-operating with the Kings County w.r.t. the aforementioned 3 lakes even though they are not in any sense of the imagination `that polluted' and we understand are on an Oligo to Meso transition.

[II] The fundamental way to handle this aspect is as follows:

(A) Incorporate the `superb wording' w.r.t. the philosophy of Lake Carrying Capacities suggested by the County Planning staff in their report d/February 06, 1995 w.r.t. Planning Dts. 1 & 3, a recommendation you rejected. That wording is quite general and applies to any and all areas, not just in the County but worldwide.

(B) Having first accomplished the aforementioned task, then we suggest assigning maximum allowable average ice-free Chlorophyll-a (Ch-a) concentrations. These values are dependent upon the desired uses for each lake as ascertained by the **`community at large'.**

Since the concept of *Lake Carrying Capacities* is new in Nova Scotia, someone on the County's part should explain to the public their significance. **THESE CONCEPTS ARE NO DIFFERENT THAN THE NUMEROUS CONTROLS IMPOSED BY THE PLANNING AS WELL AS THE ENGINEERING DEPTS., EXCEPT THESE RELATE TO THE BENEFICIAL USES OF OUR VALUABLE WATER RESOURCES, a concept not presently enshrined anywhere.**

a) In general, average ice-free Ch-a conc. up to about 2 µg/l indicate low algal densities and an unproductive or nutrient-poor lake (but of `good quality' per general terminology). Ice-free average concentrations below 1 µg/l indicate `high quality' per general terminology. Average conc. between 2 and 5 µg/l, although moderately high, are acceptable for swimming and other water contact recreation (`fair quality' per general terminology). However, lakes in this intermediate range can experience short term pulses of up to 10 µg/l to 12 µg/l in warm, calm periods in midsummer/fall, producing algal blooms. Average ice-free conc. exceeding 5 µg/l are high; at these levels, water quality for swimming and other water contact recreation frequently deteriorates, and aesthetic quality declines.

b) You do not need existing data to pick a desirable Ch-a value (which is based on the desired/preferred public uses), but nevertheless data of varying intensities are presently available in the public domain and we have already catalogued all of the reliable ones and are available to you on request from us.

g) Having picked desirable Ch-a values, equivalent TP (Total Phosphorus) values have to be computed and there are a host of statistical relationships, the more credible of which are the international `OECD' studies, the Dorset Research Center's work and the Carlson indices (the latter ones are mandatory in the U.S. for projects funded by the USEPA Clean Lakes Program). We have already prepared easy to understand *Synopsis* and these are available to you on request.

[III] The next sequence is to ascertain what steps if any are needed for development controls. These will of necessity vary between areas serviced by onsite systems and those serviced with central systems with areas serviced by STPs discharging into fresh-watercourses being a whole different ball-game.

(A) Dts. 15, 18 & 19 are predominantly served by onsite systems with a few STPs discharging into lakes. At the present there is nothing simple you could do w.r.t. STPs which do not have TP removal (properly functioning secondary STPs remove 0-20% of the TP. In addition, 80-95% of the TP in the STP effluent is in inorganic form which has high biological availability for algal growth and depending on total loading, the effects could be quite dramatic and pronounced especially during the summer months when minimal flushing takes place in most lakes). **Though what you can definitely achieve is to ascertain the desirable number of onsite systems within 300 meters of lakes, and secondly within 300 meters of streams (if needed) mapped on the 1:50,000 topographic map series.**

In this regard, we have developed relatively extensive spreadsheet models of most areas in question and they are easily understood by anyone having a rudimentary knowledge of

`Lake Management'. We herewith undertake to supply a copy of the model(s) on request and these can easily be read if you have MSExcel software. We made the spreadsheet quite flexible, in other words, you could vary any of the inputs (including export coefficients) at ease and obtain answers to ***"what if?".***

(B) Alternately, you could use a different system which is also being promoted by the Canadian leader, the Dorset Research Center of the Ontario Ministry of Environment & Energy, namely allowing phosphorus to increase a certain percentage over natural background values (together with aerial deposition) subject to a cutoff of a maximum value. We believe the cutoff is 20µg/l TP, but we are awaiting the info from Ontario and on receipt we will be sending same to you/staff.

[IV] Note: NOTWITHSTANDING recent publicity locally, various `alleged' innovative systems have not proven themselves. While these together with stewardship practices will have some benefit, the magnitude is not expected to be significant. Those of us who are quite proficient in our studies of literature published since the late `60s (i.e. keeping on top of articles published in related leading scientific journals, not general public interest magazines) are totally aware there have been numerous studies and all sorts of claims in the international domain, but to date only a small handful have proven their efficacy and have been accepted by peers worldwide. Even these latter ones have not had totally desirable results that the authors originally claimed when assessed by independent authorities at arm's length. **This is the reason that the Ontario Ministry of the Environment & Energy has been aggressively promoting controls on the numbers of onsite systems**.

Even in perfectly operating systems (which are rare in the real world), considerable amount of phosphorus stays in a plume and does progress downstream to the lake through principally **macropores resulting from decaying roots & vegetation in soil as well as through fractures in bedrock, and other phenomenon.** The rate of progression and the magnitude will depend upon the soil complexes, etc. but it is believed that eventually (years to decades), phosphorus will reach the lakes. By applying the 50% retention figure in Halifax and Wolfville soils reported in the 1978 Shubie studies by Hart, Scott & Ogden, and conducting our theoretical modelling utilizing the latest regression relationships from the Dorset Research Center, we have been able to account for the phosphorus loading in most lakes where reliable inlake data is extant.

Our results and conclusions are similar to those of the Hart, Scott & Ogden study except that we covered much larger number of lakes in numerous watersheds (approx. 300 at various stages of completion at the present) and we have the added benefit of some latest international research which the investigators mentioned did not have at their disposal in 1978. We like to caution you that even the 50% retention was derived only for properly functioning systems and in addition was based on short time-span field monitoring (several months). While laboratory tests will not show these since ideal conditions exist there, in the real world they are only a dreamworld. It is indeed possible to attenuate the phosphorus loading (through closed systems) but is quite costly and impractical in most cases. In urban areas, it is a case of impervious areas, etc., and we will not address these at the present time as this submission will get inordinately lengthy, in addition, it is quite difficult to summarize an enormous amount of scientific

literature from the last 20 years in submissions like these, but we have now prepared several synopsis as well as literature references, and they are available on request for your study and assimilation.

[V] Incidentally, it is an accepted fact that the background values (together with direct aerial deposition) of phosphorus in many of our County lakes is quite low and per the theoretical modelling lie mostly in the **2-4 mg/l** range (assuming clearwater lakes). Dr. John Underwood while at the N.S. Dept. of Env. carried out some basic field sampling of several pristine and near-pristine lakes in Halifax County and he has supplied all of his data which we categorized. The results from the 1984 survey are that the mean TP values for 22 pristine clearwater lakes was **2.7 mg/l (range was less than 1 to 5).** Paul Mandell, a Dalhousie researcher based on sampling during 1991-92 obtained a value of **4 mg/l TP (0.53 mg/l of Ch-a)** for Pockwock lake with a slightly disturbed watershed (anecdotal). We have considerable data on other lakes in National Parks and elsewhere and they are once again available to you in summary format if you request for same.

Whether you believe you can or believe you can't, either way you're right

..... Henry Ford